

Digital Twins in the Circular Economy

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Digital Twins in the Circular Economy

Agenda

01

Overview

02

What's the issue?

03

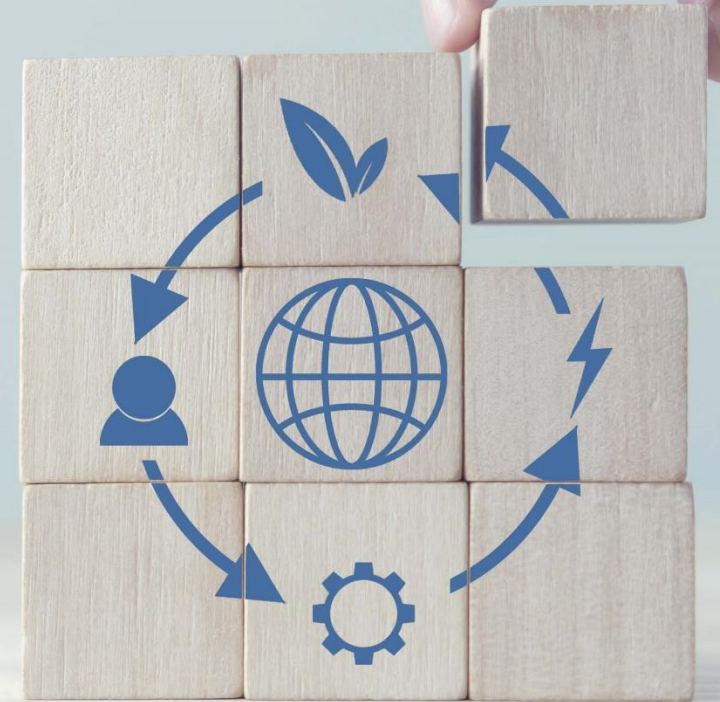
Why does circular economy help?

04

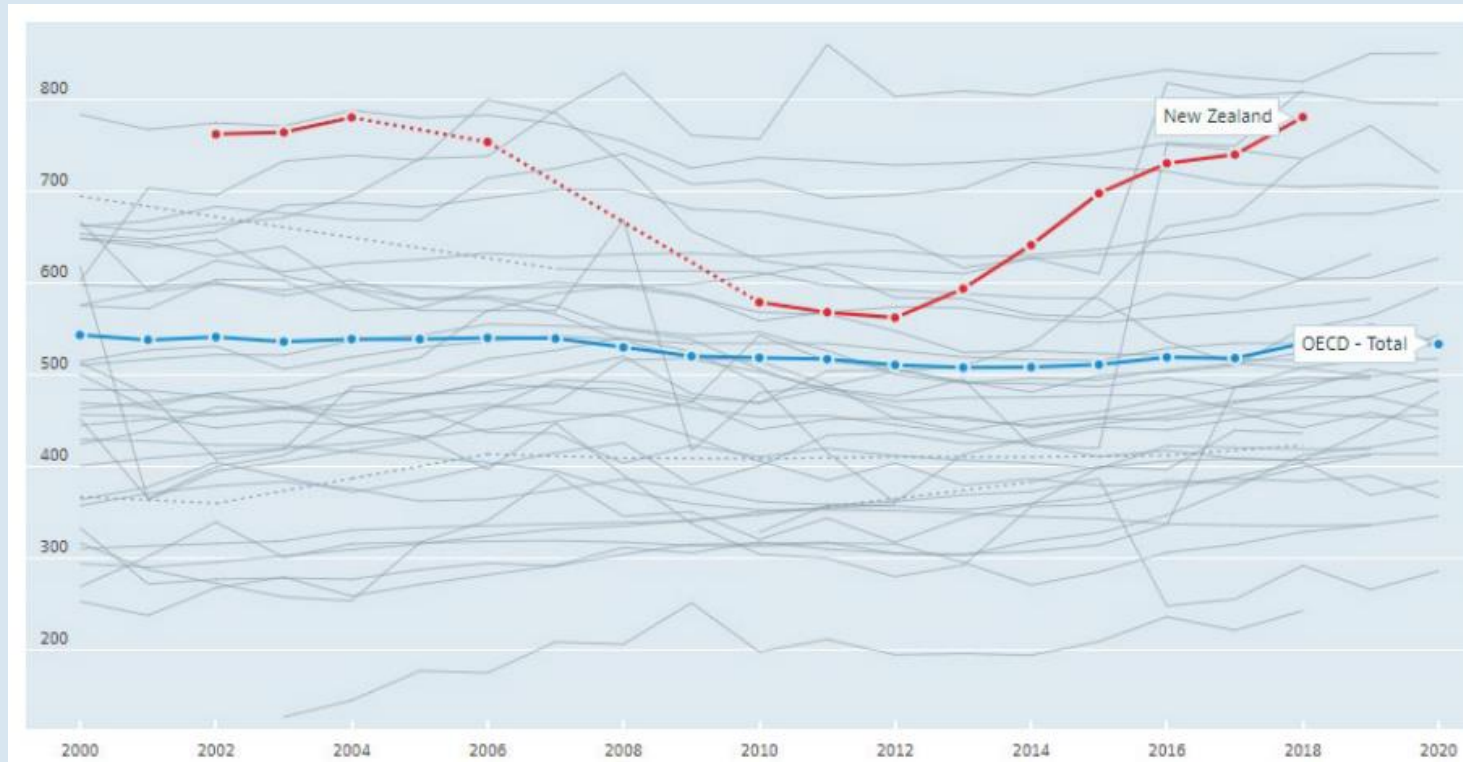
How does digital help?

