Dfco2 Newsletter

August 2025 edition

Message from Centre Director

As we welcome the arrival of spring, I am pleased to share with you the latest updates from our Centre. This season marks an exciting milestone for us, as we move into our second year of operations following our official launch by the Australian Research Council. The momentum we have built over the past year has laid strong foundations, and I am proud to report that all 12 of our research projects are now well underway across our national network.

2025 has seen notable developments for sustainable infrastructure in Australia, with policymakers and industry leaders coming together to adopt advanced lifecycle assessment (LCA) practices, embrace net-zero strategies, implement mandatory reporting standards, and support circular economy frameworks. These shifts are transforming how infrastructure is designed, evaluated, and executed—positioning Australia to meet both its climate goals and economic ambitions. Achieving national net-zero goals demands a coordinated, cross-sector approach, and we are grateful for the continued support of all our Centre partners and collaborators.

Professor Chun-Qing Li
Centre Director

Centre Launch

14 July 2025, RMIT University

We proudly celebrated our Centre's official launch, officiated by the Australian Research Council Chief Executive Officer, Professor Ute Roessner. This milestone represents a major step toward meeting the industry and community demand for sustainable infrastructure that ensures both environmental responsibility and community wellbeing.

The launch event included presentations by Professor Chun-Qing Li and Mr Rod Balding, CEO, Standards Australia, followed by a dynamic panel discussion. The panel featured a diverse group of experts, comprising **Professor Chun-Qing Li, Professor Kim Rasmussen** (University of Sydney)**, Mr Thomas Kuen** (Melbourne Water) and **Dr. Jingxuan Zhang** (RMIT), reflecting the multidisciplinary and diverse demographic representation within our Centre. Together, they explored the Centre's vision for driving innovation in carbon-neutral infrastructure through collaborative research.

Further details of the launch is available here: https://www.rmit.edu.au/news/all-news/2025/jul/dfco2-centre-launch

The Centre researchers' innovation was highlighted through a presentation by **Professor Jie Li** and **Dr Rajeev Roychand,** Centre researchers from RMIT, who showcased their award-winning Coffee for Stronger Concrete project - winner of the Universities Australia Shaping Australia Award (Problem Solver category). The team developed a technique to make concrete 30% stronger by turning waste coffee grounds into biochar, reducing the long-term cost of using concrete in infrastructure, and landfill wastes.

National Industry Forum

14 July 2025, RMIT University

We held our inaugural National Industry Forum, bringing together national leaders from government, industry, and academia to share insights and strategies for accelerating carbon neutrality in infrastructure through lifecycle-focused design.

Forum Themes:

- **Design for Sustainabilit**y – Exploring innovative approaches to embed sustainability at every stage of infrastructure planning and delivery.

- **Artificial Intelligence in Whole-of-Life Design** – Examining the role of AI in optimising infrastructure performance, predicting long-term outcomes, and informing data-driven decision-making.

The dialogue reflected a strong current emphasis on governance, technical feasibility, and data assurance as critical enablers of progress.

We were honoured to have **Gillian Geraghty**, *Director-General and ACT Chief Engineer, Infrastructure Canberra*, and Chair of our Industry Advisory Committee, lead the Forum. Her cross-sector expertise set the tone for a productive exchange aligning policy, industry, and research.

The Forum marked a key step in advancing national collaboration toward carbon-neutral infrastructure. THANK YOU to all participants and panellists for their valuable contributions and look forward to continued partnership in driving sustainable outcomes.

Personnel Updates

Our Centre's growth is accelerating, driven by a vibrant and expanding community of researchers who are propelling our mission into the future. We are pleased to welcome our new students and research fellows from across our seven university nodes. Their diverse expertise and fresh perspectives are already enriching the collaborative, multidisciplinary environment of our Centre.

PhD and Masters students

We are excited to welcome our new cohort of students - **Yinan Sun, Boshi Qian, Priscilla Fong** and **Shabnam Shirazizadeh**.
We look forward to the valuable contributions each of you will make to our Centre.

Yinan Sun

University: RMIT University
Supervisor: Prof Chun-Qing Li

Yinan has a background in structural engineering and reliability analysis, with research focused on applying advanced modelling to practical challenges in vibration control, life-cycle assessment, and sustainable infrastructure design.

His research focuses on time-dependent reliability theory-based pipeline structures whole life cycle carbon neutral design. This work integrates time-dependent reliability theory with carbon accounting to model how materials, loads, and environmental factors change over decades in buried pipeline systems. The framework enables infrastructure designers to simulate full life cycles, plan proactive interventions, minimise emissions, and ensure structural safety.

