



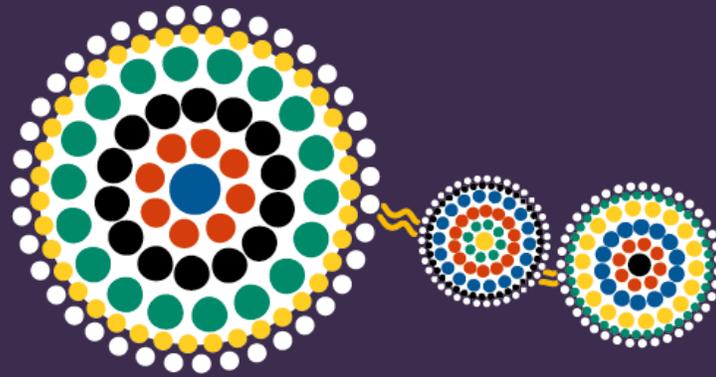
University of
**Southern
Queensland**
Australia

RESEARCH COLLABORATION OPPORTUNITIES

Clean Energy and Sustainability
Symposium

March 2024

Prof. John Bell, DVC Research & Innovation
Guie Hartney, Executive Director International



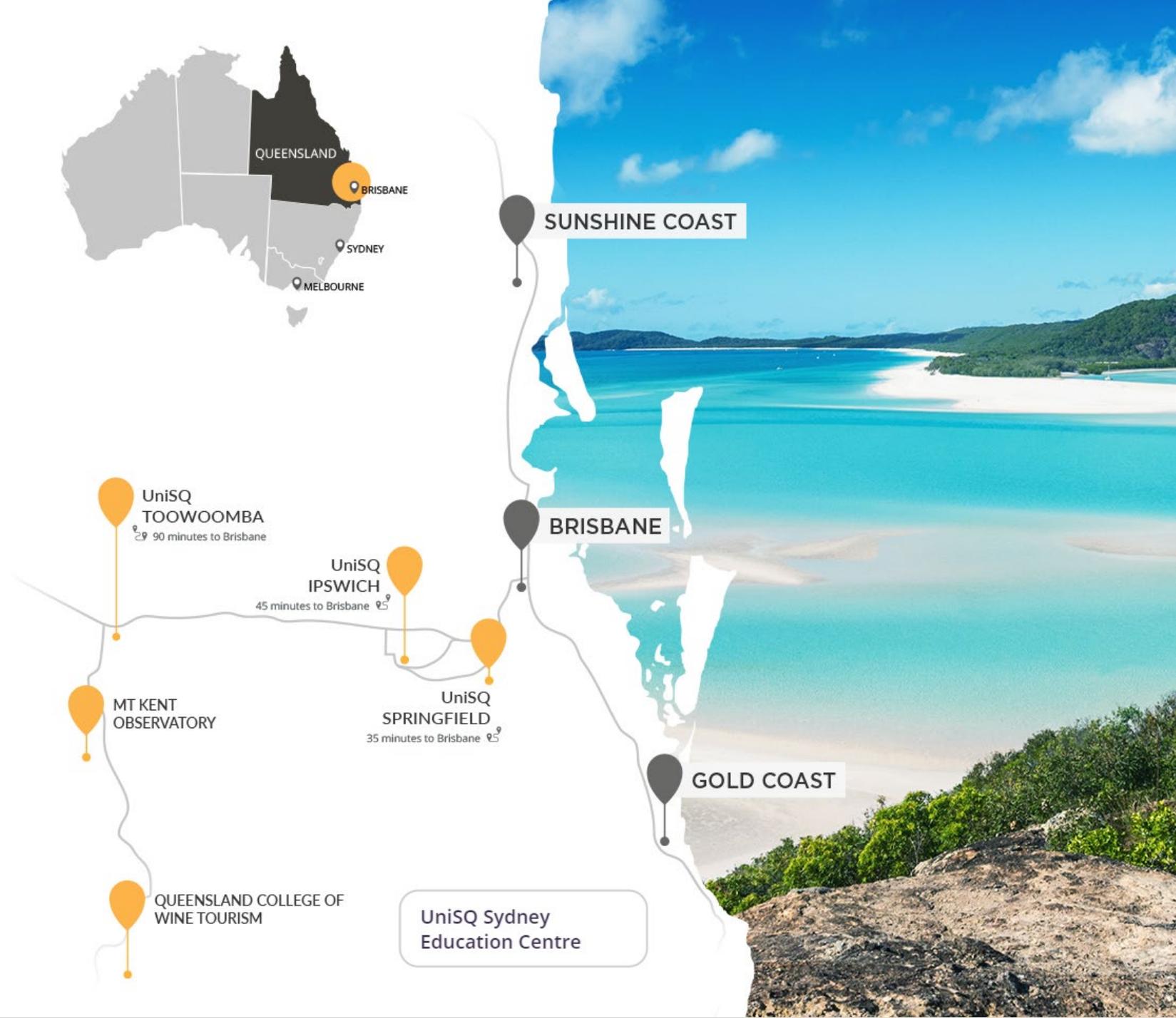
Acknowledgement of Country

The University of Southern Queensland acknowledges the traditional custodians of the lands and waterways where the University is located. Further, we acknowledge the cultural diversity of Aboriginal and Torres Strait Islander peoples and pay respect to Elders past, present and future.

