AUSTRALASIAN BIM ADVISORY BOARD

Digitalisation for Decarbonisation:

Challenges, Pathways and Strategic Steps for Low-Carbon Construction and Infrastructure in Australia and New Zealand

December 2025

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Australasian BIM Advisory Board (ABAB)

In May 2017, the Australasian BIM Advisory Board (ABAB) was established by the Australasian Procurement and Construction Council (APCC) and the Australian Construction Industry Forum (ACIF), together with NATSPEC, Austroads, buildingSMART Australasia and Standards Australia. This partnership of national policy and key standard-setting bodies represents a common-sense approach, capturing the synergies existing in, and between, each organisation's areas of responsibility in the built environment. It also supports a more consistent approach to the adoption of Building Information Modelling (BIM) across jurisdictional boundaries.

The establishment of ABAB creates a pioneering approach to the Australasian building sector, with government, industry partnering to provide leadership to improve productivity and project outcomes through BIM adoption.

ABAB is committed to optimal delivery of outcomes that eliminate waste, maximise end-user benefits and increase the productivity of the Australasian economies. ABAB has evolved from a previous APCC–ACIF collaboration established in 2015 at a BIM Summit. This summit produced resource documentation to support BIM adoption (refer to www.apcc.gov.au for copies).

Members of ABAB have identified that, in the absence of central principal coordination, the fragmented development of protocols, guidelines and approaches, creates a significant risk that may lead to wasted effort and inefficiencies, including unnecessary costs and reduced competitiveness.

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What is Building Information Modelling (BIM)?

BIM is a digital form of construction and asset operations. It brings together technology process improvements and digital information to radically improve client and project outcomes and asset operations. BIM is a strategic enabler for improving decision-making for both buildings and public infrastructure assets across the whole life cycle. It applies to new build projects and crucially, BIM supports the renovation, refurbishment, and maintenance of the built environment – the largest share of the sector. [EU BIM Task group Handbook, 2018].

What is BIM process consistency?

BIM process consistency is the consistent use of proven methods, techniques, standards, templates, workflows, and tools within and across the public sector. BIM process consistency improves the performance of BIM adoption and implementation.

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Position Paper

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Executive Summary

Australia and New Zealand face a pivotal opportunity to accelerate their transition to net-zero emissions. With construction and infrastructure among the largest sources of carbon emissions, urgent transformation is needed, and digitalisation offers a powerful pathway forward.

As Australia and New Zealand have committed to net-zero targets by 2050, digital technologies must be leveraged to accelerate decarbonisation. Digitalisation can transform project planning, delivery, and operations by enabling real-time data collection, carbon accounting, and performance optimisation.

However, systemic challenges – including fragmented standards, knowledge and capability shortages, and limited adoption by Small and Medium Enterprises (SMEs) – impede this transition. This position paper argues that aligning digital transformation with climate objectives is not only a technical solution, but a policy and governance imperative. As Infrastructure Australia, identified, strategic, coordinated action across government, industry, and academia is essential to unlock the full potential of digitalisation for a low carbon future (2024).

This position paper is intended for use by those seeking to build the case within their organisation or agency, to inform or raise awareness with a Minister, Secretary/Director-General, project manager, procurer, or other key decision-maker. This Position Paper builds on existing reports by presenting a concise synthesis of evidence supporting digitalisation as a key enabler of decarbonisation. Drawing on widely accepted statistics that highlight the urgency for change, it consolidates the case for action into a clear, timely, and accessible format.

1. Context: Emissions, Opportunity and Urgency

Climate change presents an urgent existential threat, driving governments and industries around the world to pursue rapid decarbonisation. While clean energy transitions dominate the discourse, the role of digitalisation in enabling decarbonisation is becoming increasingly evident. Digitalisation, the integration of digital technologies to collect, process, and act upon data in real-time, offers substantial efficiencies and innovation across sectors, particularly in construction and infrastructure.

