

# Carbon emissions in the Investment Framework

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TPG24-34

December 2024

## Acknowledgement of Country

We acknowledge that Aboriginal and Torres Strait Islander peoples are the First Peoples and Traditional Custodians of Australia, and the oldest continuing culture in human history.

We pay respect to Elders past and present and commit to respecting the lands we walk on, and the communities we walk with.

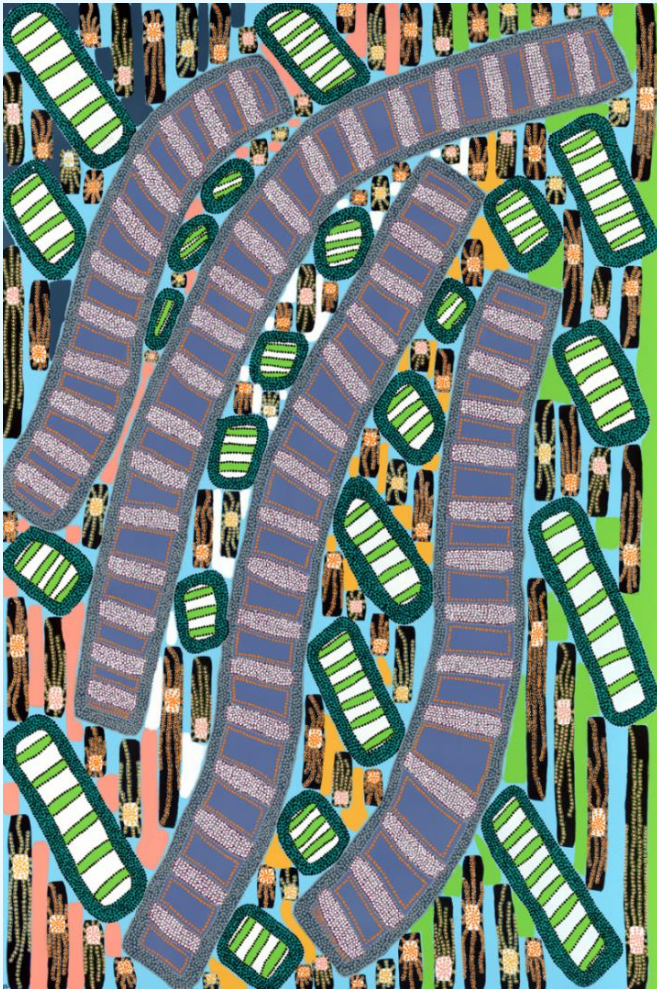
We celebrate the deep and enduring connection of Aboriginal and Torres Strait Islander peoples to Country and acknowledge their continuing custodianship of the land, seas and sky.

We acknowledge the ongoing stewardship of Aboriginal and Torres Strait Islander peoples, and the important contribution they make to our communities and economies.

We reflect on the continuing impact of government policies and practices, and recognise our responsibility to work together with and for Aboriginal and Torres Strait Islander peoples, families and communities, towards improved economic, social and cultural outcomes.

Artwork:

*Regeneration* by Josie Rose



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Key information	
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<input checked="" type="checkbox"/> <b>GUIDANCE/ADDITIONAL INFORMATION</b> to provide clarity or explain requirements in detail.	

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Document version number	Approval Date	Author	Approver	Description
1	December 2024	Centre for Economic Evidence	Michael Coutts-Trotter, Secretary, NSW Treasury	This document sets out the requirements on including carbon emissions in business cases and the carbon values that NSW Government agencies must use when valuing carbon emission impacts in cost-benefit analysis.

