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ENGINEERING IN THE PUB

Sustainability in the construction sector: Opportunities, challenges, and rewards.

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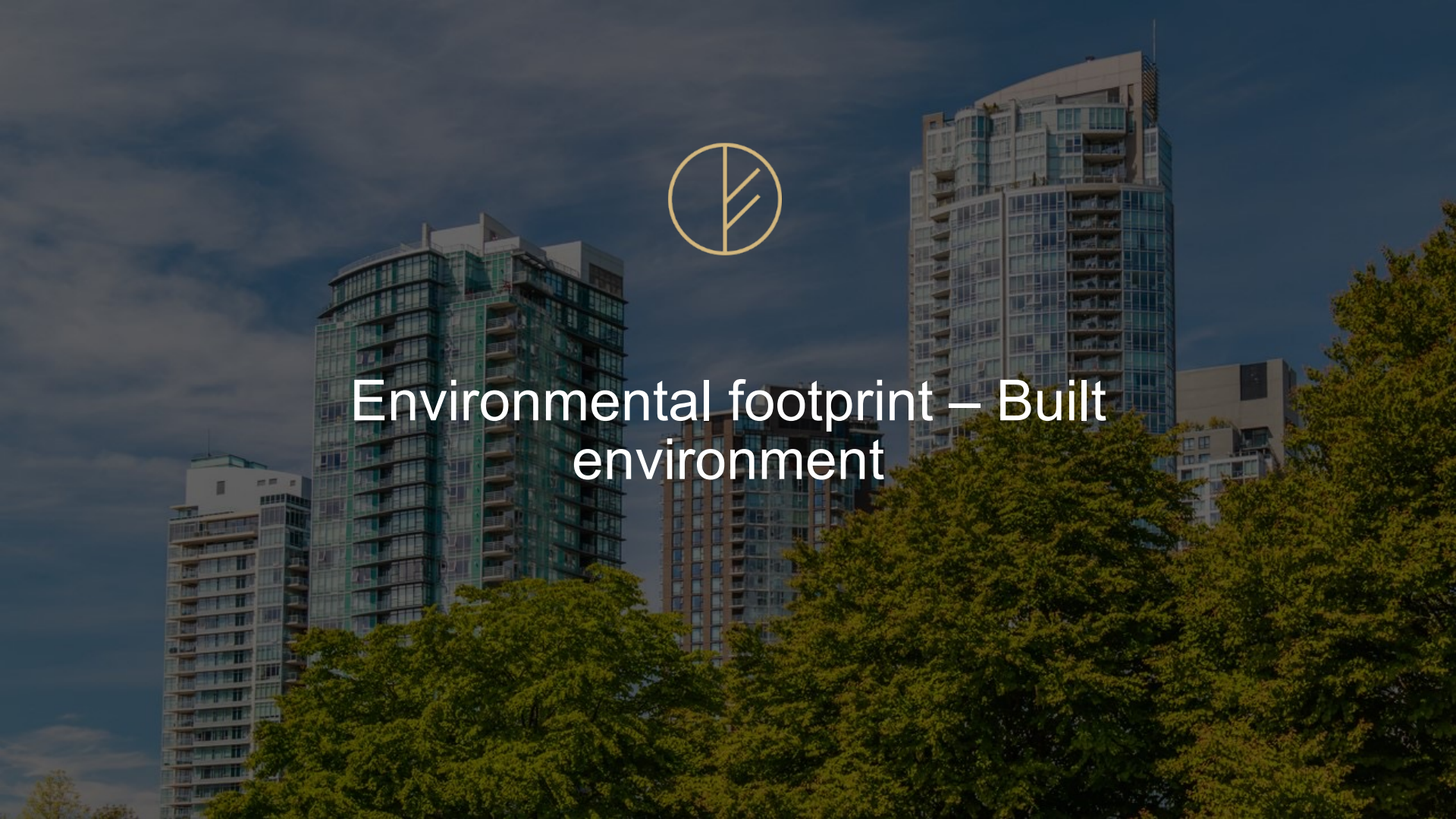
Overview

In this webinar, we'll endeavour to:

