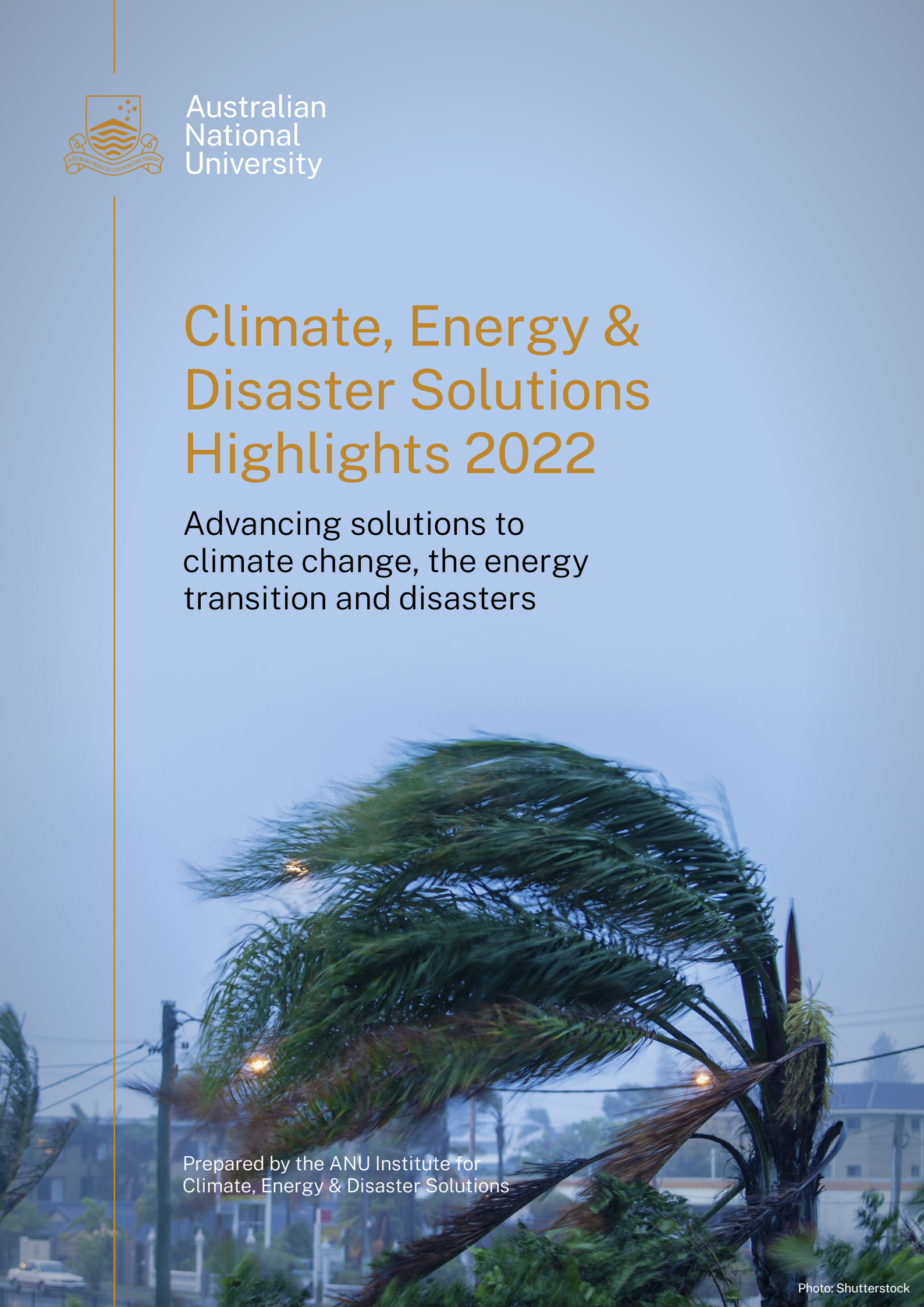
Australian National University

Climate, Energy & Disaster Solutions Highlights 2022

Advancing solutions to climate change, the energy transition and disasters



Prepared by the ANU Institute for Climate, Energy & Disaster Solutions

Photo: Shutterstock

For many Australians, 2022 will be remembered by the heavy rains and storms that battered the east coast, resulting in some of the most severe flooding the country has ever seen.

It's a story shared around the world in places like Pakistan, where more than 1,500 people lost their lives and millions more were displaced after catastrophic flooding left a third of the country underwater. As each year passes, extreme weather events and the ensuing damage and disruption long-predicted by scientists comes to fruition, more frequently and severely, as the impacts of climate change set in.

At the May federal elections, Australians sent a clear message – delay on climate action will no longer be tolerated. Since then, we are witnessing strengthened ambition in Australia's climate and energy policy, and associated policies such as biodiversity conservation. National emissions targets have increased and our path to the global goal of net-zero emissions has been reset. On-going challenges have, and will continue to emerge as this change gains momentum. Soaring electricity and gas prices are one notable example, highlighting the inherent volatility of a system reliant on fossil fuels. The need for transformative solutions to these challenges has never been greater.

Now in its second year, The Australian National University (ANU) Institute for Climate, Energy & Disaster Solutions (ICEDS) continues to strengthen the University's capacity and capability in climate, energy and disaster research, teaching, outreach and engagement. Collaboration across our growing member base, facilitated through channels such as ICEDS research clusters and seed funding grants, drives the University's unique transdisciplinary approach to tackling these complex and interwoven issues.

Throughout the year, ICEDS has continued to initiate, support and highlight the vital work of ANU researchers who are driving innovative solutions to these challenges. Examples of this work in 2022 include the People's Catchment project, where a team of ANU researchers is partnering with flood-affected communities in the NSW Northern Rivers region to build flood resilience; research into the feasibility of electric vehicle usage in remote regions of Australia; and research that is identifying methods to stop cities and companies causing planetary harm.

Demand for ICEDS professional education offerings has grown exponentially over the year. Our executive education team delivered short courses to over 400 professionals from Australia and around the world, including parliamentarians, executives, technicians, analysts, journalists and community members, building their knowledge and capacity to deal with climate, energy and disaster issues.

Our event program continues to provide important opportunities for a broad range of audiences to engage with experts in discussion on matters of regional and global significance. In 2022, we were delighted to host the first annual ANU Disaster Solutions Update event, where experts from around the world explored opportunities to advance approaches to prevent and respond to disasters.

ANU researchers continued to engage extensively with media throughout the year, reaching global audiences of up to 221 million on a wide range of climate, energy and disaster-related matters. They have also continued to provide numerous formal and informal briefings to policymakers, industry and communities in Australia and across the Asia-Pacific region.

In 2022, the ANU Below Zero Initiative progressed work towards the University's greenhouse gas emission reduction target of below zero emissions by 2030. Key areas addressed in the year included replacement of gas heaters with heat pumps, starting the process of turning the Kioloa campus into a key part of the local renewable grid, strategic planning for emissions removal projects and community engagement and education.

We are proud to share with you just a small selection of the world-leading work being undertaken by ANU researchers. On behalf of the Institute, we would like to thank you for your support over the past 12 months and encourage your continued engagement with the University on this vital work.

