



THE UNIVERSITY OF
MELBOURNE

Melbourne
Climate
Futures

Climate Research Accelerator (CRX) projects 2023-24

Impact Report



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Acknowledgement of Country

The University of Melbourne acknowledges the Traditional Owners of the unceded land on which we work, learn and live: the Wurundjeri Woi-wurrung and Bunurong peoples (Burnley, Fishermans Bend, Parkville, Southbank and Werribee campuses), the Yorta Yorta Nation (Dookie and Shepparton campuses), and the Dja Dja Wurrung people (Creswick campus).

The University also acknowledges and is grateful to the Traditional Owners, Elders and Knowledge Holders of all Indigenous nations and clans who have been instrumental in our reconciliation journey.

We recognise the unique place held by Aboriginal and Torres Strait Islander peoples as the original owners and custodians of the lands and waterways across the Australian continent, with histories of continuous connection dating back more than 60,000 years. We also acknowledge their enduring cultural practices of caring for Country.

We pay respect to Elders past, present and future, and acknowledge the importance of Indigenous knowledge in the Academy. As a community of researchers, teachers, professional staff and students we are privileged to work and learn every day with Indigenous colleagues and partners.

Executive summary

The Climate Research Accelerator (CRX) funding program is designed to support projects to make an immediate impact on the climate problem. It is also one of the ways that Melbourne Climate Futures seeks to curate and leverage research and enable partnerships and interdisciplinary connections.

In 2023, we awarded our second round of CRX funding. Eight diverse projects – five with a prior level of establishment ('sapling') and three new ('seed') – were awarded \$40,000 and \$25,000, respectively, to progress their research activities. Each project brought together interdisciplinary teams from across the University and external partners. These are typically projects that would not have progressed further without this funding.

Project leads participated in a series of three workshops across the 12-month program. These workshops focused on stakeholder engagement, understanding and evaluating impact, and media engagement. The funding timeline culminated in a final showcase where the project's lead researchers presented their findings. These sessions facilitated interdisciplinary collaboration to create novel methods of urgently addressing the climate crisis.

This report provides an overview of these projects' impact. Many of the projects are ongoing and will have further, longer-term impacts that are not captured here.



2023 Projects

1. Assessing the potential of recycled glass for greener infrastructure
2. Integrating Wurundjeri Woi Wurrung feedback on digital design technology and mapping for the Great Birrarung Parklands
3. Rephraming integrated design: Towards a more comprehensive software tool that integrates life cycle assessment into the design of buildings, neighbourhoods and cities
4. Reading climate
5. The changing risk of very rare to extreme floods in a warming climate
6. Biodiversity finance: Leveraging private capital to protect nature
7. Developing a spatial index and dashboard of electric vehicle solar charging potential for decarbonisation
8. The living archive of Aboriginal art: Indigenous artmaking for a better climate future



[Click to learn more about the Climate Research Accelerator \(CRX\) projects 2023](#)