In Australia, buildings and infrastructure are directly responsible for nearly one-third of national carbon emissions and indirectly contribute to over half. When both operational and embodied carbon are considered, these sectors account for approximately 39% of Australia's total emissions (ClimateWorks Australia, 2020). In 2023 alone, embodied carbon from building activity contributed around 10% of Australia's emissions, with upfront carbon generated during construction making up 7%. Unlike operational emissions, which can be mitigated over time through clean energy and efficiency, embodied carbon is locked in at the point of construction, making early-stage interventions vital.

New Zealand presents a different but equally urgent context. While agriculture and energy dominate national emissions (53% and 38% respectively), the manufacturing and construction sectors still accounted for 8% of total emissions in 2023. As urban development and infrastructure investment continue to grow, the carbon impact of the built environment will only increase without deliberate action.

Australia's 2024 Embodied Carbon Projects for Infrastructure and Buildings report outlines the scale of the task ahead:

- Buildings contributed 21 Mt CO_2e of embodied carbon in 2022–23, followed by transport infrastructure (10 Mt CO_2e) and utilities (5 Mt CO_2e).
- The current pipeline of buildings and infrastructure is projected to generate between 37 and 64 Mt CO_2e annually over the next five years, totalling 247 Mt CO_2e without intervention.
- A 23% reduction in upfront carbon is possible by 2026–27 through like-for-like material and process substitutions alone, equivalent to 9 Mt CO_2e or 2% of total national emissions.
- Further savings can be realised through design optimisation and "less-build" strategies that reduce unnecessary asset expansion.

To meet Paris Agreement commitments and achieve net-zero by 2050, Australia and New Zealand must fundamentally rethink how built assets are designed, delivered, and managed. This requires a whole-of-value-chain approach, integrating lifecycle thinking, breaking down sector silos, and embedding emissions intelligence from the outset. For Australia, this means reducing embodied carbon emissions in the built environment by at least 60% by 2035. Achieving this target demands systemic change across the sector, including early project decisions (e.g. adapt/reuse), design optimisation, low-carbon construction practices, and decarbonised supply chains.

This scale of embodied emissions has prompted growing momentum for coordinated national responses. Leading policy and industry bodies, including Infrastructure Australia, Standards Australia, Engineers Australia, the Australasian Procurement and Construction Council, and the Australian Sustainable Built Environment Council, have called governments to a stronger, unified approach to decarbonise construction and infrastructure delivery. Governments, as major asset owners, regulators, and the largest procurers of infrastructure across Australia and New Zealand, are uniquely positioned to lead this transformation. Their decisions shape industry practice, influence market readiness, and set the standard for emissions performance across the built environment. Without strong public sector leadership, there is a high risk of fragmented, inconsistent adoption of digital and decarbonisation frameworks, particularly across jurisdictions and supply chains.

Digitalisation offers a powerful lever and opportunity to address these challenges. Globally, digital technologies are already being employed to optimise energy use, enhance project coordination, reduce waste, and enable circular economy practices (Infrastructure Australia, 2021). However, urgent attention to the increasing scale and speed of digital transformation is needed to achieve systemic decarbonization.

However, to realise the full potential of digitalisation, foundational steps are urgently needed. Many projects still lack a clear carbon baseline, consistent reporting frameworks, and integrated data environments. Establishing standardised measurement at the outset is critical so that project teams can accurately model, track, and compare emissions performance over time.

Digital tools must be embedded not only in design and construction but also in operations and maintenance. When supported by accurate, real-time data, these tools enable organisations to determine whether carbon is being reduced, maintained, or inadvertently increased throughout the asset lifecycle. This requires a shift toward carbon accountability, where performance data informs procurement, investment, and operational decisions at every level.

Technologies such as Building Information Modelling (BIM), digital twins, Artificial Intelligence (AI), Blockchain, and the Internet of Things (IoT) offer the visibility, traceability, and predictive insight needed to manage carbon effectively. They enable:

- Carbon modelling at concept and design stages
- Smarter procurement and material choice based on embodied emissions data
- Enhanced project coordination to reduce inefficiencies and waste
- Real-time emissions tracking to inform maintenance and asset optimisation
- Integration with circular economy strategies, including adaptive reuse and material recovery

The Australasian BIM Advisory Board (ABAB) has been instrumental in promoting this digital shift. Through cross-government and industry collaboration, ABAB has championed the use of BIM and structured information management as core enablers of low-carbon, high-performance asset delivery. Its ongoing leadership reinforces the need for consistent standards, aligned procurement practices, and the widespread upskilling of project teams. Equally important is ensuring digital tools are deployed strategically where they deliver demonstrable sustainability gains. While detailed assessment of the resource costs of AI and data infrastructure is beyond this paper's scope, the sector must consider technologies with transparent evaluation of their net environmental benefit.