Professor Mark Howden FTSE,
Director and Head of Climate

Professor Frank Jotzo,
Head of Energy

Dr Roslyn Prinsley,
Head of Disaster Solutions

ANU Institute for Climate, Energy and Disaster Solutions (ICEDS)

Building a community across ANU

Strengthening capacity and capability in climate, energy and disaster research, teaching, outreach and engagement

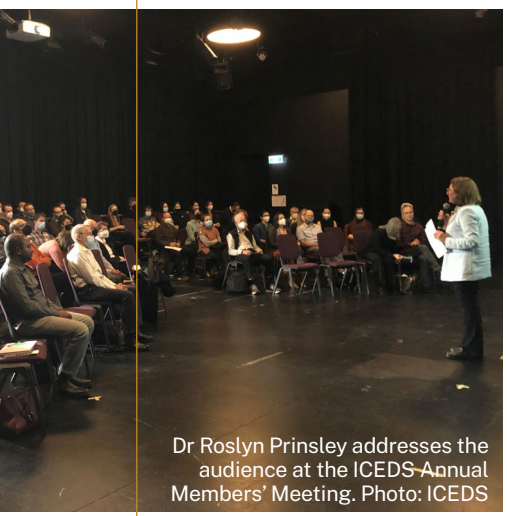
Over
570
members

7
out of 7
ANU colleges

26
out of 27 ANU
schools

Annual members' meeting

The 2022 ICEDS Annual Members' Meeting provided an update on the progress of the Institute and facilitated an activity that identified emerging trends and gaps across ANU climate, energy and disaster research and education. Participants also heard a keynote presentation from Jo Evans, Deputy Secretary at the Department of Climate Change, Energy, the Environment and Water, in which she gave an overview of the Government's climate change and energy agenda.



Dr Roslyn Prinsley addresses the audience at the ICEDS Annual Members' Meeting. Photo: ICEDS

Research Clusters

Throughout 2022, engagement within and between the 26 ICEDS research clusters continued to build communities of practice on climate, energy and disaster solutions across the University. This year, the new *Law, governance and institutions* research cluster formed to explore the complexity of norms, rules, practices, and institutions inherent to climate change responses, energy system transitions and disaster solutions in Australia, the Asia Pacific and further afield.

Our growing membership of ANU researchers from various disciplines provides unique opportunities for collaboration and capacity building to generate solutions-driven initiatives. Members have been engaged in extensive research, teaching, public policy engagement and outreach activities throughout the year. Read more about the 2022 highlights from our members, listed by research cluster: bit.ly/3HNVLEl

These are the ICEDS Research Clusters:

Earth systems
BIODIVERSITY
Security
Energy Economics and Policy
HEALTH
Agriculture, Food and Nutritional Security
Low Carbon and Resilient Cities
Extreme events and future scenarios
Climate Economics and Policy
RENEWABLE FUELS
Sustainable Transport
SMART GRID
Carbon Removal
Industrial decarbonisation
HYDROGEN ECONOMY
Risk, Vulnerability and Resilience
Solar Thermal
Fusion Power
Solar PV
Energy Storage and Recovery
Corporate Engagement and Action
WATER AND FLOODING
Law, governance and institution
Psychology, Communication and the Arts
Indigenous Peoples, Cultures and Knowledges
Adaptation, Livelihoods and Development in Asia and the Pacific

Associate Professor Marnie Shaw worked in medical research before moving to ANU. Photo: ABC News.

Associate Professor Marnie Shaw

From Brains to Batteries

Marnie Shaw's path to becoming an Associate Professor in the ANU School of Engineering and Research Lead at the ANU Battery Storage and Grid Integration Program (BSGIP) was a little less than conventional. "I get a lot of surprised looks when I tell people about my background," she says.

Having completed her PhD in Physics at the University of Melbourne, Marnie started working at a biotech start-up in Boston in the United States before undertaking research on brain imaging in Germany and Australia. Then four years ago, Marnie moved to ANU to work in renewables.

"From brains to batteries!" she jokes. But for Marnie, the change in career direction was a no-brainer.

"I see the shift to a decarbonised energy system as the greatest and most important challenge I could work on," she said.

Marnie's work looks at battery storage and the services batteries can provide to support the uptake of renewable energy. One of her current research areas is neighbourhood batteries, which are a medium-scale shared form of energy storage.

In 2022, Marnie was announced as the recipient of the Chloe Munro Scholarship for Transformational Leadership. The award honours the late Chloe Munro AO FTSE, a visionary pioneer of the path to clean energy in Australia. The scholarship will involve a seven-month development program for women in clean energy.

"The award means a lot to me," said Marnie. "We all know that we need to improve gender balance in the clean energy sector so it's a very positive step that the Clean Energy Council have set up this scholarship program to support women as they move into senior leadership roles in the sector. It also makes me personally feel very supported on my path forward."

Read more > bit.ly/3Wfd4m9

Research highlights

$45m injection to electrify innovation in Aussie solar tech

ANU will play a critical role in researching and developing cheaper, more efficient and more sustainable solar technologies thanks to a multi-million-dollar investment that will ignite more sparks in Australian solar innovation.

The Australian Centre for Advanced Photovoltaics (ACAP), led by The University of New South Wales (UNSW) in collaboration with ANU and other institutions, will receive $45 million in Federal Government funding over the next eight years to ensure the nation continues to be a world leader in the development and deployment of cutting-edge solar technology, including the next iteration of solar panels.

ANU Emeritus Professor Andrew Blakers, who is coordinating the University's involvement with ACAP, says continued investment and advances in clean energy infrastructure is needed now more than ever amid constraints on the global energy market and higher prices fuelled by ongoing supply issues.

"The way out of current energy difficulties is more investment in solar and wind, supplemented by extra transmission to bring the new solar and wind power to the cities," Professor Blakers said.

Read more > bit.ly/3Ogc5Pc

Australia is well positioned to rise to the challenge of developing more capable and more efficient solar cells, says ANU Emeritus Professor Andrew Blakers. Photo: ANU

ANU expert warns our window of opportunity to avoid sea-level rise is closing. Photo: Nerilie Abram/ANU

Clock is ticking to save East Antarctica from climate change

The worst effects of global warming on the world's largest ice sheet could be avoided if nations around the world succeed in meeting climate targets outlined in the Paris Agreement.

That's the call from an international team of climate scientists, including experts from ANU and the Australian Centre for Excellence in Antarctic Science (ACEAS), who have examined how much sea levels could rise if climate change melts the East Antarctic Ice Sheet (EAIS).

The team's research, published in *Nature*, suggests by limiting global temperatures to well below 2°C above pre-industrial levels, the EAIS is predicted to add less than half a metre to sea-level rise by the year 2500. If the targets aren't met, sea-level rise from the EAIS alone could climb up to five metres in the same time period.

If greenhouse gas emissions are drastically scaled back and only a marginal rise in global warming is recorded, the research team predicts the EAIS - which holds the vast majority of Earth's glacier ice - will likely not add to sea-level rise this century. But the researchers say sea levels will still rise due to unstoppable ice losses from Greenland and West Antarctica.

The researchers warn if countries fail to meet Paris Climate Agreement targets, we risk awakening a "sleeping giant".

"The EAIS is 10 times larger than West Antarctica and contains the equivalent of 52 metres of sea level," co-author Professor Nerilie Abram, from the ANU Research School of Earth Sciences, said.

