UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Sustainable Development Goals 2023 Update

Introduction from the Vice-Chancellor

Tangata Tū, Tangata Ora

Engaged, Empowered, Making a Difference

Kia ora

Welcome to the University's yearly SDGs Update.

2023 was a milestone year for the University of Canterbury, as we celebrated our 150th anniversary. Through a series of events and activities the University community reflected on our history, and our ongoing role into the future. In this sense, sustainability was a key theme throughout the year. The many events held during 2023 gave me a unique opportunity to connect with a wide cross-section of our wider community and to understand more about the responsibilities we have as an institution to both support and guide our region.

As an example, the Community Feast brought together over three hundred people to enjoy a hāngi and other food grown and prepared locally. The collaboration of the many organisations that partnered to create this event focused on the idea of providing healthy and sustainably produced food and making the event accessible to all people in our community. As such, the event highlighted practical ways in which many of the Sustainable Development Goals intertwine. Subsequently, the University signed the Canterbury Food Resilience Charter to affirm our commitment to this important event.

Also noteworthy is that University achieved a historic high in student enrolments and I am pleased to highlight that enrolments in new degree programmes focused on sustainability have been strong, while our researchers continued to directly contribute to building capacity around critical, multi-faceted sustainability challenges, such as climate change and its impacts.

From an energy perspective, it is exciting to note that 2023 was the final year in which the University was primarily heated by coal. For many years coal has accounted for approximately fifty per cent of the University's carbon footprint. Extensive works over a number of years and considerable investment have resulted in a carbon neutral heating solution, which in 2024 will see a massive drop in our greenhouse gas emissions.

I hope you enjoy reading this update.

Professor Cheryl de la Rey

Tumu Whakarae | Vice-Chancellor
Te Whare Wānanga o Waitaha
University of Canterbury

2023 Highlights

24,354 students enrolled at UC in 2023

2,289 Māori students
Up from 2,236 in 2022

792 Pasifika students
Up from 648 in 2022

15,890 Delivered student-courses aligned with the SDGs

212 Additional courses mapped to the SDGs
Now total of 640 SDG mappings

Ilam campus boilers have been fully converted to run on biomass

10.3% Female enrolments in Science & Engineering Up 10.3% in 2023

Introduced our newest qualification, the Bachelor of Digital Screen (Hons)

UC Sustainable Design Society launched – a new student-led group aimed at building a more sustainable future

Finalist in the Australasian Green Gown Awards for our work on Next Generation Learning and Skills

UC Business School first institution in Australasia to successfully complete the Business School Impact System assessment process

Celebrated our 150th with a vibrant Community Feast – over 300 people from all walks of life attended

Hosted a 150th Anniversary Fundraising Gala Dinner with about 500 guests in attendance

Staff and students were invited to a fun party to mark our 150th birthday

All staff were eligible to take a day off work to volunteer with a charity of their choice in celebration of our 150th

Held a special exhibition at the Christchurch Arts Centre on the earliest history of UC

Collaborated with the Christchurch Symphony Orchestra to celebrate our 150th anniversary at the Christchurch Town Hall

Special publication launched *A New History: The University of Canterbury 1873-2023*

Dr Tufulasi Taleni is an award-winning researcher in the Faculty of Education.

1 NO POVERTY

End poverty in all its forms everywhere

UC alumni provides free access to justice

Keegan Jones is making waves in his community by offering iwi-based free legal clinics to reduce barriers to justice through a te ao Māori lens. Jones says his legal clinics make justice more accessible. “In Northland, we have the largest proportion of poverty across the country, which increases barriers to justice.” A key focus for Jones is building strong connections. “When you’re dealing with these kinds of issues, a lot of them are really raw, and you want to establish a relationship before getting into the nitty-gritty of the issues.” His vision extends beyond his local community, and he aspires to see free legal clinics based on te ao Māori and tikanga established throughout Aotearoa New Zealand. “I want to copy

Keegan Jones is making waves in his community by offering iwi-based free legal clinics to reduce barriers to justice through a te ao Māori lens.

this blueprint that we created here in Whangārei and make it accessible to every other inspiring lawyer who wants to create their own clinic," he says. To facilitate this, he started another project called 'The Free Legal Clinics Project' and is currently collaborating with two other lawyers based in South Auckland and Waikato.

Double awards win for Pacific education specialist

Dr Tufulasi Taleni was recognised for his research and impact in the field of Pacific education, winning two 2023 National Awards. Dr Taleni received the Pasifika Community Researcher Award and the New and Emerging Researcher Award. The awards follow Dr Taleni's doctoral confirmation, making him the first Pacific staff member with a doctorate degree at UC's Faculty of Education. "It really motivates me to move forward and share this story with our Pacific people, as we need to encourage more Pacific researchers in this area. This recognition also reinforces the importance of issues that contribute to the disengagement and underachievement of Pacific learners. The impact of poor education in childhood is poor health, low paid jobs, unemployment, and poverty. I carry out research because I think of the children – they are at the heart of my research," says Dr Taleni. Through his research, Dr Taleni has developed the Soalaupulega Samoa framework, which is based on the need for leaders within education, health, and the community to lead action in addressing key issues impacting children, families, and communities.

Food practices adaptation

Dr Joya Kemper from UC's Business Faculty collaborated in international research exploring the way family food practices adapted and emerged during the disruption of COVID-19. Conducting a survey of low socio-economic status families with primary school children across the UK and Aotearoa, the research team's analysis illuminates that this disruption triggered the emergence of three practices that were necessary to carry on and mitigate the impact of disrupted food practices; 'asking for help', 'planning' and 'research and experimentation'. As a way to deal with disruption to their food practices, many participants called on the support of the community, including the use of food banks and the sharing of food. The published findings have practical implications for policy makers and non-government organisations, such as providing formal support that is accessible while reducing any associated stigma.

UC offers a wide range of study options in SDG 1, including:

- Introduction to the Principles and Concepts of Sustainability
- Social Policy, Social Justice and Activism
- European Foreign Policy in the 21st Century

58 publications based on Elsevier mapping

50% of publications have international collaboration

Based on publications from 2019 to 2023

Global dangers of glacial flooding

A new study identifies regions around the world where people are most at risk from flooding caused by melting glaciers and could help save vulnerable lives. Dr Thomas Robinson says glacial lake outburst floods can happen without warning when a natural dam fails. His research team has for the first time identified areas and communities worldwide that are most in danger from this growing natural hazard, with more than half of the world's exposed population found in just four countries: India, Pakistan, Peru, and China. "While High Mountains Asia has the highest potential for glacial lake outburst flood impacts in India, Pakistan and China, we highlight the Andes, which affects people living in Peru and Bolivia in particular, as a region of concern with similar potential for impacts but fewer published research studies," Dr Robinson says. Those living in the Andes region are also very vulnerable to the impact of such a disaster, according to the researchers' measures of poverty, education levels, corruption and other factors. "We are keen to work with national and local governments in these high-risk areas to help identify and explore potential mitigation options", says Dr Robinson.

2 ZERO HUNGER

End hunger, achieve food security and improve nutrition and promote sustainable agriculture

Researchers trial sustainable biocontrols for food industry

'Nature's ninjas' could help protect kiwifruit and bees from dangerous pathogens if new research pays off. The term 'nature's ninjas' was coined by UC scientist Dr Heather Hendrickson to describe phage biocontrols – viruses that attack specific bacteria in an organism. This capacity sets them apart from antibiotics, which often kill beneficial bacteria as well as harmful ones. Dr Hendrickson's interdisciplinary research team has been awarded government funding over 5 years to trial phage 'cocktails' designed to combat key agricultural pathogens. Targets include the kiwifruit vine canker and the American Foulbrood virus that attacks honeybees. As well as improving the food sector's productivity and security, this venture will strengthen a

Dr Heather Hendrickson has been awarded MBIE funding for research on sustainable biocontrols in the food industry.

manufacturing bioindustry capable of supporting highly skilled jobs and enhancing access to environmentally conscious global markets. “If we build the intellectual and physical infrastructure to use phages safely in agricultural industries, we’ll be well positioned for potential future applications, including those targeting human pathogens,” says Dr Hendrickson.

Community Feast champions

UC hosted a Community Feast event in April, as part of our 150th Anniversary. The festive event brought food resilience organisations in Christchurch Ōtautahi together with researchers, local government and members of the public, and was themed around food security, production and waste, as well as resilience, sovereignty, culture and nutrition. Guests were treated to a hangi by Grenville Ratima (Ngāi Tūāhuriri) with salads and desserts by Green Dinner Table and preserves and pickles provided by members of the Canterbury Community Gardens Association. Community Feast was created to thank organisations, community groups and individuals who do so much for food security and resilience in Christchurch. The event attracts a network of organisations who are tackling global problems on a local level.