CRX 2023–24 at a glance



11

project leads from
5 faculties



29

UniMelb team
members across 8
faculties



24

external
partnerships



A\$290k

funding provided in
this round



1

video content piece



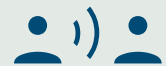
265

video views



3

capacity-building
workshops



42

mentions of
projects in media

CRX overview as of January 2025



22

projects over three
funding rounds



73

UniMelb team
members across all
9 faculties



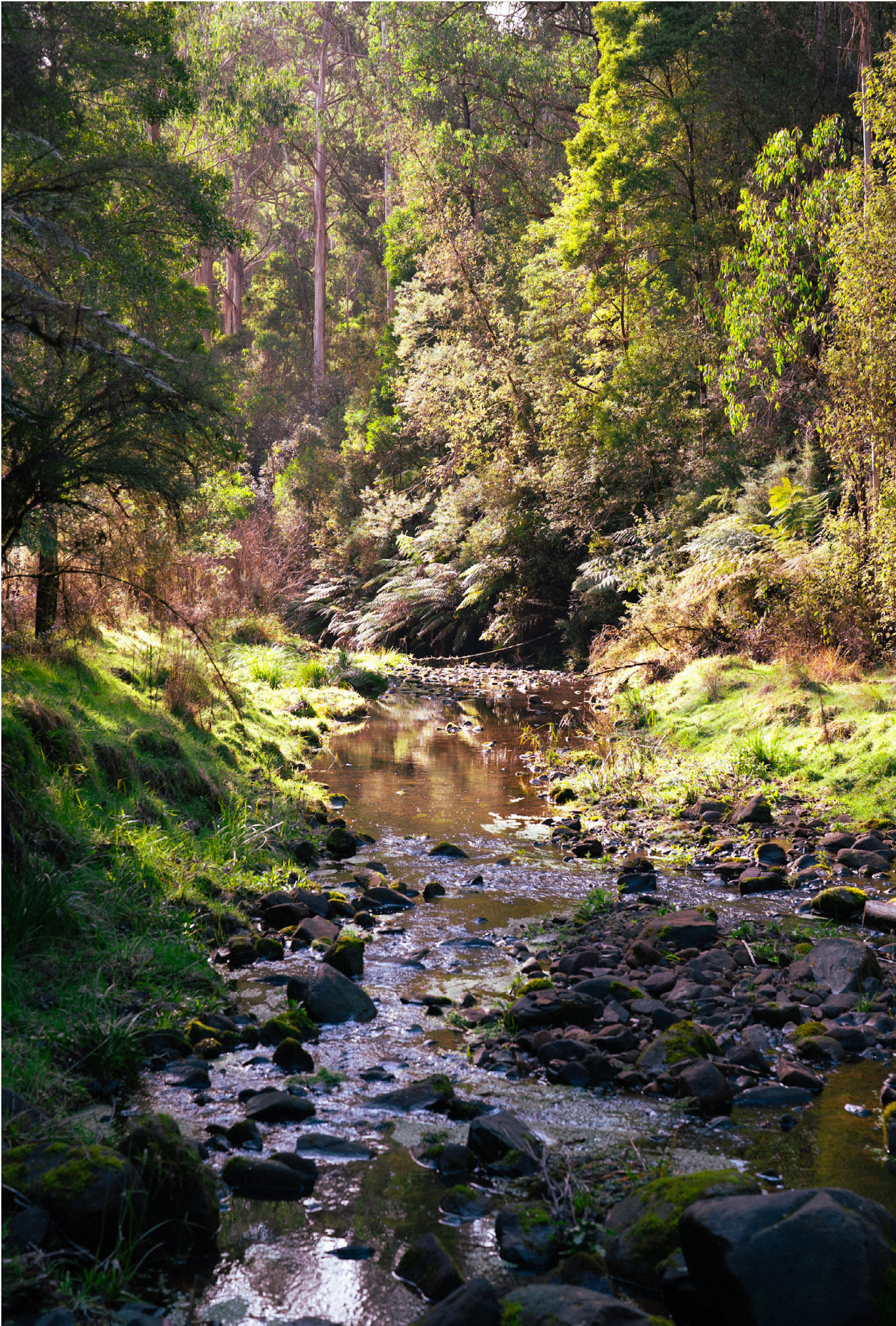
41

external partners



A\$830k

funding distributed
across all 3 rounds



Assessing the potential of recycled glass for greener infrastructure

Project Lead: Tuan Nguyen¹



This project developed an innovative product, *Glasscrete*, which not only diverts waste glass from landfills, but also transforms it into a valuable resource for eco-friendly concrete production, reducing its environmental footprint.

The project

The increasing growth of the global population and rapid urbanisation have brought about a booming demand for infrastructure development in Australia and around the world. As a result, the construction industry heavily relies on concrete, a fundamental building material. While concrete is highly versatile and durable, its production comes at a significant cost to the environment, accounting for approximately eight per cent of global carbon dioxide (CO₂) emissions.

Through rigorous laboratory experiments, this project confirmed the compatibility and technical feasibility of *Glasscrete*, by replacing up to 30 per cent of cement with recycled glass powder and up to 100 per cent of sand with glass fines for the construction of greener infrastructure. It exhibits comparable structural performance to conventional concrete while presenting promising potential for reducing CO₂ emissions through the partial substitution of cement with glass powder.

Impact statement

This project's outcomes significantly advance understandings of low-carbon, eco-friendly concrete solutions, representing a critical stride towards enhancing resource efficiency and tackling environmental challenges linked to conventional concrete production. Through strong collaboration with various stakeholders, the project actively raised public awareness and fostered the adoption of sustainable *Glasscrete*, promoting sustainable development within the construction industry.

The impact of this research extends beyond the short-term outcomes, and the team is excited about the prospects of furthering sustainable practices in the construction industry through *Glasscrete*'s implementation. This project represents a crucial step towards achieving a low-carbon, sustainable future and making significant contributions towards the Net Zero 2050 target.

¹ Other project members: Echo Wang, James Helal, Xuemei Liu, Tuan Ngo.

Funding outcomes

‘The CRX funding exposed me to diverse, multi-disciplinary research in addressing climate change ... I have learnt valuable lessons about doing impact research, engaging with stakeholders and showcasing research outcomes. The project findings ... have contributed to my successful ARC Discovery Early Career Researcher Awards (DECRA) project, which focuses on geopolymer concrete material for thermal energy storage.’

The CRX funding enabled the appointment of a research assistant, Echo Wang, who played a vital role in developing and optimising the concrete formula incorporating a high volume of waste glass (Glasscrete).

By transforming waste glass into a valuable component of construction materials, this project exemplifies the potential to combine environmental responsibility with technological innovation, contributing to the concrete industry’s sustainability outlook.

Project outputs, engagement, and partnerships

- Formulation, development and testing of Glasscrete, including economic and environmental assessment
- Cross-faculty collaboration between Dr Tuan Nguyen and Dr James Helal, which led to another collaborative grant application: the ABP–FEIT Research Collaboration Development Grant 2023
- Engagement with:
 - Campus Sustainability, to explore the potential of implementing recycled concrete in upcoming University construction projects
 - Dr Rebecca Patrick, Faculty of Medicine, Dentistry and Health Sciences
 - Industry partners to explore the possibilities of recycling plastic waste, leading to additional funding from the Emerging Markets Impact Industry Collaboration Fund
 - Wyndham City Council, to consider a trial of recycled glass concrete in their projects
 - A waste management company and concrete supplier to study recycled concrete aggregate
- Successfully secured additional funding to develop a sustainable concrete using recycled plastic aggregate (through the Emerging Markets Impact Industry Collaboration Fund). This extra financial support reinforces our commitment to advancing sustainable, recycled concrete development.