"If temperatures rise above 2°C beyond 2100, sustained by high greenhouse gas emissions, then East Antarctica alone could contribute around one to three metres to rising sea levels by 2300 and around two to five metres by 2500,"

Read more > bit.ly/3TNjCGk

Taken on February 28, this photo shows the impacts of Terania Creek. Just upstream a local resident measured 930mm in 18 hours. Photo: Dave Yarnall

ANU researchers team up with Northern Rivers community to build flood resilience

In late February 2022 the Northern Rivers of NSW experienced a series of extreme rainfall events that led to widespread, catastrophic flooding throughout the region. Vital creek and rainfall gauges, which inform official sources and warning systems, were either broken or transmitting inaccurate data. By contrast, local residents were witnessing and recording clear indications of an emerging flood crisis.

Now, a team of researchers and students from across ANU is partnering with local residents in the region to enhance community systems and networks to gather, collate and share flood intelligence data. Entitled *The People's Catchment*, the community-led initiative is harnessing ANU expertise to help build community resilience to future extreme floods, which are worsening under the impacts of climate change.

Community initiatives underway with *The People's Catchment* include a CB UHF radio network for communication when mobile and internet connections fail, a network of local residents - "rain sentinels" - with automatic and manual rain gauges to catch and share real-time data over the whole catchment, and processes to benchmark creek levels for the 2017 and February 2022 floods so that data collected in future high rainfall events is meaningful to those downstream. The methods and technology are being developed and trialled in the Terania-Keerrong sub-catchment.

These initiatives are being supported through a multidisciplinary team of ANU researchers and students, who are providing both technical support and key insights into community efforts. This includes technical advice on rain and creek gauges, idea generation for online sites and apps to share information, and research to explore the systemic issues that led to the lack of flood intelligence during the floods, to share with institutions and organisations. The ANU team is also gaining insights from the community problem-solving, incorporating on-the-ground experiences and knowledge from those who lived through the floods, to inform future disaster responses and solutions.

"Our research with the community is mutually beneficial. ANU has incredible resources, which we are using to benefit communities. We also get much benefit, learning from the community about what works in their environment, for them," said Dr Roslyn Prinsley, who is Head of Disaster Solutions at ICEDS and also lead investigator on the project.

Read more > bit.ly/3PK7oOz

Australia has power to lower CO_2 emissions in Asia and the Pacific

Australia could drastically lower carbon emissions in the Asia-Pacific region by exporting zero-carbon commodities such as electricity, green hydrogen and green metals, according to new research by ANU experts.

The study of Australia's potential to supply zero-carbon commodities to the Asia Pacific is the first to quantify the energy, land and water requirements of a new zero-carbon export model for Australia.

The study shows Australia could reduce the Asia-Pacific region's greenhouse gas emissions by about 8.6 per cent if the current level of key commodity exports such as thermal coal, liquefied natural gas, iron ore, bauxite and alumina could be replaced by green alternatives. To do so would require about two per cent of Australia's land area for solar and wind farms.

Lead author Professor Paul Burke, from the ANU Crawford School of Public Policy, says Australia has a big opportunity.

"Australia is one of the world's largest exporters of fossil fuels and we have a real chance to shift to a much cleaner export bundle," he said.

Fellow authors Dr Fiona J Beck, Associate Professor Emma Aisbett and Emeritus Professor Ken Baldwin say the way Australia sources and uses energy is transitioning rapidly and the country has an opportunity to lead the way globally.

Read more > bit.ly/3Xa4YvU

Distinguished Professor Xuemei Bai is the lead author of a new report which recommends what business and cities must do to protect Earth system boundaries. Photo: ANU

How to stop cities and companies causing planetary harm

What businesses and cities must do to stay within 'safe and just' environmental limits for carbon, water, nutrients, land and other natural resources is the subject of a new set of recommendations from Earth Commission experts, including Distinguished Professor Xuemei Bai.

The researchers argue that methods need to be developed to identify what cities and companies must do for the world to stay within the Earth system boundaries' (ESBs) and to help them assess their share of responsibility towards global budgets.

The authors argue for 'science-based targets' and say objectives must be 'measurable, actionable and time-bound', pointing out that few cities and companies currently have science-based targets and of the top 200 cities with the highest emissions, only 110 have 'net zero' pledges that align with the Paris Agreement.

Lead author, Xuemei Bai, Distinguished Professor at the ANU Fenner School of Environment and Society, and a member of the Earth Commission said: "It's a long haul, but humanity needs to stay within our planet's finite budgets. Developing scientifically-robust and socially-just methods to allocate natural resources and responsibilities is essential to respect them."

"Cities and companies are main contributors to planetary level changes, but also key actors for solutions. There are knowledge gaps in how to translate such boundaries into concrete allocations for businesses and cities, and our recommendations seek to fill those gaps," Professor Bai said.

Read more > bit.ly/3HVPjer

What difference could seconds make to responding to earthquakes and tsunamis? Photo: Shutterstock

ANU research could add life-saving seconds to early warnings for earthquakes and tsunamis

An interdisciplinary team of ANU researchers has identified a sensor that can detect earthquakes and tsunamis seconds or minutes earlier than current disaster early warning systems.

Preliminary modelling suggests that gravitational forces from seismic pressure waves due to earthquakes can be measured by high-precision gravitational force sensors. These measurements can alert seismologists to changes in the gravity field before tremors from earthquakes are registered by the seismometer networks currently used for early warnings.

The seismic pressure waves create changes in the density of the Earth's crust, resulting in a change of a gravitational force, which in turn are measured by the sensor.

"Measuring these tiny forces is extremely challenging, considering they are created by enormous forces and pressure within the earthquake," says Dr. Bram Slagmolen, Research Fellow at the ANU Centre for Gravitational Astrophysics.

Dr Slagmolen believes that if the feasibility of the sensor being implemented in current operational earthquake systems can be tested, the technology could have significant benefits.

The transformational technology has the potential to improve the response time to catastrophic events like earthquakes by tens of seconds and tsunamis by tens of minutes, saving many lives and greatly reducing economic loss.

"Having that extra time could give people a chance to move to safer places, critical operations like surgery can be suspended, high speed trains halted, and electrical power stations and gas mains protected," said collaborator Professor Phil Cummins from the Research School of Earth Sciences, whose research includes earthquakes and tsunami early warning systems.

Read more >
bit.ly/3VgxhXp

ANU expert says there is “no excuse” for leaving remote communities out of electric vehicles discussion. Photo: Jamie Kidston/ANU

Electric vehicles pass the remote road test

Electric vehicles can handle the distances required to travel to essential services in remote and regional Australia, a new ANU study has shown.

According to co-author Dr Bjorn Sturmberg, Research Lead at the ANU Battery Storage and Grid Integration Program, the results indicate the use of electric vehicles in remote communities is more feasible than might be expected.

"We analysed the distances between people's homes and the nearest ‘service hub’ towns - where they might go to the do the shopping, for example," Dr Sturmberg, said.

"The vast majority of residents, or 93 per cent, could do those trips with even the lower-range of electric vehicles currently available on the Australian market. That's without needing to recharge en route."

Dr Sturmberg said given this, there's no excuse for leaving our remote communities out of the discussion.

"We need to do better - electric vehicles shouldn't be left in the too hard basket.

It's an unequitable and unfair path forward if remote and regional communities are the last ones left driving diesel vehicles, especially as they will be some of the most impacted by catastrophic climate change," Dr Sturmberg said.