# Carbon emissions in the Investment Framework

## Purpose

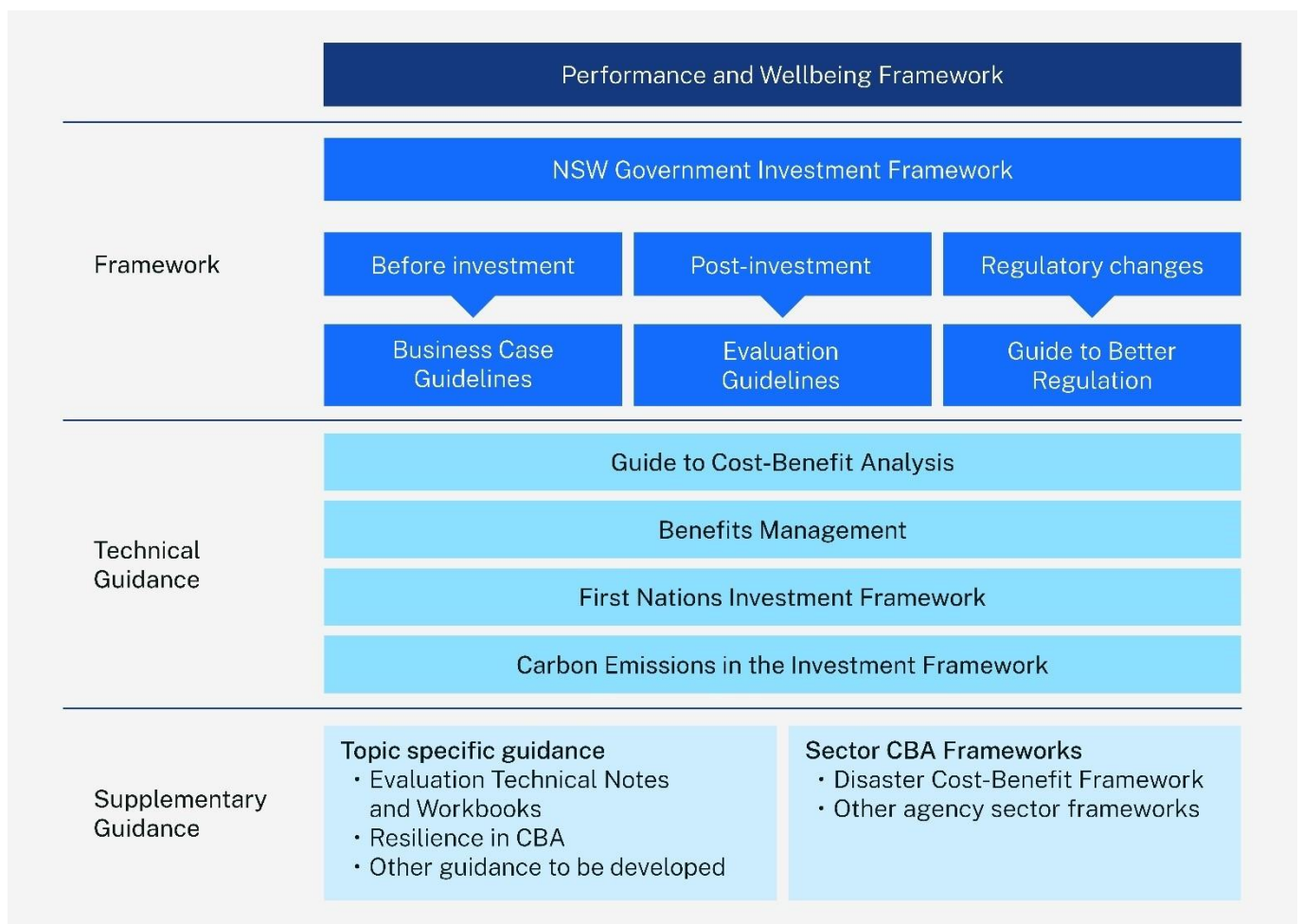
This document sets out the NSW Government Investment Framework requirements on carbon emissions. It also presents the carbon values that NSW Government agencies must use when valuing carbon emission impacts in cost-benefit analysis (CBA).

This set of carbon values is a non-market ‘shadow price.’ It is designed for internal use in government decision-making and will not impact the price of goods and services in the broader economy.

