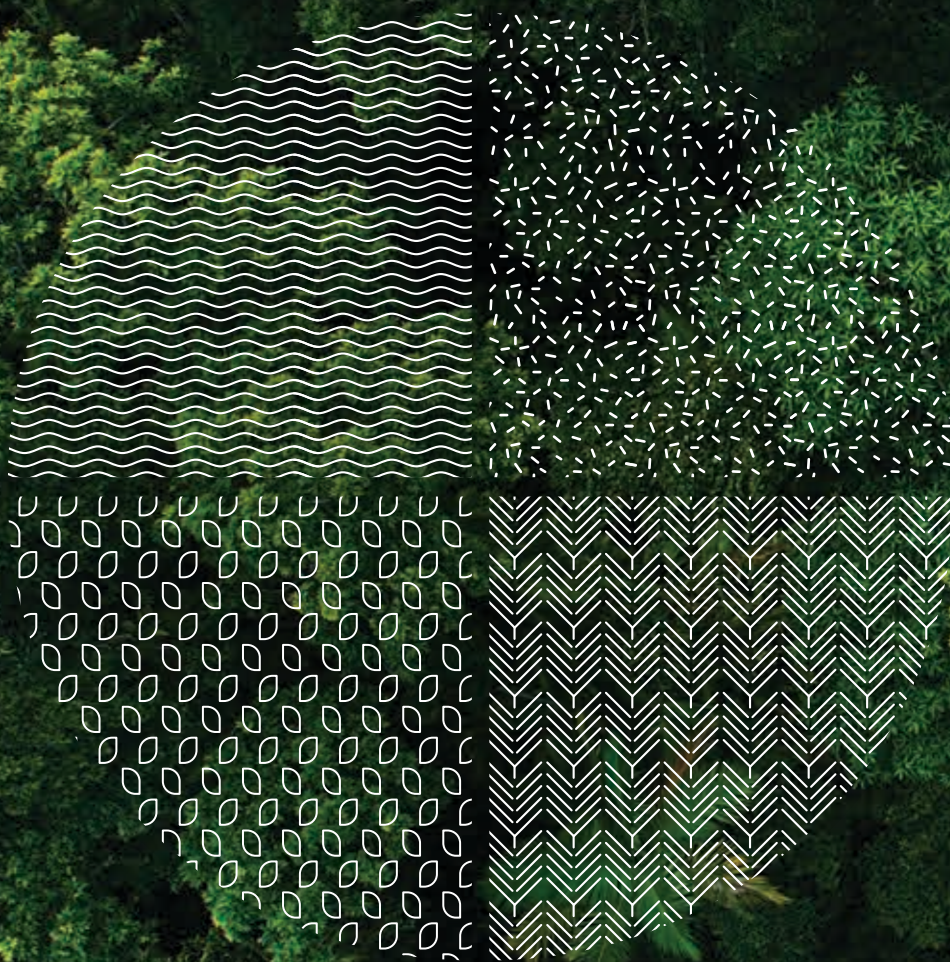


# SUSTAINABILITY AT MELBOURNE

15

STORIES ON ENVIRONMENTAL  
RESEARCHERS WHO WANT  
TO CHANGE THE WORLD



THE UNIVERSITY OF  
MELBOURNE





# Welcome

## Sustainability is a daunting topic.

Yet the people profiled in this short survey of sustainability work at Melbourne believe in the power of ideas and the possibility of action. Each combines a commitment to critical inquiry with a practical program to make a difference.

So colleagues are charting temperatures and mapping past climates, drawing on Indigenous history to illuminate land management, saving wildlife, building green roofs and solar panels, promoting geothermal power. There is a determination to work with environmental realities from fire to urban settlements. Scholars work on supply chains for food, clean water for thirsty cities, and better health amid a very different climate.

Research provides a common theme – understand what is happening to our climate so we can respond in thoughtful ways. This means discussion of evidence

and careful prediction about future stresses. We may no longer be able to prevent a warmer world, but good research can encourage resilience and anticipate challenges.

Though just a small sample of work on a vital subject, *Sustainability at Melbourne* is informed by a quiet optimism: we can make a difference. Research provides a basis for action to address the scientific and political challenge of creating a sustainable future.

Regards,

**Glyn Davis**  
Vice-Chancellor  
University of Melbourne, 2015

Publication produced by



MELBOURNE SUSTAINABLE  
SOCIETY INSTITUTE



Picture shows the Melbourne School of Design building, which opened in 2014 and has been awarded a 6 star Greenstar Education Design Rating. It's home to the Melbourne Sustainable Society Institute



From water, food and climate change to protecting wildlife and improving the way our cities work, the University of Melbourne is committed to excellent research on sustainability.

We have an estimated 1300 researchers working in fields relevant to sustainability and resilience, with annual research expenditure of about \$218 million. Read some of our researchers' stories here – and who knows, you might uncover something that will become part of your daily life in the future.

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# Listening to Indigenous knowledge



Kerry Arabena

“We know we have  
had custodial responsibilities  
to care for country, in doing  
that then it cares for us”



**It's a deeply traditional idea that has somehow become revolutionary: humans should live within the bounds of their ecosystems. Kerry Arabena is working to revitalise the concept, which has a 60,000-year history in Australia. And she has one particular reason for optimism.**

Arabena is Chair for Indigenous Health at the University of Melbourne. She's started a research program around Ecohealth – elevating Indigenous knowledge on the environment and on country, for the good of people and of the land.

“We've had 60,000 years or so of being able to live within the confines of an ecosystem, and people's entire lives were framed by that ... now it's a deeply challenging mind-shift,” says Arabena, a descendant of the Meriam people of the Torres Strait.

Far from exploiting country, water and the atmosphere for profit in a market economy, Arabena would like to see Indigenous ideas of stewardship revived. “We know we have had custodial responsibilities to care for country, in doing that then it cares for us,” says Arabena.

Moving away from the unsustainable exploitation of natural resources and away from technological “progress” is incredibly difficult, she says. But it's needed.

“It's like a jarring of people to call them back to their real authentic self. I don't know if our real authentic self means sitting in front of a computer for 16 hours a day, walking across roads looking at our mobile phones.”

Arabena displays a qualified optimism about changing Australians' relationship with country. Based in the University's Melbourne School of Population and Global Health, she's quick to point out

that there is now the largest number of adolescents alive on the planet than ever before.


“Young people who are highly globalised, they know that they want to take care of and manage land. They're doing incredible things,” she says. “I think with that kind of population we can really change the world.”

Arabena's research work includes investigating the health and wellbeing impacts of Indigenous people getting out onto country.

“The vision is to take [Indigenous] people back out to country and improve their health and wellbeing by engaging in custodial responsibilities and cultural custom,” says Arabena, a former social worker who did a PhD in human ecology.

She cites research that found taking Aboriginal people with chronic illnesses out to traditional lands had profound health benefits. She'd like to research





this – the cultural determinants of health – further. Tied to that is the environmental impact of integrating Indigenous knowledge, for example on burning-off, diversification of grasslands, and soil regeneration.

Arabena is also working on climate change, writing a book chapter for 2015 on how to manage the impacts of climate change on Aboriginal people. “People who live in rural and remote-area communities are going to feel the full impacts of climate change before we get to feel them in the cities,” she says.