UniSQ

Locations

- UniSQ Toowoomba
- UniSQ Springfield
- UniSQ Ipswich
- Mt Kent Observatory
- Queensland College of Wine Tourism
- UniSQ Sydney – Study Hub



A man with long hair and a beard, wearing a white lab coat, is holding a small potted plant. He is standing next to a white ABB industrial robot arm. The robot arm is positioned over a tray of various small plants. The background is dark, and the lighting is focused on the man and the robot. The text "Placed in the top 2% of all universities worldwide" is overlaid on the image in white.

Placed in the top 2% of all
universities worldwide

40+

40+ years delivering flexible study options via online learning



Our rankings

5/5



5 out of 5 stars in global ratings for teaching, research, internationalisation, online learning and employability

5/5



Rated 5 out of 5 in Australia for graduate starting salary



TOP 400

Ranked as a World Top 400 University



TOP 55

Ranked top 55 young universities worldwide

QS Stars World University Rankings, 2024
Time Higher Education Rankings, 2024

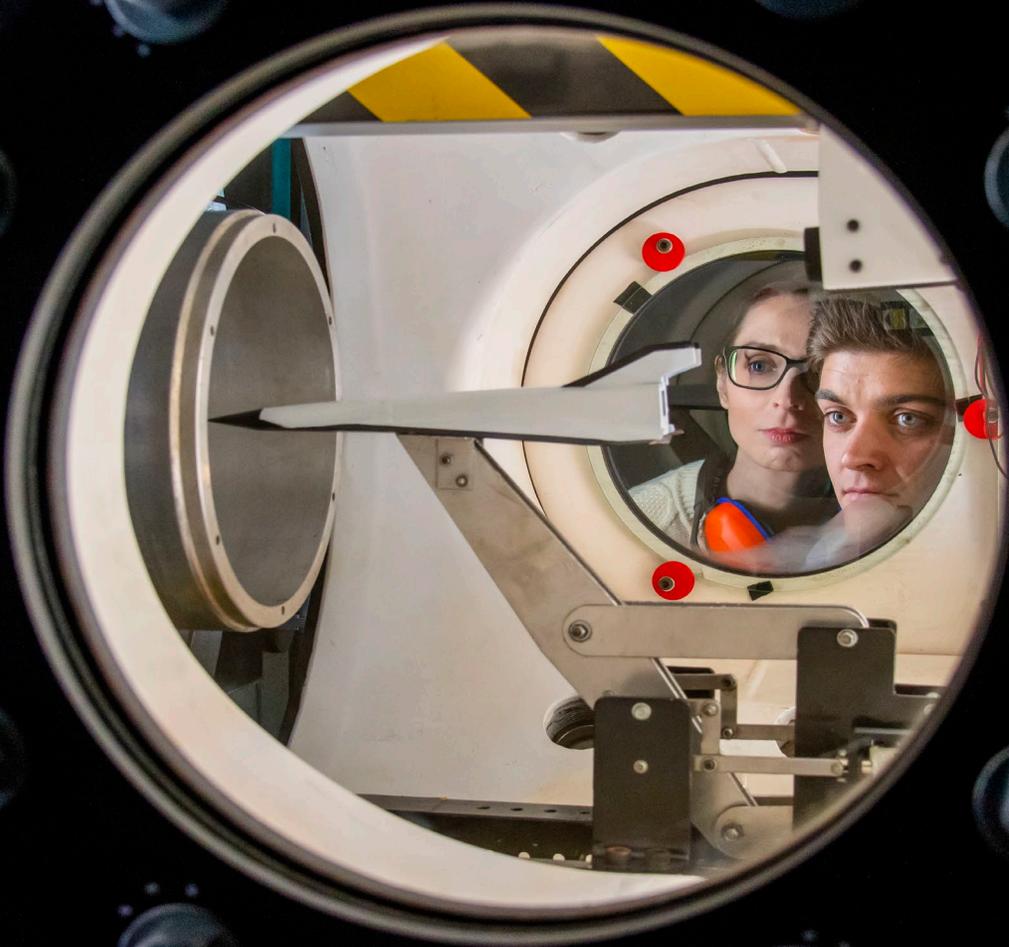


Study at UniSQ

Bachelor degrees
Master Degrees
Doctorates

Semester Programs
Exchange
English language pathways

-  Agriculture & Environment
-  Arts & Humanities
-  Aviation
-  Business & Management
-  Education & Teaching
-  Engineering
-  Information & Communications Technology
-  Law & Criminology
-  Media & Communication
-  Nursing & Allied Health
-  Psychology & Wellbeing
-  Sciences
-  Surveying & Built Environment
-  Visual & Performing Arts
-  English Language Programs
-  Double Degrees
-  Research



1st

Globally in
Nature and Physical
Sciences in 3
categories

30

Areas of research
at World Standard or
Better*

59.4%

International
collaboration
scholarly output

4 FLAGSHIP AREAS



**AGRICULTURE
AND
ENVIRONMENT**



**SPACE AND
DEFENCE**



**REGIONAL
DEVELOPMENT**



HEALTH



3 dedicated institutes,
10 research centres,
multiple medical
simulators,
2 flight simulators, and
1 observatory



Some of our research
projects:

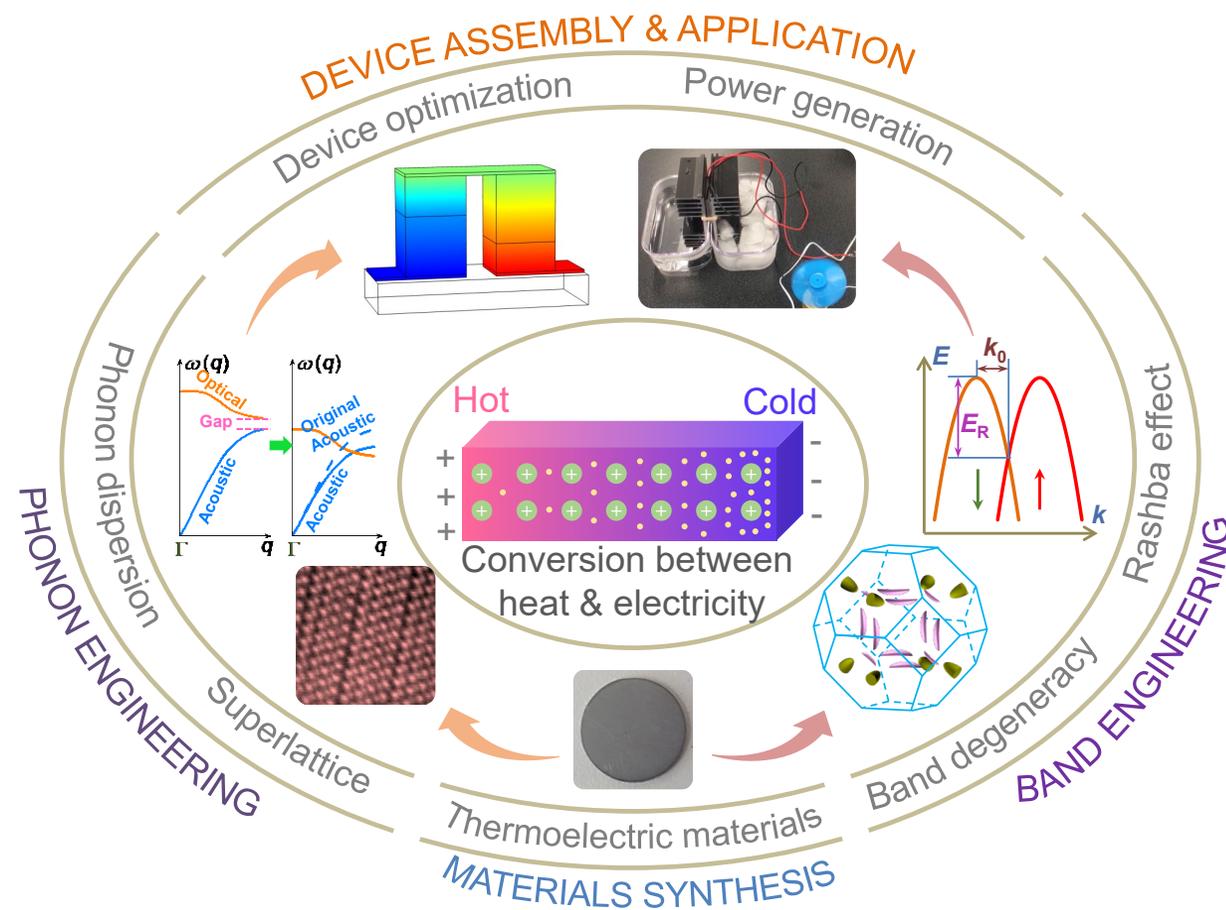
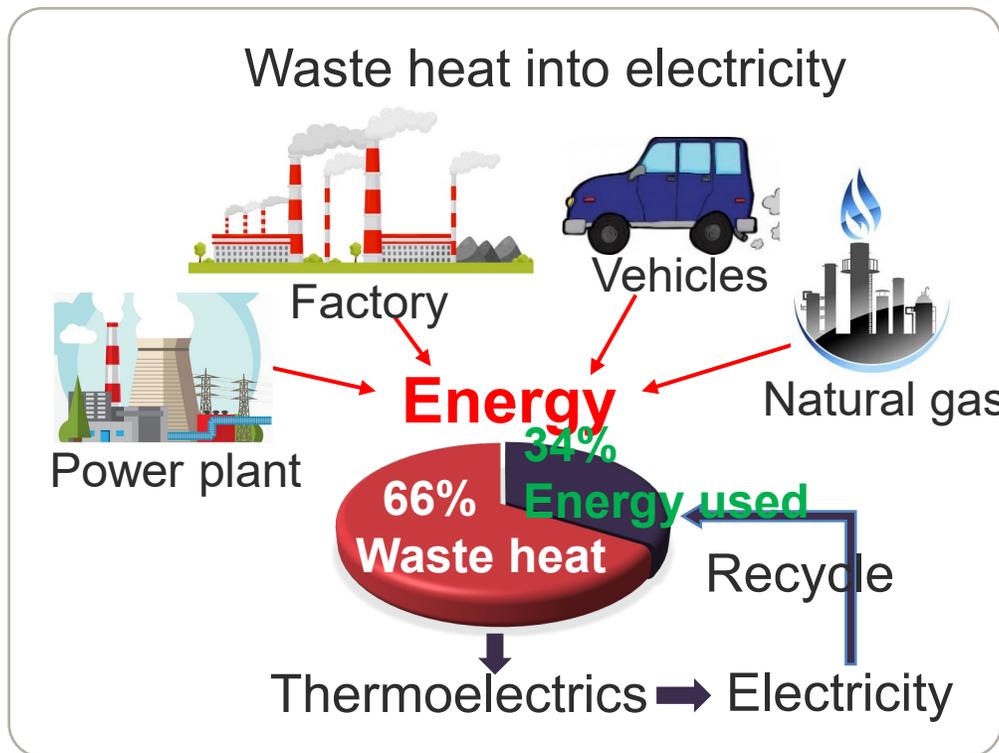
UniSQ Research- Energy Technology (#1 and #3)