## Background

The NSW Government Investment Framework ensures a consistent, evidence-informed approach to assessing projects, programs and policies (referred to as ‘initiatives’) throughout their lifecycle. This document forms part of the Framework and provides technical guidance to support assessment of carbon impacts before investment, post investment, or for regulatory changes (see Figure 1).

Figure 1: NSW Government Investment Framework



### More guidance

- [NSW Government Business Case Guidelines \(TPG24-29\)](#)
- [Evaluation Guidelines \(TPG22-22\)](#)
- [Guide to Better Regulation \(TPP19-01\)](#)
- [NSW Government Guide to Cost-benefit Analysis \(TPG23-08\)](#)
- [Benefits Management Framework \(TPG24-31\)](#)
- [First Nations Investment Framework \(TPG24-28\)](#)

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## Summary of requirements

### Mandatory

As part of business case and CBA development for an initiative, NSW Government agencies are required to:

- consider the impact on emissions that:
  - occur in New South Wales, or
  - occur elsewhere to manufacture or transport materials or products consumed in New South Wales
- include carbon emissions in CBA for:
  - all capital projects with a total cost of \$100 million or more, or
  - for other projects (capital, recurrent, digital, regulatory changes) when likely to materially impact the results or decision making
- use the carbon values in Table 1 when valuing carbon emission impacts in CBA, and
- use the carbon values in Table 2 for sensitivity analysis.

# 1 Assessing carbon impacts

## 1.1 What emissions should be considered?

Emissions that occur within New South Wales and emissions from the manufacture and transport of materials consumed in the state, regardless of where they occur, are within the scope of this policy.<sup>1</sup> This includes embodied carbon, operational carbon and enabled emissions (see Box 1). It does not include emissions that occur elsewhere from the use of products produced in New South Wales. These can, however, be considered and presented separately when of interest to decision-makers.

Examples of in scope emissions associated with NSW initiatives include those from:

- the combustion of fuels within New South Wales, whether as part of the initiative, for the purposes of generating electricity for the initiative, or by NSW residents because of the initiative
- the manufacture or disposal of products within New South Wales
- overseas industrial processes to manufacture materials and products used in New South Wales
- transportation of materials to a site
- the use of land within the state.

Inclusion of emissions from materials consumed in the state regardless of where they originate avoids incentives to shift emissions offshore, which would place local industry at a disadvantage in bidding for government work while not decreasing global emissions.

Figure 2 Types of emissions in scope

Embodied carbon			
Product	Construction	In-use	End of life
<ul style="list-style-type: none"> <li>• Emissions from manufacture of products and materials used in the asset</li> </ul>	<ul style="list-style-type: none"> <li>• Transport of products to site</li> <li>• Energy</li> <li>• Construction waste</li> <li>• Land use change</li> <li>• Enabling works</li> </ul>	<ul style="list-style-type: none"> <li>• Use</li> <li>• Maintenance</li> <li>• Repair</li> <li>• Replacement</li> <li>• Rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>• Deconstruction</li> <li>• Waste transport, processing, and disposal</li> </ul>
Operational carbon		Enabled emissions	
Operational use, energy, and water		Users' utilisation of asset or services	
Circular economy			
Emissions beyond the asset life cycle including reuse, recycling, and energy recovery			

Adapted from [INSW Embodied Carbon Measurement for Infrastructure](#).

<sup>1</sup> This encompasses Scope 1 and 2 as well as upstream Scope 3 emissions.



## Definitions

**Embodied carbon:** Emissions associated with the creation, maintenance and end-of-life disposal of an asset. Includes emissions associated with the production and transportation of materials, construction-related emissions and end-of-life emissions. Emissions associated with maintenance, repair, replacement and refurbishment over the asset life are also considered part of embodied carbon.

**Operational carbon:** The emissions associated with the operation of assets, particularly energy and water usage. It may also include fugitive emissions of refrigerants and chemicals for (waste) water treatment.

**Enabled emissions:** Emissions associated with activities enabled by an initiative (for example, emissions from third-party vehicles driving on a road).