Community Gardens Research Symposium

Following on from the Community Feast event, UC teamed up with staff from Lincoln University to co-host the inaugural Community Gardens Research Symposium. It is understood that community gardens are part of a jigsaw of initiatives that can help improve food resilience in our communities, along with many other benefits. The symposium sought to bring together researchers working in this area, along with community garden practitioners to share more about what is being researched, and to learn what research priorities could be. Many people attended for a session that strengthened networks and made it easy for community-based practitioners to access university-based research resources.

UC offers a wide range of study options in SDG 2, including:

- Mental Health and Food
- Sustainability Systems in Engineering
- Environmental Politics and Policy
- Politics of International Aid and Development

88 publications based on Elsevier mapping

66% of publications have international collaboration

Based on publications from 2019 to 2023

Developing new algorithms to manage biosecurity threats

New research will explore how algorithms could help speed up New Zealand’s response to serious biosecurity threats such as foot and mouth disease and stop them spreading. Associate Professor Alex Gavryushkin is co-leading research into using algorithms to help respond to a biosecurity outbreak swiftly and effectively. The algorithms can present a range of possible outbreak scenarios, rather than just the one that’s the most statistically likely, as well as updating their predictions in real-time. In a globalised, interconnected world, new pathogens are only a plane or ship ride away and they can have serious implications for the local and global economy. “Once we have this efficient infrastructure for biosecurity algorithms in place, we will be in a far better position to prevent problems further down the track by doing the difficult, time-consuming pre-computations early on, including before outbreaks start and in parallel to them,” says Associate Professor Gavryushkin.

Dairy farming, coastal flooding and sea level rises

Dr Heather Craig from UC’s School of Earth and Environment collaborated in a multidisciplinary research team that analysed dairy farm exposure and impacts from extreme and relative sea levels rises in Aotearoa-New Zealand. Spatio-temporal modelling was undertaken of New Zealand farmland, such as at milking shed locations, to categorise severity of damage. Analysis highlighted the increasing exposure of the dairy industry to coastal flooding, which included 472 farms potentially being impacted by a 10-year annual recurrence interval. The research findings suggest significant implications for Aotearoa where the dairy industry is of high economic and social importance, demonstrating the need for industry targeted climate change adaptation and disaster risk reduction measures.

Dr Matt Hobbs published study demonstrates a link between environmental factors, and youth mental health.

3 GOOD HEALTH AND WELL-BEING

Ensure healthy lives and promote well-being for all at all ages

Ground-breaking study on Muslim Kiwis

A new study exploring perceptions of Muslim Kiwis is being led by a former refugee turned research scientist, Dr Usman Afzali. Dr Afzali lost close friends and members of his community in the March 15 Mosque shootings. Deeply affected by what happened, Dr Afzali says, “I thought I should be one of the people who finds solutions for Muslim issues.” He was asked to collaborate on The New Zealand Attitudes and Values Study, a large national longitudinal study of social attitudes, personality, ideology and health outcomes of New Zealanders and their changes of attitudes and values over time. The study aims to understand how Muslim New Zealanders perceive themselves and what makes them resilient. Dr Afzali and the research team hope to finalise their research in 2026 and share their

Postdoctoral Fellow, Dr Usman Afzali.

findings with local and national government bodies in the hope of showing the diversity and challenges within the group. “The study includes where we come from, what we contribute to New Zealand, what we think and what our needs are,” says Dr Afzali.

Youth mental health and the environment

Global statistics on youth mental health make for sobering reading, with depression a leading cause of adolescent illness, and suicide a common cause of death. A recent study co-led by UC Senior Lecturer in Public Health Dr Matt Hobbs, adds to the body of research investigating the complexities behind these stark figures. The results of the study showed that young people living in health-constraining environments were more likely to experience poorer emotional and mental health. Young people living in health-promoting environments were less likely to have problems with substance-abuse. While Dr Hobbs acknowledges that environmental factors are only one of the complex influences impacting youth mental health, he hopes the study’s findings could help to inform practical interventions by policy makers. “While we know there are many influences on mental health, it’s possible that small changes in upstream factors, such as environment, may result in large improvements in the mental health of a population, because of a population-level shift in the distribution of risks, exposures and resources,” says Dr Hobbs.

Changing the world, one smile at a time

For many of us, achieving something we’ve been told we can’t do is satisfaction enough. Kenny Ardouin was inspired to build a career around it. Born with cleft lip and palate Ardouin was only twelve when a health professional told him: “You’ll be able to speak, but you’ll never make a career out of public speaking.” Following speech language therapy, and several years working as a speech language therapist himself, Ardouin is now a Lecturer in UC’s School of Psychology, Speech and Hearing. Ardouin has been invited to be a member of the Scientific Committee for the International Appearance Matters 10 Conference in Bristol next year. He will represent UC as the only Scientific Committee member from New Zealand, and one of only two members from outside Europe and the USA.

Relationships and Sexuality App now launched!

Back in 2021 we reported on the development of a new relationships and sexuality mobile app for Young People. We are pleased to report the new app has now been launched. Called *Te Puāwaitanga: Beyond the Birds and Bees*, the free platform is a

504

publications based on Elsevier mapping

60%

of publications have international collaboration

Based on publications from 2019 to 2023

New Zealand first led by UC lecturers Tracy Clelland, Dr Fabian Gilson and Associate Professor Adrian Clark. The free online platform aims to provide a wide range of reliable information about sexuality, sexual health and relationships. It includes an app, Instagram, and TikTok site for young people as well as a website for parents, educators and anyone working with young people, and answers all those awkward, funny and confusing questions. The app covers many topics, including being in love for the first time, gender identity, breaking up, safer sex, boundaries, bodies, consent and healthy relationships.

Gardening to change minds and save lives

A UC-led project aims to reduce type 2 diabetes in local Pacific communities by bringing people together to grow vegetable gardens at home. PhD student Dr Esala Vakamacawai is leading the project. “We know this problem of type 2 diabetes is present in Fiji and in indigenous Fijians,” Dr Vakamacawai says. “This is a non-communicable disease that is related to modifiable lifestyle factors such as obesity, diet and exercise, so that means as health professionals we can do something about it.” The consequences of type 2 diabetes can be devastating. As a surgeon in Fiji, Dr Vakamacawai performed many amputations on patients for whom lifestyle modifications did not work or were recommended too late, he says. Attitudes need to change, however, and that’s where the gardening project is gaining traction. In the last year the project has established 20 backyard vegetable gardens with a local Pacific club.

Researchers honoured for an innovative approach to literacy that has helped more than 45,000 Kiwi children learn to read and write.

4 QUALITY EDUCATION

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Researchers elected as Royal Society Fellows

Five UC researchers and a graduate have been elected to the Academy of the Royal Society. Professor Jennifer Adams, Professor Brendon Bradley, Professor Bronwyn Hayward, Professor Brett Robinson and Professor Te Maire Tau were announced as Fellows, and internationally renowned UC graduate, economist Professor David Teece was elected as a Honorary Fellow. Physics and Astronomy Professor Adams is New Zealand's lead scientist in the IceCube collaboration. Earthquake Engineer Professor Bradley has made significant contributions in several areas of earthquake science and engineering. Political Science and International Relations Professor Hayward is an internationally recognised researcher at the intersection of climate

Professor Bronwyn Hayward.

change, sustainability and youth studies. Professor Robinson has made leading contributions to the understanding of fluxes of the chemical elements in the soil - water - plant continuum. Professor Tau (Ngāi Tahu) is a leading tribal historian who has dedicated himself to the re-discovery, protection and translation of Ngāi Tahu histories and knowledge. Professor Teece is a global science leader in his field of economics and business. His new paradigm for understanding market firms introduced the role of 'dynamic capabilities' in driving entrepreneurial innovation and commercial success, turning the neoclassical conceptualisation of the firm on its head.

Weaving sport and community into teaching

Dr Phillip Borell was awarded a 2023 Teaching Medal, UC's highest award for teaching excellence. He had never planned on being a career academic but researching and becoming a lecturer in the School of Māori and Indigenous Studies and within the Bachelor of Sport Coaching, has been an opportunity to integrate all of his interests, including sport, community, family and culture. Dr Borell is currently developing a new, tailor-made Māori sporting practices paper that will be part of a te ao Māori-focused major for the Bachelor of Sport degree being introduced from 2025. His goal is to encourage critical thinking and develop students' ability to engage with Māori perspectives. Dr Borell is strong on community engagement and theory being backed by practical experience and often invites key contacts into the classroom to talk to students about their real-world experiences.

Law students secure prestigious internship

Rā Neilsford-Jones and Emily Speirs are heading to Washington DC for prestigious internships in the US Congress as part of the NZUS Council *Mike Moore Internship Programme*. The programme provides students the opportunity to gain beneficial work experience as they engage with the US political system, build invaluable connections, and develop a deeper understanding of international relations. Emily is studying towards a double degree in Arts and Law, and will be interning for Darrell Issa, a senior member of the House Judiciary and Foreign Affairs Committees. Rā is studying towards a double degree in Law and Science and is interested in anything related to kaupapa Māori. Rā will be interning for the longest-standing native American congressman, Tom Cole.

