

# TE HERENGA WAKA— VICTORIA UNIVERSITY OF WELLINGTON

Anchoring a capital city innovation system and connecting with the world



**Science**  
**Health**  
**Engineering**  
**Architecture**  
**Design Innovation**

# THE UNIVERSITY'S MĀORI NAME IS TE HERENGA WAKA IT MEANS THE MOORING PLACE OF CANOES



*“We see this as a metaphor for our role in the knowledge and innovation system. Ports are places of diversity, excitement, and connection. Ports are where you begin and end journeys of discovery.*”

*This document profiles areas of strategic focus for the division of Science, Health, Engineering, and Architecture and Design Innovation. These are areas where we seek to make a real difference. Such impact, however, will only be achieved through commitment and partnership.*

*We invite you to join us on these journeys.”*

**Professor Ehsan Mesbahi**

Pro Vice-Chancellor Science, Health, Engineering,  
Architecture and Design Innovation



# IT IS TIME TO STEP UP



The world faces massive, complex, and immediate challenges that have global and local dimensions. Examples include climate change, biodiversity loss and fragile ecosystems, water resource scarcity and quality, global pandemics, economic deprivation, housing crises and sustainability of urban environments, health inequities, the challenges and opportunities of digital environments, mental health, and the causes of crime.

To meet these challenges, **we think it is time for a different way of working**: boundaries need to fall; effort needs to be focused, sustained, and scaled; new capabilities are needed; and we need to pick up the pace.

But we are **optimistic** and while these are undoubtedly large problems to solve, they can equally be seen as **opportunities to grasp**—opportunities where through insight, innovation, and partnerships we build sustainable, inclusive, and prosperous futures. A **progressive** vision.

The division of Science, Health, Engineering, and Architecture and Design Innovation, working with others across the University, is moving ahead on this journey.

**He Ao Ariari, He Ao Āpōpō—Delivering Today and Shaping Tomorrow** is our blueprint for action. It is our public statement of commitment as well as an open invitation to others: **we are here for you and with you.**



# HE AO ARIARI, HE AO ĀPŌPŌ

## DELIVERING TODAY AND SHAPING TOMORROW

This document profiles areas of strategic focus for the schools, centres, and institutes that comprise the division of **Science, Health, Engineering, and Architecture and Design Innovation**.

Here we show how we are meeting the challenges of our time by mobilising effort, bringing relevance, and providing leadership via productive, collaborative networks within the University and beyond.

