

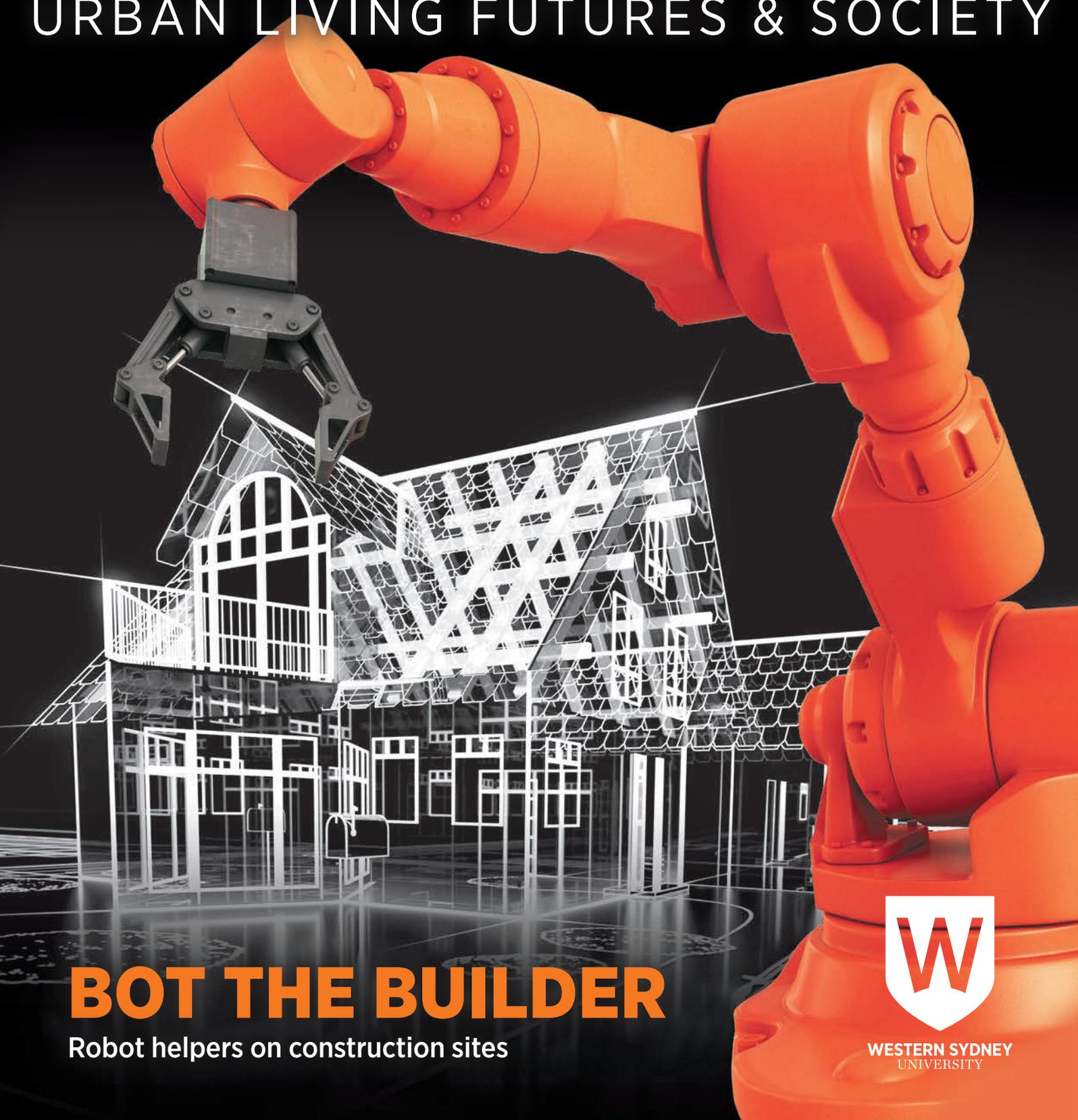
➤ **COVERING NEW GROUND**
Sustainable light rail landscaping