Then there’s the 2016 Onehealth Ecohealth conference, which will look at what it means to live within an ecosystem. The Melbourne conference will host about 2000 people. Arabena is on the board and chairs the program committee.

Arabena’s research agenda is ambitious and her record shows she’s prepared

to challenge established norms and institutions, on issues including Indigenous reconciliation and constitutional recognition (she was founding co-chair of the National Congress of Australia’s First Peoples). She has described herself as a provocateur.

“I would hope that what I do is give people a different perspective,” Arabena says. “I want to stretch the limits of people’s thinking.” ■





# Clean drinking water for the world



Peter Scales



Seven billion people, not enough clean water, groundwater running out, rivers contaminated by chemicals.

This is what keeps water engineer Peter Scales awake at night.

Scales says the world is heading for a water crisis. Some rivers are so polluted they can't even be used for irrigation. Cities are pumping dry their underground water reserves. Climate change is altering rainfall. There are more and more chemicals in water supplies – and the effects on human health are sometimes unclear.

The solution, he says, is cheap, safe technology which can recycle dirty water – including sewage – into drinking water.

"The fact that people haven't got the ability to take dirty water and turn it into clean water is a real problem in the world," says Scales, who leads

the water theme at the University of Melbourne's Carlton Connect sustainability and innovation precinct. "Recycling gives you a lot more resilience in your water supply."

Scales has been working on a new, optimal system to recycle wastewater. He hopes it can be used in Asia, particularly China, India and South-East Asia, where some aquifers are dangerously low.

The technology is also suited to Australia's inland cities and towns. Major coastal cities have been drought-proofed by desalination plants but that's not an option for towns like Orange, Bathurst and Bendigo. "How would they go in the next big drought? The answer is they're not as resilient," Scales says.


Drinking recycled sewage has been controversial in Australia. "I'm not saying that's an easy social thing to manage," Scales says, but notes the next drought will come eventually.

Nationally, Scales has mapped out how Australia can better manage its notoriously variable water resources in a blueprint for Carlton Connect. The blueprint calls for smarter use of technology and markets, and more focus on sustainability.

It's a natural fit for this self-described "farm boy" from country Victoria. "I grew up on a farm near Bendigo, I'm interested in water, I'm interested in country."

Scales' new water recycling system is being tested in a pilot plant. The plant takes existing technology and rearranges it into a sequence of seven stages, including ozonation, microfiltration, UV and chlorination. While other plants strip out pathogens (bugs) first, then chemicals, this plant removes the chemicals early. "We're doing it the other way round," Scales says. He's also prioritised keeping costs down.





## Scales' new water recycling system is being tested in a pilot plant.



Scales, an academic in chemical and biomolecular engineering, says while wastewater systems are good at removing pathogens, chemicals should be a priority. Water can contain pharmaceuticals, antibiotics, hormones, industrial chemicals, chemicals like Bisphenol A from plastics – and some pass straight through treatment plants.

The plant, in Hobart, will be tested throughout 2015 then installed in a town of 150 people. Scales runs the plant via

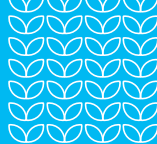
his laptop in Beijing. He says cities and towns will start needing this technology in 10 to 20 years, as climate change affects water supply. “We’ll be ready.”

“I get a real buzz out of doing practical problems and getting into them, and finding out there’s some really fundamental research in them that people haven’t done,” Scales says. Would he drink water from the plant? “Yeah, no problems.”

So why is Scales in Beijing? Melbourne University has a joint research centre with China on river basins, and joint classes and e-subjects are run with students at Beijing’s Tsinghua University. Scales has partnerships with 10 groups in China, including the Chinese Academy of Science. About 50 people are involved. He travels to China regularly.

Next is India; Scales plans to get involved in the high-profile project to clean-up the Ganges River. ■





# Making green roofs work in Australia



Claire Farrell

**When Claire Farrell couldn't find quite the right plants to grow on rooftop gardens in Australia's hot, dry climate, she went bush.**

Farrell, a modern-day plant-hunter, set off for a remote Victorian National Park to investigate which plants were thriving on rocky outcrops with shallow soils (conditions similar to green roofs). She identified a range of species then ran an experiment at the University of Melbourne's Burnley campus.

The results showed four plants were well-suited. These species have now been planted across roofs in Melbourne. Farrell thinks they could be part of solving the puzzle of growing green roofs in Australia.

'Green roofs' are gardens planted out on rooftops. They're popular in Europe, particularly Germany, and in US cities like Portland and Chicago. Popular inhabitants are succulents, flowers, vegetables and native species.

Green roofs haven't taken off in Australia, says Farrell, a Lecturer in Green Infrastructure in the University of Melbourne's Science faculty. "They're not as widespread as overseas," she says.

"It's hotter and drier here ... you can't just translate what's been done in temperate parts of the US and Europe to Australian conditions and expect it to work. You'd have a lot of dead plants."

So researchers at the University's Burnley campus, located on a bend of the Yarra River in suburban Melbourne, built Australia's first research green roof. It opened in 2012. People can walk from the staff room out onto the second-floor roof, which contains more than 200 species, paths, seats and an umbrella.

"We get a lot of butterflies and bees and birds, just because there's so many different plants out here," says Farrell. "The general public love it. People will say 'can't we just put that everywhere?'"

The research green roof inspired Farrell's plant-hunting expedition, which was to the Terrick Terrick National Park near the Murray River. A key reason to plant a green roof is to reduce stormwater runoff. Heavy rain rushes straight off hard surfaces into waterways, causing erosion and spreading pollution. Gardens soak up some of the rain, reducing runoff.

The catch is that the best survivors on green roofs are succulents (which store water in thick, fleshy leaves or stems) – but they absorb little water when it rains. Farrell wanted to find native plants which can survive drought but soak up plenty of water when it's wet. Her four best species – three monocots (grasslike plants) and a herb – do just that.

"That work is pretty groundbreaking, prior to that it was all about survival," she says. "No one really thought about balancing water use and survival."





There's plenty of other research happening on Burnley's demonstration roof. It includes sections with shallow soil and deeper soil, irrigated and non-irrigated sections, native and exotic species. There's even tomatoes and thyme, along with Farrell's thriving monocots. Students taking the Specialist Certificate in Green Roofs and Walls study there.

Burnley researchers found the cooling effect of a rooftop garden (soil and plants reflect heat, and provide shade and insulation) can cut air-conditioning use by 38 per cent. A PhD student found people preferred green grassy vegetation on a green roof, and that working near one improved concentration.

Farrell says green roofs also reduce the "urban heat island effect," where the hard surfaces of cities store and release more heat compared with cooler, leafy suburbs.

The Burnley team has gone on to design green roofs for five commercial and University buildings, including the first native grassland roof in the southern hemisphere.

But before householders race out to plant a rooftop garden, beware. Farrell points out most existing houses aren't strong enough to carry the weight; new houses work better. With summer temperatures regularly in the 40s, the plants have to be right, as does the soil (Farrell has been experimenting with different soil additives; a form of charcoal stores water well and helps plants survive).