The Digital by Default initiative, led by Infrastructure Australia and supported by ABAB, Consult Australia and others, provides further momentum by setting a national direction for digital integration across public infrastructure projects.

This trajectory is being reinforced by recent policy moves. In 2024, the Infrastructure and Transport Ministers Meeting (ITMM) endorsed a nationally consistent set of carbon values to guide infrastructure investment. It also approved the Embodied Carbon Measurement for Infrastructure: Technical Guidance, which provides a unified framework for quantifying emissions from materials used in transport projects. These actions signal a clear shift toward standardisation and accountability, laying the groundwork for digital technologies to deliver measurable, scalable carbon reductions across the built environment.

2. The Case for Digitalisation in Decarbonisation

Traditional infrastructure delivery methods are no longer sufficient to meet the decarbonisation demands of the 21st century. To achieve net-zero targets, Australia and New Zealand must adopt digital technologies that can drive down emissions across the asset lifecycle, enabling smarter decisions, better resource use, and continuous performance optimisation (Ebert et al., 2022).

Across both countries, there is growing recognition that digitalisation plays a critical role in accelerating decarbonisation efforts. In Australia, a coalition of industry organisations has developed an implementation guide to improve traceability and digitalisation of construction product information across the supply chain. The National Building Products Coalition is working to ensure that key attributes, such as embodied carbon, can be recorded, shared, and verified in real time as materials move through the construction process (2024).

In New Zealand, regulatory reforms are underway to embed carbon measurement and reporting into the national building code. Government proposals are also exploring how to support sector-led, technology-enabled decarbonisation, including improved access to digital tools and emissions data to streamline carbon management in construction.

Digital tools and processes are especially valuable because they allow carbon impacts to be identified early, before they are locked in through materials or design choices. By embedding digital workflows across planning, procurement, construction, and operation, both embodied and operational carbon can be systematically reduced, through data-driven decision making at all stages of an asset lifecycle.