➤ **FINAL SNAPSHOT**
Preserving Himalayan heritage

➤ **A SPORTING CHANCE**
Making uniforms more inclusive

FUTURE-MAKERS

URBAN LIVING FUTURES & SOCIETY



BOT THE BUILDER

Robot helpers on construction sites



WESTERN SYDNEY
UNIVERSITY



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CONTENTS

- 2 Editorial
- 3 Infographic

6 TACKLING INCLUSIVITY



9 MAKING A SUSTAINABLE DIFFERENCE



11 FEATURE: RESTORING THE HERITAGE OF LANGTANG



16 PANEL: RESEARCH FOR A BETTER FUTURE



4 FAST-TRACKING GREEN CITIES



8 TAKING ON THE CYBER HACKERS



10 RAISING THE ROOF ABOUT HOUSING INSECURITY



14 FEATURE: CONSTRUCTIVE CONVERSATIONS



➤ **COVER STORY**

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Aboriginal and Torres Strait Islander peoples should be aware that this publication may contain the images and names of people who have died.

ABOUT

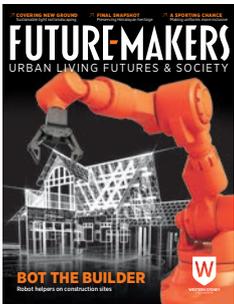
Western Sydney University is a large, student-centred, research-led university, embracing Australia's global city, Sydney. Established in 1989, the University proudly traces its history to 1891 through the Hawkesbury Agricultural College. Today the University has more than 200,000 alumni, 45,000 students and 3,300 staff.

The University is now ranked in all major global university ranking systems, and is in the top 2% of universities worldwide. Through investment in its academic strengths and facilities, the University continues to build its profile as a research leader in Australia and is nurturing the next generation of researchers. Western Sydney University graduates go on to take up rewarding careers that make real contributions to societal change, lifting the pride of students, staff and the community.

A guiding principle for the University is that there is no limit to potential success for those with drive, talent, confidence and ambition.

westernsydney.edu.au

ON THE COVER



➤ Constructive conversations
page 14

Cover image:
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THE FUTURE OF URBAN LIVING

Welcome to this special issue of *Future-Makers*, which highlights research from Western Sydney University’s Urban Living Futures and Society theme. The issue includes stories about greening light rail (page 4), preserving the heritage of Nepal’s Langtang valley (page 11), making sporting codes more inclusive (page 6), highlighting housing insecurity (page 10), user protection against cyber-attacks (page 8), transforming the construction industry (page 14) and the way we conduct business (page 9).

At the core of Urban Living Futures and Society research lies the goal of fostering sustainable, healthy and resilient communities. Cities throughout the world are faced with the challenges of urbanisation, and climate change, making it crucial to rethink what it means to create vibrant, inclusive, equitable, sustainable and resilient cities. Our research connects the complexities of culture, society, economy, health and environment challenges with evidence-based solutions. Our work also supports the University as an anchor institution within Western Sydney, aligning our action research related to the SDGs to the University’s Western Growth Strategy, the Werrington Living Lab development, and the University’s role in the Digital Western Parkland City Initiative.

The University’s Western Growth strategy aims to revitalise our campus network between peri-urban and CBD locations, enabling connectivity, and becoming a catalyst of CBD development, education and health precincts and community engagement across the Greater Western Sydney Region.

The Werrington Living Lab development will foster an open-innovation ecosystem integrating current research and innovation within a collaboration of researchers both public

and private. It will allow research to be developed that contributes to rethinking urban placemaking incorporating living, learning and working. It will deliver transformational impact, building our reputation, and offering socio-economic benefits to the local communities in our region, and to our university.

The Digital Western Parkland City Initiative brings universities together with industry, councils and the NSW Government with four digital commitments: Digital Action Plan, Smart Western City Program, 5G Strategy and Opening Available Data Sets. These commitments will see the use of new and smart technology, open data sets, smart systems and digital opportunities to provide digital capability, productivity and amenities for the Western Parkland city.