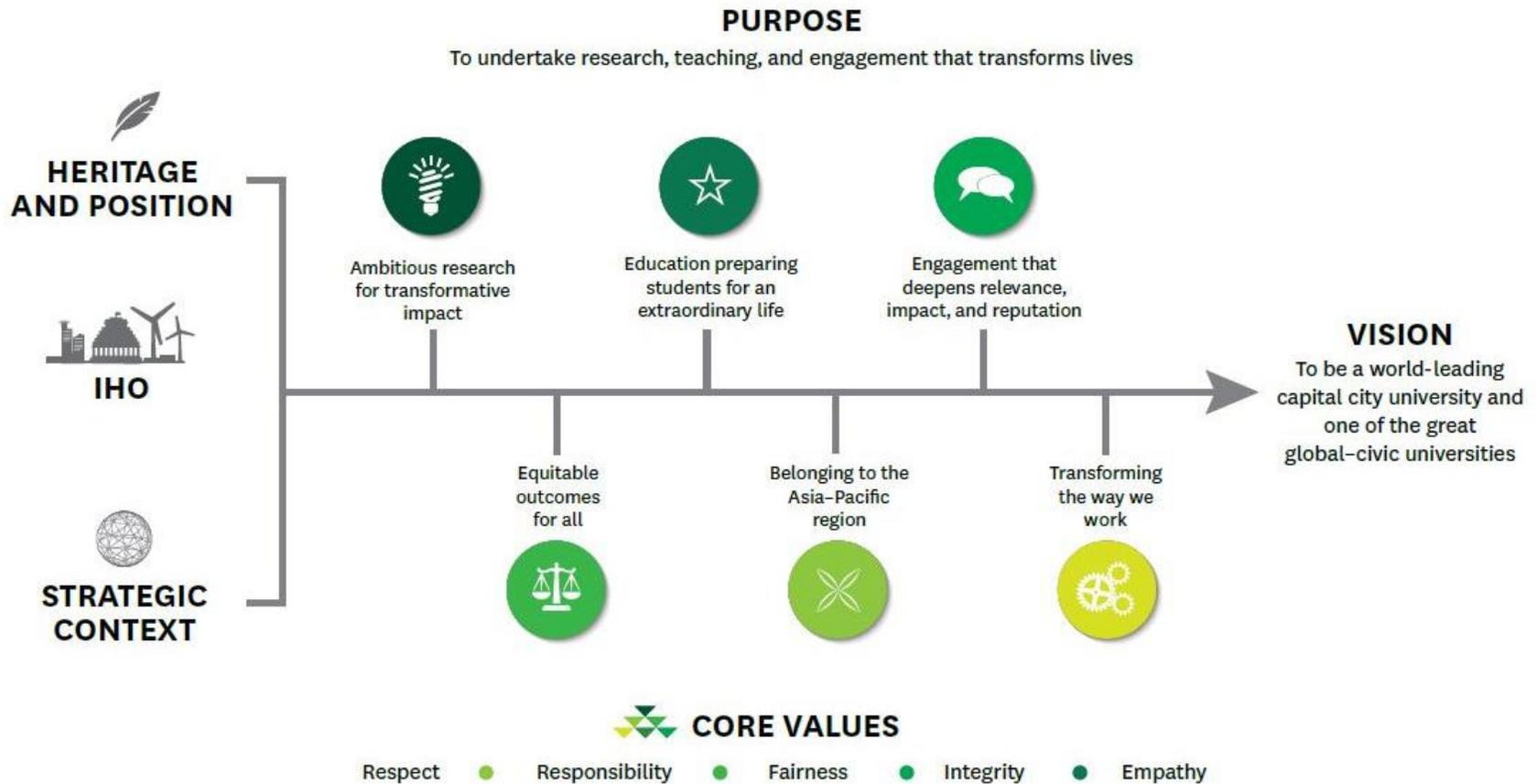
The **Delivering Today and Shaping Tomorrow** programme advances **Victoria University of Wellington's Strategic Plan 2020-2024**, which sets a path to be a world-leading capital city university and one of the great global-civic universities.



# HE AO ARIARI, HE AO ĀPŌPŌ

## DELIVERING TODAY AND SHAPING TOMORROW

This diagram from the University's Strategic Plan provides an overview of the University's purpose, vision, and core values.