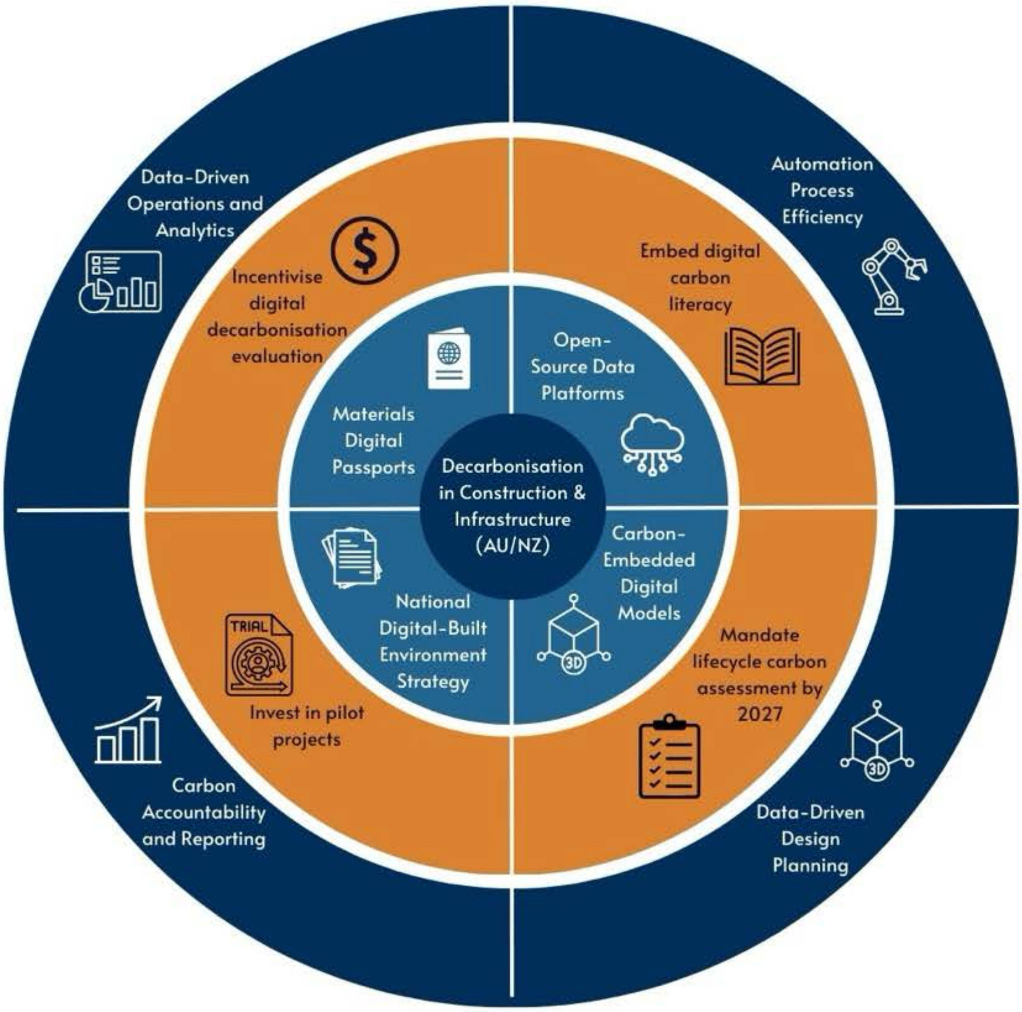


Figure 1: Digitalisation Capabilities to Enable Decarbonisation in Construction and Infrastructure

The following four categories of digital capability represent critical enablers for the transition.

a. **Data-Driven Design and Planning**

BIM enables early carbon performance analysis, clash detection, and lifecycle carbon tracking. BIM is utilised in the conceptual design phase and right through to detailed design. It facilitates integration of sustainability criteria during design, significantly reducing embodied carbon (Abanda et al., 2017). BIM with Carbon-Embedded Digital Models optimises design and material use and can be utilised for life cycle analysis and therefore identification of carbon in various stages and elements of a project. As AI usage becomes more widespread and its environmental effects are properly assessed, suitable AI agents can be integrated into stages such as design, approval, construction, delivery, and maintenance. This approach helps maintain a consistent emphasis on decarbonisation throughout the entire lifecycle.

b. **Data-Driven Asset Operations and Analytics**

Digital twins, integrated with IoT sensors, provide real-time feedback on infrastructure performance, allowing predictive maintenance and optimised energy consumption (Lu et al., 2020). Applied effectively, digital twins allow infrastructure managers to fine-tune asset performance and extend useful life while minimising environmental impact. AI may also enhance carbon estimation, identify low-carbon alternatives, support design-for-disassembly, and circular construction practices (Marzouk and Abdelkader, 2022). Over time, machine learning models can refine performance predictions, improving decision-making at scale. Digital Twins, AI, and Big Data enhance real-time management and predictive insights and could be utilised in the operations and maintenance phases.

It is also clear that institutional financing is increasingly requiring ESG measures and data pre-investment to assess the carbon intensity of the project, thereby influencing construction practices and improving asset outcomes, digitalisation plays a critical role in providing the data for the financiers.

c. **Carbon Accountability and Reporting**

Digital platforms can automate and visualise carbon reporting and compliance. These tools can align with regulatory frameworks, automate Environmental Product Declaration (EPD) integration, and enhance ESG reporting. They offer transparency, reduce administrative burden, and ensure compliance with emerging national and international disclosure requirements (Global Infrastructure Hub, 2022). Carbon management, if embedded as part of the procurement requirements in the project, will not add to the overall project cost for digitally enabled contractors.

d. **Automation Process Efficiency**

Drones, Robotics, Autonomous Machinery, including 3D printing, and IoT Sensors, may enhance onsite efficiency and waste reduction, reducing construction-phase emissions.