Integrating Wurundjeri Woi Wurrung feedback on digital design technology and mapping for the Great Birrarung Parklands²

Project Leads: Kirstine Wallis and Alex Felson³



This project partners with and utilises local Indigenous knowledge to model and predict future flood conditions in riverine systems for the state to determine whether Melbourne's current and future flood control structures are designed for near and mid-term scenarios, and to identify areas and infrastructure at extreme risk.

The project

The project focuses on digital sharing, Indigenous framing, and adaptation planning as one stage of a long-term adaptation plan for the Great Birrarung Parkland being developed with the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation (WWCHAC) Education Group through the University of Melbourne.

The Birrarung catchment, spanning an expansive 4,046 square kilometres, encompasses a diverse tapestry of natural landscapes, urban areas, and agricultural spaces. Central to this catchment is the majestic Birrarung (Yarra) River. In early 2021, the Birrarung Council – the voice of the Yarra River – invited postgraduate landscape architecture students from three universities to collaborate and develop a vision for the Great Birrarung Parkland.

In response, the Melbourne School of Design created the Design with Country: Resilience Studio, comprising urban designers and landscape and built-form architects, to explore the large, urbanised riverine system and develop and visualise design interventions for present to future scenarios. This multi-disciplinary studio brings together Aboriginal perspective, heritage and Country living systems with contemporary urbanisation and Birrarung catchment management.

Impact statement

This project contributes to the University of Melbourne's Design with Country initiative and focuses on resiliency planning for the Great Birrarung Parkland. Through collaborative action and a commitment to conservation and sustainable management, the Yarra catchment's significant environmental and cultural values can be preserved, ensuring the health and vitality of these vital waterways for generations to come.

Funding outcomes

'The CRX funding allowed the project team to gain better understanding and accuracy with future local projections and helped shape their mitigation and adaptive strategies for a more resilient future for the Great Birrarung Parklands.'

CRX funding was sought to establish a science advisory group to work with landscape architecture, urban design and architecture students, alongside the WWCHAC and Indigenous designers, to incorporate the latest climate projections. These projections included more frequent and intense rainfall events and associated flooding of riverine systems and tributaries, as well as drought projections and increased weather intensities, to apply a better understanding of these challenges for climate adaptation and resilience.

² **Graphic Content Warning:** Aboriginal and/or Torres Strait Islander peoples should be aware that this report may contain the images and names of people who have passed away.

³ In partnership with the Urban Ecology and Design Lab, the Centre for Spatial Data Infrastructures and Land Administration (CSDILA) and D-Lab, and with guidance from the WWCHAC Education Group.



CRX funding supported workshops and research support for staff members to Walk on Country with Traditional Owners from the WWCHAC Education Group, and to share their technology capabilities and data (capture, visualisation, and analysis). It also allowed the team to showcase the digital technology workshop to the Wurundjeri elders Uncle Dave Wandin and Uncle Bill Nicholson, and to establish a location at a confluence along the Birrarung to target for further analysis and documentation.

Project outputs, engagement, and partnerships

- Introduced Uncle Bill, Uncle Dave and the Education Group of the WWCHAC to the D-Lab in Melbourne Connect
- Coordinated X-2 pilots and drone flight with Lidar and Photogrammetry for the Dights Falls area.

- Worked with the D-Lab to process the data and organise it into 3D spaces for review and discussion with the WWCHAC Education group
- Presentation and discussion with the WWCHAC and stakeholders around information display and communication
- Established a co-educational course working with the WWCHAC on envisioning the Birrarung as a living entity and shaping its future vision. Led by University staff, including First Nations teachers and guests, students are immersed in local culture and science to navigate the concept of connection to Country, to understand the challenges and opportunities of the river precinct and surrounding areas from multiple perspectives, and to model future scenarios.

Partners

The project has engaged and collaborated with the following stakeholders:



Faculty of Engineering and IT



Wurundjeri Woi Wurrang Cultural Heritage Aboriginal Corporation



CSDILA
CENTRE FOR SPATIAL DATA INFRASTRUCTURES AND LAND ADMINISTRATION



YARRA RIVERKEEPER



Melbourne School of Design



Melbourne Water

Rephrasing integrated design: Towards a more comprehensive software tool that integrates life cycle assessment into the design of buildings, neighbourhoods and cities

Project Lead: James Helal⁴



This project developed a software tool, **Rephrase**, to enable architects and engineers to incorporate the environmental footprint within their designs. The ability to assess the embodied environmental flows of urban infrastructure at such a detailed level represents a crucial advancement in our pursuit of creating more sustainable and resilient urban environments.

The project

Regulation and current attempts to improve the environmental performance of the built environment have principally focused on operational energy and greenhouse gas (GHG) emissions, which are associated with the ongoing uses of buildings such as lighting, heating, cooling and other operational demands. However, studies have revealed that embodied energy and GHG emissions are often underestimated in the built environment and rarely considered.