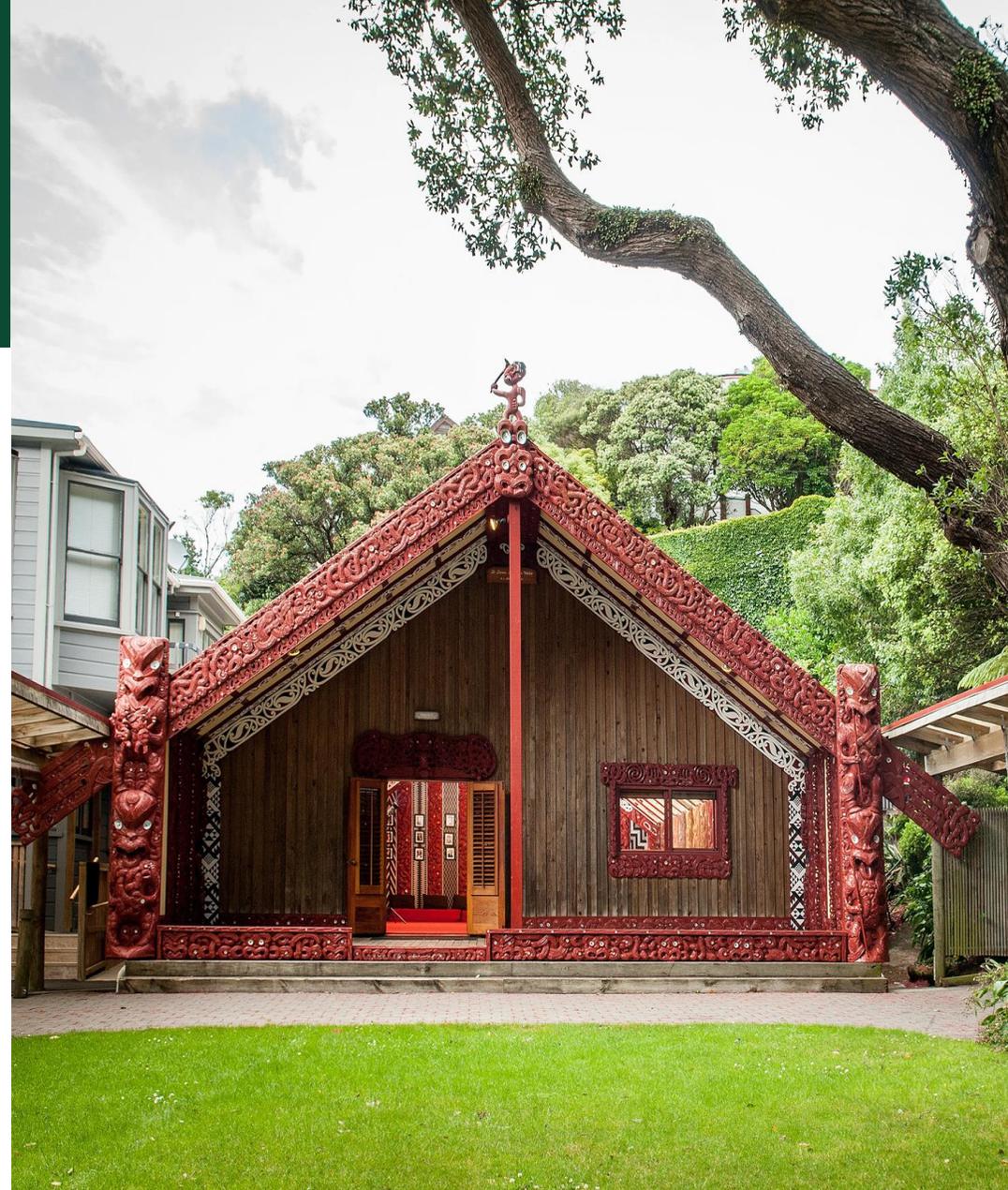
# HE AO ARIARI, HE AO ĀPŌPŌ

## DELIVERING TODAY AND SHAPING TOMORROW

Fundamental to our programme of work is the development of pathways for us to deliver on **Mai i te Iho ki te Pae—Māori Strategic Outcomes Framework**. The Māori aspirational notion that from our **iho** (essence, core) we strive to extend beyond the **pae** (horizon, surrounds) is at the heart of our approach. We also recognise that we have a long way to go to achieve our aspirations for Māori research, education, engagement, and ultimately equitable outcomes.

All of this will require large scale and collaborative effort at pace.

We want to engage meaningfully with partners: Māori, communities, business, and government to shape our efforts and approaches and **this document is a starting point** for those discussions.



# ALIGNING THE DIVISION WITH STRATEGIC DIRECTION INCORPORATES FOUR ELEMENTS



**Clear philosophy  
and commitment**



**Strategic challenge  
areas of focus**



**Diverse and evolving  
capabilities**



**Thinking and acting  
with others**



# PHILOSOPHY



**A driving question is not 'what are we good at?' but is instead 'what are we good for?'**

We believe Science, Technology, Engineering, Architecture and Design Innovation can change the world for the better—improving people's lives and the health of the environment.

But to make progress we must also **engage** in ways that deepen relevance, impact, and reputation. At **Te Herenga Waka—Victoria University of Wellington** we draw on the concept of **whanaungatanga**: we grow meaningful and long-lasting relationships that benefit our University communities and beyond.