05

What next?



A growing problem or A significant opportunity?



Municipal waste by kg/capita, 2000-2020 by OECD countries

BUSINESS / CONSTRUCTION

Ministerial intervention needed to solve sand shortage

11:14 am on 28 February 2024

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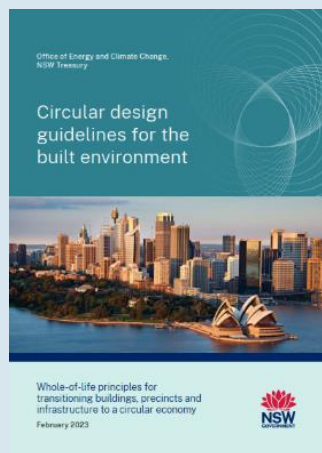


An average new house build produces 4.5 tonnes of waste, equating to more than \$31,000 if recycled instead of being sent to landfill

Circular Built Environment

Circular Design Strategies

The earlier that circular design principles are embedded in projects. The more opportunities there will be to identify and implement viable solutions to ultimately design out waste from the outset.



Build **Future Ready**

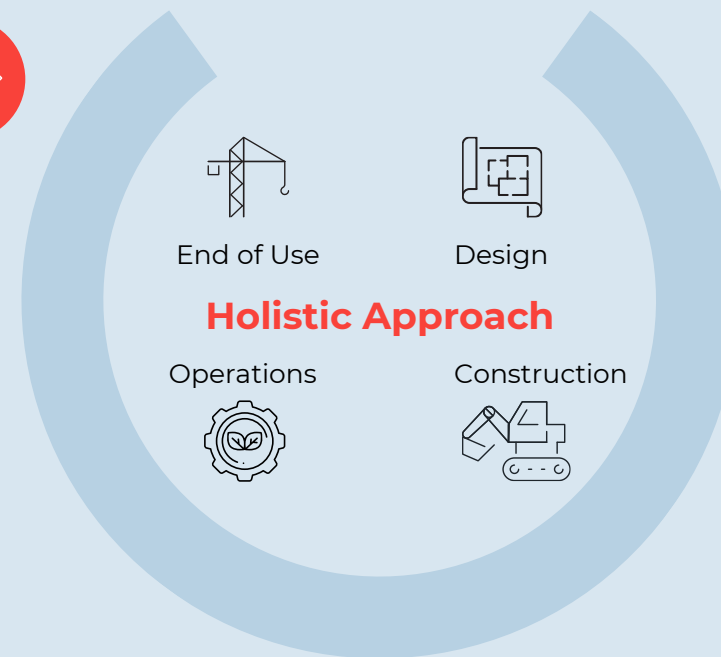
Build **Collaboratively**

Build **Light**

Build **Less**

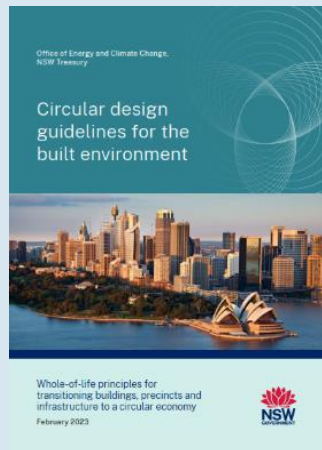
Build **Low Impact**

Build **Wise**



Circular Built Environment

- 1.1 Design for adaptive reuse
- 1.2 Design for longevity
- 1.3 Design for flexibility and modularity
- 1.4 Design for disassembly and recoverability
- 1.5 Design for materials optimisation
- 1.6 Design for ease of maintenance
- 2.1 Reuse existing materials
- 2.2 Select products with recycled content
- 2.3 Select products that are designed for disassembly and reuse
- 2.4 Select low impact new materials
- 3.1 Materials database
- 3.2 Design and construct responsibly
- 3.3 Identify innovative markets
- 3.4 Manage 'products as a service'