Through transdisciplinary collaboration across the University and with industry partners, this project enhanced the software tool developed by Dr James Helal, Rephrase, to better identify cost-effective solutions that reduce the life cycle environmental effects associated with buildings.

Impact statement

This work facilitates decision-making that supports sustainable urban development, retrofitting, and planning, influencing urban management practices globally.

In the long term, Rephrase aims to impact beyond the realm of individual building designs and transition towards influencing urban design methodologies. While this goal is set for 2024 and beyond, the current direction, with its emphasis on detailed environmental assessments combined with cost-optimisation strategies, suggests a promising path ahead.

Funding outcomes

‘This funding has been a catalyst for growth, both for the Rephrase project and my career as a researcher. It has facilitated a critical step forward in my pursuit of contributing meaningful solutions to the challenges of sustainable development.’

⁴ Team members: Robert Crawford, Georgia Warren-Myers, Elisa Lumantarna, Dan Hill, and Pablo Sepulveda.



Since the public deployment of the Rephrase platform, its user base has expanded to approximately 155 registered users and professionals from the built environment. This growth underscores Rephrase’s increasing traction in real-world applications and its value to professionals seeking to integrate sustainable practices into their projects.

The CRX grant was used to hire a research assistant to implement the necessary programming and software interface enhancements and validate the added capabilities of Rephrase. Through the comprehensive restructuring of its software, Rephrase’s efficiency and adaptability were substantially improved. The software tool has seen critical advancements, not only in its core functionalities but also in its user accessibility, with a vastly enhanced website interface.

The integration of Rephrase with **Nested Phoenix** has broadened the project’s impact to an urban scale, enabling comprehensive life-cycle assessments and material flow analyses for neighbourhoods and cities. Nested Phoenix is a next-generation computational engine for an integrated dynamic life-cycle assessment and material stocks and flows analysis of the built environment.

The Rephrase project successfully applied for the Australian Research Council (ARC) Linkage Program. This application, aimed at developing a decision-making framework that evaluates the environmental, social, and financial implications of retrofitting versus rebuilding, has rallied an impressive consortium of industry leaders. Partners such as Arup, Aurecon, FK Architects, Hassel Studio, and the City of Melbourne, alongside the Green Building Council of Australia, represent a formidable coalition in the built environment sector. By leveraging these opportunities and engaging with a wide array of stakeholders, Rephrase is poised to play a critical role in transforming the built environment sector towards greater sustainability and resilience.

Project outputs, engagement, and partnerships

- Publications in the respected *Journal of Energy and Buildings*, and a paper on integration of cost optimisation within Rephrase at the World Sustainable Built Environment conference, underscoring the theoretical framework and practical utility of the initiative
- Engaged with a network of experts and practitioners in sustainability and the built environment, including the Council on Tall Buildings and Urban Habitat (CTBUH)
- Collaboration and active participation with Aurecon, a reputable entity in the built environment sector. Direct involvement from Aurecon’s integrated design manager, Pablo Sepulveda, meant that the project benefited from an industry-specific lens
- Codebase refactoring – essential to make the code more efficient, easier to understand, and adaptable without altering its functionality
- Website development, deployment and enhanced data visualisation
- Incorporation of additional building geometries. Rephrase’s design optimisation capabilities now include circular and elliptical structural systems. This significant addition broadens Rephrase’s applicability, accommodating a wider array of architectural designs
- Incorporation of additional building systems. Work is ongoing to amass a database of facades, each subject to an embodied greenhouse gas emissions assessment
- Development and deployment of a cost optimisation module. An extensive database of cost coefficients for construction materials is under construction.

Reading climate

Project Leads: Sarah E. Truman and Larissa McLean Davies⁵



This ongoing project responds to the pressing imperative for improved climate education in schools. It activates English literary education through incorporating Indigenous-based texts for reimagining social and environmental futures.

The project

Climate change has been identified as the major crisis facing the world and a core issue for young people. Addressing the climate crisis in education requires interdisciplinary approaches that reflect the urgency, scope and scale of the situation.

Directed by the [Literary Education Lab](#)⁶ and in collaboration with the Stella Prize, this project builds new understandings about the connections between sustainability and environmental justice and Indigenous Knowledges in the context of secondary-school English literature.

Impact statement

Using sociable and relational approaches to reading, this project explores the interface between Indigenous literatures and climate justice by bringing into dialogue Indigenous authors, interdisciplinary scholars, English teachers, and students through book clubs and public events, and generating an online toolkit of teaching and learning resources.

Funding outcomes

‘The CRX grant ... provided the means to scale up and test previous research in preparation for submitting, and winning, an ARC Linkage Grant.’

At the time of the CRX application, the Melbourne Graduate School of Education had provided seed funding for this project, with team members having run an international online symposium in collaboration with the Stella Prize. The CRX grant helped accelerate and build on the previous work that Reading Climate had already completed, through providing the means to scale up and test previous research in preparation for submitting an ARC Linkage Grant.