But if a green roof seems too hard, the Burnley team also does green walls and facades. ■



The Burnley team has co-authored a free Growing Green Guide, available at



[www.growinggreenguide.org](http://www.growinggreenguide.org)

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38%



# Tracking climate change – in real time



David Karoly

**The thermometer pushed 50 degrees C at times as Australia sweltered thought its hottest year on record in 2013. So was this the effect of human-induced climate change – or just a very hot year?**

While politicians confidently gave their opinions, climate scientist David Karoly decided to dig deeper. He ran a study which concluded it was “virtually impossible” to have reached those temperatures without humanity’s greenhouse gas emissions.

“This couldn’t happen without climate change ... it’s the first time that any study has been able to make such strong conclusions,” he says.

That study landed on the front page of the *New York Times*, which described it as “perhaps the most definitive

statement climate scientists have made tying a specific weather event to global warming”.

But Karoly, who has been researching climate change since 1987 and is a Professor of Atmospheric Science at the University of Melbourne’s School of Earth Sciences, is still not satisfied. He’s working on ways to inform the public about whether extreme weather events like heatwaves, floods and bushfires are linked to climate change – within days.

The process is rigorous; climate scientists do conclude that some events are not linked to climate change. Karoly cautions against “overhyping” the link.

His study on 2013 involved analysing climate model simulations and observational data. Some models show what happens in a world without human-caused climate change.

Others show a world affected by climate change. The simulations were run on many models by different research groups around the world. The scientists found that without climate change, Australia’s 2013 heatwave would happen about once every 12,000 years. It would happen once every six years with climate change. The risk of a hot year like 2013 was increased at least 2000 times by climate change.

So how to do a study like that in “near-real time,” as Karoly wants? It used to take six to 12 months. “That’s not quick enough, the public’s lost interest,” he says.

His team has started working on calculations in advance, preparing data tables so analysis can happen quickly. And Karoly is working with US and UK scientists on identifying the causes of weather events within a week.





▼  
Karoly's team won a Eureka prize in 2014 for mapping the last 1000 years of Australia's climate history.

◀ David Karoly (right) talking to Peter Doherty (left)

That program – World Weather Attribution – starts in 2015. “What we’re trying to do is to communicate as quickly as possible in a way that is scientifically robust,” he says.

It’s a big change for Karoly, who as a young man studied theoretical physics and applied maths and hated public speaking. He switched to weather and climate and his first research on climate change was in 1987; “I did it because I thought I was clever and young and was going to disprove that human-caused climate change was having any influence on temperatures ... all scientists are sceptical.”

But he found emissions were affecting temperatures. Karoly went on to work with the UN’s climate science body, the Intergovernmental Panel on Climate Change (IPCC). He was an author of the IPCC’s 1990 and 1995 reports, a lead

author in 2001 and 2007 (when the IPCC won the Nobel Peace Prize), and an editor in 2014.

He’s also engaged with climate policy, motivated by what he describes as the “apparent disconnect between policymakers and scientific evidence”. He sits on the board of the government’s Climate Change Authority and is involved in the Wentworth Group of Concerned Scientists.

He does 200 media interviews a year and was part of a University team which won a Eureka prize in 2014 for mapping 1000 years of Australia’s climate history.

Climate change is politicised and controversial in Australia. Climate sceptics have been influential and policymakers have not always acted on scientists’ advice. Karoly has been regularly criticised.

That hasn’t put him off. “I respond by trying to remain engaged, it provides me with a stimulus to say I need to do more,” he says. “I find it means that my research and my communication is even more important, because if the science was accepted, the policies were in place, I could retire.”

He’s not retiring yet. He wants to research whether forests and soils will store less carbon dioxide as the planet warms. And there’s work to do on methane clathrates, frozen methane (a potent greenhouse gas) deep in the ocean. As the oceans warm, will the ice melt and the methane enter the atmosphere? ■



# Speaking up



Peter Doherty

**As Peter Doherty sees it, science is under siege. The rich and powerful are not listening to what scientists are saying – and the ramifications are serious.**

Doherty, a biomedical scientist who won the Nobel Prize for his work on immunity to viruses, thinks scientists have an obligation to speak out publicly. Sustainability and climate change are big issues for him.

“What science is telling us about what we’ve been doing to the natural world is suddenly a big problem,” he says from his office at the University of Melbourne. “Unless we change the way we do things, we’re in real trouble.”

Doherty has written books and articles on sustainability, and spoken in the media. He’s appeared in *The Monthly*, on *Lateline*, and spoken at the Festival of Ideas. He chairs the board of the ARC Centre of Excellence for Climate Systems Science and advises the Melbourne Sustainable Society Institute.

In 2014 he signed an open letter to Prime Minister Tony Abbott calling for climate change to be put on the G20 agenda (it was). He’s fearless on Twitter, where @ProfPCDoherty has 5000 followers.

“The people in science need to speak out,” says Doherty, who was Australian of the Year in 1997. “We all need to be communicating.”

Doherty’s next book, due in 2015, looks at knowledge and power. He thinks the two have come into conflict, and looks at why those with knowledge have been sidelined. He also raises doubts about capitalism.

“To some extent, the nature of our contemporary capitalist culture, with the focus only on growth, not on sustainability, is analogous to cancer ... If all we value is consumption, I think we’re lost.”

If this seems a long way from his publications on microbiology and immunology, Doherty, who works at the University’s new Peter Doherty

Institute for Infection and Immunity, says there’s a tradition of biomedical scientists like Sir Macfarlane Burnet and Frank Fenner taking a broader view. They’re trained to see humans as balanced ecosystems, which resonates with the idea of a sustainable society and planet. And Doherty says the practice of medicine is based on “duty of care”, a principle he thinks should be extended to the health and wellbeing of the atmosphere, oceans, rivers and soils that sustain all life.

He’s also across more recent trends. Doherty would like to run a production studio to make videos about scientific research, and tells his students to post their own versions to YouTube. “I’ve suggested they could become the Kim Kardashians of science.”

Doherty’s calls for politicians to listen to scientists may not always succeed, but he’s not stopping. “You have to try. What can you do but try?” he says. ■



# Rethinking climate politics



Robyn Eckersley



## Robyn Eckersley is not satisfied with the status quo.

She doesn't just explain why things are the way they are. She also imagines alternatives, suggests long-term solutions and raises dangerous, "unthinkable" ideas.

Eckersley, a political scientist, works on the international politics, governance and ethics of climate change (among other things). She asks difficult questions about whether current efforts to tackle climate change are enough – the answer is no. She then asks why, and what could solve the problem.

This topic takes Eckersley from her office at the University of Melbourne to UN climate summits – Copenhagen in 2009, Durban in 2011, Doha in 2012, Lima in 2014 (shown in the photograph).

She plans to attend the 2015 summit in Paris where a treaty on climate change is due to be signed.

Intellectually, the boundaries are wide also. Eckersley has written a paper proposing a new UN Climate Council, where a small group of key countries (the most capable, the biggest emitters, the most vulnerable) works on the core of a climate treaty, to be put to a broader UN audience. Called "inclusive minilateralism," this might circumvent the slow pace of the United Nations Framework Convention on Climate Change (UNFCCC).

