Australian National University

ANU CLIMATE HIGHLIGHTS 2020

Contributing to climate change solutions

Here in Canberra, 2020 started in a way that I and so many others will never forget – in a haze of thick, orange smoke caused by the fires burning across much of the country. Unfortunately, climate change has intensified three of the key factors that lead to extreme fire weather, namely dry fuel, high temperatures and dry air. We have good reason to be concerned about further climate changes.

In response, many Climate Change Institute (CCI) members have collaborated to directly address these threats, including via the award-winning Bushfire Impact Working Group and the ANU-Optus Bushfire Research Centre of Excellence, which is working on early detection and extinguishing of bushfires.

Whilst 2020 has been defined globally by the COVID-19 pandemic, it is now also tied with 2016 as the warmest year on record. This is in spite of onset of the La Niña climate pattern that tends to lower global temperatures. The La Niña event has also brought much needed rain to many areas of Australia, providing respite from drought conditions and boosting agricultural production.

Despite 2020 being the equal hottest year, I'm feeling more optimistic about our collective future.

This is largely due to recent announcements from four of our major trading partners (China, US, Japan and South Korea) that they are aiming for net zero emissions by 2050 (or in China's case 2060) joining existing key trading partners such as the EU and NZ.

All Australian states and territories also now have net zero emissions targets by 2050 (or 2045 for the ACT). In the lead up to the UN climate negotiations in November 2021, the Federal government will come under increasing international and domestic pressure to declare their own 2050 net zero target. It is anticipated that governments globally will ratchet up their emission-reduction commitments to make progress towards the Paris Agreement goals.

Crucially, 2021 will demonstrate whether we 'snap back' to the pre-COVID-19 emissions trajectory, or instead use the situation to move to a more sustainable development pathway that clearly and constructively addresses climate change.

I'd like to thank every one of you for your interest over the past year - please keep acting on, engaging with, and discussing climate change with others.

This is the last annual report for the CCI in its current form. As of 1 January 2021, the CCI was merged with the ANU Energy Change Institute, and the Disaster Risk Science Institute, to form a new combined entity – the ANU Institute for Climate, Energy & Disaster Solutions. This means that in addition to our previous work on climate change, we'll also be looking at energy change and disaster risk reduction. I look forward to engaging with you all across these topics in the coming year.

The following pages cover a fraction of what we've been working on – please visit climate.anu.edu.au/climate-highlights/2020 to find out more.

Prof Mark Howden, Director, ANU Climate Change Institute, December 2020

ANU Climate Change Institute

Image: Bushfire smoke shrouds Australia's Parliament House in Canberra during the 2019-20 bushfire season. Credit: Jamie Kidston/ANU

BUILDING A COMMUNITY OF CLIMATE RESEARCHERS & TEACHERS

324
Climate Change Institute members

7
out of 7 ANU Colleges

22
out of 27 ANU schools

273
academic staff members and 51 PhD student members

CCI Member Profile – Prof Sotiris Vardoulakis

Prof Sotiris Vardoulakis. Photographed by Lannon Harley.

Sotiris Vardoulakis is Professor of Global Environmental Health at the ANU National Centre for Epidemiology and Population Health.

"My research focusses broadly on interactions between the built and natural environment, climate change, and human health. This includes interactions between environmental stressors such as air pollution and people", Sotiris says.

"Over the years, my focus has shifted from identifying and quantifying the risks to health, to actually looking into policy and technological solutions to improve health and improve the environment."

Sotiris has found multiple benefits have stemmed from becoming a CCI member.

"CCI has helped me in many different ways, through connecting with other researchers across the university, connecting with other institutions and initiatives, and having a platform to disseminate my work."

