



Our vision and mission

The building and construction industry accounts for 10% of global energy-related CO₂ emissions. A key contributor is the overuse of raw materials coupled with inefficient use and reuse of resources and waste products.

Our goal is to drive decarbonisation in this industry through the adoption of the circular economy principles:

Design → Advanced manufacturing → Reuse.

In this way, we aim to foster efficient resource management and energy consumption, while providing pathways to new jobs and business opportunities.

Our approach

Design is the first step in the circular economy, our multi-disciplinary team with expertise in chemistry, materials science, architecture and civil engineering is taking a design-centred approach to developing sustainable low-carbon construction materials and products.

In collaboration with business experts we are partnering with industry and local councils, while also building a talent pipeline for Australia's circular design, advanced manufacturing and reuse technologies.

Our research

A key Enabling Research Theme of the Net Zero Initiative (NZI) is 'Emissions Reduction through Demand Reduction'. Under the pillar 'Materials and Embodied Carbon' our research focuses on the circular economy paradigm and principles in the following ways:

- Design: our circular eco-design seeks to achieve net zero construction through a people-centric approach.
- Advanced manufacturing: we incorporate the latest advanced materials technologies in the design and construction of buildings and elements for the built environment.
- Reuse: we are incorporating strategies for the reuse of raw materials, products and processes, which will reduce landfill and the need for new raw materials.

For example, we focus on high-strength, low-carbon construction materials in two specific areas: roof tiles and bridges. We are exploring computational-driven design of appropriate materials and construction products and using advanced manufacturing technologies for their production. Meanwhile we are reusing end-of-life materials to achieve deep cuts in the embodied carbon of these products.

Meet our research experts

Our interdisciplinary research team leverages outstanding capabilities and infrastructure. Experts working under this pillar include:

School of Chemical and Biomolecular Engineering

Professor Ali Abbas (Pillar leader): Director of the Waste Transformation Research Hub

Professor Jun Huang: Director of the Laboratory for Catalysis Engineering

Dr Amirali Ebrahimi Ghadi: Sustainable Technology Solutions, Carbon Capture

Dr Gustavo Fimbres-Weihs: Research Fellow in Enviro-Techno-Economic Analysis, Carbon Capture

School of Civil Engineering

Professor Kim Rasmussen: Chairman of the Centre for Advanced Structural Engineering

A/Prof Daniel Dias-da-Costa: Advanced Computational Simulation Techniques, Structural Engineering and Material Mechanics

Professor Gwénaëlle Proust: Deputy Director of the Sydney Manufacturing Hub

A/Prof Yixiang Gan: Deputy Director of the Sydney Nano Institute

School of Aerospace, Mechanical and Mechatronic Engineering

Professor Simon Ringer: Materials Engineering and Director of Core Research Facilities

School of Project Management

Dr Mahshid Tootoonchy: Net Zero systems

School of Architecture, Design and Planning

A/Prof Sandra Loschke: Associate Dean of Indigenous Strategy and Services

A/Prof Arianna Brambilla: Co-chair of the cluster Building Efficiencies of the Smart Sustainable Building Network

Business School

Dr Maria Rummyantseva: Academic Fellow in Innovation, Discipline of Strategy, Innovation and Entrepreneurship

Contact us

For further information or to discuss in greater detail, please contact:

Net Zero Initiative

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How your business will benefit

By partnering with us, your business will be able to:

- collaborate with leading academic and industry experts from the University of Sydney to address the challenges faced by your business;
- help shape the next generation of postgraduate students with skills relevant for your business needs;
- host one of our talented PhD students, who will be placed in your business for up to one year; and
- benefit (pending eligibility) for the Australian Government's R&D Tax Incentive Scheme.

Past projects

Our Waste Transformation Research Hub is a founding member of MECLA (A NSW Government led alliance in materials and embodied carbon). Our current and past partners include: Delta Electricity, iQ Renew, Ashbri, Circrete, LGNSW, NSW Circular, local council partners, GECA, CSIRO, The University of Newcastle, University of Technology Malaysia.

We have successfully commercialised our 'low-carbon concrete' recipe for materials in horizontal non-load bearing infrastructure, viz eco-pavements. We have also developed a high strength green concrete recipe (up to 77 MPa compressive strength). In this project we will take these learnings and experiences to transition into vertical and load-bearing infrastructure, including a durable heat-storing roof tile, and the first Australian non-reinforced bridge.



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