More specifically, CRX funding was obtained to help support the following research questions:

1. How do English teachers engage with Indigenous ways of knowing and understanding Country to imagine sustainable climate futures?
2. What new knowledge about climate justice in English education can be developed through interdisciplinary collaboration between Indigenous writers and texts, and the environmental humanities and climate science?
3. What real-world applications will new knowledge about the intersections of climate fiction, Indigenous Knowledges, racial justice and climate science have for the field of sustainability education?

⁵ Other project members: Marcia McKenzie, Sandra Phillips, Clare Archer-Lean, Melitta Hogarth.

⁶ The [Literary Education Lab](#) is housed at the University of Melbourne, with collaborations nationally and internationally.

Project outputs, engagement, and partnerships

- Strong collaborations with the Stella Prize for women and non-binary authors, scholars at University of Sunshine Coast, University of Western Sydney, and scholars in UK and Canada
- Awarded AUD\$100K ARC Linkage grant
- Publication of a Reading Climate Pilot Report for teachers
- Created and produced a Reading Climate Toolkit based on research with teachers, authors, and interdisciplinary scholars. It includes advice for teachers, online resources such as video recordings of Indigenous authors, provocations around sustainability and climate justice, and worksheets hosted on the Literary Education Lab website
- Held online workshop with teachers around reading climate literatures, which was uploaded on the project website to be used as a resource
- Interviewed and recorded Indigenous authors Tony Birch, Ellen van Neerven, and Sandra Phillips
- Presented at the Association for the Study of Australian Literature conference
- Engaged with Victorian Curriculum and Assessment Authority (VCAA) and Victorian Association for Teaching of English (VATE) to share resources
- Keynote address and Toolkit launch at the English Teachers Association
- Keynote at the 2024 AATE (Australian Association for Teaching of English) conference
- Presented project findings at the American Educational Research Association in Philadelphia
- Hosted international symposium with 140 attendees. Professor Kathryn Yusoff (Queen Mary University, London) provided a public keynote address on reading geologies and climate racism and literatures
- Hosted and collaborated with visiting scholar Sandra Muse Isaacs (University of Windsor), who delivered a symposium lecture on the project website
- Held roundtable event with Indigenous authors, scholars and teachers, including a podcast recording
- Invitation to collaborate on Indigenous resource project, Ngarrngga
- It has garnered keen interest from teachers and administrators, with an offer for further partnership with AATE.



Partners

The project has engaged and collaborated with the following stakeholders:

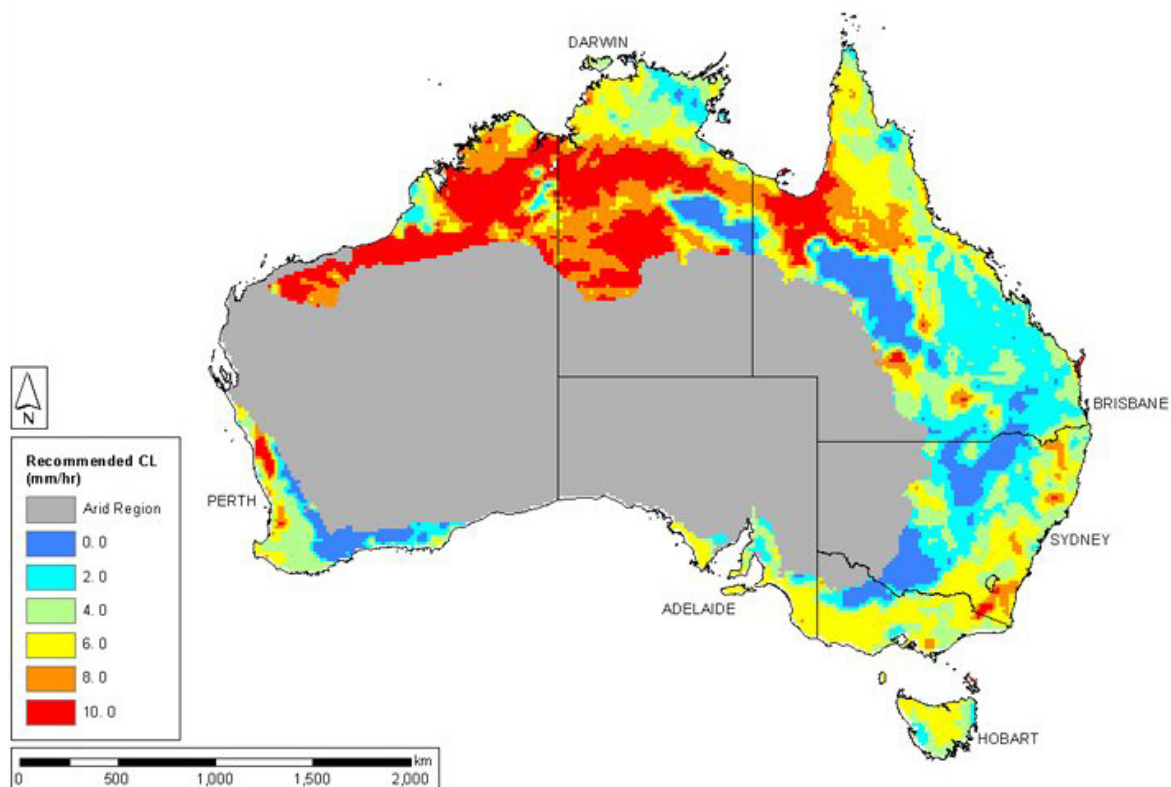


Faculty of
Education



The changing risk of very rare to extreme floods in a warming climate

Project Lead: Conrad Wasko⁷



In a world first, this project has provided methods in Australia's flood guidance that engineers, practitioners, and legislators are using in their water resources design and planning.