# OUR COMMITMENT

We are **collectively** focused on positive change and outcomes:

- We **advance knowledge** so that people can **use and apply it**.
- We **connect with people's lives** and **aim to lift their wellbeing**.
- We are a **touchstone** for social, creative, and scientific progress.
- We are **key players in addressing grand challenges** and are recognised for this.
- We **support community and national wellbeing** and in doing so we strive for equity, diversity, and inclusion.
- We honour **Te Tiriti o Waitangi**.
- Our work creates **opportunity and economic prosperity**.
- We **fearlessly explore new frontiers**.
- We are a **catalyst, a generous host, a productive partner, a foundry for new thinking**.
- We do this with a clear sense of **our identity in this place** as **Te Herenga Waka—Victoria University of Wellington**.





# STRATEGIC CHALLENGE AREAS



## **Papatūānuku Our Earth**

Deepening our understanding of Earth systems, better predicting future states, strengthening ecological and social resilience, and successful climate adaptation



## **Taurikura Thrive**

Harnessing innovation to significantly improve human health and wellbeing



## **Marutau Safe**

Developing ethical, intelligent, and evidence-based systems and practices to keep people and communities safe from harm



## **Hanga autaiā Build better**

Using frontier technological and design innovation to enhance our built and material environment and how we live within this



## **Waro kore Net-zero carbon**

Rapidly transitioning the world's energy and materials systems in a way that ensures sustainability and supports prosperity



## **Whakapiki Quantum leap**

Flourishing in a world of big data and advancing our digital and computational capabilities to address the big questions

# OUR STRATEGIC CHALLENGE AREAS SHAPE THE WAY WE WORK

- Supporting and aligning basic research, applied research, and teaching programmes—catalysing new opportunities, perspectives, and impact
- Pushing the frontier of new knowledge—this is mission critical for addressing big challenges and basic research is a necessary foundation
- Increasing interdisciplinary work and deepening collaboration to accelerate the translation of research results into real-world applications and stimulate new questions for future investigation
- Supporting whai mātauranga through a significant increase in research that engages constructively with mātauranga Māori and/or Māori communities
- Developing new degree programmes, innovative continuing education programmes, stronger networking within interdisciplinary degree programmes, and project work with practical applications. The challenge areas also provide opportunities to further support Māori scholarship and nurture akoranga—our collective responsibility for learning
- Transforming students' views of themselves and the difference they can make and facilitating connections and pathways as students graduate and step out into the world.





**PAPATŪĀNUKU**  
**OUR EARTH**



## Deepening our understanding of Earth systems, better predicting future states, strengthening ecological and social resilience, and successful climate adaptation

We have a distinguished track record of interdisciplinary effort towards understanding and responding to climate change, biodiversity loss, and natural hazards.

Given these increasingly existential challenges we are now **doubling down** in our role as kaitiaki and becoming more actively focused on mitigating and reversing the negative impacts of human activity and better preparing Aotearoa New Zealand for an ever-changing world. Priority themes and actions include:

- **Ice, climate, and sea-level:** Making a critical contribution to global models and deepening our understanding of local climate dynamics (**Te Puna Pātītio—Antarctic Research Centre** and the **Climate Modelling Hub** in collaboration with both the National Institute of Water and Atmospheric Research (**NIWA**) and the Institute of Geological and Nuclear Sciences (**GNS Science**))
- The **New Zealand Climate Change Research Institute** has an outstanding record nationally and internationally and will continue to undertake large-scale, interdisciplinary research programmes that anticipate the essential questions facing decision makers now and in the future
- **Oceans, lakes, and rivers:** We aim to build Wellington-based interdisciplinary national and international partnerships that serve long-term national need and build mission-critical capabilities from foundational research to translational innovations relevant to the life systems and communities that rely on wai in all its forms and functions
- Advancing the work of our **Centre for Biodiversity and Restoration Ecology**, which extends from global change biology through to developing place or species-specific management solutions and policy to support the resilience and sustainability of our living systems
- **Geophysical hazards and risks:** Furthering our deep and productive partnership with **GNS Science** and drawing in broader disciplines to ensure government, business, and society are well-informed and prepared.