"Yes the barriers are obvious - large distances, unsealed roads. But the benefits are equally obvious. It's difficult and expensive to get diesel out to these communities, and electric engines are simpler and more robust than fuel engines."

Read more > bit.ly/3V2Q4FD

Bleak outlook for Australian coal exports to China

China's demand for coal imports, including from Australia, will drop significantly by 2025, according to new modelling led by researchers at ANU.

The researchers examined China's plans for decarbonisation as well as investment in domestic railroads in order to reduce dependence on seaborne coal imports and increase the country's energy security.

Their purpose-built model shows China's thermal imports could fall by at least 26 per cent, from 210 Mt to 155 Mt per year, between 2019 and 2025. If China follows through on ambitious climate policies, thermal coal imports could fall as low as 115 Mt per year in 2025 - a decline of 45 per cent.

Lead author of the study and energy economist, Dr Jorrit Gosens from the ANU Crawford School of Public Policy, said the modelling shows major coal exporters like Australia would feel the biggest losses from the changes.

"Our findings are clear: Beijing's plans for rapid decarbonisation and energy security signal the end for Australia's current coal export boon," Dr Gosens said.

"And this isn't going to happen far off into the future; it is imminent. Our modelling predicts Chinese demand for Australian thermal coal will fall to between 30 and 40 Mt in 2025, down from about 50 Mt in 2019.”

Study co-author Professor Frank Jotzo, Head of Energy at ICEDS, said the changes would have long-lasting impacts on the Australian economy as well as on political debates about climate change.

"Our findings should be of high concern to the coal industry and to Australian governments. Coal will be on the way down. We need to foster alternative economic futures. Australia's resource and energy industries have every opportunity to prosper in a low-emissions world."

Read more > bit.ly/3YLiKGj

ANU kick-starts transformational research into climate, energy and disasters, thanks to Seed Funding Grant

Transformational research into the growing challenges of climate change, the energy transition and disasters received a boost in 2022, thanks to funding from ANU, administered by ICEDS.

In July, the Institute announced that nine ANU research projects had been successful in securing grants totalling over $160,000 to support novel, additional research across climate, energy and disaster-risk fields, under its inaugural Seed Funding Grant initiative.

The following is a summary of three of the projects funded under the Seed Funding Grant.

Project outputs have been valuable tools in framing stakeholder engagement and achieving support for the next phase of the project, says Professor Blackhall. Photo: Shutterstock

Development of a roadmap for a socially just transition within the agricultural sector

Led by Chief Investigator Professor Lachlan Blackhall (Head, ANU Battery Storage and Grid Integration Program), this project will co-design a roadmap for decarbonised energy transition in the agricultural sector with industry, policy and rural community stakeholders.

"Industry and government stakeholders are interested in understanding the opportunities and challenges associated with a renewable energy transition for the sector, however there is currently a lack of information available on transition pathways and implementation options," said Professor Blackhall.

As an outcome of this project, the research team will synthesise the learnings from the scoping study and convene a symposium in March 2023.

"The symposium will bring together stakeholders across industry, government, academia and community groups to co-design a process for developing an energy transition roadmap for agriculture, which can then be presented to appropriate funding agencies," said Professor Blackhall.

Dr Sara Beavis and Nicholas Metherall will explore nature-based solutions to build flood resilience in low-lying Pacific Island Countries. Photo: Shutterstock

Maximizing co-benefits through measurement reporting and verification (MRV) baselines for carbon dioxide removal projects in low-lying Pacific Island Countries

Led by Chief Investigators Dr Sara Beavis and Nicholas Metherall (who are both with the ANU Fenner School of Environment and Society), this research will conduct a baseline climate and disaster risk vulnerability assessment to identify sites where afforestation/reforestation (tree planting) can be used as a nature-based solution to reduce risks of soil loss, erosion, streambank collapse, public health issues and adapt to increasing flooding and cyclone damage.

The results of the project will inform the establishment of nurseries and tree planting activities. Co-designed with local stakeholders, this preliminary study intends to support a range of long-term outcomes. These will include supporting agroforestry livelihoods and carbon credit generation to diversify sources of income for local village communities.

There has been very little research on the role of partners in times of crisis, say study leaders Dr Bansal, Dr Dawel and Dr Leach. Photo: Picsea/Unsplash

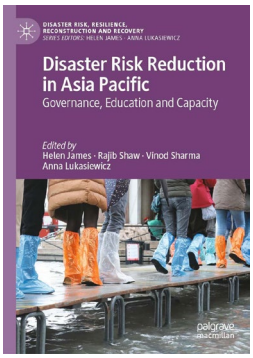
Partner's influence on mother and child mental health following climate crisis: a missing link in the MC2020 cohort

Climate-related extreme events like bushfires are associated with adverse pregnancy, birth and child developmental outcomes. However, the mechanisms underlying these associations (including parent mental health) are not well understood. This project, co-led by Dr Amita Bansal (ANU Medical School), Dr Amy Dawel (ANU Research School of Psychology) and Dr Liana Leach (ANU National Centre for Epidemiology and Population Health), plans to leverage existing Mother and Child 2020 (MC2020) cohort study data, and collect new data from partners, to better understand how families have been impacted by, and develop, during and after the times of climate crisis.

"This study will give us a clearer picture of how family dynamics impacted children's emotional and social behaviour in the wake of the bushfires and COVID-19," says Dr Bansal.

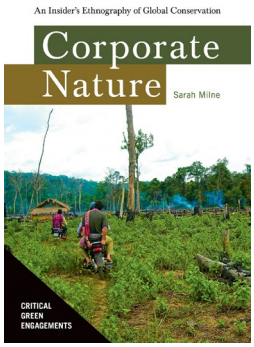
Book Release Highlights

Disaster Risk Reduction in Asia Pacific: Governance, Education and Capacity



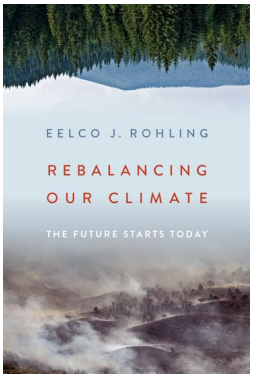
Initiated by the late Professor Helen James, Founding Director of the former ANU Disaster Risk Science Institute, and co-edited by ICEDS Honorary member, Dr Anna Lukasiewicz, this book focuses on how societies in the Asia-Pacific approach disaster planning, preparation, recovery and resilience, and addresses different dimensions of international frameworks to reduce the impacts of disasters.

Corporate Nature - An Insider's Ethnography of Global Conservation by Dr Sarah Milne



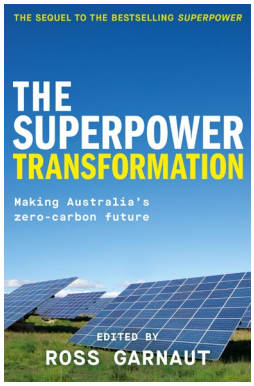
Authored by Dr Sarah Milne (ANU Crawford School of Public Policy), the book delves inside the black box of mainstream global conservation, revealing how big international NGOs struggle in the face of complexity — especially in settings where corruption and political violence prevail. Milne argues that the ability of NGOs to ignore and conceal failings produces an undesirable form of socionature, called corporate nature, that values organisational success over diverse knowledges and ethical conduct.