**Circular economy:** The next cycle of embodied carbon where recycled content reduces emissions when producing a new asset.

## 1.2 How should emissions be valued?

The costs of emissions, and benefits of reduced emissions, must be included in CBA for all capital projects with a total cost of \$100 million or more, or for all other capital, recurrent and digital projects and regulatory changes when likely to materially impact the results. The values apply when CBA is used before investment (ex-ante) and following investment (ex-post).

Table 1 provides carbon values in 2024 dollars for use in CBA. These were derived from a model of marginal abatement costs consistent with the state’s legislated emissions reduction targets. Refer to Appendix A for further details on the method and Appendix B for a comparison with other carbon values.

The financial year 2050 value should be applied if analysis extends beyond 2050. There is no need to apply indexation beyond financial year 2050, as the carbon values in this document are in real (2024) dollars.

These values must be applied in CBAs submitted after January 2025 and replace those in Technical Note – Carbon Value in Cost-Benefit Analysis.

Table 1: AUD carbon values (per tonne) for use in CBA (in 2024 dollars)

FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
\$130	\$131	\$133	\$137	\$146	\$164	\$196	\$240	\$284	\$316	\$334	\$343	\$347
FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45	FY46	FY47	FY48	FY49	FY50
\$349	\$350	\$350	\$350	\$350	\$350	\$350	\$350	\$350	\$350	\$350	\$350	\$350

### Carbon values for sensitivity analysis

The CBA Guide requires CBAs to include sensitivity analysis. Table 2 provides high and low carbon values for this purpose.

Table 2: AUD carbon value (per tonne) for use in sensitivity analysis (in 2024 dollars)

	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
High	\$230	\$231	\$233	\$237	\$246	\$269	\$313	\$370	\$426	\$470	\$501	\$522	\$538
Low	\$90	\$89	\$88	\$90	\$96	\$112	\$141	\$183	\$225	\$255	\$270	\$277	\$278

	FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45	FY46	FY47	FY48	FY49	FY50
<b>High</b>	\$552	\$565	\$578	\$590	\$602	\$614	\$627	\$639	\$651	\$663	\$676	\$688	\$700
<b>Low</b>	\$278	\$276	\$274	\$272	\$269	\$267	\$264	\$262	\$260	\$257	\$255	\$252	\$250

## 1.3 How should emissions be measured?

Table 3 provides references to technical guidance on measuring emissions.

Table 3: Carbon measurement guidance

Type of emissions	Technical guidance
Embodied	NSW Government Embodied Carbon Measurement for Infrastructure Technical Guidance <sup>2</sup>
Operational	Green Building Council Australia Energy Use Calculation Guide <sup>3</sup> Infrastructure Sustainability Council Energy and Carbon Guideline <sup>4</sup>
Enabled	Australian Transport Assessment and Planning Guidelines PV5 Environmental parameter values <sup>5</sup>

## 1.4 Strategic alignment with emissions targets and policies

The business case should explain how the initiative will contribute or otherwise affect relevant government emissions reduction policies and commitments.

Table 4: Emissions reduction policies and commitments

Policy	Emissions implication
NSW Climate Change (Net Zero Future) Act 2023	This Act legislates NSW's approach to addressing climate change. It enshrines whole-of-government climate action to deliver net zero by 2050, legislates emission reduction targets, sets an objective for NSW to be more resilient to a changing climate, and establishes the independent Net Zero Commission.
NSW Net Zero Plan Stage 1: 2020–2030	The Net Zero Plan Stage 1: 2020–2030 is the foundation for NSW's action on climate change and target to reach net zero emissions by 2050. It outlines the NSW Government's approach to protecting our future by growing the economy, creating jobs and reducing emissions in the decade to 2030.