1. Thermoelectric Technology – for energy generation and cooling
2. Battery technology and integration



Thermoelectrics: waste heat into electricity

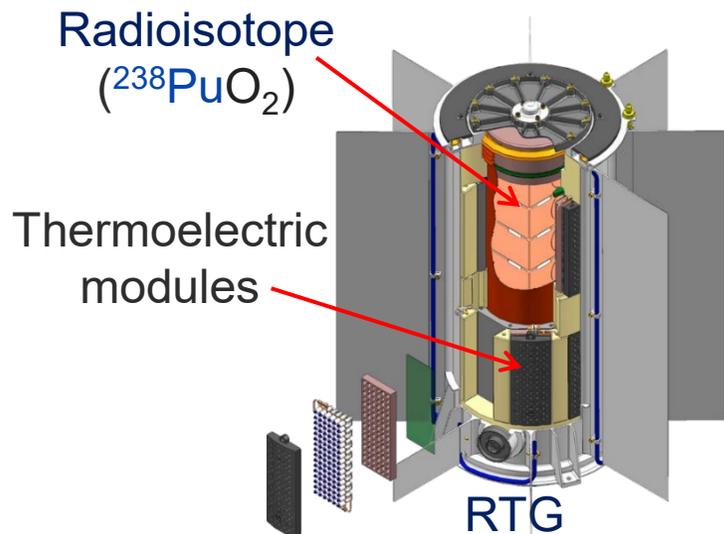
ARC FT230100316, 2024 – 2027



Centre for Future Materials

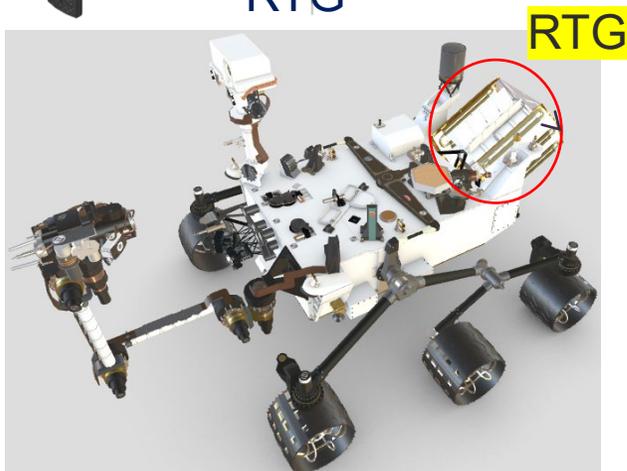


Radioisotope thermoelectric generator (RTG)



Voyager 1 in 1977
RTG will work until 2025.

iLAuNCH,
Trailblazer
Program,
2023-2025



Mars probe "Curiosity"



RTG is the only steady power supply for space probes running for over 30 years.

CATEGORIZATION OF STORAGE TECHNOLOGIES (Hossain et al. 2020; AEMO 2022b)

Type ¹	Duration ²	Response time ²	Storage Type				
			DS	CS	SS	MS	LDS
PHES	hrs-mon	Sec-min				✗	✗
CAES	hrs-mon	Sec-min			✗	✗	✗
FES	Sec-min	Sec		✗			
Fuel cells	hrs-mon	Sec		✗	✗	✗	✗
BES	hrs-mon	milli-sec	✗	✗	✗	✗	✗
SES	Sec-hrs	milli-sec	✗	✗			

¹ PHESS: Pumped Hydro Energy Storage; CAES: Compressed Air Energy Storage; FES: Flywheel Energy Storage; BES: Battery Energy Storage; SES: Supercapacitor Energy Storage

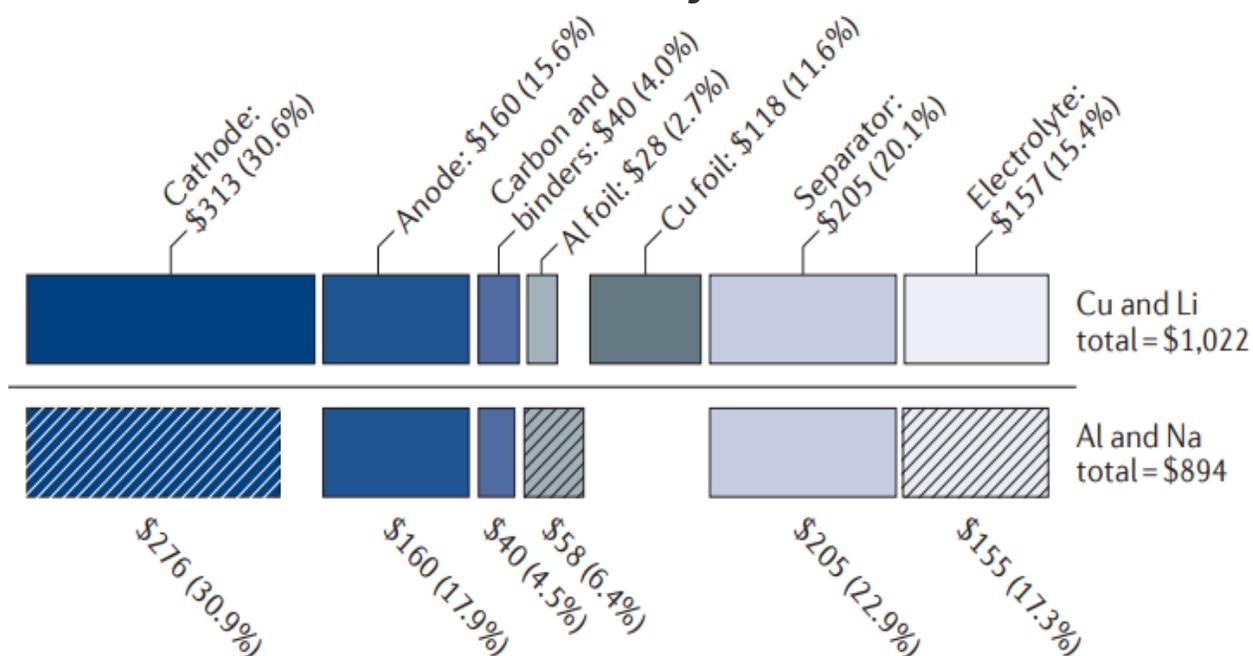
² Mon : Months ; Sec : seconds ; Min : Minutes