Rebalancing our Climate by Eelco J Rohling



Authored by Professor Eelco J. Rohling (ANU Research School of Earth Sciences), Rebalancing Our Climate documents a wealth of ways to adjust the trajectory of climate change. Released in early 2022, the book was supported with an online launch event, hosted by ICEDS. Read more about the book and watch a recording of the event here: bit.ly/3YAiny0

The Superpower Transformation: Making Australia's Zero-Carbon Future edited by Ross Garnaut



In his bestselling *Superpower*, renowned economist and ANU Emeritus Professor Ross Garnaut showed that Australia could become an economic superpower of the post-carbon world. Now, in *The Superpower Transformation*, he turns that idea into a practical plan to reshape our nation, outlining new evidence that stronger and earlier action on climate change would be good for jobs and incomes. Garnaut looks at the challenges for the new federal government and how Australia can best meet the objectives set at the Paris and Glasgow climate conferences – and the growing costs of not doing so.

Education highlights

Over
140
climate, energy and disaster courses across ANU

12
professional short courses (with total 400 participants & 1500 applicants)

4.5
rating out of 5 by professional short course participants

How can Indigenous knowledge help to build resiliency in the face of climate change?

Vehia Wheeler should have a bright future ahead of her. But as a young person living with the increasing challenges of climate change, she's acutely aware that a 'bright' future is by no means guaranteed.

"I go through periods of eco-grief. I see our coral dying right in front of my eyes – that didn't happen when I was growing up," she said.

While this might be overwhelming for a lot of people, Vehia has used her personal experiences to drive her work, and to instigate positive change for her people, her land, and her culture.

"I feel very much that we need to do something, and that is what ultimately makes me happy and fulfilled. I can't imagine myself putting in so much effort to anything else," she said.

This year, Vehia commenced her PhD at ANU, researching ancestral land views and decolonial futures in Mā'ohi Nui (French Polynesia). She has also been named as a recipient of the ANU Game Change Scholarship, which provides game-changing support to the emerging generation of PhD scholars working in the area of climate change.

"Indigenous knowledge and methodologies prioritise self-reflection - your position and how you relate to the subject and people that you're studying, and that you're in relationship with. I chose to work with Tahiti because I'm Tahitian and I have family here, and I felt like it was appropriate for me as a Tahitian person, and it's also a part of my future," said Vehia.

Read more > bit.ly/3C8DpKL

Game Change Scholarship recipient Vehia Wheeler shares how her personal experiences drive her work. Photo: Bryan Kuwada

Gaining the tools to make change, with the Master of Climate Change

After completing his undergraduate degree in commerce, Tommy Buckingham commenced his career in the technology sector across sales, partnerships and operations. Life was by most measures, comfortable.

However, Tommy was becoming increasingly concerned about the impacts of climate change. Like many, he wanted to make a positive impact, but wasn't sure how best to do this.

"I wasn't clear about where we need to focus our attention and time to start to solve the many challenges we face as a result of climate change," he said.

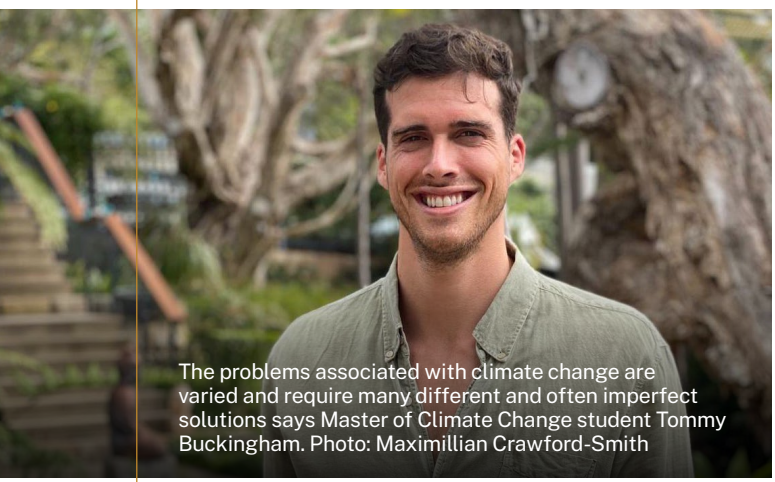
In a stroke of serendipity, a close friend and ANU graduate introduced Tommy to Master of Climate Change convenor, Dr Rebecca Colvin.

"Dr Colvin explained that the program would allow me to gain a scientific overview of climate change and build a deep understanding of where the greatest opportunities to solve the biggest climate challenges lie. I immediately knew it was the right program for me," Tommy said.

Tommy notes that the strengths of the Master of Climate Change include its multidisciplinary approach, as well as the research component focussed on corporate net-zero target setting.

"The program explores solutions that are grounded in policy, economics and science but also recognises the politicised and complex nature of climate change," he said.

Read more > bit.ly/3PGagvJ



The problems associated with climate change are varied and require many different and often imperfect solutions says Master of Climate Change student Tommy Buckingham. Photo: Maximillian Crawford-Smith

Working alongside classmates from different backgrounds was a highlight for Master of Energy Change student Simone Antich. Photo: Evangelina Sanchez

Addressing the energy transition through multiple lenses, with the Master of Energy Change

Being surrounded by people who are older and more experienced than you can be intimidating. But for Simone Antich, studying the Master of Energy Change program at ANU with classmates from different backgrounds was a highlight of her experience.

"Meeting classmates who are passionate about renewable energy from all walks of life and at different stages of their career has been a truly invaluable experience," said Simone. "I am constantly learning from, growing and considering new ideas thanks to the outstanding individuals I have met throughout this program."

Simone entered the Master of Energy Change program immediately after completing her undergraduate study in sustainable energy management. She was looking to build on her previous learnings and find out more about a career pathway in renewable energy policy.

"I was eager to delve into energy policy, an area crucial to guiding the energy transition and one which I had had little exposure to," she said.

Read more > bit.ly/3FEblj8

Professional Short Courses

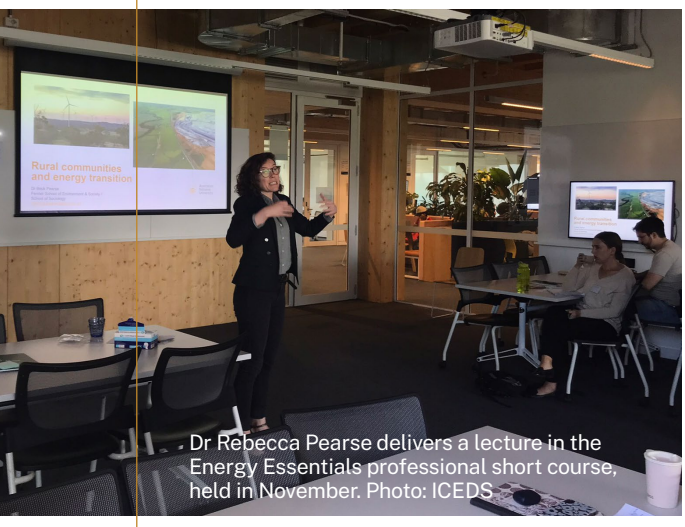
Growing demand for ANU Expertise

2022 has seen an increase in requests for ICEDS professional short courses involving Australian and overseas participants, which reflects the growing demand for expertise on the policy, practice and research of climate, energy and disaster solutions.