Policy engagement workshop

On 28 February 2020, we held a Policy Engagement Workshop in collaboration with the Energy Change Institute (ECI), and the Public Policy and Societal Impact Hub. The workshop was a bespoke service offered to CCI and ECI members, to provide them with practical advice about how to engage with policymakers. It also provided an opportunity for the researchers to build connections with some key decision-makers in the climate and energy domains. Many thanks to our speakers: Russell Miles, Director of the Climate Resilience and Development Section, Australian Department of Foreign Affairs and Trade; Melissa Hogan, Assistant Manager in the International Energy Security Engagement section in the Department of Industry, Science, Energy & Resources; Peter Burnett, Honorary Associate Professor at the ANU College of Law; and Dr Subho Banerjee, a Special Adviser at the Public Policy and Societal Impact Hub.

The workshop provided researchers with an opportunity to build connections with key decision-makers in government.

RESEARCH HIGHLIGHTS

The CCI brings together cutting-edge climate research – from climate science and its effects on our environment to societal, economic, political, legal and technological impacts and responses.

A selection of the research themes that CCI members are working on.

Just Transition
Asia & the Pacific
Bushfires
Water
Carbon Dioxide Removal
Communications
Economics
Oceans
Climate change
Agriculture
Heatwaves
Security
Weather patterns
Mental health
Food security
Climate modelling
Policy
Health
Adaptation
Biodiversity
Sustainable cities
Emissions reduction

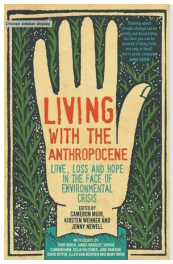
RESEARCH HIGHLIGHTS

Below is a small sample of projects which demonstrate the breadth of climate change research by CCI members in 2020, and you can read more at climate.anu.edu.au/research/highlights/2020

New books in 2020

The Psychology of Fake News – Accepting, Sharing, and Correcting Misinformation

Co-edited by Dr Eryn Newman, ANU College of Health and Medicine



Living with the Anthropocene: Love, Loss and Hope in the Face of Environmental Crisis

Featuring contributions by Prof Libby Robin, ANU Fenner School of Environment and Society

How magnesium could help cut carbon emissions from concrete

Dr Anna Herring (left) in the lab at ANU.

Concrete contributes about eight percent of the world's carbon footprint – around 3 billion tonnes of carbon dioxide – but research into a new type of concrete that actually traps carbon could cut its emissions drastically.

"My dream goal for the future would be to close the cycle so we have zero emission concrete," says Dr Anna Herring, a researcher at ANU Research School of Physics.

Dr Herring is studying concrete that's formed with magnesium, instead of calcium.

Conventional concrete is formed from the raw material limestone (calcium carbonate CaCO3). During the processing, limestone is converted to calcium oxide (CaO), releasing carbon dioxide.

Magnesium-based concrete undergoes a similar chemical process, but is able to re-trap the carbon dioxide within the crystalline structure of the magnesium-based minerals, by forming hydrated magnesium carbonates, which form the binding material that holds the concrete together. Trapping carbon dioxide in this way would cut as much as 70 percent of the emissions from concrete.

"I hope we can support the construction industry around the world to move towards zero emissions" says Dr Herring.

Authored by Dr Phil Dooley, ANU Research School of Physics.

We know that heat kills – accurately measuring these deaths will help us assess the impacts of climate change

Australia is well known for its temperature extremes, with scorching hot summers and, in some areas, icy winters. These temperatures can be so extreme that they can be fatal. Dr Thomas Longden's research examined heat-related deaths in Australia.

"This research found that in Australia, there were over 36,000 deaths associated with the heat between 2006 and 2017. This equates to about 2% of total deaths in Australia for this time period."

Dr Longden found that in the vast majority of cases, however, the death certificates did not record extreme heat.

"As temperature-related deaths are one of the main measures we use to assess the impacts of climate change, it's important we measure them accurately and consistently."

There are several factors influencing which demographics are most vulnerable to this increased heat.

"This vulnerability is not just a health issue, it's an energy-security issue, it's an equity issue, and typically it's impacting people who are already vulnerable to other issues."

"Some people can stay indoors in air-conditioned houses; and if their bills go up they can afford it, but there's a lot of people who can't."