<sup>2</sup> [Embodied Carbon Measurement for Infrastructure Technical Guidance](#)

<sup>3</sup> Available to Green Building Council Australia members

<sup>4</sup> Available to Infrastructure Sustainability Council members

<sup>5</sup> [Australian Transport Assessment and Planning Guidelines - PV5 Environmental parameter values](#)

Policy	Emissions implication
NSW Government Resource Efficiency Policy (GREP)	<p>GREP aims to reduce the NSW Government’s operating costs and lead by example when it comes to efficient use of resources. GREP includes measures, targets and minimum standards to drive efficiency in four key areas:</p> <ul style="list-style-type: none"> <li>• energy use</li> <li>• water use</li> <li>• waste management</li> <li>• air quality.</li> </ul> <p>The current GREP was adopted in 2019 and is in the process of being revised.</p>
NSW Government Decarbonising Infrastructure Delivery Policy and Measurement Guidance	<p>The policy adapts PAS2080: Carbon Management in Infrastructure principles to mandate embodied carbon management in the NSW Government context. Specifically at the business case stage, under the policy proponents are to:</p> <ul style="list-style-type: none"> <li>• apply the carbon reduction hierarchy</li> <li>• quantify and consider upfront carbon at a minimum</li> <li>• engage early with the market to develop low carbon solutions</li> <li>• develop a carbon management plan.</li> </ul> <p>The Embodied Carbon Measurement for Infrastructure – Technical Guidance provides the supporting methods and inputs to enable consistent measurement across asset types.</p>
Net Zero and Climate Change Policy (Transport)	<p>The policy sets out principles and requirements across planning and decision-making processes, resourcing and uplifting practices, and reporting and assuring processes.</p> <p>The policy prescribes the principles and requirements to:</p> <ul style="list-style-type: none"> <li>• achieve Transport’s net zero emissions and climate change targets</li> <li>• support the transport sector’s transition to net zero</li> <li>• continue creating a transport network that is resilient, responsive and optimally adapted to a changing climate.</li> </ul>

## 1.5 Development of lower carbon options

On an ‘if-not-why-not’ basis, business cases should consider options to:

- build nothing or build less (for example, demand reduction or regulatory change)
- upgrade or repurpose existing assets
- use assets for multiple purposes
- build differently (for example, infrastructure with less operational and enabled emissions, such as rail instead of road)
- design approaches and construction methods to minimise emissions. For example, using:
  - recovered, recycled, repairable or innovative materials
  - efficient construction practices such as just-in-time or design for manufacture and assembly

- energy efficiency measures such as installing insulation
- renewable energy such as solar panels or supporting the uptake of lower-emissions transport (e.g. including electric vehicle charging).

Lower carbon options can create additional costs as well as benefits. These trade-offs should be considered.

Refer to Infrastructure NSW (INSW) Decarbonising Infrastructure Delivery Policy and INSW Embodied Carbon Measurement for Infrastructure Technical Guidance for further guidance on identifying opportunities to reduce carbon emissions.

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## 1.6 Early market engagement

Decarbonisation should be one of the matters considered during early market engagement to encourage innovation, support identification of lower carbon options and improve understanding of the deliverability of these options.

The INSW Decarbonising Infrastructure Delivery Policy includes further guidance on engaging with the market to reduce upfront carbon for building and other infrastructure initiatives.

Refer to TPG24-29 NSW Government Business Case Guidelines for further guidance.

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## 1.7 Carbon management plans

The INSW Decarbonising Infrastructure Delivery Policy requires preparation of a carbon management plan as part of a business case, for:

- building initiatives with expected total cost over \$50 million
- other infrastructure with expected total cost over \$100 million.

A carbon management plan documents the governance, accountability, monitoring and reporting of activities related to managing carbon. It is a live document that is updated as the project progresses from planning into delivery and completion.

A carbon management plan may also be useful for initiatives not reaching the above thresholds where:

- the initiative has a carbon reduction target
- there are significant opportunities for carbon reduction over the initiative's lifecycle
- proponents wish to demonstrate credibility of their carbon reduction approach and carbon estimates.

An organisation-wide carbon management plan may be appropriate where carbon responsibilities and actions do not vary across projects.

Refer to the INSW Decarbonising Infrastructure Delivery Policy for further guidance.