Throughout the year, ICEDS delivered 12 professional short courses to over 400 participants. This included four Essentials courses – Climate Essentials and Energy Change Essentials – focusing on the latest developments in climate change and the energy transition in Australia and the region. Essentials participants included professionals from national and sub-national government departments, non-government organisations, community groups, private companies, regulatory agencies and academia.

What people said about our Essentials courses:

- *"Great range of speakers and topics."*
- *"This is a well-rounded introductory course to those interested in the energy transition. I wouldn't hesitate to recommend."*
- *"I found all of the lectures extremely interesting, informative and nicely varied. The speakers were very engaging and made the students feel comfortable asking questions throughout."*



Dr Rebecca Pearse delivers a lecture in the Energy Essentials professional short course, held in November. Photo: ICEDS


Dr Igor Skryabin in Vientiane, kick-starting the Grid Integration of Renewable Energy (PDR Laos) professional short course. Photo: Emma Roan

Educating professionals around the world

In 2022, ICEDS also delivered a series of international short courses, funded by the Australian Government Department of Foreign Affairs and Trade (DFAT). The courses focused on climate change adaptation and mitigation, the energy transition, and the integration of renewable energy into the grid. A total of eight courses were delivered across South and Southeast Asia, Africa and Latin America. They were often delivered in blended modes (online and in-person) and multiple languages, supported by simultaneous live translations and translated courses materials, to meet the changing demands of cross-cultural executive education.

What people said about our international courses:

- *"This course was a great experience. I learnt so much about energy transition and I am fully loaded with knowledge to make contributions anywhere I find myself."*
- *"The lecturers were on top of their area of expertise. They were able to explain the topics to my understanding."*
- *"For me, the experience exposed me to the science of climate change and equipped me with the tools to practically assist the communities that I work with."*
- *"The calibre of academics and industry experts provided by the course is world class. The course and ICEDS have measured up to the high standards expected of the ANU. Kudos."*
- *"Excellent information from the lectures ... I'd want to extend my sincere gratitude to the ANU Institute for Climate, Energy & Disaster Solutions for hosting such an excellent and urgently required course for people all around the world."*

2022 also saw the launch of the South-East Asia Energy Transition Partnership, funded by the United National Office for Project Services (UNOPS). This long-term program involves over 100 officials and energy stakeholders in Vietnam, Indonesia and the Philippines, and aims to build regional capacity on the energy transition. Over the year, 21 roundtables were delivered, involving participants in deep dive discussions on the energy transition and associated regional issues.

ANU Below Zero

Driving leadership on climate action

In 2020, ANU announced the Below Zero Initiative, which aims to transition the University from a source of greenhouse gas emissions to a sink for atmospheric carbon dioxide, to share learnings and provide leadership and solutions for climate action.

Throughout the year, the Below Zero team has been conducting scoping and pilot exercises informing detailed plans to scale up ANU action from 2023 onwards. Key activities have included:

The ANU Below Zero initiative has developed an ANU energy dashboard to provide visualisations of energy consumption on all ANU campuses and sites. Credit: ANU

Emissions reductions

- Piloting the electrification of individual building heating infrastructure from gas-fired boilers to electrical heat pumps.
- Developing the Acton Campus Infrastructure Decarbonisation Masterplan, which aims to electrify the campus heating/cooling infrastructure at scale.
- Developing an ANU energy dashboard to provide visualisations of energy consumption on all ANU campuses and sites.
- Developing *Guidelines for Low Carbon Travel* and piloting the use of GHG calculators to improve awareness of the emissions footprint of travel.

Emissions removal

- Developing *ANU Principles for Carbon Removal* to drive future activities.
- Scoping and early development of partnerships with landowners and projects for carbon dioxide removal on ANU sites, including at Warramunga Station (NT) and Kioloa (NSW)

Engagement

- Piloting the ANU Green Impact initiative, encouraging staff and students to reduce emissions and take climate action on campus.
- Hosting a Global Alliance of Universities on Climate members workshop, focused on decarbonisation of infrastructure and reducing travel emissions.
- Hosting students through College of Business and Economics Internships. In 2022 students worked on projects across travel, ESG frameworks, the Australian carbon credit market and electric vehicle infrastructure.

The ANU Below Zero Initiative has been improving awareness of the carbon footprint of travel in 2022. Credit: Ante Hamersmit/Unsplash

ANU student interns help University towards Below Zero target

In 2022, undergraduate students Peter Phillippa and Tom Adams swapped-out their regular university lectures and tutorials to undertake semester-long for credit internship positions with the ANU Below Zero Initiative.

“I chose to get involved as the field of research excited me. It was something I wanted to learn more about, in order to eventually do my part to help reduce the impact of climate change,” says Peter.

Tom had similar feelings, finding work on climate change adaptation and mitigation interesting and challenging.

“Climate change is an important issue to me so helping an organisation deliver on its climate ambition was appealing,” he said.

As a part of their internships, Peter and Tom researched Australia’s Emissions Reduction Fund (ERF) and Carbon Credit options, to determine how these could be best implemented by ANU to achieve the University’s 2030 below zero emissions target.

“Peter and Tom’s projects built on one another,” said Below Zero Emissions Removal Manager, Caitlyn Baljak.

“By the conclusion of their internship both students produced well-researched reports and implementable recommendations for ANU to best achieve below zero emissions,” she said.

Both Tom and Peter spoke highly of their internship experience. In particular, they valued the opportunity to gain work-experience and build research skills outside of the classroom.

Read more > bit.ly/3PXFFKx

Photo: ANU

For his internship, Peter Phillippa identified the best carbon sequestration method for ANU to meet the University’s Principles for Carbon Removal. Photo: ANU student research committee

Events

24
lectures, seminars, roundtable discussions and workshops

3,643
audience members

4.5
rating out of 5 by surveyed event participants

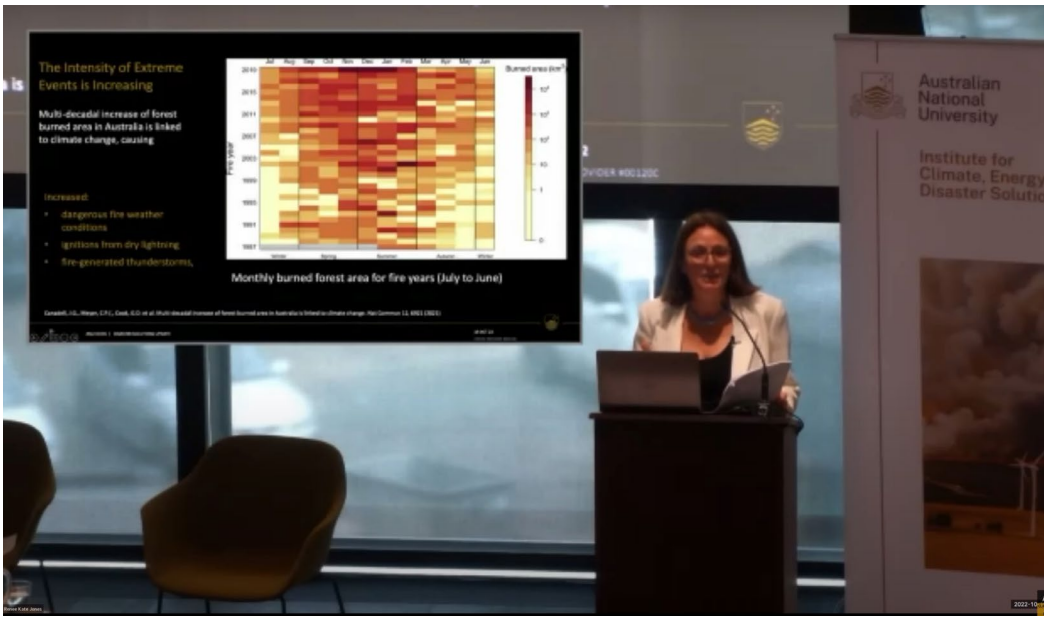
84%
of those surveyed will talk to others about the event

ICEDS ran an extensive events program in 2022, engaging audiences with a wide variety of topics across in-person, online and hybrid formats. Here are a few examples of these events.