## Harnessing innovation to significantly improve human health and wellbeing

Priority themes and actions:

- **Health systems innovation:** Our health system is in flux and this is the moment to draw on the leading-edge thinking of our experts in health systems design, apply our deep understanding of the Aotearoa New Zealand context, as well as develop the health workforce of tomorrow. We are focusing existing research centres and establishing new ones to meet this need, including **Te Hikuwai Rangahau Hauora—Health Services Research Centre**, **Te Tātai Hauora o Hine—National Centre for Women's Health Research Aotearoa**, and **Te Hau Kori—Centre for Physical Activity and Wellbeing** in conjunction with **Sport NZ**
- **Pae ora:** The health system needs to support hauora Māori in a very different way and Māori will increasingly shape care provision. Translational research and an appropriately skilled workforce will be critical here, informed by mātauranga Māori, and a deep understanding of the diverse needs of Māori communities. Similar challenges also hold for Pacific health and we will play an active role in addressing these
- **Digital health:** Our response to COVID-19 is a live case study of both the promise and challenges with harnessing data analytics, information technology systems, and digital tools for better health delivery. Data science and artificial intelligence have the potential to bring world-leading and patient-centred healthcare but only with deliberate and careful analysis, innovation, and planning
- **Mental health:** Cross-disciplinary approaches are needed to develop scale interventions to improve the mental resilience of New Zealanders
- **Breakthrough bio-innovation:** By bringing together frontier science, modern facilities, transdisciplinary approaches, and open innovation, Wellington can rapidly advance as a hub for bio-innovation, bio-discovery, and drug discovery - leading to better health outcomes and high-value economic opportunities. This also involves the crossover application of advanced biological and chemical science and engineering towards animal health and environmental challenges (bringing together expertise in cell biology alongside one of the largest groups of carbohydrate chemists in the world at **Te Kāuru—Ferrier Research Institute** in conjunction with New Zealand's leading independent biomedical research organisation, the **Malaghan Institute of Medical Research**).

## Developing ethical, intelligent, and evidence-based systems and practices to keep people and communities safe from harm



Reducing harm and enabling individuals and communities to be safe requires an interdisciplinary approach that brings together scientific, regulatory, cultural, social, and psychological dimensions. Priority themes and actions include:

- **Cyber security:** The global expansion of cyberspace is changing the way we live, work, and communicate. It is also transforming the systems we rely on—healthcare, transport, finance, energy, and food. Cyberspace is increasingly central to our security and prosperity. We are therefore accelerating our efforts in cyber security research, innovation, and education. We aim to get ahead of the curve by anticipating future needs, working alongside government, industry, communities, and our colleagues in leading research centres around the world
- **Rethinking crime in Aotearoa:** We want to change how we think about crime—building interdisciplinary programmes focused on reducing crime and addressing trauma and intergenerational trauma. Our work straddles the nexus of crime science, humanities, law, and health research and will increasingly draw on mātauranga Māori-informed approaches and enduring Māori partnerships
- **Safety and wellbeing at work:** We want people to be safe and well in their working environments. Working with WorkSafe NZ and other organisations, we are informing best practice and designing evidence-based interventions to ensure the health, safety, and wellbeing of all workers
- **Comprehensive biosecurity solutions:** We will play a leading role in ensuring community and economic wellbeing through the recognition of the interconnection between people, animals, plants, and their shared environment.

# HANGA AUTAIA BUILD BETTER

## Using frontier technological and design innovation to enhance our built and material environment and how we live within this



New Zealand struggles with housing availability, affordability and inequity, labour supply for construction, low productivity, sustainability challenges, and limited competition. Yet we continue to neglect leading-edge science and technology as part of the solution for this sector. Other countries are supporting innovation partnerships and we are falling behind.

Priority themes and actions:

- **Digital fabrication and construction:** Moving architecture and construction into the digital age and advancing net-zero and broader sustainability goals, with spearhead effort in
  - New Zealand house of the future
  - innovative social housing solutions
  - IT for building systems and industry performance
- **Future cities:** Small, sustainable, global, AND prosperous— Wellington as a model city for a net-zero carbon future using state-of-the-art technology and design-thinking to create environments that support connection and inclusion, quality of life, innovation, and net-zero carbon goals (across the whole University).