- **Explore various facets of sustainability in the construction sector, particularly within the built-environment.**
- **Consider embodied vs operational carbon.**
- **Understand how circular economy principles can be applied to the built-environment**

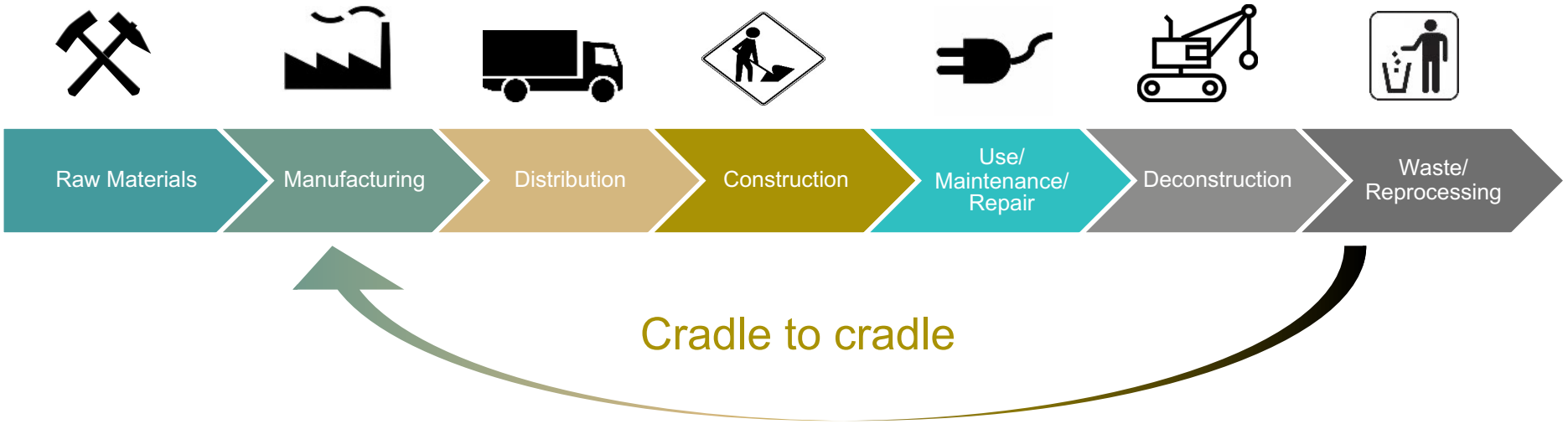


Environmental footprint – Built environment

Environmental footprint

- The built environment sector presently accounts for 39% of global emissions: 28% from operations and 11% from embodied carbon in materials.
- By 2060, the total global floor area of buildings will double, with more than 50% of this anticipated within the next 20 years.
- Within Australia, buildings account for 25% of Australia's carbon emissions.
- C & D waste constitutes 44% of Australia's waste.

Adopting a lifecycle approach to sustainability



Materials & construction – Embodied carbon

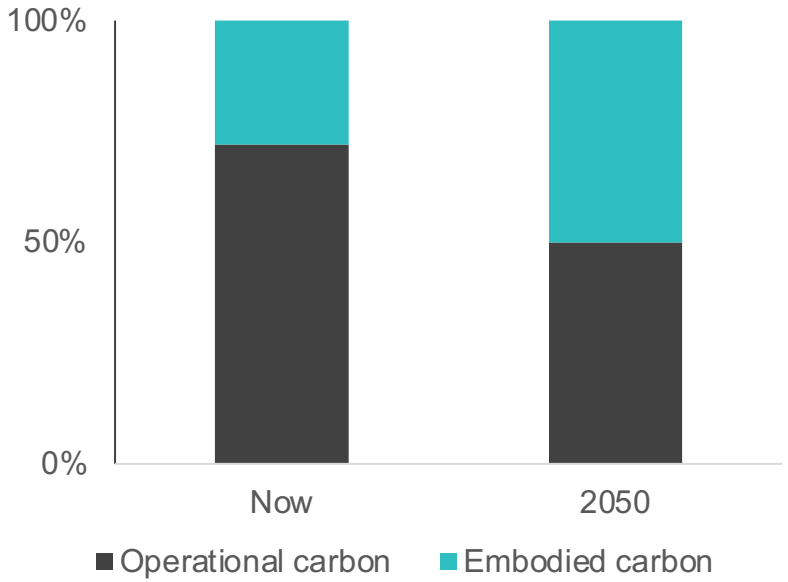
Operations

End-of-life – Circular economy principles.