194

publications based on Elsevier mapping

43%

of publications have international collaboration

Based on publications from 2019 to 2023

Awards given to UC teachers and mentors

Improving access for diverse learners was a common theme among the 2023 winners of our annual Teaching Awards. Stand-out UC teachers are nominated for the teaching awards by their students and fellow academics. The Outstanding Teaching and Learning Transformation Award was given to ENGME!, a peer mentoring programme that has made a positive impact for more than 6000 students since its launch 6 years ago. The Teaching Excellence Award winners were presented to Teena Henderson, Lecturer in Te Reo Māori, and to Dr Toni Collins, Senior Lecturer in Law who embeds bicultural competence in her teaching, including legal language and Māori perspectives on Natural Resources Law. Lisa Davies was awarded the Hapori Community of Practice Award, for her support in the Master of Māori and Indigenous Leadership degree.

Innovation Medal for children's literacy approach

UC researchers were honoured for an innovative approach to literacy that has so far helped more than 45,000 Kiwi children learn to read and write. Since its introduction in 2020, the Better Start Literacy Approach has been adopted in more than 850 schools, nearly half of all New Zealand state primary schools. UC's 2023 Innovation Medal was awarded to the research group in recognition of the transformative impact of their work and their success in using evidence-based research to boost children's skills in reading, writing and oral language. Professor Gillon said the UC award is great recognition of the group's efforts: "We feel very proud of the level of scale that the Better Start Literacy Approach has reached across the country."

5 GENDER EQUALITY

Achieve gender equality and empower all women and girls

92-year-old graduate Dr Patricia Roberts-Pichette returned to UC from Ottawa for the University's 150th Anniversary celebrations. Pictured with Amo Matua | Executive Dean Science Sarah Young.

92 years of resilience and perseverance

At 92, UC graduate Dr Patricia Roberts-Pichette reflected on her pioneering career. After graduating 70 years ago with a Bachelor of Science followed by a Master of Science from UC, Patricia left in 1954 for Duke University in America on a Fulbright scholarship to complete her PhD in Ecology and Forestry. Dr Roberts-Pichette then taught for 10 years at the University of New Brunswick, Canada, and went on to lead the way in global ecology. To this day she continues researching and her work is regularly cited in academic research, specifically her work on the venus fly trap. While she reflects on her life with pride, it was not an easy road: she often found herself the first or only woman in her work. Her best advice was about passion: "If you really

want to do something, and if it's that important – go do it. Go around the corners, go under barriers, put your head down and go straight through, that's what you do. But you've got to love it; if you don't love it, don't try." Dr Roberts-Pichette's career included roles in Environment Canada on a UNESCO Program, where she managed the Canadian Secretariat. After working at the Canadian International Development Agency, she was appointed to a technical advisory committee on international agriculture with an office at the UN Food and Agriculture Organization in Rome. Dr Roberts-Pichette later had a national award for excellence named after her by Environment Canada.

Beginning her filmmaking career here at UC, Zoe McIntosh is now an award-winning director of commercial, documentary and dramatic works.

Alumni Q&A: Zoe McIntosh

Beginning her filmmaking career here at the Ilam School of Fine Art, Zoe McIntosh is now an award-winning director of commercial, documentary and dramatic works. Her latest feature film, Stylebender, had its global premiere at the Tribeca Film Festival in June 2023, where it was nominated for Best Documentary and Best New Director. McIntosh notes it was difficult to get a break as a woman in filmmaking. McIntosh says, "It is SO hard to become a film director and even harder as a woman. How I transitioned was by submitting two films I had made at University into a few film festivals overseas and in NZ. They got traction and won a few awards. This recognition opened doors for me to direct films in NZ while I was still quite young". McIntosh's most recent project, Stylebender, is a feature film about Israel Adesanya, the Nigerian-born, New Zealand-based MMA champion. The film goes beyond the ring and delves deep into an unlikely fighter's journey.

UC offers a wide range of study options in SDG 5, including:

- Gender and the Law
- Women/Theory/Film
- The Politics of Need: Globalisation, Poverty and Welfare Provision
- Social Services in Aotearoa
- Gender Sensitivity and the Human Services

75

publications based on Elsevier mapping

48%

of publications have international collaboration

Based on publications from 2019 to 2023

Wahine of the waves

UC History Professor Katie Pickles highlighted research which explains how women broke down the boy's club barriers to surf lifesaving in New Zealand. Girls and women now expect to be able to participate and compete in surf lifesaving in New Zealand, but it wasn't always that way. Until relatively recently, patrolling the beach and waves was pretty much a male domain. Post-war years saw some gains: women were allowed to become summer beach patrollers and be paid for their work. By 2017, half of New Zealand's surf lifeguards were women, but they made up only 28% of rescue boat drivers. A recent survey found girls and women still faced some barriers to participation. A wahine on water programme sets out to redress the remaining gender imbalance, providing mentors and training opportunities, while Surf Life Saving New Zealand has made it a mission to include all peoples and cultures within the organisation.

6 CLEAN WATER AND SANITATION

Ensure availability and sustainable management of water and sanitation for all

Consumers perceptions on farming

Assurance systems such as freshwater monitoring are a cornerstone of New Zealand's agribusiness. They enable compliance with regulations, product safety and international trade. But these systems face growing challenges. Urban communities demand higher transparency and engagement, consumers are increasingly sceptical of the effectiveness and compliance of farm operations. UC Professor Pavel Castka and Senior Research Fellow John Reid co-authored a white paper based on a recent survey, to address challenges and to improve farm assurance systems. The authors explored technological developments, public awareness and the potential to incorporate Māori perspectives. The survey was designed to gather

public perceptions of farm assurance and identify ways to enhance public understanding of farming and its impacts. It suggests better farm monitoring systems could strengthen agriculture's social license to operate. It also highlights the importance of transparency, accountability and engagement with interest groups and communities to foster trust and ensure compliance.

> "Our Waterways Plan aims to increase base flow, reduce contamination, and improve habitat for aquatic species."

Improving Waterways Catchment Management

In 2021 we reported on our ongoing efforts aimed at improving UC waterways. Waiutuutu Okeover Stream runs through our Ilam campus. We commenced the Waiutuutu Okeover Digital Twin Project, which involves a virtual model of the stream and surrounding infrastructure such as bridges and the local environment, with real-time information about the functional condition of water quality data and water data. Phase 1 of the project involved a trial basic sensor station, and Phase 2 expands on the concept with multiple sensor stations in-stream for continuous monitoring for real-time data and analysis. Development of Phase 2 is now underway. Phase 2 will assist us with day-to-day operational decisions of the Waiutuutu Okeover Stream, and also long-term strategic planning, environment reporting, trend analysis and management scenario modelling.

UC offers a wide range of study options in SDG 6, including:

- Freshwater Resources
- Freshwater Restoration and Recovery
- Freshwater Science Field Skills
- Groundwater and Geothermal Systems

207 publications based on Elsevier mapping

60% of publications have international collaboration

Based on publications from 2019 to 2023

Water Teaching and Monitoring

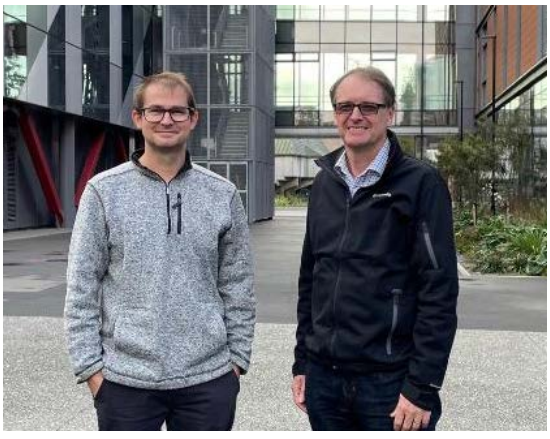
The streams flowing through our campus waterways provide us a range of teaching opportunities. For example, the macroinvertebrate and stream flow data collected by BIOL112 (Biology) and GEOG201 (Geography) provides a valuable addition to our usual monitoring. Our Waterways Plan aims to increase base flow, reduce contamination, and improve habitat for aquatic species. To assess these goals, water quality and quantity measurements are collected quarterly, and ecological monitoring is conducted annually. This is then compared to previous studies conducted on campus since 1979, to evaluate long-term change.