We hope you enjoy this glimpse into the transformative research being undertaken by Western’s Urban Living Futures and Society theme. We are proud to showcase our researchers who are leading the way in tackling some of our most critical urban challenges – locally, nationally and internationally. ♥

Professor Alana Maurushat
Research Theme Champion

Professor Nicky Morrison
Research Theme Champion

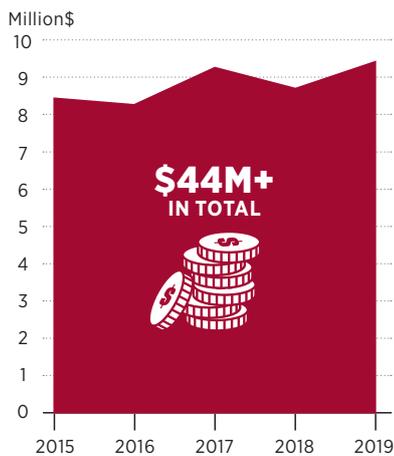
Dr Kylie Budge
Research Theme Fellow

WESTERN SYDNEY UNIVERSITY IN NUMBERS

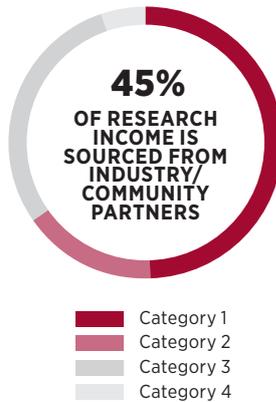
Located in Greater Western Sydney, one of the fastest growing regions in Australia, Western Sydney University is home to a vibrant and diverse community of staff and students.

URBAN LIVING FUTURES & SOCIETY RESEARCH

RESEARCH INCOME



SOURCE OF RESEARCH INCOME



URBAN LIVING FUTURES & SOCIETY 2018 EXCELLENCE IN RESEARCH FOR AUSTRALIA DISCIPLINES ABOVE WORLD STANDARD



- Cultural Studies



- Human Geography
- Sociology
- Communication and Media Studies
- Linguistics

RANKINGS

2020 Times Higher Education World University Rankings **TOP 2%**

THE WORLD UNIVERSITY RANKINGS 2020 YOUNG **36th** in the THE Young University Rankings

THE IMPACT RANKINGS 2020 TOP 10 **2nd** in Australia **3rd** in the world

NATIONAL RANKINGS FOR INDIVIDUAL SUSTAINABLE DEVELOPMENT GOALS

1st **6** Clean Water and Sanitation
14 Life Below Water
15 Life on Land

2nd **5** Gender Equality
10 Reduced Inequalities
12 Responsible Consumption and Production
16 Peace, Justice and Strong Institutions
17 Partnerships

QS WORLD UNIVERSITY RANKINGS TOP 100 2020 Communication & Media Studies, Nursing, and Sociology

ACADEMIC RANKING OF WORLD UNIVERSITIES (ARWU) 2020

23rd Ecology
TOP 75 Agricultural Sciences, Automation and Control, Civil Engineering, and Nursing

2019 LEIDEN RANKINGS FOR RESEARCH COLLABORATION

80th in the world
3rd in Australia

FAST-TRACKING GREEN CITIES



Light rail tracks offer an unexpected opportunity to add greenery to cities.

Planting vegetation

along light rail tracks could add the equivalent of two football fields of green space to the middle of Parramatta, according to Western Sydney University research.

In a viability study commissioned by Transport for NSW for the Parramatta Light Rail project, Western researchers found that installing what will be Australia's longest green track will have multiple benefits.

After receiving the team's report, Transport for NSW committed to adding three separate sections of green track totalling 900 metres, as part of the Parramatta Light Rail project which is expected to open in 2023.

Lead researcher Dr Sebastian Pfautsch, from Western's School of Social Sciences, says that replacing hard surfaces such as concrete and bitumen along light rail with grasses and groundcover offers a rare opportunity to green Parramatta city, where land is in high demand.

"If you put it together, we are adding more than one hectare of green space in Parramatta downtown," says Pfautsch. "It's amazing!"

The Parramatta Light Rail program director Mr Anand Thomas agrees, adding that the "green track will make the light rail blend in better with the existing local landscapes".

