PROJECT 1.11.4 Circular Economy – PSG 03 October 2026

Benchmarking and Scaling-up Australia's Circular Economy Practices

Case Study Progress Brief:

1. Circular Economy Pathways for TfNSW (RMIT)
2. Circular Design Standards for Precast Systems (Curtin)
3. Net Zero Operational Waste Management in Sport Venues (UQ+CU)

1. Circular Economy Pathways for TfNSW: Optimising Material Reuse and Asset Lifecycle Value (RMIT)

SBEnrc Case Study Summary

Project Number & Title	***Benchmarking and Scaling-up Australia's Circular Economy Practices***
PSG Chair	Ashleigh Morris
Project Leader	Atiq Zaman
Case Study Lead	Usha Iyer-Raniga
Participants	• Lidija Dumbaloska - Transport for NSW (TfNSW) • Mohamed Mansour- Transport for NSW (TfNSW) • Raz Guirguis - Transport for NSW (TfNSW) • Vivian Tam - Western Sydney University

Overall Goal: *To identify selected materials and assets streams, such as copper wiring, ballast and ETCS Signals and identify potential reuse and recycling opportunities.*

Used railway ballast can be successfully reused on building sites as a sustainable construction material through a washing and screening process. This recycled ballast can be incorporated into various applications, such as anti-frost layers, drainage blankets, concrete or asphalt base layers, bedding material for paving, and backfill for earthworks, reducing waste and the need for virgin aggregates.

NSW track ballast is generally cleaned every 12.5 years and fully renewed as part of the track bed substructure every 25 years, although the actual frequency depends on factors like ballast quality and traffic volume. Regular cleaning and maintenance can extend the life of the ballast and reduce the need for complete replacement.

Both types of case studies are relevant to the proposed study. If you have multiple projects in mind, we can discuss further how to capture both aspects:

1. the application of circular economy principles (through demonstrations, pilots, or completed projects), and
2. the decision-making processes (factors influencing circularity goals and targets).

Industry Partners and Offerings: *(Identification of all industry partners involved and their contributions or offerings to the case study)*

- TfNSW
- *Sydney Trains*
- *NSW Govt*
- *Etc.*

Objectives: *(Specific goals linked to the project objectives)*

The objective of this case study is to systematically identify and evaluate circular economy opportunities within TfNSW's priority material and asset streams, such as ballast, signalling equipment, electrical and mechanical components, copper cabling, concrete elements, and rail sleepers—by mapping current practices, end-of-life pathways, and stakeholder decision factors across the asset lifecycle.

The study aims to benchmark existing reuse, refurbishment, and recycling practices within the NSW rail network against national and international best practice, and assess the potential for higher-order R-strategies (e.g., reuse, repurpose, remanufacture) to extend asset life and reduce waste. Ultimately, the case study will contribute to the development of a nationally consistent CE framework by providing verified data, material flow insights, and evidence-based recommendations for scaling up CE practices across Australia's infrastructure sector.

Research Methodology and Data Compilation: *(Explanation of how the research will be conducted and how the data will be gathered and compiled)*

1. Comprehensive Literature, Standards, and Policy Review
   - *Review Australian and international CE frameworks relevant to rail and infrastructure and analyse NSW policies on waste management, asset disposal, procurement, and sustainability.*

2. Material and Asset Mapping (Hot-Spot Analysis)
   - *Undertake a quantitative and qualitative assessment of TfNSW's legacy and current asset classes and prioritise 3–4 high-value asset classes (e.g., ballast, signalling systems, copper wire, mechanical/electrical components) based on circularity potential, carbon impact, and feasibility.*

3. Case Study Analysis of Priority Materials
   - Conduct deep-dive analyses of selected materials (e.g., ballast reuse pathways, prefabricated building reuse potential, second-life opportunities for signalling equipment, batteries, electrical components) and evaluate technical and regulatory constraints affecting material recovery, reuse, or repurposing.