4. Challenges to Adoption

While these five key barriers to adoption have persisted over time, addressing them is essential for governments to effectively capture carbon usage data within projects and make informed, environmentally conscious decisions.

a. **Fragmented Governance and Standards**

Australia's construction industry operates under varying state and territory-level regulations, leading to inconsistency in the adoption of digital and sustainability standards (Standards Australia, 2021). A concerted effort by all levels of government and all State and Territory governments to remove overlap and streamline standards will make it easier for industry to participate and deliver benefits to all projects.

b. **Digital Skills and Workforce Gaps**

A significant barrier is the limited availability of digital and sustainability skills across the construction workforce, particularly within SMEs (Construction Skills Queensland, 2022). The advantages of digitalisation need to be continuously articulated and demystified to maximise productivity benefits. Additionally, the construction sector workforce requires a broader understanding of how to address the decarbonisation dilemma by continuously improving digital skills.

c. **SME Participation and Cost Barriers**

Transformation must take into account the fragmented nature of the industry. High initial costs and unclear return on investment (ROI) from digital investments deter many SMEs from adopting advanced technologies (CSIRO, 2020). This also includes consideration for financially accessible software options, as well as training for existing trades and building professionals. As workforce demographics shift and digitally native professionals enter the industry, wider adoption of digital tools will naturally follow. However, governments and industry should consider how digitalisation for decarbonisation can become more commonplace so that it does not create participation barriers for SMEs.

d. **Data Interoperability and Privacy**

Siloed project data, lack of common data environments (CDEs), and concerns around cybersecurity hinder digital collaboration across value chains (Infrastructure Australia, 2021). Concurrent development of solid digital models that reflect current design and construction workflows must occur. Trust and reliability in the underlying data will be critical to project success and improved outcomes. Digital passports require robust third-party certification to enable end-to-end resource tracking and Environmental Product Declaration (EPD) creation. Blockchain technology presents a valuable opportunity to support verification and tracking processes.

e. **Procurement policy**

Mature procurement processes – clear policy signals that provide industry with requirements for accelerated emission reduction through planning, delivery and asset management, as outlined by the NSW Government's Sustainable Infrastructure Program, are key to addressing the carbon in every element of a projects lifecycle.

It is incumbent on government procurement to embed digitalisation and decarbonisation into contracts to ensure delivery. Such an approach could include the use of materials digital passports to accompany every payment. Governments are encouraged to consider strategies that discourage project developers from eliminating carbon abatement measures during value engineering, as such actions may result in future asset owners inheriting high-carbon infrastructure and facing higher operational costs.

The various state and territory governments Climate policies are outlined in *Figure 2* at the end of the paper.

5. Pathways for integration of digital and decarbonisation agendas

While there are many potential approaches, the following four key strategies are identified as critical for effectively aligning digital and decarbonisation agendas across the construction and infrastructure sectors in Australia and New Zealand.

a. National Digital-Built Environment Strategy

Australia and New Zealand would benefit from government coordinated strategies that align digital adoption with decarbonisation goals. This strategy should align data requirements with decarbonisation goals, promoting interoperability, integration of standards for digital modelling, carbon accounting, and smart asset management (Infrastructure Australia, 2021). Additionally, it should incorporate training programs to equip professionals with the necessary skills to implement these initiatives.

b. Carbon-Embedded Digital Models

Mandating carbon performance modelling in digital design tools such as BIM for publicly funded infrastructure projects can ensure sustainable outcomes from the outset (ClimateWorks Australia, 2020). These models will require comprehensive development that must reflect the unique properties and requirements of Australasian contexts. There are already existing Life Cycle Assessment (LCA) tools that allow for the import of data. The United Kingdom's National Annex to BS EN 15978 has been successfully applied in BIM based projects to reduce embodied carbon.

c. Open-Source Data Platforms

Open-source data platforms can facilitate benchmarking, reduce duplication of effort, and encourage innovation, especially among SMEs (Global Infrastructure Hub, 2022).

d. Materials Digital Passports

Digital material passports and blockchain can track resources for reuse, improving waste recovery rates and reducing embodied emissions (Turk and Klinc, 2017). Digital passports and Environmental Product Declarations (EPD) necessitate well-resourced independent bodies to verify and police the accuracy of manufacturer-supplied information.