7 AFFORDABLE AND CLEAN ENERGY

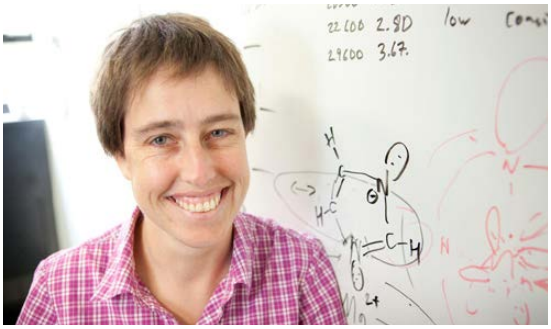
Ensure access to affordable, reliable, sustainable and modern energy for all

Green hydrogen powering the future of NZ

The idea of using green hydrogen to power the world is nearly everywhere – it has the potential to alter the playing field for sustainable power, but it's just that – an idea. Professor Andy Nicol and Dr David Dempsey have received multi-million-dollar government funding to start making that idea a reality. The research team will answer critical questions for the future of green hydrogen in New Zealand. The team have found a handful of suitable sites and will continue to investigate these sites to find the most suitable. Once the team has answered outstanding questions, underground storage of hydrogen could enable us to store large amounts of energy for use during times of high demand. Their research will start laying the key foundations for a sustainably powered New Zealand.



Professor Andy Nicol and Dr David Dempsey received funding from MBIE to answer critical questions for the future of green hydrogen in New Zealand.



UC Associate Professor Deborah Crittenden says her research shows long-life, high performance organic batteries are possible.

Organic, recyclable batteries

Associate Professor Deborah Crittenden says long-life, high performance organic batteries are possible, and could be a cost-effective and environmentally conscious replacement for the lead-acid and lithium-ion batteries commonly used to store energy from rooftop solar panels. On a larger scale, they could help Aotearoa store energy generated from renewable wind and solar farm sources across the national grid. “We believe these batteries will play a critical role in helping New Zealand reach its climate change goals of 100% renewable electricity generation by 2035 and carbon neutrality by 2050,” she says. “We’re working on using room temperature molten salts made out of cheap and plentiful organic materials to boost the energy density of existing redox-flow batteries. We expect our batteries to be roughly on-par with lithium-ion batteries in terms of energy density and voltage, but because the energy storage components of our batteries are liquids, they will be instantly refillable and rechargeable and have substantially lower environmental impacts than other batteries on the market because of their sustainable and recyclable materials,” says Associate Professor Crittenden.

Producing green hydrogen from trees

Chemical and Process Engineering PhD student Jhulimar Castro is part of a team led by Professor Shusheng Pang that has been working on experimental research to convert the wood biomass to green hydrogen and securing future energy supply. “Green hydrogen is one of the best alternatives to fossil fuels, which is why it is a key factor in the Government’s net zero emissions by 2050 scenario,” says Castro. “It is important to me as a chemical engineer to contribute towards solutions for the world’s challenges through research, in this case climate change mitigation and energy security. In the future, my goal is to join an energy company to help with the commercialisation of this technology and to apply my research to do something beneficial for our communities, economy and environment,” says Castro.

317

publications based on Elsevier mapping

73%

of publications have international collaboration

Based on publications from 2019 to 2023

Chemical and Process Engineering PhD student Jhulimar Castro’s research looks at the commercial viability of producing green hydrogen from pine trees.

Predicting natural power

Geothermal energy is extracted from heat deep beneath the Earth’s surface. Because it sits over the boundaries of two active tectonic plates, New Zealand has a number of geothermal areas. Geothermal fields are used for energy generation, however small earthquakes or hydrothermal eruptions could threaten that energy production. Dr Alberto Ardid and Dr David Dempsey are part of a research team developing new monitoring systems that can anticipate geothermal instability, by harnessing insights from data collected from geyser eruptions in Yellowstone National Park, USA. The goal is to provide new monitoring systems for the geothermal industry to help reduce risks to people or harm to the land resulting from small hydrothermal eruptions or earthquakes triggered by geothermal activity. Dr Dempsey, who oversees the research, says the aim is to help New Zealand’s geothermal industry adapt to future hazards environmental changes caused by humans, and climate-change mitigation strategies like carbon sequestration. “New Zealand’s geothermal industry has an enormous role to play in Aotearoa’s low carbon future, but we need to be alert to new hazards and be prepared to mitigate them,” says Dr Dempsey.

8 DECENT WORK AND ECONOMIC GROWTH

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Microcredentials addressing a "skills emergency"

Governments and industry are crying out for new skills, referring to a global "skills emergency". Statistics from the 2020 World Economic Forum suggested that by 2025, 40% of workers will need reskilling and 94% of business leaders believe employees will have to develop new skills on the job; the report also posits that by 2025 97 million new jobs will evolve or emerge. Modern employers are asking for better skills and more "soft skills" as part of higher education. UC's Dean of Future Learning and Development, Professor Mick Grimley, says shorter professional development courses and microcredentials have huge potential to bridge these skills and knowledge gaps. Microcredentials tend to focus on skills and new knowledge. UC offers

microcredentials, and demand is strong. UC has partnered with the NZ Transport Agency to deliver a microcredential in project management, and this has had high success rates. The Agency confirmed online delivery has allowed them to increase the capability of their project managers, consider a career development framework, and attract new talent into a field that is difficult to resource.

PACE internship advances slow fashion career goals

A summer internship led to a job that is now furthering graduate Josie Tricker's dreams to positively impact people's clothing choices. Having started her postgraduate studies, Josie approached her supervisor about the possibility of doing a summer internship aligned with her interests. This paved the way to her securing a UC Professional and Community Engagement (PACE) internship with a charitable organisation that connects and supports environmental and sustainability organisations. UC's PACE Programme is open to all disciplines, enables students to apply their learning and develop workplace skills while also earning academic course credits. At the end of the internship, Josie was hired to work part-time around her studies. "One of the last PACE assignments we did was writing a CV and covering letter for a job we would love to do. I ended up applying for a job with a second-hand clothing company in London because it was such a perfect fit for me," says Josie.

Taking part in UC's PACE Programme as part of her studies has been a very rewarding experience for UC Psychology student Josie Tricker, whose summer internship was followed by a job offer.

UC offers a wide range of study options in SDG 8, including:

- Entrepreneurship and New Ventures
- Creating impact led enterprises
- Business and Sustainability
- Workplace Skills and Corporate Social Responsibility
- Social Entrepreneurship

229 publications based on Elsevier mapping

76% of publications have international collaboration

Based on publications from 2019 to 2023

Alumni Q&A: Zahra Emamzadeh

After completing her undergraduate and master's at the University of Tehran, Zahra and her family emigrated to New Zealand. Following successfully completing her PhD at UC in 2022, Zahra is now working to support ethnic communities in her role with the Ministry of Education. Zahra's PhD research topic revolved around a comparative study between American and Iranian media, examining how their editorials represented the Joint Comprehensive Plan of Action during a certain point of time. Since graduating, Zahra now holds a position as Senior Advisor – Community Partnerships at the Ministry of Education. Her responsibilities involve supporting various ethnic communities to run a Learning Community Hub program. Zahra says her time at UC "was defined by intellectual growth, meaningful connections, and personal achievements. These cherished highlights and memories continue to shape my journey and serve as a reminder of the transformative power of higher education."

UC Alumni, Zahra Emamzadeh.

> Preparations are underway to transform a 1500m2 section of lawn between UC's health centre and student association building into a trial biodiversity meadow that is expected to create greater numbers and diversity of insect life, and in turn attract native birds and reptiles.

Read more on page 35

Associate Professor Debbie Munro has developed a prototype device and software to reduce the risk in spinal fusion surgery.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation

Taking the guess work out of spinal surgery

Associate Professor Debbie Munro has developed a prototype device and software to reduce the risk in spinal fusion surgery. Spinal infusion is a highly invasive surgery where an implant is placed in the spine to prevent movement between bones, and the treatment has a high failure rate after only five years. Associate Professor Munro developed prototype device which attaches to a rod inserted during a spinal fusion surgery, and also invented a wireless sensor and software that interprets outputs from the gauge, which will help determine the success of the fusion. Once the surgery has been found successful the device would be used to track the patient's progress. Associate Professor Munro believes this technology could be used in other parts of the body, such as hip and knee replacements to track degradation. Further testing will occur over the next year with hopes it will be ready for commercial interest in 2024.

Student Aerospace Team rockets to success

A team of 10 UC students are coming back to earth after building and launching a winning rocket 10km into the sky at an international aerospace competition. The student team won their category and placed third overall at the Spaceport America Cup in the USA, which features participants from colleges and universities around the world. The event is the world's largest student rocket engineering conference and competition, and this year 5913 participants and 158 teams from 24

countries took part. The UC students were the only New Zealand team competing. To win their category they had to design, build and launch a rocket that reached as close as possible to the target of 30,000 feet (about 10 km). The competition began well ahead of the event because every team had to provide milestones, technical reports, and safety reviews prior to launch. The students designed and built all aspects of the rocket within the tight deadlines of the competition and on top of their academic course work. The UC Student Aerospace team members are pictured and included: Alicia Smith, Avalon Beker, Henry Eden-Mann, Reuben Van Dorp, Jacob Saunders, Jack Davies, Pieter Leigh, James Graham, Caleb Melchers and Peter Lee.