Type	Description
Distributed (DS)	Non-aggregated Behind the meter battery installations
Coordinated (CS)	Coordinated via VPP arrangements behind-the-meter battery installations
Shallow (SS)	Grid-connected energy storage (< 4 hr storage capacity)
Medium (MS)	Grid-connected (4-12 hours storage) Valued for energy value with intra-day energy shifting capabilities
Long Deep (LDS)	Grid-connected (>12 hours storage) for valued for long-period storage

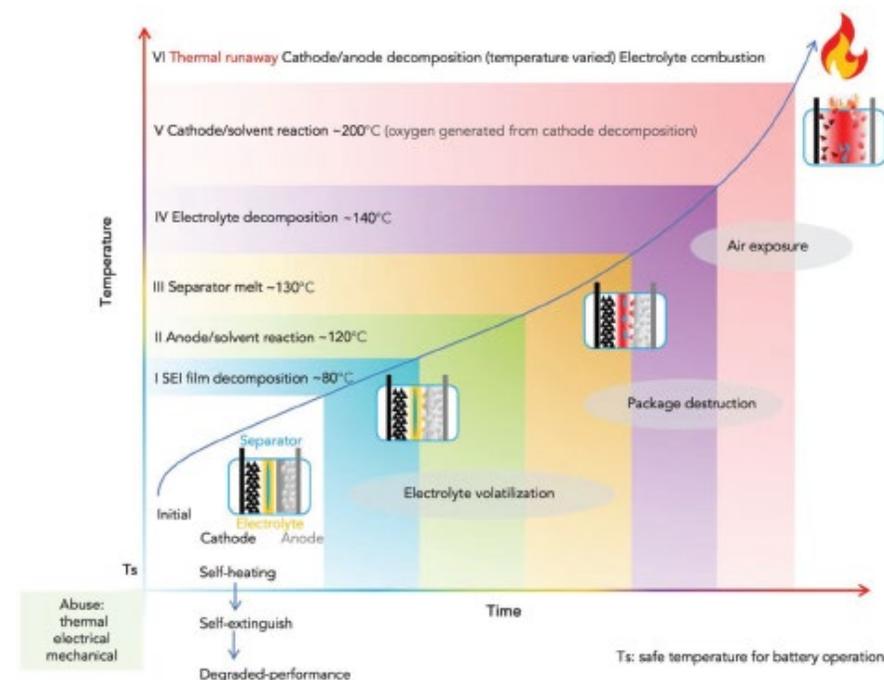
Centre for Future Materials

Why sodium ion?

Cost – not just Li vs Na



Safety



Working with a Zero Emissions Development on SIB – aims are threefold:

1. Eliminate the electrolyte (15% cost)
2. Use Novel HPA separator/electrolyte
3. Waste material source for C

Agriculture and Environment (#1, #5, #8)

1. Climate change impacts on coffee production
2. Energy and Resource Recycling



University of
Southern
Queensland

Global leaders in coffee research

Climate impacts on coffee production



Developing solutions to manage climate
risk.

Close collaborations with AGROSAVIA (Colombian Agricultural Research Corporation) on “*Preparing Colombian coffee production for climate change: Integrated spatial modelling to identify potential robusta coffee (Coffea canephora P.) growing areas*”

Hosting and co-supervising Universidade Vila Velha (Brazil) students undertaking research on environmental sustainability in coffee landscapes