There are examples already underway, with groups such as PrefabAUS and the Post Carbon Research Centre at RMIT, advocating ways to engage with governments to harmonise building codes, provide financial incentives, and integrate prefabrication into national housing strategies (RMIT, 2025).

New Zealand industry has also been pursuing digital tools and there are a number of carbon assessment tools being used by designers to assess the carbon impacts of buildings throughout the design process to inform decisions. The platform for publishing EPD data in New Zealand is EPD-Australasia.

EPDs are a well-used method for documenting carbon data of construction material products, since they require third party verification and must conform with international standards on life cycle assessment to be accepted for publication. EPD-Australasia are aligned with the International EPD system, and all EPDs on this system are entered into a digital EPD database called EcoPlatform.

This will ultimately mean the data is machine-readable and allows API access to over 13,000 entries for building product carbon datasets, recognising that this is still a work in progress. Of those, 124 are for products made in New Zealand (1314 for products made in Australia).

6. Pathway steps

Australia and New Zealand have made important progress through initiatives like Australia's Infrastructure and Transport Ministers Meeting (ITMM) and the Infrastructure Net Zero Alliance. Efforts such as Digital by Default, led by Infrastructure Australia and Consult Australia, have demonstrated how digitalisation can improve infrastructure outcomes.

To accelerate decarbonisation, these efforts must now be reinforced and aligned with emissions reduction goals. A coordinated, cross-jurisdictional approach is needed to embed digital tools and carbon considerations into business cases, procurement processes, and funding frameworks.

Leadership from all levels of government, supported by industry and academia, is critical. The following strategic steps outline practical actions to embed digitalisation as a core enabler of decarbonisation across the built environment.

The following six strategic steps together support the use of digitalisation in the pursuit of decarbonisation that requires all parties in the construction and infrastructure sector to collaborate.

a. **Incentivise digital decarbonisation evaluation with funding / tax rebates**

Expand funding for digital infrastructure and provide tax incentives for adopting low-carbon digital technologies.

b. **Embed digital carbon literacy across the value chain**

Integrate digital carbon literacy and sustainability modules into construction and engineering curricula to build on the existing 136,000 people in the workforce already doing decarbonisation work in industry. (Construction Skills Queensland, 2022). Government and industry must collaborate to scale digital solutions especially for SMEs.

c. **Encourage lifecycle carbon assessment with digital tools by beginning of 2028**

Full lifecycle carbon assessments using standardised digital tools, ensuring alignment with climate targets in public infrastructure and construction need to be in place by the beginning of 2028.

d. **Invest in pilot projects and testbeds**

Partnering between government and industry to create real-world testbeds showing digital decarbonisation benefits across diverse infrastructure types is necessary to demonstrate the value to SMEs, government and industry.

Pilot exemplar projects should demonstrate collaboration on a single project model for design, costing, carbon assessment, system fabrication and construction and into operations and maintenance.

e. **Co-developed solutions**

Further consideration is needed of co-development approaches in which academia, including Cooperative Research Centres, governments, and industry collaborate to create scalable commercial solutions.

Collaboration opportunities will evolve where government and industry can work together to scale digital solutions.

f. **Invest in training and capability uplift**

Strategic investment in training and capability uplift for sector professionals is essential to ensure digitalisation is effectively embedded as a core enabler of decarbonisation, bridging the gap between ambition and practical implementation across the built environment.