# Appendices

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## Appendix A: Methodology for valuing carbon emissions

### Approaches to valuing carbon emissions

There are two common ways to value carbon emissions:

- **Damage cost approach** – estimates the amount of damage caused by marginal additional emissions. The cost reflects the value of damage caused by allowing an extra unit of emission.
- **Target consistent approach** – estimates the marginal cost of reducing emissions along a trajectory necessary to reach a defined emissions reduction target.

Typically, the costs of negative externalities are estimated by reference to the damage caused by those externalities. There are, however, several difficulties with a damage cost approach:

- It does not account for the state's 2030, 2035 and 2050 legislated targets.
- There is disagreement on modelling assumptions and estimates produced and adopted in other jurisdictions vary widely.
- It would be challenging to confine the damage cost assessment to New South Wales (the referent group specified in the CBA Guide) given the global nature of carbon emissions and the associated damages.
- Internationally, jurisdictions appear to be moving towards the target consistent approach.

A target consistent approach is therefore the preferred approach. The first-best method to value carbon emissions using a target consistent approach would involve a comprehensive Australian emissions market that values carbon emissions consistently with Australian targets, abatement opportunities and opportunity costs. Values would be revealed by market participants. No such market, however, exists.

In the absence of an Australian emissions market, the second-best method involves modelling the marginal abatement costs consistent with the state's legislated emissions reduction targets. This is the approach that was used to generate the carbon values included in Table 1.

### Marginal abatement cost modelling

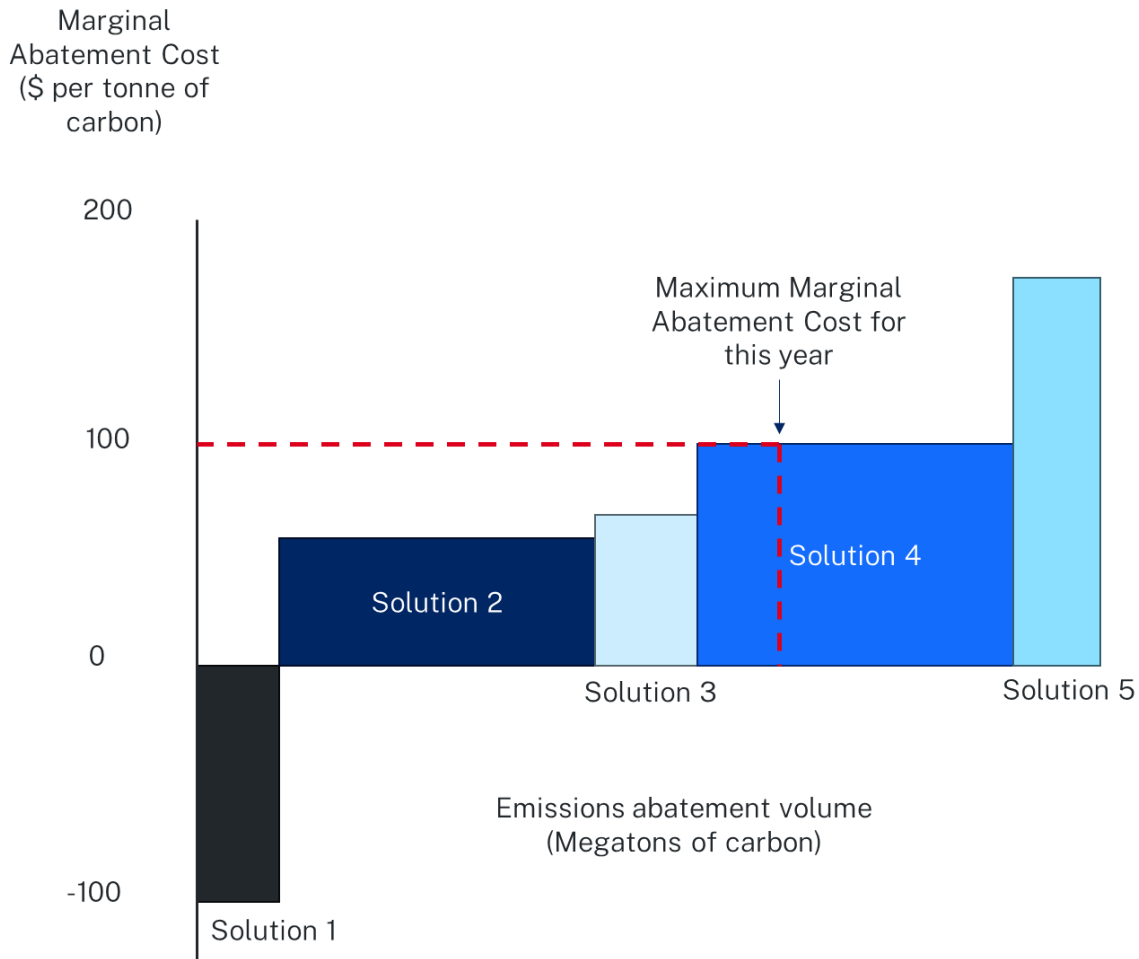
The model of marginal abatement costs was developed by NSW Treasury in collaboration with NSW Department of Climate Change, Energy, Environment, and Water, and Transport for NSW. It was informed by analysis of over 140 academic and industry reports, and workshops and interviews with decarbonisation experts.