The project

An imperative of governments worldwide is to ensure that the infrastructure our society uses to live, work and commute continues functioning within tolerable risks of interruption or failure. To assess this risk, engineers use a method called 'design flood estimation', usually defined in terms of a recurrence interval, the 100-year flood event.

To estimate the 100-year flood, engineers need to account for the rainfall intensity, but also the amount of rainfall that is 'lost' to infiltration into the subsurface. These losses are defined using existing data, but, with climate change, these losses are increasing and changing the nature of flood events.

Despite global knowledge that changes in soil wetness need to be considered in assessments of flood risk, no jurisdiction in the world is assessing how these changes could be incorporated into flood risk assessments. This project aimed to calculate the changes in rainfall losses due to climate change across Australia to directly inform practical engineering applications.

Impact statement

The methods this project has provided in Australia's flood guidance are currently under review with Department of Climate Change, Energy, the Environment and Water (DCCEEW) by a panel consisting of members from Engineers Australia and the insurance industry. This guidance is essential to appropriately design and plan policies and other responses to floods.



⁷ Project members: Elisabeth Vogel, Rory Nathan.

Funding outcomes

‘This funding enabled us to translate previous research findings into a product which can be used by industry through an update in our flood guidance’

CRX funding was used to hire research assistants who, using the Australian Bureau of Meteorology’s Australian Landscape Water Balance (AWRA-L) model, linked changes in soil moisture to the losses used in design flood estimation. By using the Bureau’s soil moisture projections, they projected changes in these ‘design losses’ that are used in these models to represent how wet or dry it is before it rains. The research has conclusively projected these design losses across Australia for climate change, which are estimated to increase by five per cent per degree of warming.

It has also identified that the losses can vary with the severity of the event (an unexpected result), which may be investigated in the future. It has derived design loss change factors for climate change across Australia that have been incorporated in Australia’s flood guidance.

Project outputs, engagement, and partnerships

- A publication detailing the methodology of how to incorporate changes in antecedent soil moisture wetness in water resources and engineering planning and design
- Published ‘A systematic review of climate change science relevant to Australian design flood estimation’ in *Hydrology and Earth System Sciences* journal
- Held Hydrology and Water Resources Symposium
- The work has been exhibited to:
 - Department of Energy, Environment and Climate Action (DEECA)
 - Bureau of Meteorology
 - The Hydrology and Water Resources Symposium (this is the primary outlet for this research, as the annual conference is attended by most Australian practitioners)
 - The Australian Meteorological and Oceanographic Society (AMOS)
- An ARC DECRA grant related to this project was awarded and an ARC Future Fellowship application is in progress, building on this research
- As a new partnership, project lead Conrad Wasko is also supervising a PhD student with the Australian Bureau of Meteorology to continue to understand how climate change is impacting changes in soil moisture and how it affects flooding.



Biodiversity finance: Leveraging private capital to protect nature

Project Lead: Attila Balogh⁸



This project developed Themeda (Thematic Mapping of Ecosystem Dynamics with AI), an innovative approach in ecological forecasting designed to predict changes in ecosystems with large temporal variation.

The project

Biodiversity continues to decline and the financing gap between what is currently being spent globally and what is needed over the next ten years is estimated to be more than A\$700 billion. However, no studies have quantified and priced risks surrounding biodiversity loss or examined the potential role of private financing in addressing the financing gap.

This project addressed this challenge by developing the first objective and data-driven assessment of the Savanna region in Australia's Northern Territory.

Impact statement

Themeda leverages diverse environmental and land-related data sources to predict land-cover changes as part of a larger pipeline that processes, analyses, and interprets complex environmental data to provide insights into the dynamic nature of ecosystems. This prediction model has the potential to be applied to land-cover predictions in other regions and has the potential to become an essential tool for more deliberate land-use planning, especially for agricultural activities.

Funding outcomes

'This project has led to multiple new collaborations throughout the University of Melbourne and other universities, both in Australia and overseas.'

⁸ Project members: Rebecca Runting, Robert Turnbull, Damien J. Mannion, Jessie Wells, Kabir Manandhar Shrestha.

The grant enabled a team of data scientists at the Melbourne Data Analytics Platform (MDAP) and researchers from the School of Geography, Earth and Atmospheric Sciences (SGEAS) to develop machine-learning algorithms to generate land use/land cover (LULC) datasets that will be an essential input for examining both farming activity and the biodiversity-link bond issued to Cairns Airport. This was an essential prerequisite for progressing to subsequent stages in the research plan that examine the economics underlying biodiversity-linked financing instruments.