Boshi Qian

University: The University of New South Wales
Supervisor: Prof Jianfeng Xue

Boshi Qian holds a Master's degree in Structural Engineering from the University of California, Berkeley and over 7 years of industry experience. His research focuses on developing reliability-based metrics for carbon emissions of each stage of infrastructure to assess and manage uncertainties. By establishing and analysing carbon emission inventory database for different stages of infrastructure lifecycle, he aims to improve prediction accuracy and help to develop robust methods to determine carbon neutrality index.

Priscilla Gunn

University: The University of South Australia
Supervisor: Prof Yan Zhuge

Priscilla holds a Bachelor of Engineering (Hons.) in Petrochemical Engineering and a Master of Engineering Science in Civil Engineering. Her research focuses on the utilisation of biosolids derived biochar to develop sustainable cementitious materials with enhanced thermal energy storage and release capabilities. The aim is to create high performance composites that can stabilise indoor temperatures and improve building energy efficiency. This approach addresses waste management challenges while contributing to low carbon, climate resilient infrastructure capable of mitigating the impacts of extreme heat events.

Shabnam Shirazizadeh

University: RMIT University
Supervisor: Prof Jie Li

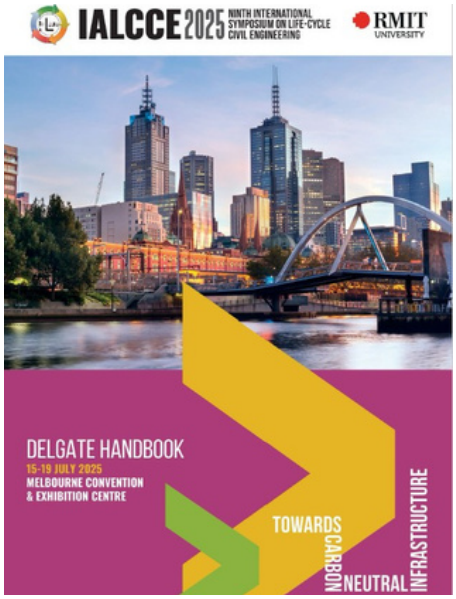
Shabnam received her Bachelor's degree in Civil Engineering and her Master's degree in Geotechnical Engineering, both as a Talent Student Graduate. Her Master's thesis, "A study on dynamical and kinematical conditions of shear band formation in hypoplastic granular materials," reflected her strong interest in continuum-based approaches to modelling the mechanical response of granular media.

Her current research interests lie in applying the concepts of Continuum Mechanics to geotechnical engineering problems, with a focus on the conditions that govern localization phenomena such as shear band formation in granular and porous materials. In addition, she is interested in seismic analysis of geotechnical problems using the Modified Pseudo-Dynamic (MPD) method and in reliability-based assessment of geotechnical problems. Through her research, she seeks to advance rigorous theoretical frameworks and computational methodologies for the analysis and design of geotechnical problems.

DfCO2 is actively seeking talented researchers to fill PhD positions across all our university nodes - please refer to scholarship opportunities listed on https://dfco2.org.au/opportunities/

9th International Symposium on Life-Cycle Civil Engineering (IALCCE 2025)

15-19 July 2025, Melbourne Convention & Exhibition Centre



RMIT proudly hosted the IALCCE 2025 Symposium, with our Centre honoured to sponsor this landmark event and contribute to the global dialogue on sustainable and resilient infrastructure.

Co-chaired by our Centre Director, **Professor Chun Qin Li** and **Professor Dan Frangopol** (Lehigh University), the symposium brought together over 300 delegates from 31 countries.

The event highlighted global breakthroughs in life-cycle design, performance assessment, digital tools, whole-of-life costing, and risk analysis -advancing infrastructure safety, resilience, and sustainability across diverse environments.

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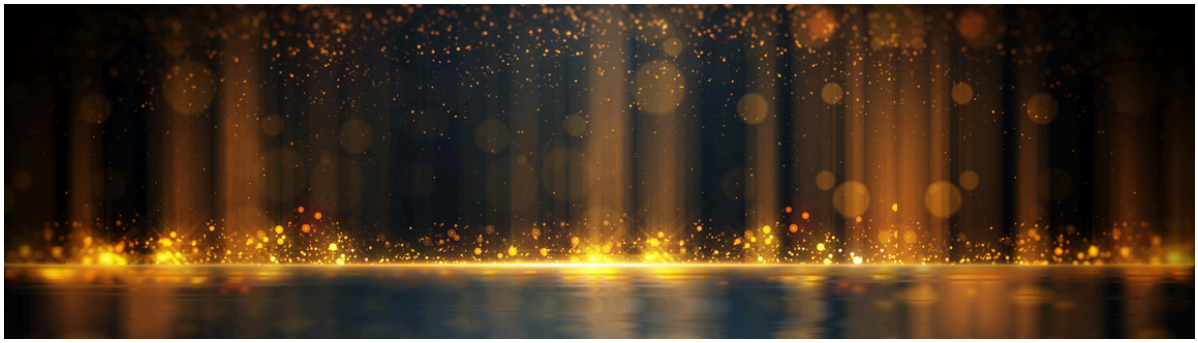
Our Centre researchers and made a strong impact at **IALCCE 2025** – joining global researchers, industry, and government representatives to accelerate progress on infrastructure design and delivery. More than 10 Centre researchers and students presented their research papers, chairing and contributing to workshops and forums, showcasing our commitment to driving innovation in sustainable infrastructure.