"There's plenty of scope for having better energy efficiency, and better initiatives to make sure that access to heating and cooling in homes doesn't differ by suburb and socio-economics."

Temperate-related deaths are one of the primary measures used to assess the impacts of climate change.

Read more at iceds.anu.edu.au/research/highlights/2020-research-highlights

RESEARCH HIGHLIGHTS

Study finds carbon pricing works

Carbon pricing has a long, conflicted history in Australia.

Yet for Associate Professor Paul Burke, this does not detract from its credibility.

Economists see carbon pricing as a key tool in the emissions reduction toolkit.

“For economists, carbon pricing is seen as a key tool in the kit for reducing emissions.”

Paul, alongside colleagues Professor Frank Jotzo and Dr Rohan Best, recently published the largest study to date into the effect of carbon pricing on the growth rate of carbon dioxide emissions from the energy sector.

“In this paper, we wanted to look across the international experience to evaluate the effect of carbon pricing on emissions.

The results pointed to the efficacy of carbon pricing in reducing the growth rate of emissions.

“We found evidence that in otherwise similar countries, if one has a carbon price and one doesn’t, then the emissions growth rate tends to be lower in the one with the carbon price.”

As for the possibility of re-introducing a carbon price here in Australia, Paul thinks the option deserves serious consideration.

“A robust carbon pricing scheme is still a relevant idea for Australia. Most developed economies do have a carbon price of some type.”

Indian Ocean phenomenon spells climate trouble for Australia

New international research has found a worrying change in the Indian Ocean's surface temperatures that puts southeast Australia on course for increasingly hot and dry conditions.

The work led by The Australian National University (ANU) and the ARC Centre of Excellence for Climate Extremes has a silver lining, helping to improve our understanding of climate variations and the management of risk caused by Indian Ocean variability.

Lead researcher Professor Nerilie Abram said the phenomenon her team studied, known as the Indian Ocean Dipole (IOD), was a big player in the severe drought and record hot temperatures last year.

"The 2019 event, known as a positive Indian Ocean Dipole, was a big one. It cut off one of the major sources for southern Australia's winter and spring rainfall, and set up the extremely hot and dry conditions for the terrible fires that ravaged Australia this summer," said Professor Abram from the Research School of Earth Sciences and the Centre of Excellence for Climate Extremes at ANU.

The new research published in Nature reveals that these historically rare events have become much more frequent and intense during the 20th Century, and this situation is expected to worsen if greenhouse gas emissions continue to rise.

Co-researcher Professor Matthew England said the research also showed that a persistent, "tight coupling" has existed between the variability of the Indian Ocean Dipole and the El Niño-Southern Oscillation (ENSO) in the Pacific Ocean during the last millennium.

"Our research indicates that while Indian Ocean Dipole and El Niño events can occur independently, periods of large year-to-year swings in Indian Ocean variability also had heightened ENSO variability in the Pacific," said Professor England from the Climate Change Research Centre and the Centre of Excellence for Climate Extremes at the University of New South Wales.

"Looking at the tropical oceans in this interconnected way improves our understanding of seasonal to decadal climate variations in regions that profoundly impact Australia, helping us to be better prepared for future climate risks caused by the Indian Ocean Dipole."

Authored by William Wright, ANU Media

Changes In the surface temperatures of the Indian Ocean put southeast Australia at Increased risk of hot and dry conditions.

Read more at iceds.anu.edu.au/research/highlights/2020-research-highlights

EDUCATION HIGHLIGHTS

119 climate courses across ANU

62 undergraduate climate courses

82 postgraduate climate courses

3 professional short courses run by the CCI

Studying climate change at ANU

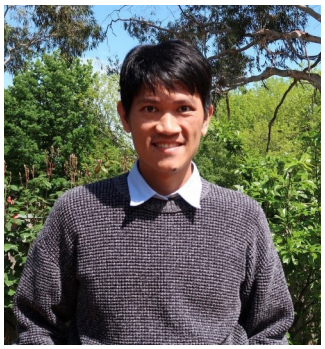
As the impacts of climate change become increasingly apparent, people who understand its multiple dimensions and can contribute to developing, communicating and implementing innovative solutions are in increasingly high demand.