The winning UC Aerospace 2023 Spaceport America Cup team in New Mexico. From left, Alicia Smith, Jack Davies, Reuben Van Dorp and Avalon Beker.

Research on International Space Station

A prototype research facility, for studying protein crystal growth, will soon orbit Earth aboard the International Space Station (ISS). The facility has been developed by Dr Sarah Kessans, in collaboration with two local companies and a USA-based research team. The research facility is scheduled to fly on the Axiom Mission 3, the third private astronaut mission to the ISS. By developing a facility that is self-contained, autonomous, and allows for on-orbit analysis of thousands of experimental conditions, Dr Kessans hopes even more research can be conducted at a lower cost into the future. "We can do a lot of analysis up in microgravity and can gain a great deal of information from the real-time data that we will be able to downlink during the experimentation on the ISS. But the real value is in being able to get those experiments back to researchers on Earth for further analysis," says Dr Kessans. "This initial project represents just the beginning of what we hope to develop into an entirely new industry in New Zealand at the interface between aerospace and biotechnology, two high-value, rapidly growing, and increasingly important sectors of the economy," says Dr Kessans.

251

publications based on Elsevier mapping

65%

of publications have international collaboration

Based on publications from 2019 to 2023

Forecasting grape growth

New Zealand's wine industry is an important and valuable horticulture sector. However, forecasting grape yield is a struggle and inaccurate techniques can be costly, affecting profits. Professor Richard Green's research team plan to develop a unique approach by finely blending an innovative 3D-imaging-based detection system with a physiological growth prediction model. Professor Green describes it as a complex, interlinked, and challenging measurement and data problem, and says this is the first time it's been approached this way. "Now we can scan through the year, which means you can perfectly align it to see how much it's grown and changed. This will help us forecast yield, and we'll gain access to data that will help us understand the crop on a whole new level," says Professor Green. He believes this project may go further than forecasting grape yield: "We'll also accelerate vineyard automation to help to mitigate labour shortages and costs, and better prepare our vineyards for climate change."

Maple syrup mission taps into hi-tech imaging

Research is underway investigating whether it's viable to produce maple syrup at scale within New Zealand, and trial plantations have been established. Professor Matt Watson is leading the research and believes producing maple syrup in New Zealand has commercial potential. His team is exploring whether densely planted trees – about 10,000 per hectare – can produce enough sap in moderately cold temperatures to make large-scale production worthwhile. While commercial production is a long way off, it is projected that 2000 hectares of maple trees could generate NZ$60 million a year in maple syrup revenue. In the latest stage of the research, Dr Jamie Robinson, a postdoctoral fellow, is using cutting-edge imaging techniques to study cells and structures inside the stems of a sugar maple tree. His aim is to understand the mechanisms that lead maple trees to produce high volumes of sugar-rich sap.

Master's graduate Joanne Lee.

10 REDUCED INEQUALITIES

Reduce inequality within and among countries

New life-changing scholarships

McCall MacBain Foundation Chair and Founder John McCall MacBain, with his wife, Foundation Vice-Chair Dr Marcy McCall MacBain, announced a significant donation to UC's Te Kakau a Māui scholarships programme. A Rhodes Scholar himself, he says the scholarships align with his foundation's goal of helping students actualise their potential and promise. "Talent is found in every corner of the world, but opportunities are not, and with this gift we hope to play a part in ensuring that talented students, no matter their background, have access to meaningful, holistic programming that can accelerate their leadership, " he says. Vice-Chancellor Professor Cheryl de la Rey says the new scholarship programme aims to transform young people's lives. "We believe these scholarships are life-changing

McCall MacBain Foundation Chair John McCall MacBain, with his wife, Foundation Vice-Chair Dr Marcy McCall MacBain.

and unique because they offer mentoring, support and career-coaching to our successful scholars, in addition to covering tuition fees for a degree. Providing an equitable and accessible tertiary education is central to UC's ethos and a big part of our history," says Professor De la Rey.

Student on track for law career thanks to new scholarship

Student Ashlin Chandra is relishing her first year at UC and being one step closer to her goal of becoming a lawyer and justice advocate. As one of the inaugural Te Kakau a Māui scholars, Ashlin receives full tuition fees for her double degree, studying towards Bachelor of Laws and Criminal Justice. For Ashlin, who represents the first generation in her family to go to university, studying law stems from a desire to help others and she hopes to give back through voluntary legal work in future. "I love being able to study in an area that I am passionate about. This scholarship works because it doesn't end when you're chosen for it – the programme stays with you. It is supporting me to reach my goal of being able to make a difference in other people's lives," says Ashlin.

Mapping reveals geographical cavities

Noticing inequalities in access to dental care, oral health therapist, Joanne Lee was inspired to complete her Masters. "Since dental care is still free for kids under 18, you can see that people who come to their appointments are often more well-off, because they can afford the time and costs of turning up. Those who can't afford it ultimately turn up in severe pain. I am hoping my research will help existing systems to pinpoint areas that currently do not have enough dentists contracted to provide dental care for adolescents, and to place adequate dental and oral health therapists in these areas to meet this need," says Joanne. Ultimately, Joanne says, the responsibility for change lies with policymakers: "We need to change the status quo - this may include the possibility of providing services for adolescents on (more) school grounds, through mobile units and in culturally appropriate settings such as churches or marae."

Study is "life sustaining"

Getting older is no reason to stop challenging your brain, says 82-year-old student Robert Walker. Walker will add a Master of Policy and Governance degree to his list of qualifications. He says studying keeps him motivated in his senior years. "It's very life sustaining as it forces you to get out of bed in the morning, go and attend lectures, and keep up some life interests rather than sitting in a chair watching tv. It's about having goals, and hopefully something good might come out of it," says Walker. After a career running a publishing and advertising company, Walker has spent his retirement studying part-time. His master's dissertation, titled *"Elderly Financial Abuse in New Zealand: Is the Law Sufficient?"*, explores elder abuse and how older citizens can become victims of criminal and fraudulent behaviour. Walker argues that a robust overhaul in New Zealand law and administration is overdue and necessary and hopes his research will lead to changes being made.

145 publications based on Elsevier mapping

50% of publications have international collaboration

Based on publications from 2019 to 2023

Reducing the cost of breathing

Sleep apnoea is a dangerous health condition where a person will unknowingly stop and start breathing in their sleep. It can lead to high blood pressure, heart disease, stroke, diabetes, and early death. The severe fatigue caused by sleep apnoea also means someone may fall asleep while at work or driving. A fourth-year student engineering project has produced a prototype device with top end capabilities for a tenth of the cost. The student research team's goal is to "help reduce health inequalities. We want to give back to our communities and affordable healthcare is a local and global issue. With Māori and Pacific peoples twice as likely to have sleep apnoea a large percentage of our population is disproportionately impacted by the costs of healthcare."

UC researchers are changing the game for chronic and respiratory illnesses. From front left, Jaimey Clifton, Ella Guy, Trudy Calje-Van Der Klei, Mia Uluilelata, Samuel Jackson, Samrath Sood, and Jordan Hill.

Dr Leighton Watson

11 SUSTAINABLE CITIES AND COMMUNITIES

Make cities and human settlements inclusive, safe, resilient and sustainable

New research on natural hazards

Canterbury researchers have received national funding to investigate how climate change could increase the risk of damage triggered by earthquakes and landslides. Dr Timothy Stahl leads the research team, and says earthquakes and landslides are two of New Zealand's deadliest and most costly natural disasters. "Cumulatively, landslides have caused more deaths in New Zealand than any other natural hazard and lead to $300 million in insurance claims each year. We plan to create up-to-date models for these hazards that will ultimately allow us to be more prepared and resilient. We'll also drive new research into how natural disasters such as landslides, cliff collapse and flooding triggered by earthquakes, are affected by climate change," says Dr Stahl.

Dr Timothy Stahl is leading new research into how climate change could increase the risk of damage triggered by earthquakes and landslides.

Pacific-NZ partnership

UC is partnering on a unique research project to help Pacific countries and the global community understand how climate change will impact the Pacific, and how Indigenous knowledge can help Pacific communities adapt. The Pacific region is one of the most vulnerable regions in the world, but the Pacific people also have a long history of resilience to environmental changes and natural hazards. The three-year, multi-million-dollar project addresses a lack of research into community resilience and response mechanisms, and the ways Indigenous knowledge can work with social sciences and natural sciences to inform a range of responses, from government policies to community plans. The findings, from 16 countries, will highlight Pacific solutions to Pacific experiences, sharing these experiences across the region and the world.