Accurately predicting land-cover vegetation change can inform a broad range of proactive land-management actions. Artificial intelligence, and deep learning in particular, is a promising tool for predicting land-cover change because it is highly flexible and can learn complex relationships. This work introduces Themeda, a neural network model that generates probability distributions of predicted future land cover based on multiple data sources. This study leverages 22 years of remotely sensed land-cover data for the world's largest intact savanna region, complemented by a large variety of spatial and temporal data including rainfall, maximum temperature, elevation, soils, land use, and fire scars.

Project outputs, engagement, and partnerships

- Published 'Themeda: Predicting land cover change using deep learning' in *Remote Sensing of Environment* journal
- Invited to participate in the Nature Positive Cooperative Research Centre (CRC) bid, which has secured A\$45 million in industry funding and aims to seek a matching A\$45 million in ARC funding. The University of Melbourne is the only Victorian university that was invited to join the bid
- Established the Centre of Excellence for Nature-Positive Climate Transitions (CNPCT), with a target ARC funding of A\$35 million over seven years. Our team has been participating in workshops with outside consultants
- Collaborated with industry, including:
 - A globally large (top 15) fund manager to help them understand biodiversity exposure across their investment portfolio
 - An Australian bank, to support developing an understanding of customer perceptions around the impact of human/firm activity on nature
 - An overseas stock exchange, to write a white paper discussing biodiversity metrics relevant for investors. This is a collaboration with academics at the University of Cambridge and the University of Hawaii.



Developing a spatial index and dashboard of electric vehicle solar charging potential for decarbonisation

Project Leads: Patricia Sauri Lavieri and Kelvin Say



This project developed a dashboard to help decision-makers understand the extent to which the driving needs of Greater Melbourne's population can be met through direct charging from residential rooftop solar photovoltaic (PV) systems.

The project

To reach net zero emissions, the electrification of passenger vehicles needs to be accompanied by strategies that manage charging times and increase the use of renewable resources. The potential to leverage the abundance of residential rooftop solar installations through direct electric vehicle (EV) charging is yet to be understood.

CRX funding enabled a cross-faculty collaboration between Dr. Patricia Lavieri and Dr. Kelvin Say to develop a model and visualisation tool that demonstrates, for the different local government areas (LGAs) in Greater Melbourne, the extent to which their households might be able to rely exclusively on rooftop solar to charge their vehicles.

Impact statement

There is significant potential for solar energy to meet EV charging needs for a large group of households across the Greater Melbourne region. The impact of this work will be to provide a strong case for policies and consumer incentives that enable the integrated deployment of electric vehicles, level 2 smart chargers, and rooftop solar technology.

Funding outcomes

'The funded activities created new knowledge that has substantially changed the way we understand the potential of residential PVs in meeting the demand for EV charging.'

The project developed a dashboard that demonstrates, for the different local government areas (LGAs) in Greater Melbourne, the extent to which their households might be able to rely exclusively on rooftop solar (without residential battery) to charge their vehicles. The dashboard includes a series of spatial indicators to facilitate the visualisation of the direct residential PV charging potential LGA.

The complete analysis provides an important case to advocate for policies and consumer incentives that integrate the deployment of EVs with level 2 smart chargers and rooftop solar technology. It also points to the need for alternative solutions to facilitate sustainable charging among apartment residents.

The project led to several insights regarding how EVs may leverage rooftop PV energy resources and what segments of the population may need/benefit from different types of policies and rebates in Greater Melbourne. The findings make clear the non-negligible role that residential PVs can have in meeting EV charging demand needs.

Project outputs, engagement, and partnerships

- Produced a dashboard that is a lasting tool that can be continuously updated to incorporate more research findings
- Facilitated the communication of these results with multiple stakeholders
- Project leads co-supervised a masters student
- Engaged with C4NET, EVC, and AGL to share the project idea and obtain relevant data
- Publication of scientific research paper about consumer co-adoption of PVs and EVs in *Scientific Reports (Nature)*
- Presented results at two international seminars at the University of Texas at Austin, USA and at the University of Sao Paulo, Brazil. These presentations resulted in an invitation to write an insight piece for the US market research company, [Zpryme's](#), website
- Presented at the [Climate Smart Engineering 2023](#) conference, organised by Engineers Australia
- An article for *The Driven* is being produced to translate the dashboard findings to the public
- A journal article has been produced to disseminate the project outputs to the scientific community
- Presented dashboard to Ross de Rango, Head of Energy and Infrastructure at the Electric Vehicle Council (EVC). The EVC helped identify industry questions that can be answered using the dashboard and pointed to additional analyses that would be very relevant
- Ongoing work is also expected to create important insights regarding consumer groups that may benefit from mid-day electricity tariff discounts to inform tariff design and contribute to a demand-response management strategy
- The project leads continue to work towards an open-source, online map-based tool that serves as a one-stop shop for spatial data publication, discovery and consumption by government, industry, researchers, and the general community.



The living archive of Aboriginal art: Indigenous artmaking for a better climate future

Project Lead: Fran Edmonds⁹



Kerri Clarke (Boonwurrung/Wemba Wemba NSW, Vic) and Karen Rogers (Ngalakan, Ngukurr, NT) reveal the finished possum-skin cloak in the Ngukurr Arts Centre, June 2023

This project is developing a digital living archive where Indigenous artists can connect their work in ways reflecting Indigenous worldviews. It found that, through creative practice, Indigenous knowledge contributes to understanding the impact of climate change.