4. Multi-Stakeholder Interviews & Decision-Making Analysis
   - Semi-structured interviews with: TfNSW asset managers, Sydney Trains sustainability teams, Rail maintenance contractors, Recycling businesses & materials processors, NSW government regulators etc. to identify decision factors

influencing reuse and disposal choices (cost, compliance, risk, safety, procurement limits, reliability requirements).

5. Gap Analysis & Benchmarking

    - Benchmark TfNSW practices against international CE rail leaders (e.g., Deutsche Bahn, Network Rail, JR East) and identify gaps in design, maintenance, procurement, and material handling that limit circularity and highlight opportunities for higher R-strategies (reuse > refurbish > recycle).

Progress Status:

1. Literature review -completed (final stage)
2. Case study data collection framework- finalised
3. Stakeholders interview- in progress

2. Co-Creating Circular Design Standards for Pre-cast Systems: Aligning Stakeholder Priorities in the Construction Value Chain (Curtin University)

ATLAS PRECAST

SBEnrc Case Study Summary

Project Number & Title	***Benchmarking and Scaling-up Australia's Circular Economy Practices***
PSG Chair	Ashleigh Morris
Project Leader	Atiq Zaman
Case Study Lead	Atiq Zaman
Participants	• Louis Bettini - Main Roads WA • Karim Yngstrom - Atlas Precast • Cathy Inglis - Think Brick • Jock Macfarlane - Georgiou • Paul Matthew - The University of Queensland • Alexandra Meek - WA Dept of Housing and Works • John Clifton – DevelopmentWA • Iva Munro - WA Govt - Westport Office • Karim Yngstrom (Atlas Precast)

Overall Goal:

To develop a standardised, industry-aligned design framework that enhances the circularity of pre-cast concrete products by integrating multi-stakeholder priorities across the construction value chain. This framework aims to support Atlas Pre-cast in improving resource efficiency, reducing environmental impacts, and aligning with emerging circular economy principles, future regulatory expectations, and market demand for low-carbon, circular construction materials.

Background and Contexts:

The Australian construction sector is undergoing rapid transformation due to increasing pressures to decarbonise, reduce waste, and adopt circular economy principles. Pre-cast concrete—widely used for structural, architectural, and civil applications—offers high potential for circularity through improved design, durability, reuse potential, and low-waste manufacturing processes.

However, the current industry landscape faces several challenges:

- *Fragmented design standards across manufacturers, engineers, architects, and builders.*
- *Limited integration of circularity principles (design for disassembly, modularity, reuse pathways).*
- *High volumes of construction and demolition waste associated with concrete products.*
- *Disconnect between stakeholder priorities including clients, contractors, designers, regulators, and recyclers.*
- *Emerging national and state-level policies encouraging material circularity, traceability, and lifecycle optimisation.*

Atlas Pre-cast, as a leading manufacturer in Western Australia, is strategically positioned to spearhead efforts toward standardising circular design practices to meet both current and future sustainability expectations. This case study explores how a coordinated, evidence-based approach can support the development of a circular design framework tailored to the pre-cast sector.

Industry Partners and Offerings:

- *Main Roads WA*
- *Atlas Precast*
- *Think Brick*
- *WA Dept of Housing and Works*
- *DevelopmentWA*
- *WA Govt - Westport Office*

Objectives:

The objective of this case study is to identify and map the priorities of key stakeholders—including manufacturers, engineers, architects, builders, clients, regulators, and recyclers—regarding circularity in pre-cast concrete products, and to evaluate existing design practices, material specifications, and product standards used by Atlas Pre-cast by benchmarking them against global best practices. The case study aims to develop a standardised design guideline that embeds core circularity principles such as design for disassembly and reuse, modularisation and material efficiency, low-carbon mix design and alternative materials, and long-term durability and adaptability. It will also assess the feasibility and practical pathways for integrating these guidelines into Atlas Pre-cast's design and production processes, and ultimately co-create a multi-stakeholder consensus roadmap outlining the shared priorities, enablers, and barriers to advancing circular design within the pre-cast sector.