The proposal was discussed widely. "It's got people talking, and for an academic that's probably as good as it gets," Eckersley says.

She's also written on the looming problem of climate refugees, researching what rights they should have and proposing an international fund for them. "You're building momentum to think big, rather than small, on behalf of those who are least responsible and most vulnerable."

And she's not shy to discuss a "coal non-proliferation treaty". This would be similar to the nuclear non-proliferation treaty. Eckersley says countries wouldn't touch the coal proposal – "it's just unthinkable ... too dangerous an idea" – but it would be a fast, direct means of slowing climate change, and should be debated. She cites the recent success of the global fossil fuel divestment movement, which encourages divestment of assets in high-emitting companies, as an example of the unthinkable becoming the do-able.

"It's about finding a window of opportunity and then stretching people's thinking about what can be achieved," Eckersley says of normative political theory (ie what ought to be). "It's a great feeling to open out the debate because people tend to succumb with resignation to the status quo."

Eckersley, Chair of Political Science in the University's School of Social and Political Sciences, says there's a long history of humanities and social science academics asking ethical questions and exploring solutions. Policymakers working in the field might be so pressured by short-term issues they struggle to find the perspective to ask the big questions, she says.

"I like to step back a bit and look more critically," Eckersley says. "I've always been a big-picture person."

Eckersley publishes widely, co-authoring a book, journal articles and three book chapters – and that's just in the past two years. She's on the editorial advisory board for publications including *Environmental Politics* and *New Political Economy*.

She's also working on an Australian Research Council project on what makes some countries leaders on climate change, while others are laggards. Eckersley is comparing five countries – Germany, the UK, Norway, the US and Australia. Her research has found it's not just about dependence on fossil fuels; political culture and foreign policy traditions are better predictors of leadership on climate change. ■



# Cheaper solar panels



David Jones

**It's one thing to install glass solar panels on a patch of your roof. How about a roof made entirely of cheap solar tiles?**

David Jones is working on it. He's developing plastic-based solar cells (he's holding one in this picture) which can be printed directly onto roofing tiles. The idea is that large commercial printers will churn out the panels, much like newsprint.

"It means your whole roof can be a solar array," says Jones, a chemist at the University of Melbourne.

He estimates the cost could be one-tenth that of current glass solar panels, because there's no glass or silicon, and no vacuum processing. "A few cents per kilowatt hour," Jones estimates – if all goes to plan. "This is potentially a very, very low-cost way of getting a high coverage of renewable energy."

That might make it easier for householders to make money from generating electricity or go off-grid, depending on government policy.

And if you'd like solar coating on your backpack to charge your mobile phone or lap top on the go, watch this space. Jones thinks his portable solar cells could double or quadruple battery life.

The technology uses "high-tech plastic ink", Jones explains. That ink, which the team makes in the lab, converts solar power to electricity. It's directly printed in many layers onto another surface like plastic, fabric, windows or tiles, and comes in different colours (it can even be made to look like slate). The result – called "organic solar cells" – functions like conventional solar panels.

"The reason we're doing this is that we really want to change the cost structure of solar energy generation, and we want to make it so cheap that ... the decision is made for you," Jones says from the lab. He's surrounded by whirring machines, rows of chemicals in small bottles and formulae scribbled on windows.

"The Australian public engage, they want to install solar panels. We want to make it even more available."

Melbourne University is the lead organisation in the Victorian Organic Solar Cell Consortium (VICOSC), with the CSIRO and Monash University involved. Jones is the co-ordinator. The state government has part-funded the project. VICOSC, running since 2007, is developing cutting-edge solar materials in the lab, then converting them to industrial scale using commercial printers. VICOSC is also researching the barriers to commercialisation.

And there are barriers. Organic solar cells have two problems. First, they are less efficient at converting sunlight to electricity. VICOSC's conversion rate is currently up to 11 per cent in the lab (silicon cells are around 25 per cent), but significantly less in outdoor conditions. Secondly, the cells are not as durable as glass – and they have to be tough to be put on rooftops.

"We're getting better," Jones says of these problems. For example, his team recently published a paper which showed efficiency was better with a very thin





active layer of ink, but printing worked better when the active layer was thick. They're working on it.

Jones says the technology is ready to be rolled out in small-scale applications like backpacks and shade awnings. They need a manufacturer, which is difficult – the technology is new so risks are higher. Bridging finance is being sought. “We see it certainly being rolled out in the next five years,” Jones says.

And once the cells are rolling off the printing presses, Jones – who chose chemistry for his undergrad and has never looked back, including a stint with BP – has already thought through the next steps. “What excites me is the fact that we potentially have a really low-cost renewable energy source, then you can start doing things you can only dream about now.”

Things like making liquid fuels (alternatives to petrol and diesel) from air. Powering the advertising displays in shopping centres from overhead lights. Coating tents and caravans with solar cells to boil the kettle. Generating fuel for electric cars. And not just in Australia; there's been interest from India and Indonesia.

“If we can do this, then all of a sudden the consequences open up a whole lot of new chemistry,” Jones says. ■



WILDLIFE

# Wildlife on the move



Kylie Soanes



Follow Soanes on Twitter



@kyliesoanes





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### How did the endangered gliding possum cross the road? With the help of Kylie Soanes, of course.

Known as a squirrel glider, this native mammal (pictured left) gets around by air. It has a web of furry skin between its wrist and ankle which forms a sail as it glides from tree to tree. Sometimes it has a baby in its pouch or on its back. "They're amazing little aeronauts," says Soanes, who has been studying the gliders since 2007.

And they are little; adults weigh under 300g, so Soanes holds one in the palm of her hand as she fits it with a radio tracker.

Squirrel gliders (*Petaurus norfolcensis*) are endangered in Victoria, partly because they can't cross busy highways. They don't like to move on foot and if a highway is more than 50m wide they can't glide across it. That's why Soanes sometimes finds them dead by the side of the road.

In an attempt to help gliders survive, some rope bridges were strung up over busy highways, and "glider poles" – similar to telegraph poles – built on median strips as a mid-way landing pad. But no one knew if the gliders were using these devices.

That's where Soanes came in. She joined a University of Melbourne project to

research whether gliders were using the rope bridges. "It was a great idea, but whether or not it worked, that was something we hadn't figured out yet," she said of the rope bridges. "Some people were sceptical."

Seven years on and Soanes, a wildlife ecologist, has turned her research into a PhD, which she finished in late 2014. She also uncovered some surprising results.

The project looked at rope bridges on the Hume Freeway, the main road between Melbourne and Sydney, at a point near Benalla in northern Victoria. For Soanes that meant going back to her home town. She visited the structures to download images from solar-powered cameras - that's one on the left. She also caught gliders (a mixture of peanut butter, honey and oats lures them in) to fit them with radio trackers. She stuck it out despite watching hand-sized huntsman spiders colonise the bridges and cockatoos dismantle her equipment.

Her team, from the Australian Research Centre for Urban Ecology, which is a joint project between the University and Melbourne's Royal Botanic Gardens, found that gliders *do* use the bridges. It took them about a year to start using them, but there were 2000 crossings recorded in the four years after that.