ANU Disaster Solutions Update: From Fire to Floods

Held on 19 October, the inaugural ANU Disaster Solutions Update: From Fires to Floods considered how we can advance our approaches to preventing and responding to disasters, both in Australia and across the region. The event brought together experts, policymakers, disaster-risk reduction practitioners, NGOs and volunteers working in disaster-risk fields, as well as the wider community, to discuss innovative approaches. Sessions explored topics such as how our changing climate is increasing the occurrence and severity of natural disasters, how can we leverage nature-based solutions to mitigate disaster severity, what role research and technology can play in bringing about transformational change to disaster response, and how can we improve our recovery responses.

Watch the event video: bit.ly/3v81XiZ



ICEDS Head of Disaster Solutions, Dr Roslyn Prinsley, address attendees at the inaugural ANU Disaster Solutions Update. Photo: ICEDS

New IPCC Climate Change Mitigation Report: How can we limit global warming?

The United Nations Intergovernmental Panel on Climate Change (IPCC) report on mitigation provided the most definitive global assessment to date of the trajectories, options and implications of reducing greenhouse gas (GHG) emissions to limit global warming.

The report assessed global GHG emissions scenarios, opportunities to reduce emissions in all sectors and to remove carbon dioxide from the atmosphere, experiences with emissions reduction action to date, and what can be done to achieve strong climate action. It also highlighted the fundamental role mitigation plays in achieving global priorities like sustainable development and a range of other national objectives.

On 6 April, ICEDS and University of Melbourne Climate Futures hosted a panel event which featured several report authors presenting its key findings including how they relate to Australia.

Watch the event video: bit.ly/3hG36uY

IPCC report authors, Professors Frank Jotzo, Mark Howden and Xuemei Bai discuss the key findings of the IPCC report on mitigation. Photo: ICEDS

Industry and academic experts discuss opportunities emerging from decarbonisation. Photo: ICEDS

Industry Opportunities in a Decarbonising World

The global push to decarbonise is accelerating. What are the new industry opportunities available in Australia as a result of this shift, and what is required to support communities who are disproportionately impacted?

The world's pledge for dramatic decarbonisation towards a global goal of net-zero by 2050 creates an opportunity for policymakers and industry leaders to prepare for a post-carbon economy. In their report *Who's buying? The impact of global decarbonisation on Australia's regions*, the Centre for Policy Development (CPD) concluded that there are between 100,000 and 300,000 jobs exposed to changes in global demand for Australian fossil fuel exports, but that new opportunities over the coming decades will likely create more jobs than those that are lost.

Hosted by ICEDS, the CPD and CO_2 Value Australia, this panel event brought together industry and research experts to examine new job creating industries, strategies to speed-up the development of the circular economy and likely international opportunities. The panel considered communities disproportionately impacted by changes to global demand for Australian fossil fuel exports and explore transition options available to them in a decarbonised market.

Watch the event video: bit.ly/3HJBaPt

Public policy engagement and outreach

ANU contributions to national policy debate

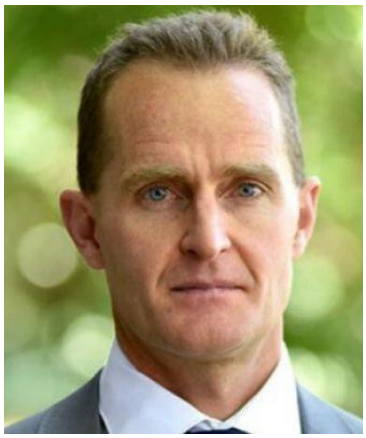
Throughout 2022, ICEDS staff and members have written and coordinated several submissions on key government inquiries. These include a submission to the *Independent Review on Australian Carbon Credit Units* (ACCUs) (the Chubb Review), incorporating nine authors across five areas of the University, which provided an outline of key deficiencies within the Australian carbon market.

A submission was also made to the Safeguard Mechanism reform consultation, which included key recommendations on ways this central policy piece can become the core of a cost-effective climate policy that covers multiple sectors.

Read more ICEDS policy submissions in 2022: bit.ly/3WizJy4

Australia's carbon market a 'fraud on the environment'

Australia's Emissions Reduction Fund (ERF) has serious governance flaws and is potentially wasting billions of dollars in taxpayers' money, a leading ANU expert warns.



ANU environmental law expert Professor Andrew Macintosh called for a full, independent inquiry into Australia's carbon market. Photo: Energy Transition Hub

Professor Andrew Macintosh from the ANU College of Law is an expert on environmental markets who has also sat on the Bushfire Royal Commission, chaired the Integrity Committee of the ERF for six-and-a-half years and was a member of the King Review of Low-cost Sources of Abatement.

He and his colleagues published a series of papers outlining systemic flaws in the ERF and the way it issues Australian carbon credits (ACCUs). They have labelled the ERF an "environmental and taxpayer fraud."

Professor Macintosh said the ERF is dominated by three types of projects: avoided deforestation in western NSW; human-induced regeneration of native forests in the dry rangelands of Queensland, NSW, Western Australia, South Australia and the Northern Territory; and the combustion of methane from landfills. These projects account for approximately 75 per cent of ACCUs issued.

"The available data suggests 70 to 80 per cent of the ACCUs issued to these projects are devoid of integrity – they do not represent real and additional abatement," Professor Macintosh said.

"Unfortunately, Australia's carbon market currently suffers from a distinct lack of environmental integrity.

"All of the major emission reduction methods have serious integrity issues, either in their design or the way they are being administered."

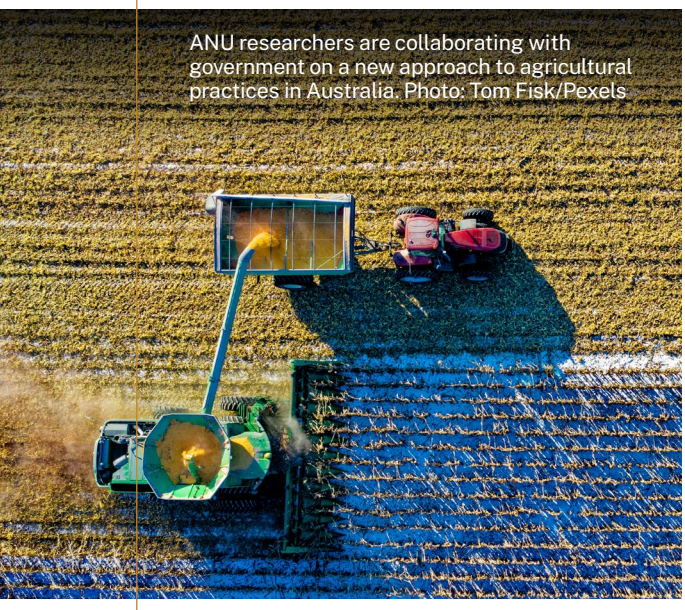
Read more > bit.ly/3WAxZzE

Shaping low emission agricultural practices in Australia

A team of researchers has completed a collaborative project exploring the barriers, enablers, and opportunities for the adoption of low emission agricultural practices in Australia. The findings will have direct impact on new agricultural climate policy within the newly formed Department of Climate Change, the Environment, Energy and Water (DCCEEW).