Student profile - Master of Climate Change

“I chose the Master of Climate Change program because it was so broad, you can fit any of your research and passions into it, and mould the program around your goals and interests."

“I’ve been able to do two research-related courses – one through the Australian National Internships Program, and one through the ANU Climate Change Institute. I learnt a lot from these – they allowed me to write and research topics that I’d never really thought about before, and that I wouldn’t have looked into if I hadn’t been undertaking these projects.”

Master of Climate Change student Demi Tinning has found that the opportunity to undertake research projects in the program has opened up her eyes to a new potential career path.



PhD Profile – Living with flooding as our climate changes

Flooding in the Lower Northern Thailand floodplain has been having disastrous consequences for the locals for decades. Growing up in the region, Phaothai Sin-Ampol lived through many of these flooding events, but did not see any resolutions forthcoming.

“Climate change has been causing unprecedented levels of flooding which are impacting people’s lives, and people are beginning to realise this now.”

“Through my PhD research, I hope to contribute to making significant changes for people in my homeland to live with floods more peacefully.”

PhD Scholar Phaothai Sin-Ampol was awarded a CCI supplementary scholarship to help develop his research and expand his expertise to help local communities in the future.

New Graduate Certificate in Climate Change Policy

The new Graduate Certificate in Climate Policy was launched in 2020. This 24 unit program (equivalent to one semester of full-time study) may be completed in-person, online, or a combination of study modes. The Certificate provides the opportunity to develop a cutting-edge understanding of climate policy, informed by research-led teaching delivered by some of the world’s leading researchers in climate policy.

You can find out more about the Graduate Certificate on its Programs and Courses webpage.

Climate Essentials Professional Short Courses

In 2020, the Climate Change Institute ran two online Climate Essentials professional short courses on recent advances in climate science and the social, policy and economic aspects of climate change. The Institute also ran a short course titled Climate Essentials for Agriculture, which provided an overview of the latest developments around climate change for those working in agriculture and on food security.

What people said:

“This was quite possibly the best course I've attended. The content was fascinating and the presenters absolutely nailed the level of detail required for the level of knowledge that I have.”

“The course had a fantastic collection of sessions which complemented each other to create a really great foundation for work on climate science/ policy.”

“Current, relevant, important information, would recommend to everyone”

“I really appreciated being able to speak to the people leading the science in this space and I think it's invaluable to the industry and society that we are in close contact with our scientists.”

Read more at iceds.anu.edu.au/study/student-profiles

PUBLIC POLICY ENGAGEMENT & OUTREACH

Climate Change Institute members are engaged with policymakers at international, national and state / territory levels on an ongoing basis. We regularly conduct private briefings for parliamentarians and government departments on a wide range of climate-related topics. Our members also have numerous state, national and international advisory roles.

Below are some examples of policy engagement and outreach:

Royal Commission into National Natural Disaster Arrangements

The Royal Commission into National Natural Disaster Arrangements was established following the devastating 2019-20 bushfire season in Australia, to examine the national disaster management preparedness, coordination, and response.

ANU made a submission to the Commission addressing three of the twelve terms of reference. The submission was coordinated by the ANU Climate Change Institute and includes authored contributions from ANU scholars across disciplines and Colleges, including from the Fenner School of Environment and Society, the College of Law and the College of Health and Medicine.

COVID-19 and Climate webinar series

2020 saw the COVID-19 pandemic emerge as a global crisis requiring immediate, wide-spread and evidence-based action. As countries took drastic measures to curb the spread of the virus, comparisons arose between the global response to COVID-19 and climate change.

From June to August, we ran a series of five online events focussing on five different topics where comparisons can be drawn between the COVID-19 pandemic's impacts and climate change.