Materials – Embodied carbon

What is Embodied carbon and why is it important?

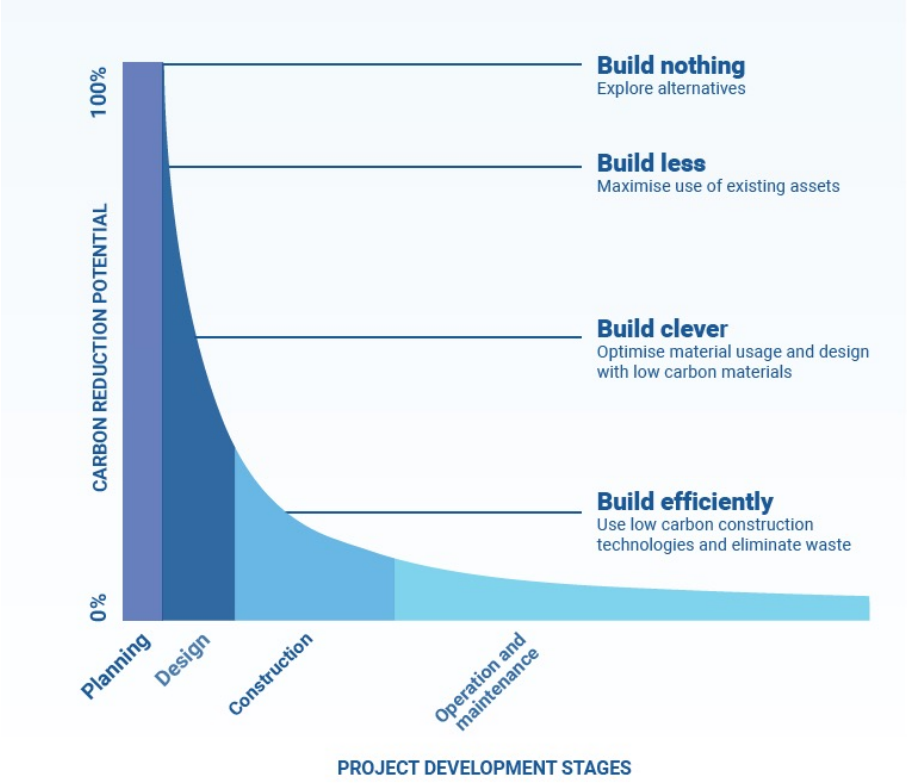
- **The emissions caused in the materials production and construction phases of an asset can be classified as embodied emissions.**
- Traditionally, there has been more focus on reducing operational carbon. However, embodied carbon will continue to grow in importance as a proportion of total emissions.
- It is estimated that more than 50% of carbon emissions from all global new construction between 2020 and 2050 will be due to embodied carbon.



Approach to reducing embodied carbon

1. **Prevent**
2. **Reduce & Optimise**
3. **Plan for the future**
4. **Offset**

Reduction opportunities for embodied carbon



Greatest opportunity to reduce embodied carbon is during the **planning and design stage**.

Reduction opportunities for embodied carbon

Using alternative materials in construction in a key lever to reduce embodied carbon. This can include:

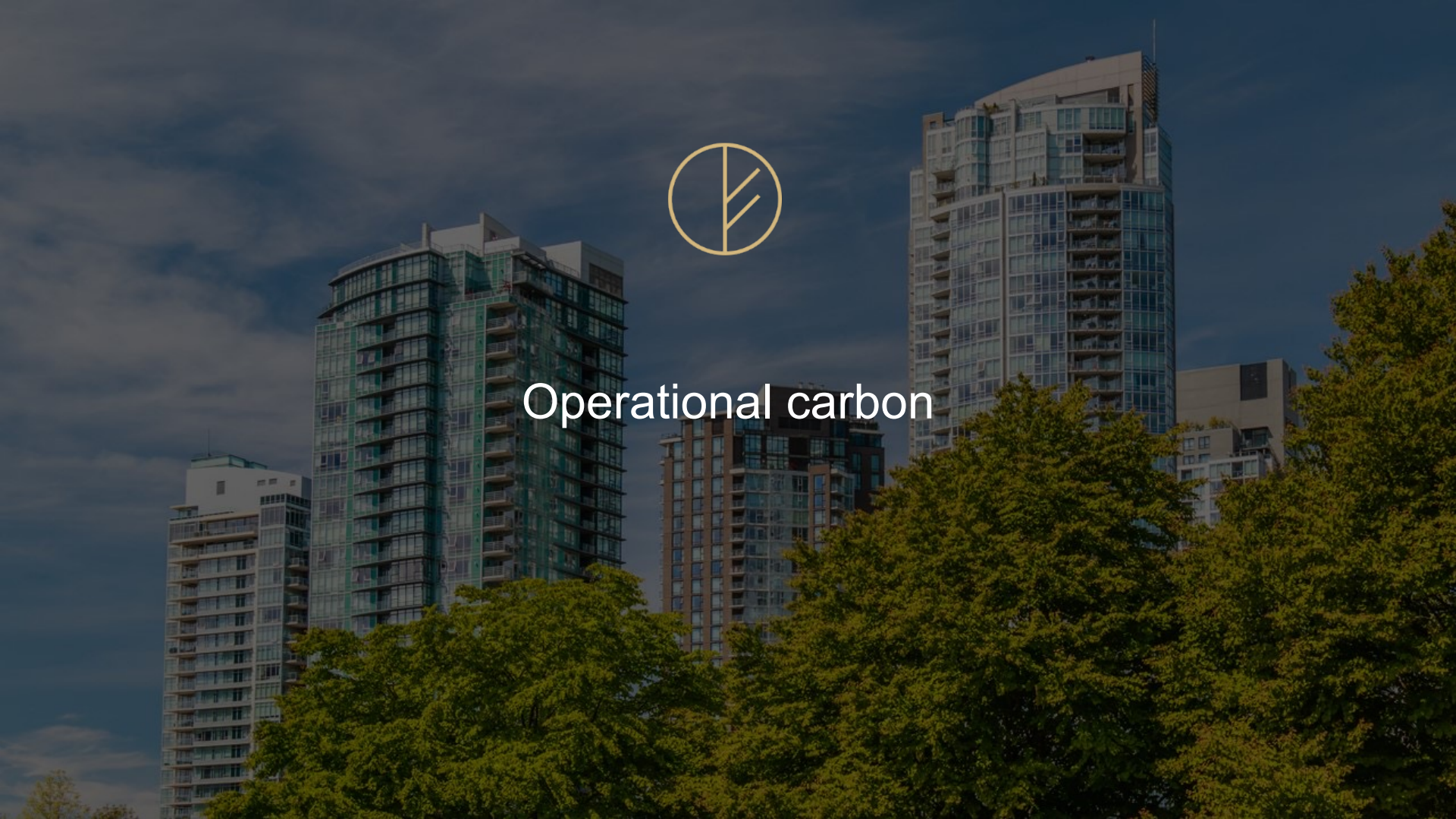
- **Green steel/ aluminium – using renewable electricity in manufacturing.**
- **Secondary materials – e.g., use of recycled plastics, use of scrap in steel making, aggregates.**
- **Supplementary cementitious materials – slag, fly-ash.**
- **Geopolymer concrete.**
- **Timber.**

ECOPact by Holcim

ENVISIA® by Boral

What tools or databases are available to assess embodied carbon?

1. **Environment product declarations – available here.**
2. **Life Cycle Assessment.**
3. **Ratings tools (e.g., ISCA Materials calculator).**
4. **Verified product databases – e.g., Building Product Information (BPI) Rating.**
5. **Other tools such as E-Tool.**



Operational carbon

Reduction opportunities for operational carbon

- **Efficient Lighting (LEDs, T5s etc…).**
- **Low Energy HVAC – Chilled beams, Cogen, Mixed mode**
- **Smart Controls – motion sensors, timers, BMS etc.**
- **Solar Hot Water – if roof is space available**
- **Appliances – Minimum 5 Star where possible**
- **Solar Passive Design – Cross vent, north facing windows, thermal mass etc**
- **PV System Buy-in/ PPA – If suitable apply to roof or façade.**

Frasers – Ed Square

6 Star Green Star Communities rating

Key initiatives implemented to reduce operational impacts

- **On-site solar energy**
- **Geothermal heating and cooling**
- **Design to reduce the heat island effect – 50 % of community is landscaped with trees**

End-of-life –
Applying circular economy principles

Circular economy

The circular economy is a systems-level approach to economic development designed to benefit businesses, society, and the environment.