Conference papers and workshops

- PhD candidate **Zoe Zou** – "Dynamic BIM-Based Digital Twin for Lifecycle Estimation of Infrastructure Embodied Carbon."
- Research fellow **Dr Jingxuan Zhang** – "Life Cycle Assessment of Kerbside Waste From Environmental, Cost, and Social Perspectives".
- A hought-provoking workshop on Whole Life Design of Carbon Neutral Infrastructure, led by **Prof Chun-Qing Li**.

The lectures and papers presented at the symposium is available on Open Access Book Life-Cycle Performance of Structures and Infrastructure Systems in Diverse Environments.

Awards and Recognitions



- Congratulations to our Research Fellow **Dr Rajeev Roychand** for recently securing the Australian Research Council (ARC) **Future Fellow 2025 grant** for his "Low-cost, ultra-low carbon and highly-reactive cementitious material project".

- CI **Prof. Yan Zhuge**'s research was featured in **Roads & Infrastructure Magazine** – Her team secured ARC Linkage Infrastructure, Equipment and Facilities (LIEF) grant funding to acquire a Hopkinson Bar — a specialised tool for testing impact loading. The new bar will enable researchers to better understand how materials like concrete and infrastructure components respond to dynamic loading, leading to safer, more resilient designs for roads, bridges, tunnels, and other critical infrastructure.

- Research Fellow **Dr Jingxuan Zhang** was awarded a **RMIT School of Engineering's ECR Career Development Initiative for 2025** (Infrastructure & Sustainable Systems category aimed at empowering ECRs to pursue innovative research ideas, foster valuable collaborations and industry engagements.

- Deputy Director, **Prof Kevin Zhang** hosted the **Industry Forum on AI-Enabled Digital Transformation in Construction** at RMIT's School of Engineering. This event brought together leaders from over 30 industry and government organisations, creating a dynamic space for genuine dialogue on how AI is reshaping the construction sector.

- The **Concrete Engineering International August 2025** issue featured an article by the RMIT Coffee Concrete research team (Dr Rajeev Roychand, Dr Shannon Kilmartin-Lynch, Dr Mohammad Saberian, Prof Jie Li, Prof Kevin Zhang, and Prof. Chun-Qing Li). The team explores the transformation of spent coffee grounds into biochar for use as a sustainable fine aggregate replacement in concrete – Read here: **Coffee Biochar Concrete – Shaping Australia Through Sustainable Construction Innovation.**

Awards and Recognitions

- CI **Prof Flora Salim** presented a plenary talk at **tpc25.org**, a forum focused on fostering collaboration between industry and public sector AI research for scientific and engineering innovation. Her talk, titled "Modeling and Simulating Complex Behavior in Dynamic Cyber-Physical-Social Systems," explored how today's world—shaped by interactions across natural, physical, cyber, and social domains—can be better understood through multimodal time-series and spatio-temporal system modelling.

- CI **Prof Usha Iyer-Raniga**, alongside fellow RMIT colleague Dr. Akvan Gajanayake, led a high-impact capacity-building workshop in New Delhi, India (9–10 July) as part of the UN Environment Programme. The event brought together key stakeholders from government, academia, and industry to drive the transition toward a low-carbon, circular built environment in Senegal and India—two nations undergoing rapid urban transformation.

- CI **Dr Chamila Gunasekara** is leading a project to converted low-grade clay into a high-performance cement supplement, opening a potential new market in construction materials. *Read here:* **Common low-grade clay strengthens low-carbon concrete - RMIT University**

- CI **Professor Flora Salim** was an invited speaker and panelist, **NVIDIA GTC 2025**, the global stage for AI innovation Technology Conference 2025 at San Jose, USA. She spoke on "The Role of AI and Accelerated Computing in Understanding and Mitigating Urban Climate Change".

Talks/ Webinar series

Throughout the year, we host a series of webinars aimed at promoting the outcomes of the Centre's research and training programs.

Our August Webinar

27 August 2025 Webinar - **A Deep Dive into Scope 3 Emissions in the Water Industry: Where to Next and Why**"

We are pleased to welcome an esteemed panel of speakers: Sarah Martin, Emily Clark and Mandhy Senewiratne, all of whom have made significant contributions to reducing hard-to-abate emissions across Victoria's water sector.