The team's review of green track around the world found that

it can make cities cooler, quieter and improve their air quality, which would be particularly beneficial around areas such as Parramatta's Westmead hospital complex.

They also found that greenery along light rail tracks not only provides habitat and biodiversity, it filters and reduces stormwater runoff. The team's report notes that in Parramatta, where annual rainfall is 960 millimetres, between 480-670 litres of stormwater would be retained yearly for each square metre of green track. Any runoff would be filtered by the vegetation and contain less pollutants than if it had fallen on hard surfaces such as concrete.

Pfautsch says green tracks can even increase property values and

viability of businesses along the tracks, such as cafes, because they create pleasant streetscapes.

While green track is found all over the world including Spain, France and Japan, it has never been tried in a hot, dry climate like that of western Sydney. Pfautsch's review found that green track is suitable in western Sydney if appropriate plant species are used.

"We proposed ground covers which had low mowing, nutrient, and watering requirements," says Vanessa Howe, PhD student and co-author of the report.

"The species are native to western Sydney and are pretty tolerant to being walked over," she adds.

The team also identified the need for proper irrigation and maintenance. As temperatures in Parramatta may regularly reach the high 40s in the next five to ten years, irrigation will be essential.

"Without regular maintenance it will look ugly and people won't like it," says Pfautsch.

Pfautsch is confident that the Parramatta green track will become a model for the rest of Australia.

"The positives are so overwhelming and the risks are manageable once you have the right strategies. Green track is a good example for progressive, functional urban design," says Pfautsch. ■

NEED TO KNOW

- Western researchers conducted a viability study on green tracks for the Parramatta Light Rail Project.
- After receiving the report, Transport for NSW agreed to add 900 metres of green track.
- This will add more than one hectare of green space in Parramatta.

This research was funded by Transport for NSW. © ddoevmore/iStock/Getty





Green track will help filter rainfall and reduce flooding, among other benefits.

“WE ARE ADDING MORE THAN ONE HECTARE OF GREEN SPACE IN PARRAMATTA DOWNTOWN.”



TACKLING INCLUSIVITY

Flexibility in dress codes makes sport a more inclusive pursuit.

When Amna Karra-Hassan founded the first mostly Muslim women’s Australian Rules football (AFL) team in 2011 she had no idea of the impact it would have.

Although the western Sydney club welcomed women and girls of all religions, cultures and ethnicities, the sight of Muslim players deftly drop-kicking a ball while wearing headscarves, tights and long sleeves as part of their uniforms soon attracted media attention and commentary. Western Sydney University sociologist, Dr Jennifer Cheng, was not surprised.

As a member of Western’s Challenging Racism Project, Cheng has been observing Muslim women and their relationship with sport since a chance meeting with Karra-Hassan in 2016.

She believes the female AFL players were seen as a bit of an oddity because their participation went against the general belief that Muslim women were not allowed to play sport because of their religion.

Cheng says there is a clear association between sport and ‘Australianness’ in society and failure to participate in sport is viewed as a failure to integrate into Australian culture and adopt Australian values.

Yet, through interviews with 13 members of the Auburn Giants AFL team, Cheng found religion had little bearing on the participants’ decision to play a sport. Instead, she found that many of the women had played sport since they were young, with the support of their families.

Modest clothing is an important factor for some Muslim women and girls when deciding what kind of sport to play. “A major barrier to Muslim women’s participation in sport is lack of accommodation by the various sports codes of their dress requirements,” says Cheng. “That’s why it’s important to give them a full range of choices in sporting uniforms.”

For the participants in the AFL study, dealing with Islamic dress requirements



This research was funded by the Freilich Project Early Career Research Small Grants Scheme. © Quinn Rooney/Staff/Getty Images Sport/Getty

An Auburn Giants player during an exhibition match in Melbourne, 2015.

was possible because the AFL code allowed them to wear long sleeves and leggings or tights underneath the standard uniform.

Cheng says the Auburn Giants AFL example shows that small accommodations can be significant in enabling Muslim women to participate in sports of their choosing.