Digital Twins for Circular Economy

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Digital Twins in the Circular Economy

Digital Twin Foundations for Circular Economy?

A digital twin is: "A dynamic and interconnected digital representation of a physical asset or system, enabling comprehensive insights and informed decision making."



Key Barriers to Digital Twin for Circular Economy in New Zealand



Interoperability & standards



Ethical considerations



Data governance, security & sovereignty



Collaboration & coordination



Skills gaps & usability



Energy use & environment impact



Competition & data sharing



University of Tasmania

Master Planning & Building Design

Scorecard

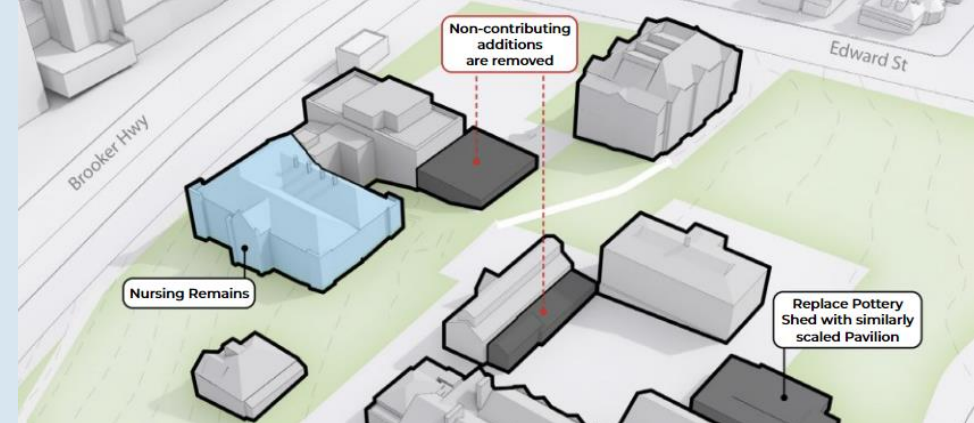
- ✓ Adaptive Reuse
- Longevity
- ✓ Flexibility
- ✓ Recoverability
- ✓ Modularity
- ✓ Maintenance
- ✓ Reuse
- ✓ Recycled Content
- ✓ Disassembly
- ✓ Low Impact
- Materials Database
- ✓ Operate
- ✓ End of Life
- Product as Service

Design out Waste

- Maximise the reuse of existing elements on site (e.g. **86%** brickwork retained and **\$90,000 saved** from demolition and landfill costs)
- Design for longevity and disassembly (e.g. **1000m²** of internal insulation designed as second skin)
- Design for flexibility
- Design for materials optimisation

Keep Material In Use

- Preference for recycled content in new materials
- Select low impact materials (e.g. **95m³** of locally sourced concrete with high % of recycled content)