As a part of the project, a government secondee spent time at ICEDS working with the research team. A briefing was presented to key DCCEEW staff (Land and Climate Active Branch, Emissions Reduction Division) in November. Dr Rachel Rodney Harris from the National Centre of Epidemiology and Population Health at ANU, who is Chief Investigator on the project, was also invited to participate as a panellist at the Livestock Emissions Reduction Forum in December. The research team was Dr Rodney Harris, Bronwyn Wilkes (ANU College of Health and Medicine), Alex Brown (DISR/DCCEEW secondee) and Holly Jones (DISR).

This project supported the development of the ANU-Department of Industry, Science and Resources (DISR) partnership in 2022.



ANU researchers are collaborating with government on a new approach to agricultural practices in Australia. Photo: Tom Fisk/Pexels

Energy insecurity during temperature extremes in remote Australia

Remote communities experience some of the most extreme temperatures in Australia. In the Northern Territory, most remote living Indigenous households are provided with or elect to use prepayment electricity meters. This payment method is associated with high disconnection rates, as electricity used to sustain safe indoor temperatures can rapidly deplete available means, frequently resulting in disconnection with little warning. At these moments, households lose access to other essential services that uninterrupted access to electricity provides, such as food storage, washing, cooking and lighting.

Through this project, a team of ANU researchers and collaborators from the Northern Territory found that nearly all households (91%) experienced a disconnection from electricity. Almost three quarters of households (74%) were disconnected more than ten times. Households with high electricity use located in the central climate zones had a one in three chance of a same-day disconnection on very hot or very cold days.

Academic analysis is led by Dr Thomas Longden of ANU Crawford School of Economics, Dr Simon Quilty of ANU School of Population Health, Bradley Riley from ANU Centre for Aboriginal Economic Policy Research and Dr Lee White from ANU School of Regulation and Global Governance, together with partners in Australia's Northern Territory.

The project has produced several research papers, and research has been cited in the Utilities Commission of the Northern Territory's *Electricity Retail Supply Code Review Draft Decision Paper* (October 2022).

There is ongoing work associated with this project to map the disparities in regulatory protections across Australia, in the project *Bringing to light regulatory disparities for electricity access and services across Australia* (White et al 2022).

Read more > bit.ly/3U5tjAe

ICEDS Executive engagement

ICEDS Director and Head of Climate Change, Professor Mark Howden has given over 240 presentations to policy, industry, academic and general audiences throughout 2022, both as Director of ICEDS and in his capacity as a Vice-Chair of the IPCC Working Group II.

He has provided high-level input and briefings for politicians, political organisations and government departments, embassies, scientists, industry, and community groups. This includes various state and federal Ministers; the Department of Foreign Affairs and Trade; the Department of Climate Change, Energy, the Environment and Water; the Climate Change Authority; the Australian Academy of Science; and Australian Parents for Climate Action, to name a few.

Professor Mark Howden discusses Australia's climate bill with Joe O'Brien on ABC News.

Professor Howden has featured in over 1,700 media items, reaching an audience of up to 14 million people, globally. This included extensive coverage following the release of the IPCC reports in February and April, in relation to the May federal election, and during the United Nations COP27 climate summit in November.

Dr Roslyn with a prototype ANU water-glider, developed to extinguish lightning fires within five minutes. Photo: Elena McNee

Professor Frank Jotzo has written op-eds for several media outlets in 2022.

ICEDS Head of Energy, Professor Frank Jotzo, led and contributed to research including on net-zero emissions strategies and Australia's climate policy, prospects for Australia as a renewable energy 'superpower', China's decarbonisation plans and coal import demand. He continued his work for the IPCC, both as a lead author and on the core writing team of the Synthesis Report.

Professor Jotzo spoke at multiple significant public events and conferences, including as a plenary speaker at the Australian Financial Review's Energy and Climate Summit. He provided many briefing sessions to governments and organisations in Australia and internationally, including as a co-chair of the T20 energy and climate task force during the Indonesian G20 presidency.

Professor Jotzo engaged extensively in media outreach on topics such as emissions targets, domestic and international climate policy, hydrogen subsidies, the decline of coal and COP27. Professor Jotzo teaches on climate change policy and economics at ANU Crawford School and via ICEDS executive short courses.

ICEDS Head of Disaster Solutions, Dr Roslyn Prinsley, has focused on establishing robust research initiatives with a focus on transformative disaster solutions.

Dr Prinsley has delivered briefings to multiple government agencies and organisations, including the office of the Prime Minister and Cabinet, the National Emergency Management Agency, Natural Hazards Research Australia, Floodplain Management Australia and the United Nations Office for Disaster Risk Reduction. Dr Prinsley presented at the Asia-Pacific Ministerial Conference for Disaster Risk Reduction on transformative solutions to disasters.

Dr Prinsley is leading a national initiative - *Partnering with communities in regional Australia to increase resilience to floods*. The project was awarded funding by the National Emergency Management Agency. The multi-stakeholder and interdisciplinary project will include development of the first Australian Guidelines to Nature-based Solutions for flood mitigation. Dr Prinsley was featured in a range of media, including the New York Times, The Conversation, Prevention Web and RiotAct for her leadership of the ANU Bushfire Initiative.

In the Media

18.1k
mentions

221 million
audience reach

3,640
media outlets

Photo: Pexels/ Alex Arcuri

Has Vanuatu just made the most significant change to any country's climate change commitments?

15 August, World Economic Forum

Featuring Dr Siobhan McDonnell

Read more > bit.ly/3Vm3blg

Photo: Shutterstock

Hundreds rescued as Sydney suffers fourth flood in less than 18 months

5 July, The Washington Post

Featuring Professor Jamie Pittock

Read more > bit.ly/3jaDd6P

Photo: Pexels/Magic K

'Fair' development of renewables in regional Australia could eliminate future energy crises, report says

15 June, The Guardian

Featuring Dr Rebecca Pearce

Read more > bit.ly/3WmzoKz

Photo: Shutterstock

Floating wind farms next big push for grid

29 May, 7 News

Featuring Professor Llewelyn Hughes and Associate Professor Christian Downie

Read more > bit.ly/3Wx7k7z

Photo: Kamran Khan/Pixabay

COP27 achieved a win with a climate change compensation fund, but the hard work lies ahead

22 November, ABC News

Featuring Dr Melanie Pill and Professor Mark Howden

Read more > bit.ly/3HRHiY3

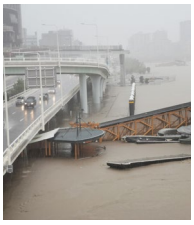


Photo: Shutterstock

Climate-fuelled disasters: warning people is good, but stopping the disaster is best. Here are 4 possible ways to do it

24 November, The Conversation

Authored by Dr Roslyn Prinsley

Read more > bit.ly/3YFzrTb

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