- Parallels and disconnects,
- Policy responses,
- Communications,
- Health implications, and
- Pacific impacts and climate negotiations.

The event series highlighted several areas where we can draw lessons from the global response to the COVID-19 pandemic to improve action on climate change, through acting promptly and collaboratively in accordance with scientific and expert advice.

You can watch the recordings of these events on the ANU Climate Change Institute YouTube channel.

A screenshot of the event 'COVID-19 and climate change: Pacific impacts and climate negotiations'. From left: Prof Howard Bamsey, Prof Mark Howden and Prof Meg Keen.

COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts and opportunities for action

On 10 November, the Australian Centre for International Agricultural Research (ACIAR) released a report titled *COVID-19 and food systems in the Indo-Pacific: An assessment of vulnerabilities, impacts, and opportunities for action.*

The report co-leaders included CCI members Dr Lisa Robins and Dr Steven Crimp. Several other CCI members also contributed to the authorship, including Dr Robyn Alders, Dr R. Michael Bourke, Dr Aparna Lal, and Dr John McCarthy.

The report found that in the Indo-Pacific, COVID-19 has intersected a number of underlying hazards already threatening food security. Most significant of these is climate change and associated increases in extreme events. These increases in extremes have challenged agricultural productivity and increased food disruptions and exposure to extended periods of food insecurity.

Read more at bit.ly/Climate-Policy-highlights

INTRODUCING ANU BELOW ZERO

91%

Over 91% of the ANU community are alarmed or concerned about climate change

7

Online workshops run, featuring presentations and discussions on each theme

226

Attendees from ANU and the broader community to the online workshops

292

Ideas for reducing ANU carbon emissions submitted to the online ideas-generation platform

Transformational change is required to limit global temperature increases to 1.5°C above pre-industrial levels, including rapid reductions in greenhouse gas (GHG) emissions and the implementation of technologies that remove and sequester GHGs from the atmosphere.

In February 2020, the ANU Council passed a resolution recognizing the need for urgency and resolving to "minimise the University's GHG emissions footprint through its own operations in line with commitments to be GHG negative as soon as possible".

The ANU Below Zero Initiative aims to transition ANU from being part of the problem to becoming part of the solution – from a source of GHGs to a net absorber of GHGs.

At the same time, through integrating real-life emission-reductions and carbon-dioxide drawdown with our world-leading research and teaching on climate change and energy, we can fast-track new and innovative approaches. ANU will announce GHG emissions targets and an overall Below Zero strategy in 2021.

Integrating Below Zero with research and teaching

Kate Donnelly is a Master of Climate Change student who presented her recommendations on ANU GHG targets at the Leadership & Targets workshop.

"What I really enjoyed about the workshop was seeing ANU leadership saying 'We know this is a problem - there's no need for discussion about that. Now what can we do to resolve this faster?' It's a galvanising moment when institutions step up like this. "

She sees great potential for students to become involved in Below Zero internships and research projects, using the campus as a classroom. There are also multiple opportunities for student groups to develop their own initiatives around practical emissions reductions.

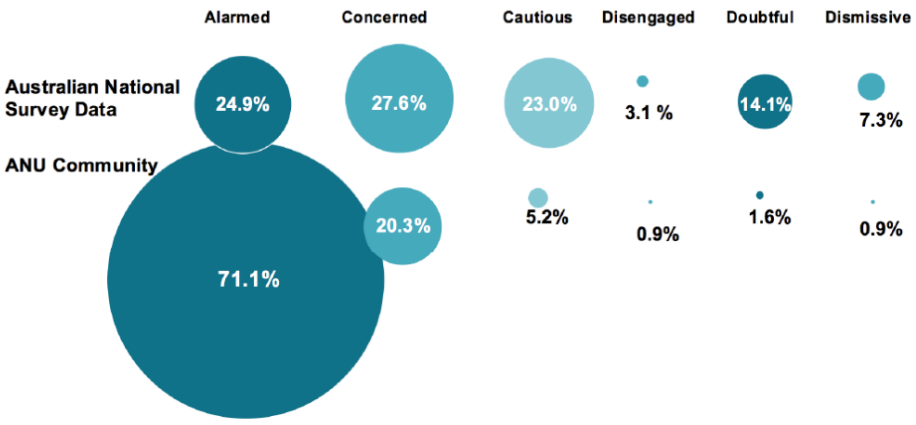
"There are so many students who bring so much expertise on this from their home countries. I'd love to be able to collaborate with others at ANU as Below Zero progresses: it will be exciting to see what new approaches emerge with the support of the Initiative."