The team also found the bridges weren't needed to save glider lives because

animals mostly didn't even try to cross the highway if there was no rope bridge. What the bridges did do was allow gliders to move around to find food, nests and a mate. Soanes' research found one of the bridges was used nearly every night by a father, mother and daughter glider, enabling genetic exchange.

The next step for Soanes is to analyse the effect of the bridges on the long-term survival of glider populations. "There are so many more parts of the story that I'd like to look into," she says. "There are so many species that we see dead on our roads."

Bridges and poles are now being built in Queensland, NSW and Western Australia to help squirrel gliders and other species cross highways. Overseas, bridges and underpasses are used for everything from bears and elephants to turtles and porcupines. But Soanes says there aren't many rigorous studies that measure the effect on species survival.

Soanes says a problem is the structures are being built only on new roads in Australia, not older roads. And without protecting animals' habitat, bridges won't save these species.

She has no regrets about her work on squirrel gliders. "A lot of people fall out of love with their project and their PhD and I haven't yet," she says with a laugh. ■





# In the line of fire



Kevin Tolhurst

"You need to be  
able to live with it,  
you need to respect  
it, you need to  
understand it."





**Within two minutes of a bushfire being reported in Victoria, a computer program has mapped out where the fire is likely to spread, helping managers decide if they should send firefighters or evacuate communities.**

That computer program, Phoenix RapidFire, is the brainchild of researchers Kevin Tolhurst and Derek Chong. And it's been 40 years in the making.

Tolhurst started studying forestry in the Victorian town of Creswick in 1974. Over time, he noticed a gap in how bushfires were managed. Predicting where a fire would spread was "largely intuition", he says. There were computerised models of fire prediction in the northern hemisphere but they didn't work in Australia's eucalypt-dominated bush. Managers had to do manual calculations and make a best guess of how to fight fires.

Tolhurst saw bushfires first-hand as a field forester, began researching fire in 1984, and joined the University of Melbourne in 1997. He began working on a computer program which could predict likely fire spread in a more rational, consistent way – and give people hours of warning that a bushfire was heading their way.

Within seconds, the program crunches data on weather, wind, vegetation, the slope of the land and how dry the bush is. It turns this into a map of where the fire is likely to go, overlaid on Google Earth, and displays the results as a video (pictured right). The program also diagnoses the type of fire – how hot will it burn? How high will the flames go? Where might embers land? Trained fire analysts monitor and act on the results.

The software, which Tolhurst developed with colleague Derek Chong, was tested in 2009 and is now used across Victoria,

NSW, Queensland, South Australia and Tasmania. Hundreds of fire analysts have been trained to use it.

"A lot of what I've learnt about fire and fire behaviour I've tried to capture in a consistent way in Phoenix," says Tolhurst, now an Associate Professor in Forest and Ecosystem Science at the Creswick campus where he started studying 40 years ago (it's now part of the University of Melbourne).

"The computer allows you to capture a lot more of the detail and the complexity ... I think it will save lives, yes."

Tolhurst hopes the software will lead to a better understanding of fire. "To try and control fire – it's too powerful an agent to be able to do that with," Tolhurst says. "You need to be able to live with it, you need to respect it, you need to understand it."

Some people may want every bushfire extinguished, but as Tolhurst points out, the bush will burn at some point. Putting out almost every fire means fuel – dry wood and leaves – builds up, contributing to megafires like Victoria's 2009 Black Saturday bushfires. As temperatures topped 48 degrees Celsius and winds gusted to 115 km/h, these fires killed 173 people. Tolhurst's research shows climate change exacerbates the risk of megafires like Black Saturday.

Tolhurst was in Melbourne's State Fire Control Centre that day, mentoring fire analysts and testing Phoenix. "It was my day off," he recalls.

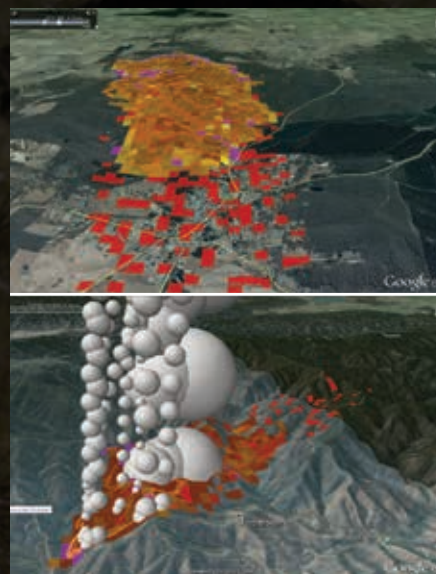
Tolhurst hopes Phoenix, which was funded by the Victorian government and the Bushfires Co-operative Research Centre, will be used to make strategic decisions about which fires can be left to burn, to reduce fuel loads. He's also using the software to educate the public, speaking to community groups, fire authorities and government departments.

"It's always been my driving force to produce knowledge and change in the way people understand and behave," he explains.

Tolhurst may have spent many years at the Creswick campus, but he's not done researching forests and fires just yet. His team is testing and refining Phoenix and improving the way it factors in wind. They're tweaking it so it can be used to manage planned burns, where fires are lit in cool weather to reduce fuel.

Tolhurst also wants to change the way fire managers work. Rather than focus on losses and disasters, he wants them to use Phoenix to measure successes; where lives are saved, what factors helped?

Above all, Tolhurst wants fire to be understood rather than simply feared. "I enjoy trying to understand it, I find it endlessly fascinating," Tolhurst says. "I think it's magnificent ... it's so much bigger than you are that it provides a certain amount of respect." ■





# Where is your food from?



Kirsten Larsen

**Not all research leads to a Eureka moment. Sometimes it's a hard slog where the errors can reveal as much as the successes.**

But then Kirsten Larsen isn't looking for a Nobel Prize. She just wants you to know more about the carrot you're eating.

Larsen, a research manager at the University of Melbourne, is trying to link urban communities with nearby farms. She has set up a Food Hub – she calls it an “action research project” – in Melbourne's outer suburbs. And it turns out the value of the trial was just as much about what went wrong as what went right.

Larsen's team chose Dandenong, on the city's south-eastern fringe, for the Hub. The population is growing rapidly and while there's productive farmland nearby, it's difficult to buy the local produce.

“Really your only option is Coles or Woolworths in some of the new areas,” says Larsen, from the University's Victorian Eco-Innovation Lab (VEIL).

Using new software, VEIL set up an online system for farmers to log their produce – mostly fruit and vegetables – every week. Local people and businesses order online, then farmers bring their goods to a warehouse in Dandenong. Workers package up the orders which are delivered to businesses and to smaller hubs like community organisations for collection. Larsen says the Hub is “no middle-class

organic marketplace,” and includes a focus on feeding vulnerable communities. The prices are usually lower than in supermarkets.

The Hub opened in early 2014 and is still running. The research part of it was funded by VicHealth.

“People are so excited about the possibilities to connect with their food and where it's coming from,” says Larsen. “And the farmers are sticking with it, because it needs to work. We have so many farmers going broke and leaving the land.”

The project aims to supply high-quality, healthy, local fresh produce, to pay a fair price to farmers, to reduce food waste, and to build more resilient and sustainable food supply systems. Larsen says food security is increasingly an issue and people shouldn't “just take for granted that there will always be an excess amount of everything”.