The modelling involved:

- Identifying a shortlist of decarbonisation solutions most relevant to New South Wales by considering policy alignment, abatement potential, deployment readiness, and enabling infrastructure and capabilities. The shortlisted solutions are expected to deliver the vast majority of abatement in New South Wales.
- Estimating the abatement cost for each solution. Abatement costs change over time due to several factors including technology improvements, operational scaling and changes to the energy grid.
- Estimating the abatement volume each solution will provide. Abatement volume is assumed to increase over time for most solutions as initial deployment constraints are lifted.

- Estimating the emissions reduction required (from estimated baseline emissions) to reach legislated 2030, 2035 and 2050 targets for New South Wales.<sup>6</sup> A linear increase in targets between legislated target years was assumed.
- Determining the marginal abatement cost for each year. That is, the most expensive unit of abatement needed to meet each year’s emissions reduction requirement assuming shortlisted solutions are deployed from least to most expensive. Figure 3 illustrates this concept.
- Smoothing the set of marginal abatement costs to produce a set of values suitable for use in CBA (included in Table 1).

Figure 3: Marginal abatement cost curve for one year



Source: NSW Carbon Values Report, Deloitte

## Approach to estimating carbon values for sensitivity analysis

The high and low carbon values included in Table 2 reflect scenarios where abatement is more or less costly than expected. They were developed by varying assumptions around the volume of abatement, speed of deployment, cost-effectiveness of the shortlisted solutions and volume of abatement required each year.

<sup>6</sup> Only the State’s Scope 1 emissions were considered, which is consistent with the legislated targets.