Research Methodology and Data Compilation: *(Explanation of how the research will be conducted and how the data will be gathered and compiled)*

1. *Literature and Standards Review*
    - *Analyse global circular economy frameworks (e.g., EU CE standards, ISO standards).*

- *Review engineering design protocols for pre-cast elements.*
- *Identify lessons learned from international pre-cast circular design case studies.*

2. *Industry Data Collection*
   - *Review Atlas Pre-cast's existing product catalogues, design drawings, material specifications, and waste generation data.*
   - *Examine manufacturing processes to identify opportunities for resource optimisation and circularity integration.*
3. *Multi-Stakeholder Engagement Interviews*
   - *Semi-structured interviews with:*
     - *Atlas Pre-cast engineers and management*
     - *Structural engineers and architects*
     - *Construction contractors*
     - *Clients and developers*
     - *Waste and recycling operators*
     - *Regulators and local government agencies*
   - *Focus on identifying stakeholder priorities, perceived challenges, and key success factors.*
4. *Co-Design Workshops*
   - *Facilitate one or more collaborative workshops using design thinking tools.*
   - *Develop consensus on preferred circular design approaches and practical implementation strategies.*
5. *Gap Analysis and Benchmarking*
   - *Compare current practices with best-practice models.*
   - *Identify gaps in design workflows, standards compliance, and material circularity.*

Progress Status:

1. Literature review -completed (final stage)
2. Case study data collection framework- finalised
3. Supply chain mapping validation workshop- TBC by Atlas Precast
4. Stakeholder interviews- in progress

3. Net Zero Operational Waste Management in Sport Venues (UQ+CU)

SBEnrc Case Study Summary

Queensland Government

Project Number & Title	***Benchmarking and Scaling-up Australia's Circular Economy Practices***
PSG Chair	Ashleigh Morris
Project Leader	Atiq Zaman
Case Study Lead	TBC
Participants	• Sam Charles-Ginn - QLD Dept of Housing and Public Works (QDHPW) • Peter Vanderaa - QLD Treasury • Peter Nelson - QLD Dept of Housing and Public Works (QDHPW) • Justine DETSI • Stadium QLD • SSC Council • Gertrud Hatvani-Kovacs, Sustainability Lead, Games Independent Infrastructure and Coordination Authority

1. **Case Study Context:**

Queensland's major sports and public venues, such as the future Olympic and Paralympic Games venues and precincts and existing Stadiums Queensland facilities,—generate significant volumes of operational waste during both event and non-event days. With Australia and QLD positioning itself as a major host of sports events, including the 2032 Olympic and Paralympic Games, the demand for evidence-based, scalable circular economy (CE) models for venue operations has never been greater. Minimising operational waste generation in sport facilities aligns with the QLD and Federal policy goals, including:

- QLD Waste Strategy 2026
- QLD Procurement Strategy 2026
- Brisbane 2032 Intergovernmental Agreement
- QLD Government Games commitments

Achieving net zero operational waste at the 2032 Brisbane Olympic and Paralympic Games requires more than operational effort — it demands that waste performance be designed in

from the outset. Waste diversion rates are largely determined by decisions made during concept design, spatial planning, and procurement well before a venue opens its doors.

This case study focuses on Operational Net Zero Waste Management, aiming to achieve and validate 90%+ waste diversion across different venue typologies (stadia, aquatic centres, and indoor sport centres). It examines how net-zero waste strategies can be embedded into operational systems, procurement processes, food and packaging systems, back-of-house logistics, fan engagement, and post-event material recovery pathways.

By benchmarking Queensland's current practices against national and international best performers, the case study provides critical data, tools, and insights that support the overarching project goal of scaling up CE practices across Australia's built environment.

Progress Status:

The case study is progressing as planned.