Larsen says Coles and Woolworths control about 80% per cent of Australia's food retail market. Food is transported long distances through a complex supermarket supply chain, and the consumer often doesn't know where goods are from.

The supermarket giants may have their critics, but running a Food Hub is no easy task. “It has been difficult,” Larsen notes wryly.

Matching supply and demand – and scaling up orders to be viable for farmers – was hard. Produce

was limited in winter. Wholesale buyers were difficult to please. The people keenest to help often did not have business skills.

And yet it did work, and Larsen has written up these problems and how to manage them. “To put a research lens into this field of activity ... can really bring value to the people who are trying to do it day in, day out,” says Larsen, referring to other food hubs, which are mostly smaller with limited IT support.

Larsen says the Open Food Network software trialled by the project makes food hubs more viable and replicable, and cuts administration time. “I see huge potential ... we're at the early days of an explosion of innovation in this field.”

VEIL, which works on emerging innovations which could form part of future sustainable systems, has also mapped Melbourne's outer suburbs to show where food could be grown. And researchers have produced “food freight reports” for fruit and vegetables, showing how freight works (and could be improved).

Larsen is also part of VEIL's Australian Research Council-funded project to model national scenarios of food security in the future, using the CSIRO's Stocks and Flows Framework. This will show the implications of climate change, drought and degraded soils for food production, and investigate under what circumstances there might not be enough food to go around. ■



“We’re at the early days of an explosion of innovation in this field.”



Take a look at the produce and prices at the Dandenong Food Hub here



[openfoodnetwork.org.au](http://openfoodnetwork.org.au)

(search under ‘South East Food Hub’)



Meet the farmers here



[southeastfoodhub.org](http://southeastfoodhub.org)



AN ORGANICS DIGESTER IN THE UNIVERSITY’S STUDENT UNION BUILDING TAKES FOOD WASTE AND CONDITIONS IT TO BE USED ON VEGETABLE GARDENS



# Having the ear of governments



Ross Garnaut

**Economist Ross Garnaut has been advising prime ministers on policy since the 1970s. So when his advice on climate change was taken up and implemented, only to be abandoned by the following government, his response was phlegmatic.**

"I'm beyond feeling things like disappointment and regret," Professor Garnaut says from his office at the University of Melbourne.

"When you're working on a big policy issue you know that things don't always work out as you would wish."

Garnaut was appointed by state, territory and federal governments in 2007 to

review how climate change would affect Australia and what should be done about it. In 2010 he updated the review and formally advised a parliamentary committee on a policy response. The equivalent of Britain's climate adviser Lord Nicholas Stern, Garnaut concluded human-caused climate change was real, the costs of action were less than the costs of inaction, and pricing carbon was the centrepiece of the best policy response.

That advice saw a carbon price enacted by the federal Labor government in 2011. The Abbott Coalition government removed the scheme in 2014.

"The regret I feel is for future generations of our species," says Garnaut, reflecting on those events. "I think what humans

have done, particularly over the last 250 years, is wonderfully good ... for that to be all put at risk through humans not using their own capacity for analysis seems to me to be a terrible pity."

Garnaut's experience as a senior policy adviser has been unique. His advice on liberalising the economy (floating the dollar, removing trade barriers etc) in the 1980s was acted on – and critics still peg him as a cold-hearted economic rationalist for that.

Yet on climate change he is seen by some in business and politics as a radical (he's publicly warned climate change could lead to "extended anarchy"). He objects to the term; "I see myself as an economic rationalist seeking to understand the issues."



WRITTEN  
OR EDITED ▼47  
BOOKS

Garnaut says his climate advising experience was not fundamentally different from past experiences. Businesses which would have been disadvantaged by reform were noisy, while other businesses were quiet. But climate policy proved "a particularly bitter and difficult issue", he says. The business community protested more loudly, and media company News Corp had more power and used it to oppose reform.

The policymaking process is now more focused on short-term political pressures and appeasing vested interests than in the 1980s and 90s, Garnaut says. There was a stronger independent centre of the polity back then, with more people engaged in questions of the national interest. Political leaders were more open to expert advice.

He has written or edited 47 books and values economics for "its relevance to understanding the great policy questions of the day". Marrying academic research with policy advice is "just what I've always done," he says.

"I first of all want to properly understand the issue, and I do that whether I'm presenting at a seminar or presenting to a prime minister."

He's made headlines lately for his research on China and climate change (he was ambassador to China in the 1980s and a founding director of Asialink). From 2012 Garnaut has argued China's economic model is changing to a less energy-intensive one in which emissions will plateau soon.

His latest research project is Indonesian energy policy. The country is committed to acting on climate change but its emissions are growing quickly; Garnaut visited coal mines and oil fields in the Indonesian forests in late 2014 to see for himself.

As for Australia, Garnaut says he is not in a hurry to investigate and advise on climate policy for future governments. He thinks his advice still stands, and repeats that an emissions trading scheme would be a strong policy choice (he has ideas on how to address the oversupply of credits, and low prices, in schemes overseas). ■



# The walkable city



Billie Giles-Corti

**Billie Giles-Corti has advice for people wanting to buy or rent a home. And she's not thinking about the price tag or how many bedrooms to look for.**

Giles-Corti wants people to think about whether an area is made for walking. Some Australians may think they want a large house in the outer suburbs – but a smaller home within walking distance of shops and jobs could actually be a better option.

“My challenge to people is to really think about the lifestyle that they want,” she says.

Giles-Corti is an expert on the built environment and public health; how to make cities better for people's health and wellbeing. While billions of dollars is spent on medical research in Australia, Giles-Corti's prescription doesn't involve any drugs. She just wants people to walk for half an hour a day.

“If there's one thing that people could do to benefit their health, for chronic disease, heart disease, diabetes, it's to be physically active,” she says. “Being inactive as well as sitting all day is actually very detrimental to your health.”

She also notes that walking is more environmentally sustainable, cushions against higher oil prices, and cuts traffic congestion.

To help get people moving, Giles-Corti and her team from the University of Melbourne's McCaughey VicHealth Centre for Community Wellbeing developed a “walkability map” for the city. First they researched what makes an area suitable for pedestrians. Three key factors are how connected street networks are (big blocks and cul-de-sacs are not helpful for walkers, while the old grid street pattern is great), density (low density doesn't help), and the presence of shops and jobs. “There's got to be somewhere to walk to,” Giles-Corti says.

The team then sourced data on these factors and layered the results onto a map of Melbourne, using GIS and the AURIN urban intelligence team. Researchers coded up different parts of the city as green, orange or red for walkability. The map shows the inner city is very pedestrian-friendly – but there's a lot of yellow and red elsewhere.

The map was posted online in early 2015. Giles-Corti hopes people will use it when thinking about where to live. “It's seen as a tool for democracy, people have a right to have access to data,” she says.

The research team is sending local councils a walkability map of their area to diagnose problems and help pedestrians, for example by putting in cut-throughs and increasing housing density.

The research team is working on similar maps for Sydney, Perth, Brisbane and

Adelaide. The study could eventually lead to US-style discounted mortgages for people who buy in walkable areas, a recognition they'll save money on car travel.