It's based on 3 basic principles:

Design out waste and pollution

- De-materialization.
- Prefabrication.
- High-strength materials.

Keep products and materials in use

- Reuse of components at EoL
- Recycling of materials – e.g., converting waste concrete to aggregates
- Shared spaces/ increase utilization of buildings

Regenerate natural systems

- Composting
- Landscaping

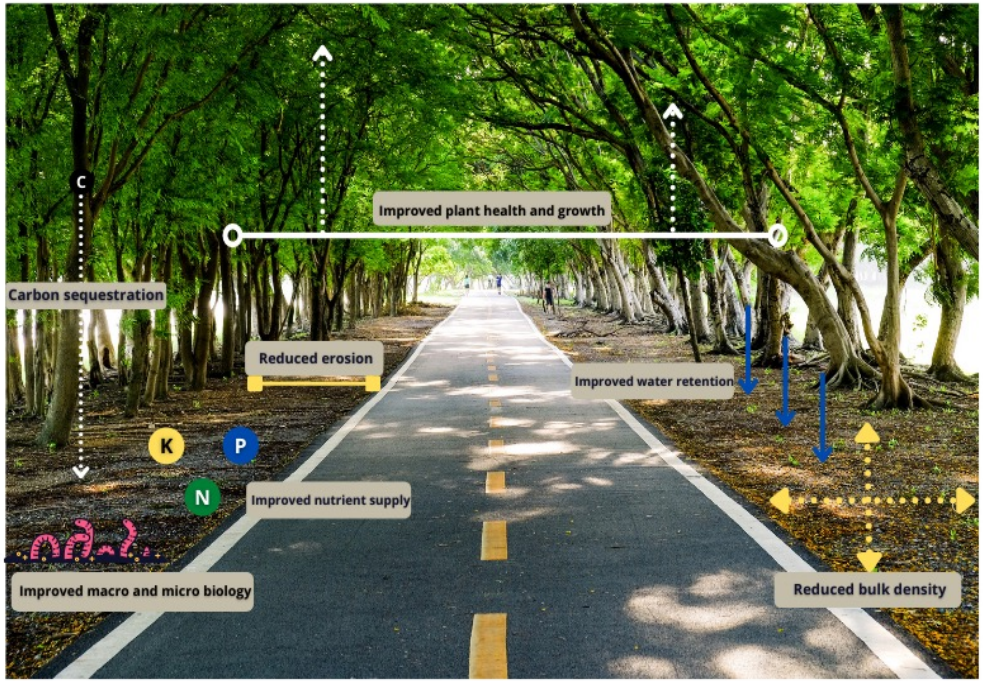
A circular scenario for the built environment could reduce global CO_2 emissions from building materials by 38% or 2.0 billion tonnes CO_2 in 2050, due to a reduced demand for steel, aluminium, cement, and plastic.

A circular built environment could generate over $700 billion in direct economic benefits over twenty years and save 3.6 million tonnes of CO_2 per year in Australia by 2040.

New ISO standard on measuring circularity is under development

Circular economy

On going case study: Compost in the built environment



<u>Converting food waste from commercial centres and households to compost.</u>

Key findings:

1. Decrease in plant-death rates compared to control.
2. Improvement in the bulk density of soil.
3. Higher water retention.

EAL Environmental Analysis Laboratory

SOILCO

To conclude

- **There is tremendous opportunity for innovation to mitigate carbon and other environmental impacts within the built-environment sector.**
- **It is important to consider the entire life cycle stage of an asset while evaluating environmental impacts.**
- **Embodied carbon emissions will become equally or more significant than operational in the coming years.**
- **Implementing circular economy principles can provide significant financial and environmental benefits.**

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