Tracking volcanic hazards

New Zealand research could help track the path of searingly hot rock and gas flows that are the world's most deadly volcanic hazard. Research by UC's Dr Leighton Watson has for the first time shown that seismic signals - ground shaking recorded by seismometers - can be used to track deadly pyroclastic flows. The catastrophic eruption at Whakaari White Island in 2019 caused a pyroclastic surge of gas and rock that killed 22 people, while an earlier eruption in 2012 of craters on Mt Tongariro also caused pyroclastic flows, resulting in the closure of the Tongariro Alpine Crossing. Dr Watson says because of the extreme hazard posed by pyroclastic flows there is an urgent need to improve monitoring capabilities. Dr Watson is currently working on monitoring avalanche activity in Mount Cook Aoraki National Park.

506 publications based on Elsevier mapping

62% of publications have international collaboration

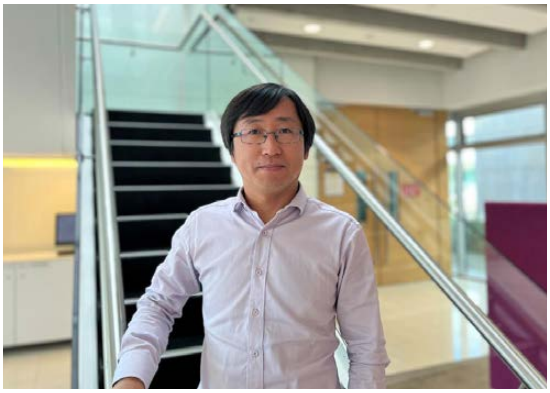
Based on publications from 2019 to 2023

Building smarter

A new study will explore how public buildings, including schools, could be designed to use sustainable cooling and heating technology and help New Zealand achieve its net-zero 2050 goal. Dr Wentao Wu is leading an international research team from five countries, who are focusing on reducing carbon emissions by improving energy efficiency in large buildings. "A combination of night-time ventilation in summer and passive heating in winter transforms thermal mass into a kind of thermal battery that is fuelled for a short time by renewable energy sources including natural ventilation and sunlight," says Dr Wu. The hope is to develop a design and retrofit guideline that will help policy makers, architects and builders create buildings that are more energy efficient, reducing carbon emissions in the sector.

UC offers a wide range of study options in SDG 11, including:

- City Politics and Urban Policy
- Sustainable Tourism Enterprises and Destinations
- Resilient Cities
- Transport, Urban Development and Wellbeing
- Sociology of the City



Buildings can be designed to use energy more efficiently, says Dr Wentao Wu who is leading new international research.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Ensure sustainable consumption and production patterns

Biodegradable plastic could be "material of the future"

Dr Heon Park believes biodegradable plastic is an option because it has a lower carbon footprint than wooden or paper disposable cutlery and degrades more quickly than conventional plastics. One potential additive he has been testing is powdered pounamu, a waste product from the jewellery carving and craft industry. Dr Park says early results using pounamu show that when a small amount of pounamu powder is added to biodegradable polylactic acid plastic, it enhances strength, reduces flammability, and accelerates degradation. Dr Park has also carried out lab testing mixing biodegradable polyvinyl alcohol plastic with spent grain – a by-product of the beer brewing industry - and turning it into a thin film. He suggests these

Dr Heon Park is researching ways to make biodegradable plastic more eco-friendly.

Photo credit: Matthew Joe.

plastic sheets could be used as a mulch on farmland to keep the soil moist and reduce weeds, meaning less energy is used for irrigation. “The ultimate goal is to develop the technology further and bring about tangible impact. By investing time, effort, and resources I want to create a meaningful and practical solution that can make a real difference for our environment,” says Dr Park.

Enthusiastic staff and students show off the new worm farm at UC: (left to right) Jess Lamb, Chelsea Lewis-Greenham, Kaitlyn Lamb, Imo McRae, Dougal McEachen from Earthly Delights, Jam Kelly, Ollie Dunshea and Tilly King.

The worm turns

Food scraps at UC are being converted into nutrient-rich compost thanks to a new project by enthusiastic staff and students. The team of dedicated composters established a worm farm as part of Compost Awareness Week in May. The new worm farm helps to educate people about using food scraps wisely, with a wooden box farm located in a high foot-traffic area outside a major food court on campus. The worm farm houses some 1000 hungry worms and provides another way to create compost alongside the Community Gardens on campus which produces many kilos of compost a year.

UC offers a wide range of study options in SDG 12, including:

- Tourism, Hospitality and Events Management
- Humans, Animals and Society
- Materials Engineering and Selection
- Introduction to Environmental Science

285

publications based on Elsevier mapping

75%

of publications have international collaboration

Based on publications from 2019 to 2023

> “By investing time, effort, and resources I want to create a meaningful and practical solution that can make a real difference for our environment.”
>
> Dr Heon Park

Plastic Reducers in Aotearoa

New research explores people’s experience of plastic-free food shopping in New Zealand. To understand how plastic reducers shopped for groceries, UC’s Dr Joya Kemper and research team members used a range of supermarkets and specialist stores. The research aligns with the global movement Plastic Free July and aims to help consumers reduce their environmental footprint through the reduction of single-use plastic. “While we find that plastic-free shopping is challenging, it is possible. We hope to learn from those currently practicing a new way of grocery shopping, by providing tips and tricks, picked up by those who have overcome some challenges, and help those who may feel equally motivated but ‘stuck’ in the current system,” says Dr Kemper.

13 CLIMATE ACTION

Take urgent action to combat climate change and its impacts

Methane-munching microbes

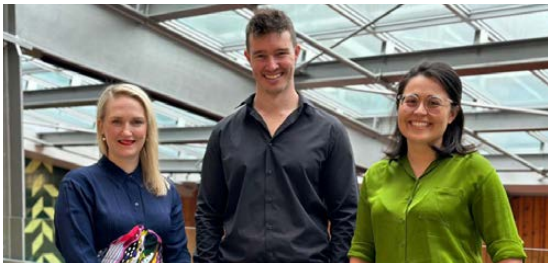
Agricultural methane is responsible for 41% of New Zealand's greenhouse gas emissions, but researchers want to change that by harnessing help from tiny living organisms. Professor Peter Gostomski's pioneering research will explore the use of on-farm biofilters to remove methane from the atmosphere. His research would use methane-eating microbes (microscopic organisms that live all around us) to convert methane back to CO2, which is considered carbon neutral as it is taken up by grass as it grows – a process known as photosynthesis. "Currently, commercial options for reducing the methane released by cows is limited to changing the herd genetics or expensive supplements. Biofilters could complement these technologies," says Professor Gostomski. New Zealand has pledged to decrease its biogenic (cow-

Professor Peter Gostomski's research aims to test multiple theories for removing cow-produced methane from the atmosphere.

produced methane) methane emissions by 10% by 2030, however there is no existing economically viable solution. “Our research aims to prove that we can remove agricultural methane in a cost efficient and sustainable way,” says Professor Gostomski.

Researching solutions to global environmental problems

Three UC academics were awarded Rutherford Discovery Fellowships to explore solutions aimed at climate change challenges, harnessing the power of enzymes for carbon capture, and helping cities prepare and adapt for an uncertain future. Associate Professor Elizabeth Macpherson’s research will investigate legal frameworks to support blue carbon futures. Blue carbon refers to carbon dioxide stored in coastal aquatic ecosystems such as saltmarshes, mangroves, seagrass meadows, and wetlands. Dr Amy Yewdall’s research work is on a pioneering system she has developed that can keep enzymes working at their best outside of cells, an innovation that could revolutionise synthetic biology. Dr Tom Logan will explore how cascading risk and multiple uncertainties can be built into climate adaptation planning. “Recent events, such as Cyclone Gabrielle, were a rude awakening to the future our communities face from multiple hazards exacerbated by climate change, and we must provide communities scientifically robust guidance on managing these interconnected impacts so they can effectively adapt,” says Dr Logan.



Associate Professor Elizabeth Macpherson, Dr Tom Logan and Dr Amy Yewdall have been awarded Rutherford Discovery Fellowships from the Royal Society Te Apārangi.

Tackling plastic waste together

Thanks to UC staff, just over 100kg of rubbish was removed from a popular site for endangered birds. Organised by UC and Environment Canterbury, volunteers joined a clean-up day at a popular nature reserve and breeding area for endangered bird species like the Australian bittern. The nature reserve gets a lot of rubbish build-up and due to the proximity of the area to waterways, there is a high risk of plastic waste transferring to the ocean. The team collected a total of 102kg of rubbish, and over 20kg of recycling. The collaboration comes after UC and Environment Canterbury signed a memorandum of understanding, solidifying their commitment to the environment.

312 publications based on Elsevier mapping

67% of publications have international collaboration

Based on publications from 2019 to 2023

Cutting freight transport emissions

Research Engineer Patricio Gallardo says a shift to coastal shipping and rail could cut New Zealand’s freight transport emissions and asks why we are not doing it. Trucking accounts for nearly 80% of New Zealand’s heavy goods transport, and a 94.5% share of the total emissions from heavy freight transport. Despite its advantages, trucking is associated with external costs, including higher carbon emissions than other modes of transportation. Gallardo and his research team have created a transport dashboard to visualise the carbon footprint of freight movements within New Zealand for a detailed understanding of the current heavy-freight system. Gallardo says freight transport emissions can be reduced through cost-effective investments in multi-modal infrastructure and alternative propulsion technologies.