The next project is to map the *liveability* of cities – whether conditions are good for human health. Is an area safe, is there affordable housing and public transport, are there shops and jobs? And what are the consequences for health and wellbeing? The National Liveability Study, led by Dr Hannah Badland, will be developed in 2015 and city-specific maps released in 2016.

It's all part of Giles-Corti's vision: public health is not just the preserve of medical researchers, it's also the responsibility of planners and decision-makers on land use, transport and food. She's lead researcher on the National Health and Medical Research Council's Centre for Research Excellence in Healthy, Liveable and Equitable Communities.

As for Giles-Corti herself, who has published more than 200 articles and reports and is ranked among the top one per cent of researchers in the social sciences by citations, is she practising what she preaches?


She walks to the shops, cycles to work, and takes the stairs up to her office. “I try once a day to walk up the stairs, five flights. I usually puff a lot but I feel better for doing it,” she says. “I'm trying to walk the talk.” ■





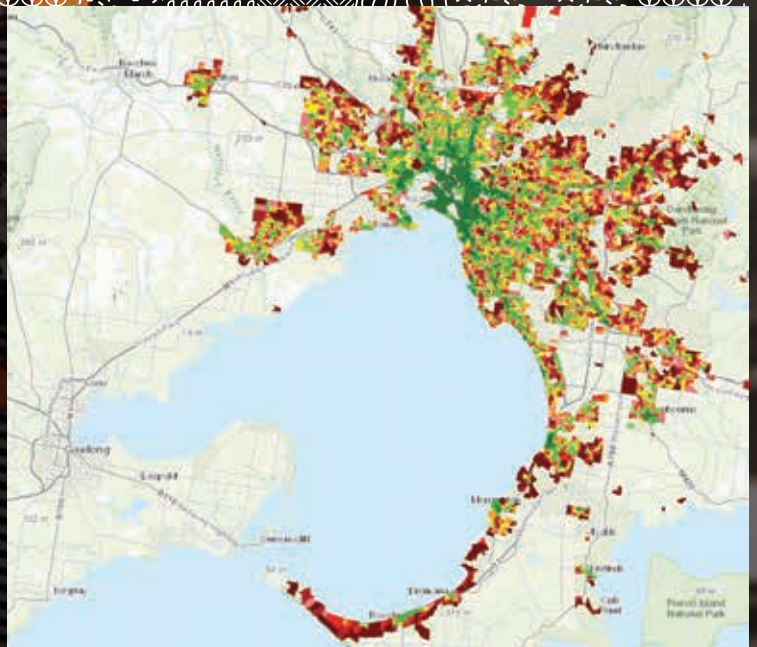
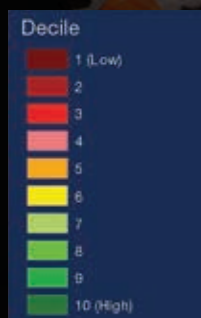
"If there's one thing that people could do to benefit their health, for chronic disease, heart disease, diabetes, it's to be physically active,"



2100 

BIKE PARKING  
SPACES ON THE  
PARKVILLE CAMPUS

METROPOLITAN  
MELBOURNE  
WALKABILITY  
INDEX ▶





ENERGY

# Going underground for clean energy



Guillermo Narsilio





## What's the secret to cooling your home on a hot summer's day, while cutting back on greenhouse emissions? You might just be walking on it.

Guillermo Narsilio is working on technology which uses the cool temperature of what's underneath the ground to chill down buildings. This can cut carbon emissions by up to 75 per cent compared with traditional air-conditioning.

But there's a catch. Narsilio says there's a "fear factor" associated with the technology, which has rarely been used in Australia. So his team from the University of Melbourne is not just researching the technology, it's installing and monitoring it.

"If people are not aware, they will never use it," says Narsilio, a geotechnical engineer (he studies soil and rocks). "We're trying to let Australians know about this technology."

The team, led by Professor Ian Johnston of the University's Department of Infrastructure Engineering, installed the technology in the Elizabeth Blackburn School of Sciences near the University campus.

28 boreholes were drilled 50 metres below ground. Plastic pipes carry water underground, where the temperature is a steady 18 degrees C, then return it to the surface. In summer the air above is usually warmer than the soil, so the water cools down the building via a heat pump. The system works in winter too; the soil is usually warmer than the air, so the heat pump uses that warmer water to heat the building. (This is different from the geothermal technology which sinks much deeper boreholes into hot rocks to generate electricity).

The school's 120 kilowatt system does use electricity – to circulate the water, and for the heat pump – but less than conventional heating/cooling systems.

"The key for us is to reduce energy consumption," says Narsilio, who studied in Argentina and the US before taking up a research fellowship at the University of Melbourne in 2006. (He liked it so much he stayed, and is now an Australian Research Council Future Fellow.)

The school installation cost about \$200,000 and saves money through lower energy bills. In other countries, systems are paying for themselves through lower bills in as little as two or three years.

Shallow geothermal is quite widely used for heating in Europe and the US, and Narsilio thinks it can take off in the southern hemisphere. Johnston and Narsilio's team, which includes PhD students, has taken calls from India, Thailand and Mauritius, although Narsilio thinks geothermal may work best in temperate climates. "We're in ideal conditions," he says of Victoria.

The school is part of a program the University's Department of Infrastructure Engineering is running to install shallow geothermal at 30 properties across Victoria – homes, commercial buildings, etc. It's funded by the Victorian government and involves engineering companies Geotech and Direct Energy. It's the largest monitored shallow geothermal project in the world.

And researchers are teaming up with academics from Cambridge University, which has expertise on the mechanical side of geothermal energy. Links have been formalised and Melbourne PhD student Olga Mikhaylova, originally from Russia, will study at Cambridge in 2015.


Narsilio, who has the habit of sizing up buildings around the Melbourne University campus to see if geothermal can be installed – the answer is often yes – thinks the public is ready to hear more about geothermal.

"People are in general interested, people ask me, 'tell me more'," he says. "There is no logical reason I can see for this not taking off." ■

## Sustainability initiatives built directly on campus

40% 

OF ALL CAMPUS WASTE IS DIVERTED TO RECYCLING

12,000 kL 

CAPTURED BY CAMPUS RAINWATER TANKS IN 2014, REDUCING THE USE OF MAINS WATER

ELECTRICITY CONSUMPTION DOWN BY 12% 

FROM DYNAMIC VOLTAGE OPTIMISATION UNIT INSTALLED IN THE LAW BUILDING

THE UNIVERSITY PLANS TO BE CARBON-NEUTRAL BY

2030 

100 kilowatt

SOLAR SYSTEM WILL BE ADDED TO WILSON HALL IN EARLY 2015



"I hope that through gaining a better understanding of the impacts of climate extreme events on food production systems, my research helps to better prepare for climate disasters."



Watch videos of the College's students and supervisors online



[climate-energy-college.net/about-us](http://climate-energy-college.net/about-us)



# Food in a changing climate



Elisabeth Vogel

When Elisabeth Vogel decided to research the impact of extreme climate events on food production, she didn't stay at her computer at the University of Melbourne. She set out for Kenya to see for herself how affected communities cope.