Elephant & Castle Town Centre Redevelopment

Town Centre Redevelopment

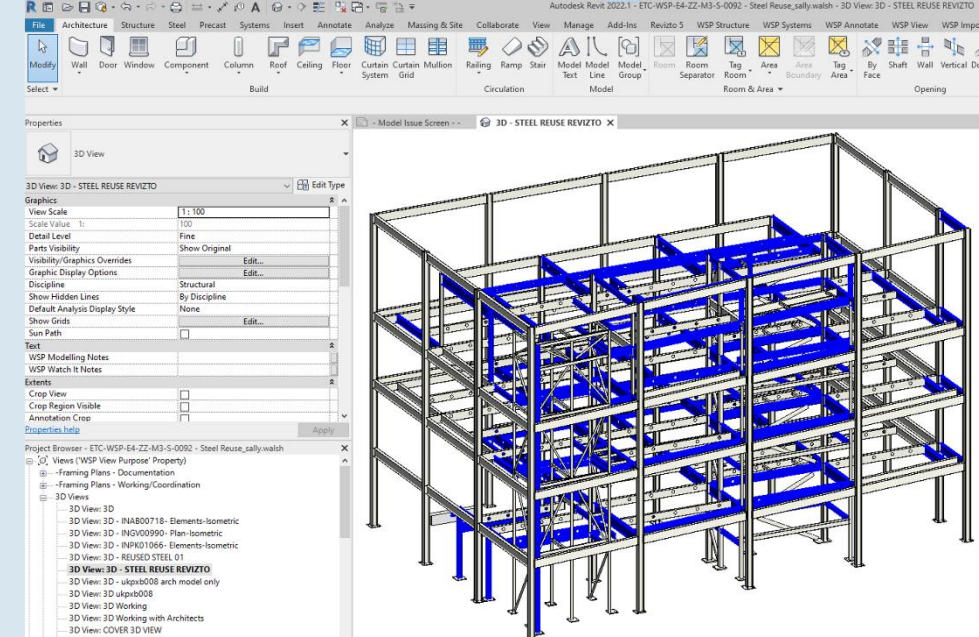
“There are a huge amount of development constraints on the site, so to be able to bring forward something of this scale is pretty special”

- Development Director Richard Palmer.

20% of reclaimed steel
will be used across the
development,
projected to save
around 200 tonnes of
embodied carbon

2,500

Projected Embodied
Carbon Saved (Tonnes)