When it rains, it really does pour

With recent extreme weather events happening in New Zealand and internationally, new research aims to improve predictions of heavy rainfall and provide the public with earlier warnings so they can prepare for extreme weather events. PhD student Cameron McErlich used a range of models and satellite observations to examine daily rainfall. “By watching changes in rainfall occurrence, we can use our findings to understand regions where extremes might change. The findings are important, because currently weather and climate research treat these things separately. Previously, we haven’t been able to verify that information as weather stations are not well-distributed, especially over the ocean. This research gives us that verification and we can show that the phrase is actually accurate,” says McErlich. Not only is the research important for New Zealand but it will also be important globally, as climate change influences the frequency and intensity of extreme weather events.

14 LIFE BELOW WATER

Conserve and sustainably use the oceans, sea and marine resources for sustainable development

Associate Professor Elizabeth Macpherson won the University's Advancing Sustainability Research Award.

Protecting freshwater and marine ecosystems

Law academic, Associate Professor Elizabeth Macpherson won UC's Advancing Sustainability Research Award for her contribution to environmental and natural resources law, and her focus on addressing global environmental challenges. She says it's a "real honour" to receive the award. "I have spent more than 20 years advocating for legal and policy frameworks that better manage global environmental challenges surrounding the protection of freshwater and marine ecosystems, while upholding the rights and authority of Indigenous peoples. This is not just a recognition of my research but of Indigenous peoples who are leading legal innovations on issues of sustainability both internationally and locally, and who have inspired and supported me along the way," says Associate Professor Macpherson.

Dr Deonie Allen takes water samples on the ice in the Arctic.

Arctic sea-ice algae attract plastics

The Arctic ecosystem is threatened by environmental upheavals caused by the climate crisis; exposing organisms to microplastics and the chemicals they contain could weaken them further. New research shows high amounts of plastic in Arctic Sea ice and sediment. Until now, the researchers only knew from earlier measurements that microplastics concentrate in the ice during sea ice formation and are released into the surrounding water when it melts. UC's Dr Deonie Allen is part of an international team, led by biologist Dr Melanie Bergmann from the Alfred Wegener Institute. The team found Arctic algae has 10 times the concentration of plastic particles than surrounding seawater, potentially threatening sea life and exposing the people who reply on marine food in the region to plastics.

Associate Professor Dr Jonathan Tonkin won the Prime Minister's Emerging Scientist Prize.

Top science prize

Associate Professor Jonathan Tonkin, from our School of Biology, won the Prime Minister's MacDiarmid Emerging Scientist Prize in 2022. The prestigious prize was awarded for his work developing new ways to forecast how biodiversity might respond to environmental threats so that it can be protected. Ecosystems are notoriously hard to predict because of all the moving parts. Tonkin's goal is to turn ecology into a more predictive science. His team seeks to find new ways to overcome the challenges associated with the natural complexity of ecosystems. "Our research focuses on understanding and predicting how our natural ecological systems might respond to these changes. That might include anything from predicting how an individual species might decline through to the collapse of whole ecosystems. It's fundamentally important to do what we can to mitigate the risks that ecosystems face, because naturally functioning ecosystems provide us with really important goods and services like clean water for drinking, food, medicine and so on," says Associate Professor Tonkin.

187 publications based on Elsevier mapping

60% of publications have international collaboration

Based on publications from 2019 to 2023

New tool could clean up waterways

A break-through testing device for phosphates could help farmers and deliver cleaner waterways for everyone. Associate Professor Deborah Crittenden says farmers want and need a user-friendly device that will allow them to accurately test for phosphates which run-off into waterways. New devices will be designed to be reusable, and contained in an easy-to-use, portable marker-pen size device that can be put into rivers and streams. They could boost agritech exports and generate export earnings while also cleaning up local waterways, says Associate Professor Crittenden. The underlying technology could also have applications in medical, industrial and veterinary settings. Associate Professor Crittenden says, "The modular design of our bio-nanosensors means that this approach can be extended to detecting other pathogens and environmental contaminants. Our end goal is to produce and manufacture our phosphate sensors in Aotearoa, creating local jobs and ensuring all of the benefits of our technology are fully realised."

Award-winning PhD student Sarah Sale.

15 LIFE ON LAND

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss

Rare sightings following campus biodiversity work

Recent sightings of a native falcon at UC suggests strategies to attract native birds back to campus are proving effective. The sightings, confirmed by Professor Jim Briskie and Dr Sara Kross, are believed to be the first time a native falcon has visited the Ilam campus. The sightings complement evidence that kingfisher and black-backed gull are nesting on campus for the first time. Native bird counts, coordinated by Professor Briskie, also found fantail and grey warbler numbers appear to have increased, while shining cuckoo have been heard singing. “It is wonderful to see these treasured species visiting and inhabiting the campus again. It is testament to a comprehensive approach that

will continue to improve the populations of native insects, birds, fishes and reptiles on campus and ensure the University is a valuable part of the north-western corridor of Christchurch," says UC's Professor Jan Evans-Freeman, Pro-Vice-Chancellor Sustainability.

Rewilding to create luxury lodgings for campus critters

A prime piece of campus lawn is to be reverted to wildflowers to provide habitats and food sources for insects. Preparations are underway to transform a 1500m2 section of lawn between UC's health centre and student association building into a trial biodiversity meadow that is expected to create greater numbers and diversity of insect life, and in turn attract native birds and reptiles. Wildflowers will be sown, which, although not native flora, will nonetheless support native biodiversity. The project is part of our Biodiversity Plan, which aims to increase diversity of native plants, insects and birds on campus and improve stream life, providing a vital link in the ecological corridor of the city's northwest. The project will provide environmental science students with opportunities for learning activities and may be utilised for wellbeing by students and staff, as an attractive space humming with plant and insect life. UC's grounds team have already employed habitat borders around trees and other selected no-mow or low-mow zones to promote insect biodiversity.

Student biologists spot hundreds of species

Biology students and staff scoured UC's Cass Mountain Research Station over a weekend, identifying hundreds of lifeforms, from lichens and fungi to slime mould and insects, including species new to the region. Field work has been conducted at Cass Station since 1914, hosting hundreds of researchers, students, and visitors over the last century. However, recent biologists used modern tools to help them record hundreds of species sightings; their mobile phones and the iNaturalist app, an open-access social network that encourages anyone – from citizen scientists to expert biologists – to record observations of species, engage with a community and help to map biodiversity around the world.

Ground-breaking study uses pine slash to improve soil

Student Mingyuan (Kathy) Liu is investigating the use of pine waste mixed with urea fertiliser on silt-covered soils from Canterbury and Gisborne. Liu says with flooding becoming increasingly common, and pine slash (a waste product from commercial forestry) causing issues, and the study indicates there's a real opportunity to use one challenging waste problem - pine slash - to fix another - silt-covered soils. "We've looked at blending pine waste into finer sawdust particles and mixing them with the soil and some fertiliser to make the soil more porous - better for water drainage and for plants to grow," Liu says. The results in a campus greenhouse show a large increase in soil fertility, and she says field testing is now required. Liu's Supervisor Professor Brett Robinson says preliminary results are exciting. "Pine slash is a current issue facing New Zealand and the rest of the world. To date, we know of no other reports detailing the rehabilitation of flood-deposited sediment using pine waste. We hope to take it to the next stage of field testing soon," says Professor Robinson.

380
publications based on Elsevier mapping

59%
of publications have international collaboration

Based on publications from 2019 to 2023

PhD student wins International Biosecurity Award

Delegates of the International Conference on Biological Invasions gathered in Christchurch to discuss effective responses to global challenges and threats that invasive alien species present to biodiversity, ecological systems, and food production and security in terrestrial, freshwater and marine ecosystems. UC PhD student Sarah Sale gave an award-winning presentation at the Conference. Following her talk about the impacts of myrtle rust on different species, the Biochemistry doctoral candidate won the award for Outstanding Student Oral Presentation. "Myrtle rust causes bright yellow pustules and infects over 500 different species including mānuka, pōhutukawa, rātā and feijoa. We're getting closer to artificial infection in the laboratory so that we can trial methods for its control", said Sale. Director of the UC Biosecurity Innovations grant, Professor Steve Pawson said, "It's important that our students are aware of the global issues biosecurity creates."

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Dr Nicholas Ross Smith.