# WARO KORE NET-ZERO CARBON



## Rapidly transitioning the world's energy and materials systems in a way that ensures sustainability and supports prosperity

**Paihau—Robinson Research Institute** has become a **powerhouse for the energy and materials transition** with diverse and world-leading science and technological capabilities and as a core collaborator in some of the world's most exciting energy and materials breakthrough projects.

We are playing a central role in New Zealand's energy and materials transition, developing IP and solutions alongside government, Māori, industry, and technology investors. These solutions not only help us reduce emissions, they are the basis for new export industries, high-value jobs, and community wellbeing across New Zealand.

Priority themes and actions:

- **Accelerating the electrification revolution** through superconductivity and high-performance electric systems (for example, fusion energy, electric aircraft engines, space technologies)
- The **development of low-energy technologies** from magnetic materials—more sensitive, energy efficient, and powerful solutions for the next generation of electronic devices in computation and beyond
- **Supporting the hydrogen revolution with GNS Science**
- **Technology development for industrial transitions**, such as the development of zero-carbon steel and cement, and addressing the problems of industrial heat. Many initiatives underway at the moment are rightly addressing low-hanging fruit with incremental innovation, but hard to abate sectors are going to need farsighted and technologically advanced solutions and we are well placed to lead in this area
- **Towards zero-waste: Developing reconfigurable materials systems** alongside **Te Mana Tangata Whakawhanake—MacDiarmid Institute for Advanced Materials and Nanotechnology** hosted by the University
- **Investment in pilot facilities for industrial scale demonstration** and increasingly being the research and development partner of choice for forward looking industry seeking to solve hard problems at pace and for mission-critical government needs.



# WHAKAPIKI QUANTUM LEAP

## Flourishing in a world of big data and advancing our digital and computational capabilities in order to address the big questions

### Priority themes and actions:

- **Data science, artificial intelligence, and machine learning research and innovation:** With the participation of Mathematics, Statistics, Computer Science, and Engineering we are growing the largest artificial intelligence (AI) research hub in Australasia. The recently launched **Centre for Data Science and Artificial Intelligence** seeks to harness the power of cutting-edge data science, AI, and machine learning towards real-world challenges. In doing so, we also advance our capabilities and develop new methods
- **A hub for immersive and interactive computational innovation** via the **Computational Media Innovation Centre:** Building on our expertise in software engineering for digital media and applying this in other domains such as health, environment, architecture and design, transport, and education. Also spearheading New Zealand's participation in the creative and entertainment industries as well as new immersive technology platforms widely referred to as the metaverse
- **Computational sciences and engineering:** We seek to exploit the power of computation as an approach to major challenges at the frontiers of natural and social science and all engineering fields. Focused on mathematical modelling and advanced computing, we develop models and simulations to understand these physical, natural, and synthetic systems. In the context of design innovation, we translate computational constructs into physical forms through 3D and 4D printing
- **Smart systems:** Internet of Things (IoT), edge AI, security in distributed systems (application to vertical themes such as environmental monitoring, building systems, digital health, aerospace).



# WHAKAPIKI QUANTUM LEAP

## Whakapiki Quantum leap underpins digital enablement of all challenge areas



- Our deep capabilities in data and insights, computation, and engineering digital systems are a powerful enabler across all strategic challenge areas and a platform for transformational approaches to future needs.
- These capabilities are already working with and alongside our research and innovation partners and we will accelerate this contribution.
- We are building scale interdisciplinary programmes and centres of digital research and innovation that drive their own frontier computational research towards the challenge areas.
- The social, economic, cultural, philosophical, and legal implications of the digital revolution are profound and rapidly evolving and so we will increasingly draw on capabilities and insights from the range of disciplines across the University.