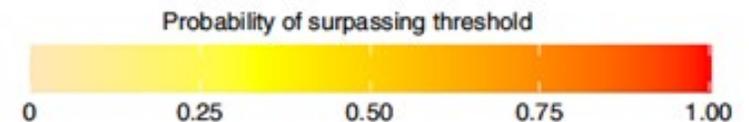
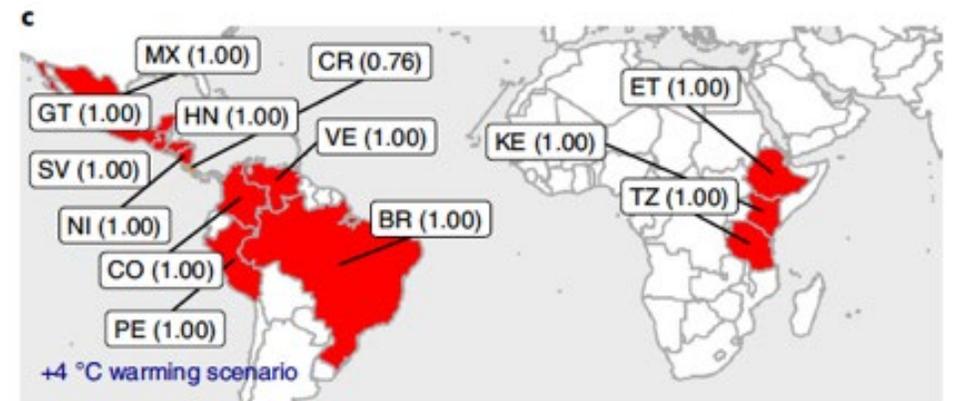
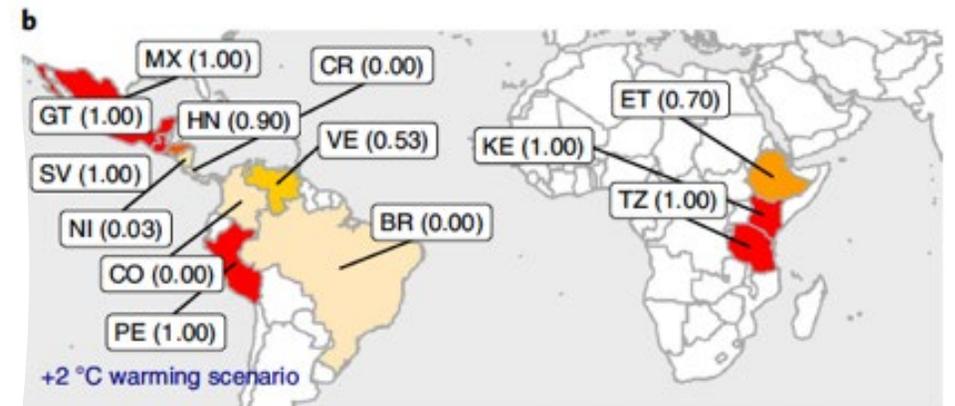
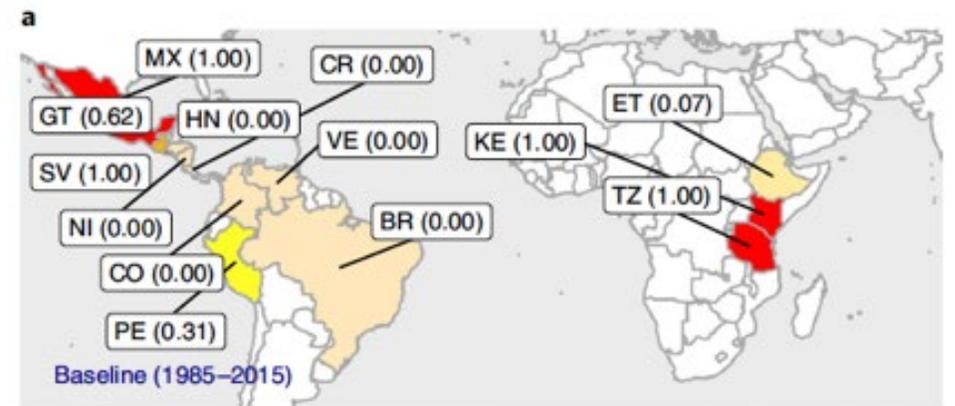


Centre for Applied Climate Science

Climate change poses to coffee productivity.

Figure shows the probability that a countries Arabica coffee producing areas will pass a critical climate threshold reducing productivity - Important implications for South America's top coffee producing countries.

Where should we be growing coffee in South America in a changing climate?



nature food

Article

Vapour pressure deficit determines critical thresholds for global coffee production under climate change

Jarrold Kath¹, Alessandro Craparo², Youyi Fong³, Vivekananda Byrreddy⁴, Aaron P. Davis⁵, Rachel King⁶, Thong Nguyen-Huy⁷, Piet J. A. van Asten⁸, Torben Marcussen⁹, Shahbaz Muehtaq⁹, Roger Stone⁹ and Scott Power¹⁰*

Received: 16 January 2022
Accepted: 9 September 2022
Published online: 13 October 2022

Check for updates

Our understanding of the impact of climate change on global coffee production is largely based on studies focusing on temperature and precipitation, but other climate indicators could trigger critical threshold changes in productivity. Here, using generalized additive models and threshold regression, we investigate temperature, precipitation, soil moisture and vapour pressure deficit (VPD) effects on global Arabica coffee productivity. We show that VPD during fruit development is a key indicator

<https://doi.org/10.1038/s43016-022-00614-8>

Climate systems modelling in agriculture and water resources

Title:

Northern Australia Climate Program

Leader: Associate Professor David Cobon

Project Team:

Dr Andrew Marshall | Dr Timothy Cowan

Project Partners:

Meat & Livestock Australia | Queensland Government | Western Australian Government Department of Primary Industries and Regional Development | Bureau of Meteorology

Project Aims:

To deliver innovative research, development, and extension outcomes to improve the capacity of the red meat industry in managing drought and climate risk across northern Australia.

Climate Science and Applications

Title:

DeRISK SE Asia

Leader: Professor Shahbaz Mushtaq

Project Team:

Mr Torben Marcussen | Dr Duc-Anh An-Vo | Dr Kathryn Reardon-Smith | Dr Jarrod Kath | Dr Louis Kouadio | Mr Michael Scobie | Dr Jochen Eberheard

Project Partners:

World Meteorological Organization | Chartered Institute of Architectural Technologists

Project Aims:

To develop climate risk management systems, best practices and insurance products that will shield smallholder farmers and businesses engaged in producing coffee, sugar, rice, cassava, rubber, dairy, and grazing across the agricultural value chain in key SE Asia countries from physical and financial disaster associated with climate change.