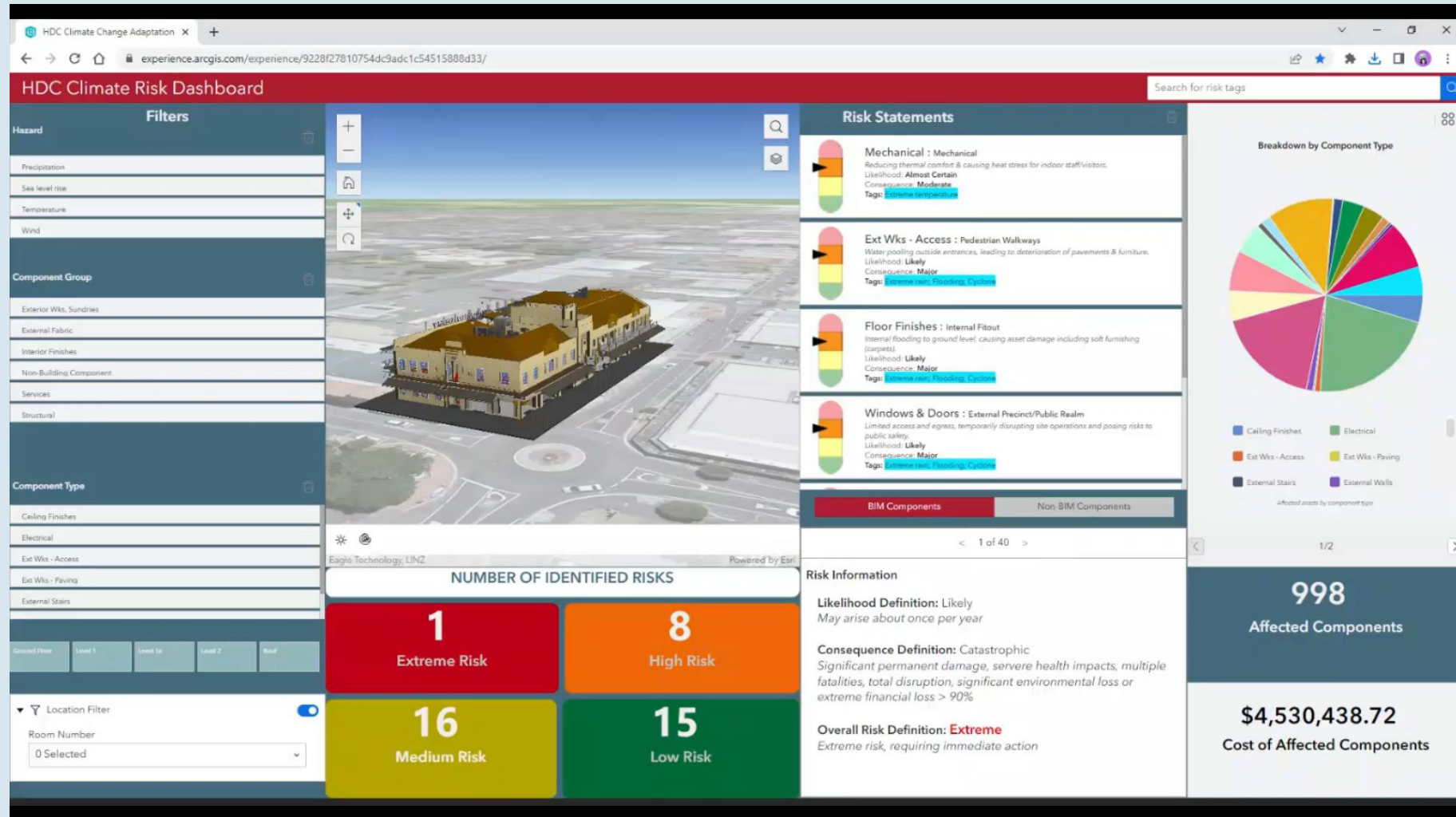


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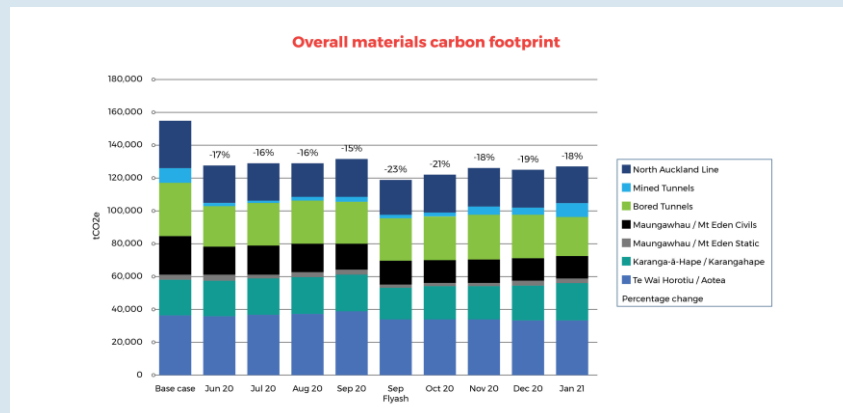
Digital Twins in the Circular Economy

Toitoti Hawkes Bay Arts and Events Centre



Implementing Sustainable Design for City Rail Link

The Link Alliance Team has set out to achieve this 15-percent reduction target through a hybrid system that includes cutting-edge cloud-based technology, data being applied to digital models via automation, instantaneous reporting and a dedicated sustainability team.



What next?



**Digital Readiness
and Maturity**



**Understanding
the why and
quantify the
benefit**



**Define your
use case**



An aerial view of a futuristic city where skyscrapers are covered in lush green vegetation, symbolizing a sustainable and integrated urban environment.

Thank you



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