## Appendix B: Comparison with other carbon values

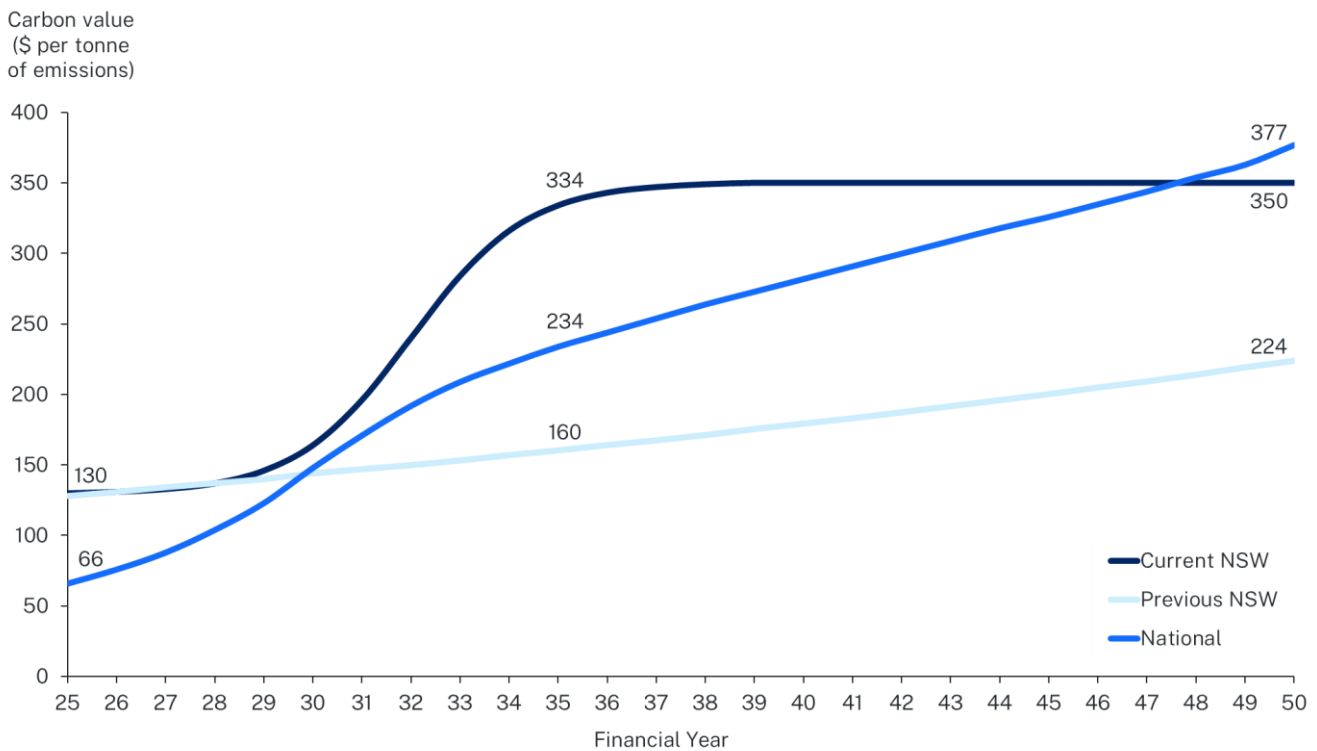
Figure 3 compares the NSW carbon values with the target consistent values produced by Infrastructure Australia<sup>7</sup> and the carbon values in the technical note that this policy supersedes.

The NSW carbon values are generally higher than the Infrastructure Australia carbon values. This reflects that NSW has more ambitious targets than the Commonwealth (particularly in 2035 where the Commonwealth does not have a target) and therefore needs to achieve more abatement sooner. Differences in values also reflect underlying differences in the NSW and Commonwealth economies including different baselines and abatement opportunities across states and territories.

The values are similar for 2050, however, reflecting that both jurisdictions have a 2050 net zero target.

The carbon value estimates in the technical note that this policy replaces took the average market price of the European Union Emissions Trading Scheme in 2022, converted it to Australian dollars, and escalated by 2.25 per cent per annum.<sup>8</sup> This was an interim measure applied in the absence of a marginal abatement cost model specific to New South Wales and does not reflect the state's emissions reduction targets.

Figure 3: Comparison of carbon values



Sources: 1. Technical note to NSW Government Guide to Cost-Benefit Analysis TPG23-08 – carbon value in cost-benefit analysis, 2023  
2. Guide to assessing greenhouse gas emissions, Infrastructure Australia, 2024

<sup>7</sup> Estimating a national emissions value for use in economic appraisal: <https://www.infrastructureaustralia.gov.au/publications/valuing-emissions-economic-analysis>.

<sup>8</sup> The 2.25 per cent escalation accounted for the expected increases in the real cost of emissions due to increasing targets and depletion of cheaper abatement opportunities.

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## Appendix C: Update frequency

The carbon values in this document will be reviewed every two years or in response to major developments.

The latter could include changes to emissions reduction targets or substantial adjustments to estimated baseline emissions.



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