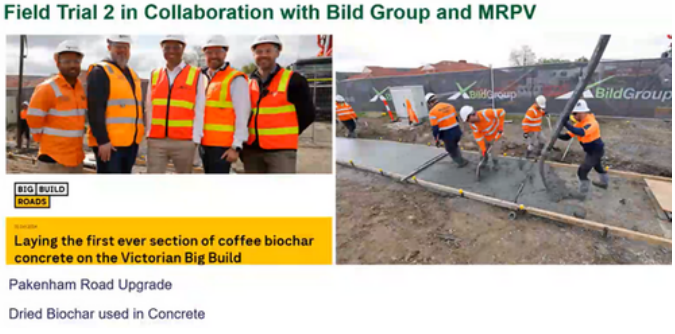
In this session will explore the evolving regulatory landscape and practical strategies shaping the future of Scope 3 emissions management in the Australian water industry.

Past events

Our May 2025 Webinar was presented by RMIT's Coffee Innovators team, Professor Jie Li and Dr. Rajeev Roychand - "**Coffee Waste to Concrete Strength: Cutting CO_2 with Biochar Innovation**."

Australia generates around 75,000 tonnes of spent coffee grounds annually, most of which end up in landfills, releasing methane. To address this, the RMIT research team has developed a groundbreaking circular economy solution that transforms coffee waste into biochar, which is then used to produce high-performance, low-carbon concrete.

This innovation has moved beyond the lab, with the world's first field trial showcasing its successful application in real-world construction. The webinar drew strong attendance and featured a highly engaging Q&A session.



Publications by Dfco2 researchers

- Facilitating circularity of end-of-life photovoltaic in China with environmental benefits and costs informed by a high-resolution waste map - ScienceDirect (https://doi.org/10.1016/j.isci.2025.112332)

- Circular Economy for Buildings and Infrastructure: Principles, Practices and Future Directions | SpringerLink (Link here)

- Converting plastic waste into wood-plastic composite products – A practical environmental impacts assessment using primary data - ScienceDirect (https://doi.org/10.1016/j.resconrec.2025.108267)

- Leveraging digital technologies for circular economy in construction industry: a way forward | Smart and Sustainable Built Environment | Emerald Publishing (https://doi.org:10.1108/SASBE-05-2023-0111)

- An Analytical Review of Construction and Demolition Waste Management and Quantification Methods Using a Science Mapping Approach - ProQuest (DOI:10.3390/recycling10030115)

- A fully coupled depth-dependent corrosion model for reinforced concrete piles under marine environmental conditions. Construction and Building Materials (https://doi.org/10.1016/j.conbuildmat.2025.140795)

- Fragility curves for hail resistance of toughened glass. Journal of Building Engineering (https://doi.org/10.1016/j.jobe.2025.112249)

- Temporal fluctuations in waste generation: An environmental and cost evaluation of glass waste collection and recycling in glass containers and asphalt production (https://doi.org/10.1016/j.wasman.2025.115040)

Industry News

- **ASBEC Report: "Our Upfront Opportunity" (May 2025)**: This policy roadmap emphasizes the need to reduce embodied carbon—emissions tied to materials and construction—by at least 60% by 2035. Strategies include modular design, reuse-first approaches, retrofit-first strategies, and building for longevity, repair, and decommissioning.

- **New NGER Amendment Brings Biosolids-to-Biochar into National Reporting Scheme Embedding** biosolids-to-biochar pathways within the NGER Scheme is a significant milestone for both the biochar industry and urban wastewater services. It enables transparent accounting of climate benefits and firmly positions biochar technology as a key element in Australia's emissions reduction strategy.

- **National Sustainable Procurement in Infrastructure Guideline:** The updated guidance now incorporates Infrastructure Australia's National Carbon Values, enabling more consistent and accurate valuation of emissions in project cost–benefit analyses to reduce embodied emissions during procurement through development and delivery of infrastructure projects. The Guideline is targeted at transport agencies, infrastructure bodies, and other public officials responsible for delivering infrastructure and contracting with industry.

Connect with Us

We are dedicated to keeping you informed about our Centre's activities. Please visit our website **https://dfco2.org.au** which is regularly updated to showcase the Centre's progress and opportunities to collaborate.

If you have any news stories, achievements, or exciting updates to share with us, please email **dfco2@rmit.edu.au** and Tag us on **LinkedIn**

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We acknowledge the Traditional Owners of Country throughout Australia on whose unceded lands we conduct the business of the Centre. We pay our respect to Aboriginal and Torres Strait Islander cultures and to Elders past, present, and emerging. We also acknowledge the Traditional Custodians and their Ancestors of the lands and waters across Australia where we conduct our business.