Disaster Risk Reduction and Early Warning/Action Systems

Title:

Filling fundamental gaps in pasture in drought-impacted savanna woodlands

Leader: Jo Owens

Project Partners:

Department of Agriculture and Fisheries, Queensland

Project Aims:

To fill gaps in knowledge of competition for water between trees and grasses to enable graziers to better manage areas with woody vegetation while adapting to Queensland's drought prone and highly variable climate.

Energy and Bioresource Recycling

Title:

Pilot to Paddock (P2) Innovative on-farm water, energy and nutrient technologies and practices for Australian Dairy, Egg, Pork and Cropping industries

Leader: Professor Bernadette McCabe

Project Team:

Dr Diogenes Antille (CSIRO) | Dr Serhiy Marchuk | Dr Jochen Eberhard | Ms Seonmi

Project Partners:

Pyrocal Pty Ltd | Logan City Council | Urban Utilities | Queensland Department of Environment and Science | University of Technology Sydney | University of Melbourne

Project Aims:

The University is a key partner in the NiCE Hub and is working with water utilities, Government departments, energy and resource companies, agricultural and horticultural businesses and local councils to investigate the value of biofertiliser from a range of organic waste streams.

Irrigation and Water Management

Title:

Automated Broad-acre Irrigation Optimisation

Leader: Associate Professor Joseph Foley

Project Team:

Dr Malcolm Gillies | Dr Alison McCarthy | Dr Simon Kelderman | Ralph Shippam, TIA, University of Tasmania

Project Partners:

Cotton Research and Development Corporation | Dairy Australia | Australian Government, Department of Agriculture, Fisheries and Forestry

Project Aims:

Broad-acre surface irrigation, large centre pivots and lateral moves, to automatically optimise irrigation events with novel technologies developed by our Irrigation & Water Management team. Sustainable and efficient ways of using water sustainably to grow crops and support the environment. Irrigation research is conducted across a wide variety of agricultural industries nationally and internationally.

Robotics, Automation and Machine Vision

Title:

Machine vision for improved pest management in cotton

Leader: Dr Alison McCarthy

Project Partners:

Department of Agriculture and Fisheries, Queensland, Cotton Research and Development Corporation

Project Aims:

Development of an app 'PestDetect' that uses the smartphone's camera and image analysis to detect and count silverleaf whitefly, leading to improved insect sampling in cotton crops. A follow-on project is targeting further priority crop attributes for crop protection.

Advanced robotic sensing technologies to enhance autonomy in crop production, biosecurity and animal welfare on-farm, with aims for on-farm adoption in the commercial farm conditions of today. The team also provides leadership on the integration of sensing systems with agricultural robotics into the future.

Advanced Composites Manufacturing

Title:

Fire-Retardant Composite Resins for Bushfire-Safe Wind Farm Infrastructures

Leader: Professor Pingan Song | Professor Xuesen Zeng

Project Partners:

ACCIONA | Allnex Resins Australia

Project Aims:

Environmentally friendly flame-retardant development and composite pultrusion process of key electric infrastructures on wind farms.

High value composites manufacturing research works closely with Australian and international aerospace, defence and space industries. We have developed unique capabilities in repair, robotic filament winding, robotic braiding, pultrusion, AI applications in autoclave and out-of-autoclave. Besides polymeric composites, we also focus on the manufacturing of oxide-oxide prepreg ceramic composites.

Functional Materials

Title:

Fire-Retardant Composite Resins for Bushfire-Safe Wind Farm Infrastructures.

Leader: Professor Pingan Song

Project Team:

Professor Xuesen Zeng | Dr Zhenhu Cao | Dean Voice

Project Partners:

Ningbo Miruo Electronic Technology Co., Ltd | Allnex Composites | Acciona Energy Oceania Pty Ltd

Project Aims:

This project aims to develop advanced fire-retardant composite resins for manufacturing bushfire-safe wind farm infrastructures. This work focuses on developing functional composites and composites for special applications. The research investigates: in-situ structural health monitoring systems, nano material for high-efficiency energy conversion, and shape memory composites.

Sustainable Industry Design

Title:

Sustainable Industry Manufacturing Planning for Long-term Ecosystems (SIMPLE) Hub – Development of Sustainable Amended Grout Products for Mining

Leader: Associate Professor Polly Burey | Dr Tristan Shelley

Project Team: Associate Professor Ali Mirzaghorbani, Hadi Nourizadeh, Mr. Alireza

Project Partners:

Jennmar Australia | Australian Government – Department of Education

Project Aims:

To enhance the sustainability of cement industries, it is essential to use pozzolanic waste additions like fly ash, silica fumes, furnace slags, waste glass, as well as other waste materials such as plastics and agricultural wastes as fillers. The objective of this project is to introduce new and improved cementitious grouts by replacing parts of the clinker content of conventional grouts with supplementary waste materials.

We are globally connected

- 
- Argentina
 - Austria
 - Australia
 - Bangladesh
 - Belgium
 - Brazil
 - Canada
 - Chile
 - Greater China (Mainland China, Hong Kong, Taiwan)
 - Colombia
 - Finland
 - France
 - Germany
 - India
 - Indonesia
 - Italy
 - Malaysia
 - Mauritius
 - Mexico
 - Morocco
 - New Zealand
 - Oman
 - Pakistan
 - Papua New Guinea
 - Peru
 - Russia
 - Scotland
 - Singapore
 - South Africa
 - Spain
 - Sri Lanka
 - Switzerland
 - Thailand
 - United Arab Emirates
 - United Kingdom
 - United States
 - Uruguay
 - Vietnam

A scenic view of a traditional Japanese garden. In the foreground, a stone path leads through lush greenery. A red wooden bridge arches over a pond in the middle ground. The background is filled with various trees and a clear blue sky. The text "Global Collaboration Models" is overlaid in white on the lower left side of the image.