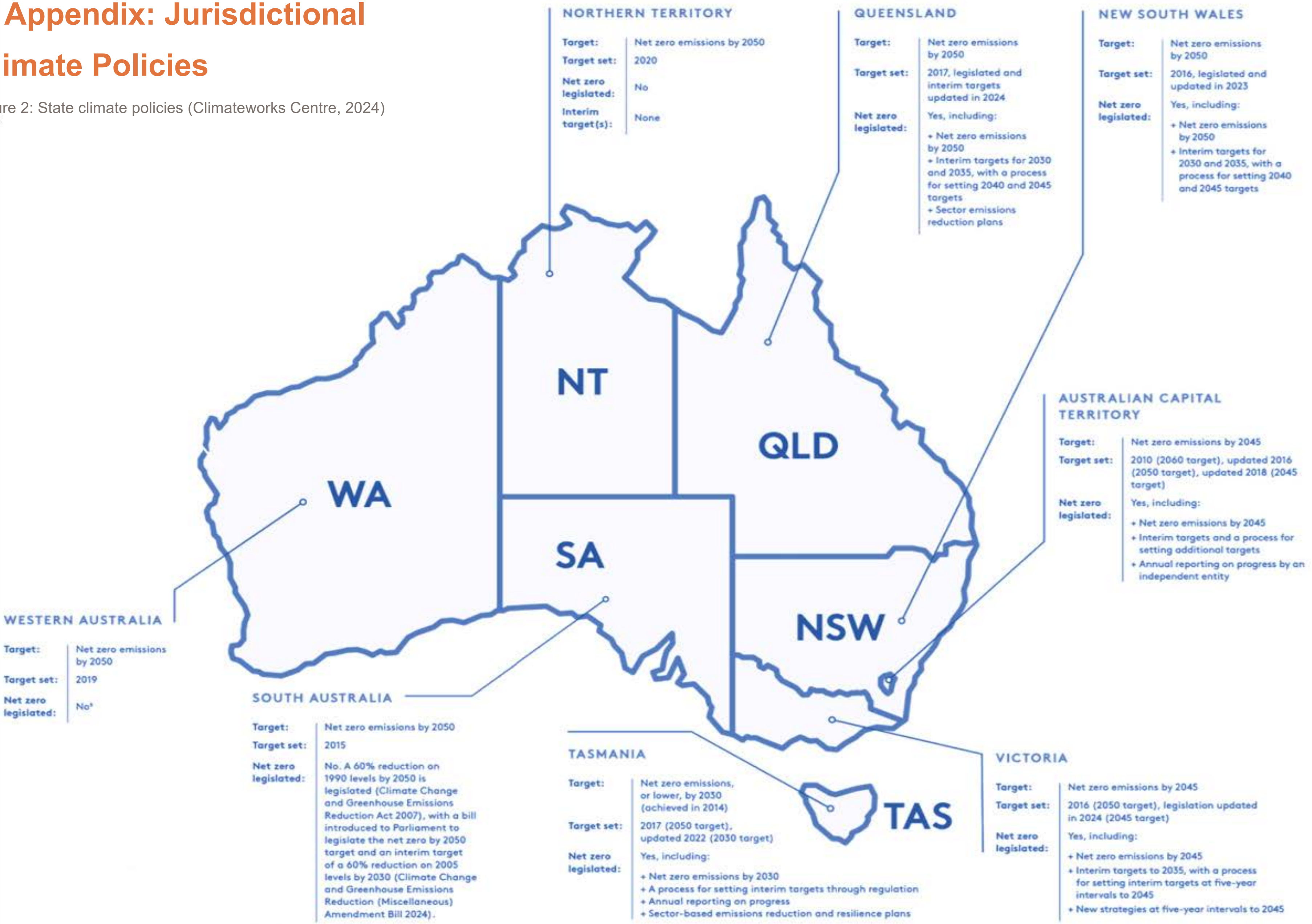
7. Conclusion

Australia and New Zealand stand at a critical juncture in the journey toward net-zero emissions. The construction and infrastructure sectors must rapidly evolve, and digitalisation presents a powerful enabler of this transformation. The time is now to embrace digitalisation. While challenges remain in policy, practice, and capability, targeted strategic interventions can unlock the full potential of digital technologies' to decarbonise the built environment.

The future of low-carbon infrastructure will be digitally driven – provided there is the political will, industry commitment, and societal readiness to make it so.

8. Appendix: Jurisdictional Climate Policies

Figure 2: State climate policies (Climateworks Centre, 2024)



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