Vogel, a PhD student, looks at how events like droughts and floods affect crop yields worldwide. She's researching how to predict extreme climate events and how vulnerable communities can best prepare.

That took her from Germany to study at The Australian-German College of Climate & Energy Transitions, a new graduate college at the University of Melbourne. In 2014, the first year of her PhD, she headed to Nairobi for a research exchange at the United Nations Environment Programme. Vogel is working on early warning systems for climate-related events in Kenya. She says the work is valuable because it's "real-world" and relevant.

"My time in Kenya allows me to learn more about how to bridge the gap

between science and policy making, and highlights to me the importance of putting affected communities in the centre of research," she says from Nairobi.

"Climate extreme events are predicted to become more frequent and severe in many regions of the world. I hope that through gaining a better understanding of the impacts of climate extreme events on food production systems, my research helps to better prepare for climate disasters."

She's also had time to visit the Kenyan national parks of Maasai Mara and Tsavo East, and visit Maasai villages.

Vogel is one of 14 students at the Australian-German College. They share an open-plan office in the new Carlton Connect precinct, looking out over bustling Swanston Street. The students are from all over the world – Argentina, the USA, France, Germany, the Netherlands, and Australia. Some have trained as engineers or lawyers, others have worked in forest policy. Two spent the summer of 2014-15 in Antarctica.

"We all share a research interest in how to mitigate climate change and its impacts, but are looking at a range of different aspects, from renewable energies and geo-engineering to equity principles, soil carbon sequestration and rising sea levels," Vogel says of the student group.

A group of German universities are partners in the College. Students spend 4 to 6 months in Germany as part of their PhD and 20 academics in Germany are joint supervisors to the students. The Melbourne Sustainable Society Institute was a founding partner in the College and helps fund students' travel.

One of Vogel's supervisors is Malte Meinshausen, the director of the College, who sits with the students in their office. Associate Professor Meinshausen has a background in climate science and policy, and is a scientific advisor to Germany's Environmental Ministry on international climate change negotiations under the UN's climate body (the UNFCCC). Meinshausen attends the UNFCCC's annual summits. He's also researching Australia's climate targets. ■



# Next-gen leaders



Kakau Foliaki

For Kakau Foliaki, it all started with the ocean surrounding his home country of Tonga.

"Every time I went to the outer islands I'd see how sea level rising is affecting their lives. When you talk to people they say 'when we grew up we used to plant there, but now it's all water. The sea is coming in'."

"The future generation, all they think of is when is the natural disaster going to happen."

That prompted Foliaki, a public servant, to move into solar power. He then took up an Australian government scholarship to study at the University of Melbourne's Office for Environmental Programs (OEP). That meant moving his young family away from Tonga, the group of islands in the Pacific east of Fiji, in 2012.

During his two-year Master of Environment he studied energy efficiency and sustainable design of buildings for the first time; they were not on the radar in Tonga. The loss of his baby daughter shortly after her birth in Melbourne crystallised his career path.

"I think that's the reason why I'm really passionate about creating a world that's better. When you leave this world you'll know you did a lot to help others who can't help themselves," he says, reflecting on that difficult time.

Foliaki wrote a thesis proposing a guide for sustainable design in Tonga's built environment. Supervised by Dominique Hes from the Faculty of Architecture, Building and Planning, Foliaki emphasised regenerative design – "giving back to nature". He's hoping to publish and enact the thesis.

He also studied leadership and interdisciplinarity at the OEP – and made good friends. There are 430 students in the OEP's graduate programs, more than a third from overseas, including students from Bangladesh, Vietnam, Indonesia, Pakistan and the Philippines. Students choose from 200 subjects across nine faculties; the course develops the knowledge and skills of people wanting to work in the environment or sustainability.

Foliaki has now returned to Tonga, where he lives just outside the capital Nuku'alofa. He leads the energy efficiency section in the Department of Energy and is developing a national energy efficiency policy to cover transport, electricity and buildings. "There's none at the moment," he notes. "But it's cheaper to actually save energy." (Tonga relies on expensive imported diesel for electricity, although off-grid islands are going solar).

One topic Foliaki studied in Melbourne was how to convince people to change their behaviour. He took from the literature the suggestion of explaining *why* he believes in the change, rather than telling people what to do. Foliaki has put this into practice.

It's not always easy. "The Tongans have this fear of losing their homes, their culture. Their future's at stake due to climate change," he says.

"But you know for sure that we'll do a lot of good, and we can change the world, and then we'll be remembered as the generation who made the impossible possible." ■



## Sustainability voices at the University of Melbourne



The **Melbourne Sustainable Society Institute (MSSI)** aims to facilitate and enable interdisciplinary research linkages, projects and conversations leading to increased understanding of sustainability and resilience trends, challenges and solutions.

The MSSI approach includes a particular emphasis on the contribution of the social sciences and humanities to understanding and addressing sustainability and resilience challenges.

[www.sustainable.unimelb.edu.au](http://www.sustainable.unimelb.edu.au)

The **Carlton Connect Initiative (CCI)** brings together talented people who share a desire to pursue innovative solutions to tackle some of our biggest sustainability and social resilience challenges.

[www.carltonconnect.com.au](http://www.carltonconnect.com.au)

The Melbourne Sustainable Society Institute and Carlton Connect Initiative are part of *Believe – the Campaign for the University of Melbourne*. To discuss opportunities to contribute to their work, visit [believe.unimelb.edu.au](http://believe.unimelb.edu.au)



### PROFESSOR TIM FLANNERY

**Professorial Fellow, Melbourne Sustainable Society Institute**

Melbourne University is playing a leading role in sustainability research. From climate change to the built environment, its sustainability stars cover a huge range of topics. I'm proud to be part of the Melbourne team because I think that together we can really further the sustainability agenda both in the University and in society as a whole.



### PROFESSOR DON HENRY

**Public Policy Fellow, Melbourne Sustainable Society Institute**

The University of Melbourne is making a major contribution to research important to action for sustainability and its translation into public awareness and policy. This is delivering substantial public benefit on a great challenge of our times for Australia and the world.



### PROFESSOR KATE AUTY

**Vice Chancellor's Fellow at the University of Melbourne, and former Victorian Commissioner for Environmental Sustainability**

A great University is a place where curiosity flourishes. Here in this University of Melbourne collection the reader will be drawn into great insights, stimulated by robust research, and encouraged by the implications for practice and policy. Sustainable best practice is about testing ideas and making places for participation and diversity.



### CATHY ALEXANDER

**Research Fellow at the Melbourne Sustainable Society Institute, editor of Sustainability at Melbourne**

Protecting the environment is one of the major challenges we face. And the task for universities is not just to do excellent research on the environment, but to make it matter – to convey it to the people with the power to act on it, and to communicate with the public. That's what this publication is about.

Written and edited by: Cathy Alexander, MSSI Research Fellow

Photography: Peter Casamento, except for Kevin Tolhurst (Claire Denby), Kylie Soanes (Esther Beaton), Kakau Foliaki (supplied by Kakau Foliaki), Robyn Eckersley (Martin Wainstein), Elisabeth Vogel (supplied by Elisabeth Vogel), and squirrel gliders (Kylie Soanes).

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