The project

This project centres around Indigenous Knowledge as critical for ecological wellbeing, contending that everyone must engage with Indigenous Knowledge to mitigate the climate crisis.

One example of artmaking as Caring for Country is the southeast Aboriginal tradition of possum-skin cloak-making, in which stories of waterways and Knowledge of Country are frequently mapped on cloaks. In 2023, Mitch Mahoney (Boonwurrung/Barkindji) took an unmarked, sewn possum-skin-cloak to Ngukurr. Along with Mitch's mother Kerri Clarke, they worked with Ngukurr artist Karen Rogers and the community to tell the story of their respective Country(s), culture and Knowledge of land, skies, waterways, plant and animal life, highlighting the diversity of landscapes and environments between the north and south of the Australian continent. The possum-skin-cloak markings and design work revealed the extent of Indigenous Knowledges about Country that are transmitted through stories as artmaking, and that this Knowledge is a living archive from First Nations perspectives.

CRX funding allowed this research team to think broadly about how the Living Archive can be developed to assist communities to work with their cultural material as a digital asset, including Indigenous data sovereignty, and self-determination over their ecological knowledge housed in archives.

Impact statement

The markings and designs on the cloak, alongside the stories they tell and the depositing of the cloak in the University of Newcastle Library, are significant lasting impacts of the project that highlight the significance of Indigenous knowledge systems as part of an extensive exchange network that exists throughout the country, and which are deeply connected to ecological sustainability.

Funding outcomes

'The CRX funding helped me ... advance this project to include international collaborators and build on the concept of centring Indigenous Knowledges for a better climate future.'

This project produced substantial relationships and knowledge exchange between two diverse First Nations Communities: Ngukurr, in southeast Arnhem Land, and members of the Clarke family from southeast Australia (inclusive of Boonwurrung, Wemba Wemba and Barkandji). This exchange included Knowledge of and stories about Caring for Country through the creation of artwork.

⁹ Project members: Richard Chenhall, Mitch Mahoney, Jeanine Leane, Tiriki Onus, Sally Treloyn.

The project worked with Ngukurr community Elders and senior Knowledge-holders to establish the Yugul Mangi Living Archive Committee (YMLAC), responsible for the governance of the Ngukurr digital archive. The digital archive is a repository of archival collections around the world, connected to Ngukurr, including Knowledge of Country as expressed through artwork. The YMLAC supports Indigenous Cultural Intellectual Property (ICIP) protocols, including access to and control of the Ngukurr community's Cultural Knowledge located in the Ngukurr living archive repository. The project has subsequently employed a community-based archivist to assist with collecting stories and gaining consent for material in the archive.¹⁰

A loan agreement has also been set up with the University of Newcastle Library, which will facilitate the sharing of the cloak with those involved in the Living Archive project and contribute to future teaching and learning that arises from the project. The opportunities for learning from the cloak and the related workshop in Ngukurr, centres Indigenous Knowledges alongside new approaches to pedagogical frameworks, highlighting knowledge concerned with climate change.



Kerri Clarke, Maree Clarke (Mutti Mutti/Yorta Yorta/ Wemba Wemba/Boonwurrung), Owen Turner (Ngandi, Ngukurr) and Robin Rogers (Warndarrang, Ngukurr) with the river reed canoe made by Mitch Mahoney (Boonwurrung/Barkandji), Footscray, Victoria, November 2023.

Project outputs, engagements, and partnerships

- Providing materials and funding support for Mitch Mahoney (Boonwurrung/Barkandji), an emerging southeast Aboriginal artist, to co-facilitate the possum-skin cloak-marking workshop in Ngukurr
- Produced the film, *Coming Together: A Possum Skin Cloak, Cultural Exchanges and Caring for Country*, telling the story of Indigenous Knowledge of Country as depicted on the marked cloak
- Keynote presentation for the Australian Archivist Society
- Presentation at 4S (Society for the Social Studies of Science) Conference, Honolulu, Hawaii
- Presentation and film launch at A Profound Reorganising of Things conference, University of Melbourne
- Major book publication: *ngargee – Coming together to celebrate: Southeast Australian Aboriginal Art*, Aboriginal Studies Press, AIATSIS, 2024
- Collaborations with:
 - Ngukurr Arts Centre to advance future funding opportunities
 - Southeast Australian Aboriginal Artists – Maree Clarke and family have indicated their support for ongoing collaborations on future projects arising from this seed funding
 - Mt Holyoke College, USA, through Mellon funding to support ongoing employment for the Ngukurr community-based archivist
 - University of Newcastle through an ARC grant to progress the collaborations with Ngukurr for a further three years
 - National Geographic Society, Washington DC, which is a first step towards building a partnership for future funding opportunities
- The project continues to build on these extensive collaborations, including furthering global networks and partners in the USA and Singapore to build the next phase of the project.

¹⁰ See the project [Blog](#) and [Facebook](#) sites for further details and images relating to the workshop.





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