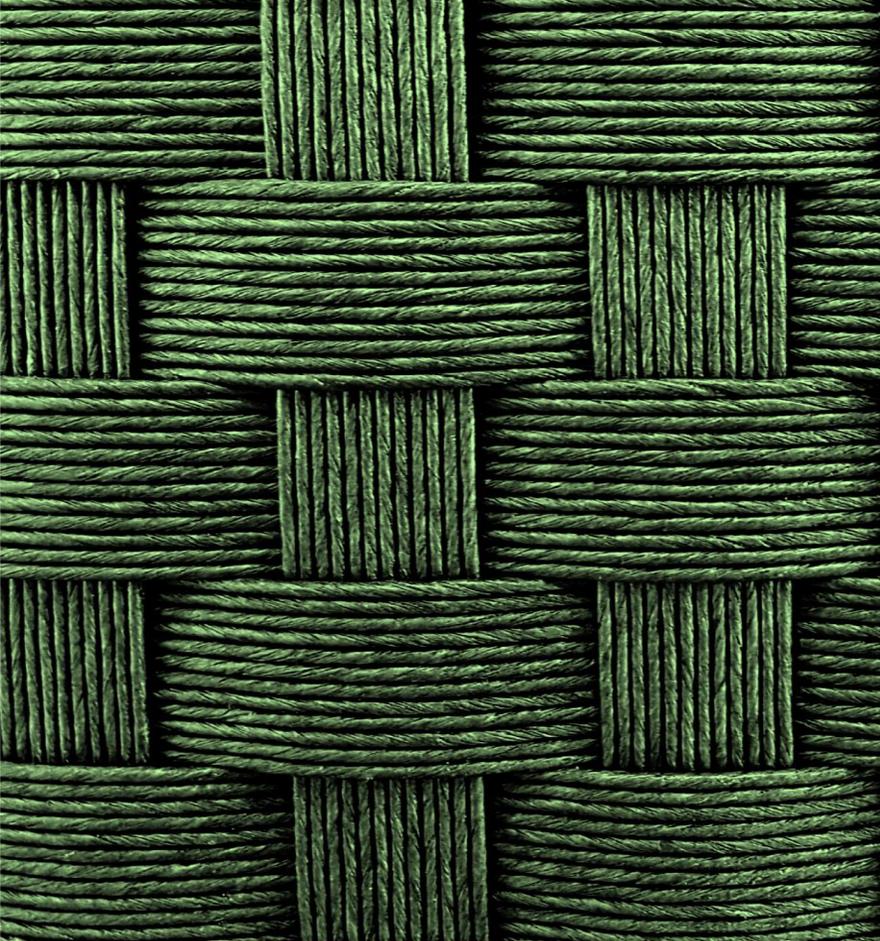
# STRENGTH FROM DIVERSITY



Our value proposition arises not only from our depth of capability but increasingly from our **breadth and diversity**—and by diversity we mean not only diversity of fields of knowledge and practice, but diversity of backgrounds, world views, and lived experience.



# THE DIVISION OF SCIENCE, HEALTH, ENGINEERING, AND ARCHITECTURE AND DESIGN INNOVATION



**Our hub is in Kelburn but we are present throughout the city: Te Aro, Pipitea, Newtown, Miramar, and Gracefield**

- Mathematical Sciences
- Biological Sciences
- Chemical and Physical Sciences
- Geography, Environment and Earth Sciences
- Psychological Science
- Computer Science
- Engineering
- Architecture and Building Science
- Health Systems and Sciences
- Design Innovation



# WE FORM A BROADER TEAM WITH COLLEAGUES THROUGHOUT THE UNIVERSITY



- Humanities
- Social Sciences
- Performing/Creative Arts
- Education
- Law
- Business
- Government

And enabled among others by:

- Office of the Deputy Vice-Chancellor Māori
- Research Office
- Wellington UniVentures
- Engagement Group



# THINKING AND ACTING WITH OTHERS IS WHAT WE DO



**As we orient ourselves towards these challenge areas and get on with things, we want to engage deeply and widely.**

In the first instance, there is a need to understand each other's needs and perspectives and build a shared sense of purpose.

Great things nearly always start small and so we are looking for opportunities to simply get started, to get involved, and to work alongside one another.

You will be seeing and hearing more from us, but most critically, we welcome your questions, suggestions, and invitations to get involved.



## CONTACT US

He Ao Ariari, He Ao Āpōpō—Delivering Today and Shaping Tomorrow

Email: [SHEADI@vuw.ac.nz](mailto:SHEADI@vuw.ac.nz)



VICTORIA UNIVERSITY OF  
**WELLINGTON**  
TE HERENGA WAKA