Kate Donnelly is a Master of Climate Change student who presented her recommendations on ANU GHG targets at the Leadership & Targets workshop.

How do ANU students and staff view climate change?

In late August, over 500 members of the ANU community shared their attitudes to climate change and emissions reduction via a brief online survey conducted by Dr Samantha Stanley and Dr Zoe Leviston of the Research School of Psychology.

Over 91% of the ANU community are either alarmed or concerned about climate change.



Read more at anu.edu.au/research/research-initiatives/anu-below-zero-initiative

EVENTS

28
CCI public lectures, seminars, roundtable discussions & Climate Cafés

3,200
Over 3,200 audience members at CCI events

4.3
Overall rating of 4.3 out of 5 stars

81%
of those surveyed will talk to others about the event

In 2020, we ran the majority of our events online due to the COVID-19 lockdown and social distancing restrictions. As restrictions begin to ease however, we are looking to continue online streaming of our events as well as allowing in-person attendance. We began livestreaming in-person events online prior to the COVID-19 lockdown, which allowed audience members to join us from across Australia and the world, and this broader reach is something we hope to continue.

Climate Updates in Canberra and Melbourne

An overview of how our climate is changing and how we're responding to these changes.

Delivering on the Paris Climate Agreement

Almost five years after the Paris Agreement, how is the world tracking to meet the targets set out in the agreement?

Preparing for flooding and cyclones in a COVID-19 world

Preparing for increased flood risk in this La Niña season, along with the practical difficulties COVID-19 is imposing on emergency service, other agencies, and communities

What people said:

"Excellent event where I felt empowered and supported to take action against climate change."

"The forum is a useful source of information tracking the state of/ and responses to climate change. The passion and focus that each speaker brings to their topic gives the forum a strong sense of identity (as an academically informed and accessible interrogation of responses to climate change)."

"A seamless and acutely informative presentation."

Read more at climate.anu.edu.au/news-events/events – See Past events 2020

IN THE MEDIA

The media is a vital channel for communicating ANU climate research to the Australian and international community. Climate researchers engage with media on a daily basis. In 2020:

10,600
media articles / programs featuring just a few of CCI's key contributors

84m
We reached an audience of more than 84 million people

3,300
CCI's key contributors were mentioned across over 3,300 media outlets

Here are some examples of 2020 media coverage:

New polling shows 79% of Aussies care about climate change. So why doesn't the government listen?

Dr Bec Colvin, The Conversation, October 2020

Australia, it's time to talk about our water emergency

Prof Quentin Grafton *et al,* The Conversation, May 2020

The bushfire crisis has given the Government a political 'out' to its climate change problem

Prof Frank Jotzo, ABC News, January 2020

Australia should create 'Pacific visa' to reduce impact of climate change and disaster on islanders

Feat. Prof John Blaxland, The Guardian, November 2020

CONNECT WITH THE ANU CLIMATE CHANGE INSTITUTE

Visit our website at:
climate.anu.edu.au

Subscribe:
Scroll to the bottom of climate.anu.edu.au

Email us at:
climate@anu.edu.au

Call us at:
+61 2 6125 6611

Like us on Facebook:
@ANUClimate

Follow us on Twitter:
@ANU_Climate

MO_CCI1210030