Global Collaboration Models

Articulation Partnerships

Dual Award Partnerships

Study Hub Partnerships

Third-Party Arrangement Partnerships

Student Mobility (Global Education Programs)

Research Partnerships & Cotutelle Program



Articulation / Dual Award (online or on-campus)

Undergraduate Level:

3 years + 2 years

3 years + 1 year

Postgraduate Level:

1 + 1

These can vary depending on the curriculum alignment and credit mapping

Cross-Institutional studies (ONLINE)

Single USQ courses to complement partner's programs:

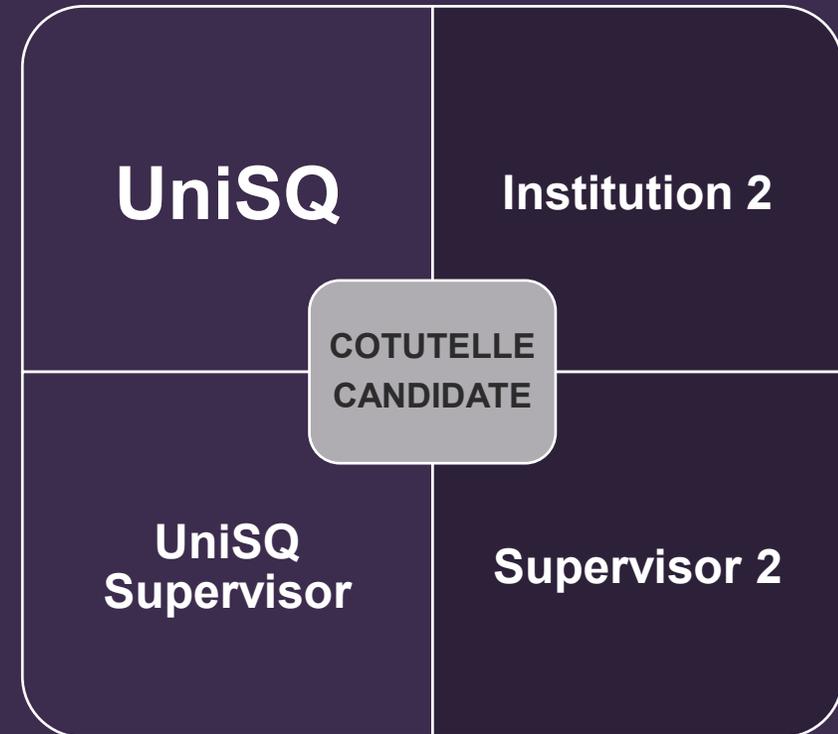
- **Business and Commerce**
- **Creative Arts & Media**
- **Education**
- **Engineering & Built Environment**
- **Health & Community**
- **Humanities & Communication**
- **Information Technology**
- **Law & Justice**
- **Sciences**

Professional Development (*Executive Training*)

- For company executives
- For government organisations
- For teachers
- For businesses
- Entrepreneurship
- Industry Expertise
- Online or on campus
- 1-4 weeks

COTUTELLE PHD PROGRAMS

- **Cotutelle** is an agreement on joint supervision involving a PhD degree.
- **2 institutions** +1 **PhD** candidate and +2 **supervisors**
- Under the Cotutelle program, the candidate is jointly enrolled at two universities, and spends time at each university (not necessary in UniSQ's case).
- A candidate is jointly supervised by staff at both institutions and upon successful completion of the program, the candidate graduates from *both* universities with a Doctor of Philosophy.



4 KEY OBJECTIVES



Cotutelle vs Joint PhD structures

Cotutelle	Joint PhD
Joint enrolment at UniSQ and an overseas university	Joint enrolment at UniSQ and an overseas university
Priority institutional partners – but open to all universities subject to approval	Institutional partners require Academic Senate Approval
Institutional memorandum of understanding (MOU) not compulsory	Institutional MOU/agreement required
Separate progress assessments	One university is designated as the lead
Single thesis submitted to both universities	Single thesis submitted to the lead university
Separate Examination	Joint examination
Two testamurs	One joint testamur
Two graduation ceremonies	One graduation ceremony

Cotutelle & Joint PhD

EXTERNAL FUNDING AGENCIES are also partners:

- ✓ PRONABEC Peru
- ✓ COLCIENCIAS Colombia
- ✓ ANID Chile
- ✓ CONACYT, Mexico
- ✓ FAPESP Brazil
- ✓ ANII Uruguay
- ✓ HEC Pakistan
- ✓ VIED Vietnam
- ✓ China Scholarship Council
- ✓ CNPQ Brazil
- ✓ DAAD Germany

Financial Support

UniSQ Cotutelle Scholarship

- Full / Partial Tuition Fees
- Full/Partial Stipend
- Round Economy Airfare

Successful scholarship recipients will be expected to have a record of excellent academic performance, and evidence of peer-reviewed research, such as publications or conference presentations.

The value and number of USQ Cotutelle Scholarships will vary each year and will depend on the quality of the application and whether the candidate has access to external funding.



University of
**Southern
Queensland**
Australia

LET'S WORK TOGETHER!

unisq.edu.au/international