Exploring 'Māori foreign policy' and China relations

A new academic paper published in the International Affairs journal explores Aotearoa New Zealand's 'Māori foreign policy' and China, and the implications of using te ao Māori principles in the face of increasing power tensions. The paper, titled *New Zealand's 'Māori foreign policy' and China: a case of instrumental reality?* by UC Senior Research Fellow Dr Nicholas Ross Smith and co-author Victoria University Master's student Bonnie Holster, examines the use of a kaupapa Māori foreign policy based on four tikanga Māori: manaakitanga (hospitality), whanaungatanga (connectedness), mahi tahi and kotahitanga (unity through collaboration), and kaitiakitanga (guardianship and the protection of intergenerational wellbeing). It is

one of the first contributions to global international relations literature based on a te ao Māori perspective. “Using te ao Māori principles in our foreign policy provides a fundamental difference in how we see the world,” says Dr Smith. “It takes a relational and intergenerational approach that offers a more complex and sophisticated way of looking at these relationships, which is radically very different to how many countries approach geopolitics,” says Dr Smith.

Dr Rachael Evans (Ngāti Tama, Ngāti Pamoana, Pākehā) was one of five scholars to receive a scholarship from the Michael and Suzanne Borrin Foundation and Ngā Pae o te Māramatanga, New Zealand’s Māori Centre of Research Excellence.

Māori financial independence research received scholarship

UC Law Lecturer Rachael Evans was awarded a PhD scholarship for research investigating how iwi can exercise rangatiratanga (sovereignty or autonomy) through the development of fiscal authority. “Before colonisation, iwi and hapū with tino rangatiratanga were active political and economic entities making their own decisions according to their tikanga (law) and kawa (rules). Colonisation imposed new systems and intergenerational poverty, which 35 years of Treaty Settlements has had mixed success in alleviating”, says Evans. A standout student, Evans has previously received a Ngāi Tahu Centre scholarship and support to travel to Canada to meet key First Nations leaders in the fiscal and regulatory authority space. “I think it’s important that people see that Māori can and do achieve in different ways. I also try and make myself available to Māori students including Te Putaiki, but also Pākehā who are interested in Te Tiriti and tikanga,” says Evans.

UC offers a wide range of study options in SDG 16, including:

- Culturally Inclusive Pedagogies: Motivating Diverse Learners
- Principles of Public International Law
- Slavery to Freedom in World History
- Introduction to Criminal Justice
- Criminal Law for Criminal Justice

189 publications based on Elsevier mapping

52% of publications have international collaboration

Based on publications from 2019 to 2023

Research aims to improve trials for intimate partner rape

UC Law Professor Elisabeth McDonald says her new book, launched at Parliament, analyses prosecutions for intimate partner rape and aims to improve the trial process. The publication focuses on a relatively under-researched aspect of the trial process – the impact on adult complainants when misconceptions about rape and family violence are used to challenge their evidence, and in particular their credibility. Professor McDonald says it’s essential for sexual violence within a relationship to be recognised as a distinct and significant form of harm and to understand the nature of consent within a context of coercive control. “The purpose of the research is to provide a more informed place from which to improve the complainant’s experience in rape trials, to ensure a fair trial process for both complainants and defendants. It is my hope that this book will provide the information needed to support some real and significant policy shifts in the prosecution of intimate partner rape”, says Professor McDonald.

Professor Elisabeth McDonald says it is her hope her new publication will “provide the information needed to support some real and significant policy shifts in the prosecution of intimate partner rape”.

17 PARTNERSHIPS FOR THE GOALS

Strengthen the means of implementation and revitalise the global partnership for sustainable development

Local MPs welcomed on campus

Following this year's General Election, we invited both long-standing and newly elected Members of Parliament to meet leadership team members. Vice-Chancellor Professor Cheryl de la Rey hosted eight local Members of Parliament on Ilam campus to share our strategies not just for UC but also for contributing to the growth and success of Waitaha Canterbury. Specifically, the MPs were introduced to our student success programme, which offers a range of initiatives to remove barriers and create an environment that gives students the opportunity to thrive and succeed. MPs also explored our new Digital Screen initiative on the Dovedale campus. With 50% of NZ-employed graduates choosing to live and work in Canterbury, the tour provided a chance for MPs to witness first-hand the projects that contribute directly to our city's progress.

Local MPs Hon Dr Megan Woods, Hon Dr Duncan Webb, Dr Vanessa Weenink, Hamish Campbell, Matt Doocey, Reuben Davidson, Laura Trask and Kahurangi Carter met with Vice-Chancellor Professor Cheryl de la Rey, Assistant Vice-Chancellor Engagement Brett Berquist and Deputy Vice-Chancellor Academic Catherine Moran.

Teaming up for the environment

Environment Canterbury and UC are teaming up to tackle some of the most pressing environmental issues of our time. Both institutions are using science to support environmental sustainability aimed at creating a more resilient future for all. A memorandum of understanding signed by UC and the regional council outlines a range of collaborative projects. This includes support for UC student work during academic breaks, student-led research projects, internships, and co-creation and delivery of academic mutually beneficial research projects. For UC, this partnership is an excellent example of its strategic intent to collaborate, share expertise, and enhance impact in the community. Environment Canterbury Chairperson Peter Scott says, "It makes sense that, as the regional council, we work closely with a leading learning organisation such as the University of Canterbury to benefit us all. Those in education, research, and innovation can bring so much to our work by way of new ideas and ways of doing things." By working together, the university and regional council are setting a powerful example of how we can unite to protect our natural world and create a more sustainable future for generations to come.

New collaboration on Indigenous-led research

The Tulo Centre of Indigenous Economics, Thompson Rivers University and UC have committed to further collaboration and exploration of opportunities to deliver unique Indigenous-led programming through the signing of two Memorandums of Understanding (MOUs). The MOUs signed creates a formal pathway for the Institutions to cooperate and collaborate to research, support and build capacity for Indigenous public administration, governance, leadership and economic development. The opportunity to share resources and expertise with international partners on a more formal footing signals the strength that we can deliver through a formal partnership approach," Pou Whakarae of UC's Office of Treaty Partnership, Professor Te Maire Tau said.

Bringing Pacific knowledge and innovation to new courses

New interdisciplinary Pacific Studies courses developed at UC draw on cutting-edge research from the region. The new undergraduate courses reframe current deficit narratives of the Pacific and its communities, celebrating a long history of resilience, Indigenous knowledge and innovation. UC researchers who developed the courses are involved in the pioneering Pacific Ocean and Climate Crisis Assessment study, which studies climate mitigation and adaptation in 16 countries in the Pacific region, with a focus on giving voice to Indigenous

TRU Provost and Vice-President Academic Dr. Gillian Balfour, Tulo Centre Chair Chief Michael LeBourdais, Vice-Chancellor Professor Cheryl de la Rey and Pou Whakarae of UC's Office of Treaty Partnership Professor Te Maire Tau.

knowledge. "Students we surveyed saw great value in Pacific Studies courses for wide ranging reasons - they could deepen their understanding of the Pacific, be exposed to and normalise diverse world views as part of their studies, and learn how to effectively engage in cross-cultural settings," says Pacific Academic Lead Ashalyna Noa. UC's Pro-Vice-Chancellor Pacific, Distinguished Professor Ratuva says, "The Pacific Studies courses will provide the relevant prisms and intellectual tools to analyse and understand Pacific cultures, sustainability, resilience, innovation and transformation in a changing world".

Community impact revealed

150 years on, Canterbury's unwavering commitment to higher education persists. According to a new Community Impact Report, UC excels at supporting young professionals to develop their best and brightest ideas, incubating start-ups, social enterprises and spinoffs. These were the findings of the first independent and comprehensive assessment of the community impact of a New Zealand university. UK-based Public First worked with local company Research First to discover how UC engages with the Canterbury region across a range of categories. The report explored six domains of economic, social, health/wellbeing, cultural/creative, leadership and environmental impact and sets benchmarks for UC's engagement with its communities now and into the future. Assistant Vice-Chancellor Engagement Brett Berquist says a core principle of community engagement is reciprocity, learning from and with the local community, collaborating and sharing expertise. "This report was an extensive listening exercise to understand what our community values and what people expect from UC," he says.

About this document

This is the University of Canterbury's (UC) fourth document produced on our commitment and engagement in support of the United Nations' (UN) Sustainability Development Goals (SDGs). Our approach for this document is to identify and summarise our activities and outcomes that most closely align with the UN SDGs, through our core functions of research, education, engagement, and operational activities, across the campus, and principally cover the 2023 calendar year.

The material is substantiated with metrics (quantitative) and case studies (qualitative). For quantitative data, searches related to the SDGs were conducted on the Scopus database to collate our research, using the keyword search terms created by the Elsevier methodology. Courses aligned with particular SDGs were identified by consulting with Course Coordinators across campus about the type and quantity of SDG-related content in their courses and auditing the results with reference to course learning outcomes and course assessments. For qualitative data, case studies that most closely aligned with producing outputs for the SDGs were selected by a variety of ways, including through a consultation process, conducting a review of our website, consulting with operational directors and managers, and gathering input and feedback from a range of UC staff and students with particular expertise.

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
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