

## OBJECTIVES

This Centre is designed to upskill the infrastructure workforce sector with the capability to measure carbon emissions uniformly and design carbon-neutral structures throughout their lifespan. Through its four integrated research programs, the Centre will make a vital contribution towards Australia's net zero emissions targets by developing methodological and technological expertise for reducing carbon emissions and sequestration techniques for infrastructure.

## SIGNIFICANCE

The challenges posed by climate change to Australia's infrastructure, natural environment, and overall liveability are indeed significant. It is critical for the Australian infrastructure sector to develop carbon neutral and resilient life-cycle decisions for its projects, considering their environmental and social impacts from planning to decommissioning. To achieve the Australian government's 43% carbon emissions reduction target by 2030, stakeholders must design out excess emissions.

Australia is still behind its global peers in adopting standardized measures for carbon accounting even though the infrastructure lifecycle contributes to 72% of the total carbon emissions in the country. The Centre aim to develop a uniformed metric for determining carbon emissions throughout the infrastructure life cycle. In collaboration with a diverse team of experts and industry leaders, the Centre strives to prepare industry ready graduate researchers and postdoctoral research fellows. Our mission involves fostering collaborative partnerships throughout the infrastructure sector value chain. Together, we will create a carbon-neutral design methodology for infrastructure across its entire life cycle, integrating a holistic approach that encompasses systems design thinking, engineering, science, and digital technologies.

## APPROACH

We aim to design carbon-neutral infrastructure from the outset, rather than measuring their emissions after completion. To achieve this, we integrate carbon emissions as design parameters in our structural designs. Our approach covers four key stages of the infrastructure's life cycle: design, construction, operation/maintenance, and end-of-life. At each stage, we assess emissions to ensure our infrastructure is both safe and environmentally friendly, i.e. carbon neutral. In the long term, the Centre's research outcomes will play pivotal role in shaping national structural design standards. Four work packages are developed to achieve these objectives.

### Work Packages

Developing models for measuring carbon emissions and carbon neutrality in whole life

Developing techniques for carbon reduction and sequestration

Developing methods for increasing circularity and longevity

Developing technical manuals with digital tools for practical application

### Key Outputs

Metrics to uniformly measure, predict and monitor carbon emissions and carbon neutrality in whole life

Techniques for carbon emission reduction and sequestration used in each stage of design, construction, operation/maintenance and end-of-life

Methods to increase circularity, e.g., reuse, recycle and recovery, and longevity, e.g., durability, adaptability and reparability with closed-loop design to reduce emissions

Technical design and management manuals with digital tools for up-take by the infrastructure industry

### Expected Benefits

Mitigating climate change impacts and fostering a low-carbon economy via carbon-neutral infrastructure.

Boosting confidence in carbon reduction techniques and driving innovations in carbon in-setting.

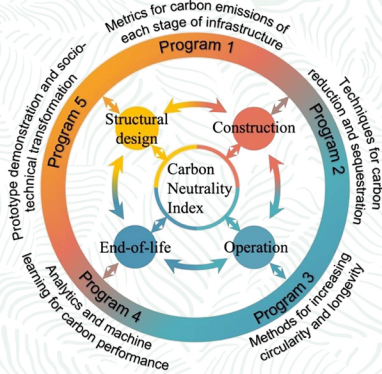
Conserving natural resources, protecting Australia's ecosystems, and enhance liveability through carbon capture, utilization, storage, and closed-loop infrastructure design.

Produce industry-ready research graduates and fellows with knowledge and skills to contribute to reducing carbon emissions across the civil infrastructure sector.

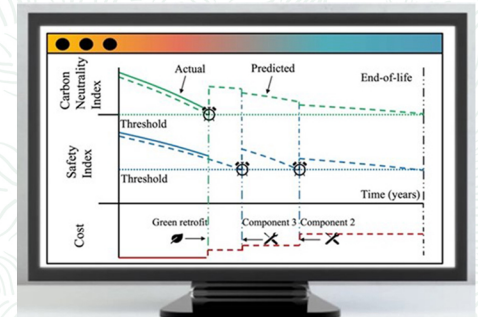




## Conceptual framework



## Expected digital tools – Digital Twin 2.0



## OUR PARTNERS



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The Australian Research Council (ARC) Industrial Transformation Training Centre in Whole Life Design of Carbon Neutral Infrastructure is funded by the Australian Government through the Australian Research Council and in collaboration with participating Australian universities and industry partners.