“Wearing conservative garments while playing Aussie Rules has not made the participants any less integrated or Australian, nor have they had to be less Muslim or less ostensibly Muslim,” she says. “Indeed, the participants have to some extent normalised wearing a hijab while playing competitive sport.”

Karra-Hassan agrees, adding that Cheng’s research was an important contribution because it captured what they knew anecdotally as a club: “That we need to create inclusive practices, and codes need to create inclusive policies to allow Muslim women to dress in a culturally and religiously appropriate way so they can participate.”

Cheng has followed her 2016 AFL study with a further examination of Muslim women’s participation in sport. This included interviews with Punchbowl United Football Club members, the Swim Sisters — a religiously diverse female swimming group — and mothers whose children played AFL Auskick. Cheng says this recent study,

although yet to be published, has reinforced many of her earlier findings.

One new observation she made was that many Muslim women involved in sport reject the idea that they are breaking down barriers and stereotypes. “In a way putting them up as examples is confirming this idea that they are not the norm and they don’t want to spread that image,” she says.

Supporting this view is the Swim Sisters participant who said: “We don’t get up and train at 5am because we want to challenge stereotypes, but because we want to train and you want to achieve the goal you set yourself”

“CODES NEED TO CREATE INCLUSIVE POLICIES SO MUSLIM WOMEN CAN PARTICIPATE.”

Punchbowl United Football Club president, Natasha Hill, agrees with the sentiment. She says the club took part in the study to provide more information about Muslim women’s participation in sport. “It helped give an insight into why we do it and how we do it,” she says. “What we know is playing sport is becoming the norm in communities and Jennifer’s research gave us a platform to highlight that.”

NEED TO KNOW

- Sport is associated with ‘Australianness’.
- Muslim women are keen to participate in sport.
- Accommodating religious dress requirements can make sport more accessible.

Like the AFL, the local football association in Canterbury-Bankstown supported Punchbowl’s female Muslims by agreeing to allow the club flexibility in its uniform to meet modesty requirements.

Similarly, the invention of the burkini in 2004 by Australian Aheda Zanetti was a game changer for Muslim female swimmers. One Swim Sister said, while in the beginning women wearing the burkini had to highlight the swimwear was “approved” to avoid criticism, its popular adoption meant “nowadays nobody says anything”. Cheng says this example highlights how increased awareness can change attitudes.

Cheng believes her studies show the contribution of sport to social cohesion is not as simple as minorities integrating into mainstream competitive sports. Rather she says sporting codes can go a “long way” in engaging Muslim women by acknowledging the need to accommodate religious requirements such as dress code, women-only hours, and even alcohol-free social gatherings.♥

16 PEACE, JUSTICE AND STRONG INSTITUTIONS



TAKING ON THE CYBER HACKERS

Understanding contemporary cyberspace attacks protects businesses and individuals.

Western Sydney University's Dr Abubakar Bello is

developing proactive security and defence strategies to thwart cyber criminals and make the internet a safer place.

Bello, a lecturer at Western's School of Social Sciences, is an expert in ransomware attacks.

These attacks begin with malicious software encrypting a user's system or personal files, and is followed up by a demand for the victim to pay before they can regain access to the files, which is not always guaranteed.

The internet of things (IoT) makes data even more vulnerable to hackers. Individual smart appliances could be infected and rendered inoperable, with a ransom demand of as little as \$20. The ransom amount is often much lower than the cost

of repair for damage caused by forcing a smart door or fridge, for example.

Bello and his colleagues are intrigued by the human behavioural factors that make ransomware so profitable to online thieves. They aim to identify what type of cybersecurity awareness and education programmes are



IN TELSTRA'S 2018 SECURITY SURVEY

\$208,000

was the average cost of downtime due to a ransomware attack

needed to protect the public against these attacks. "The more people know and understand about the risks, the better their chances of staying protected," he explains.

Bello sees significant gaps in national and international research around the development of effective cyber security awareness and educational programmes that aim to improve users' safety. "Even in cyber-advanced nations like the US, where several government-sponsored security initiatives encourage secure cyber behaviour, there is a lack of protective measures against current and future methods of ransomware attacks."

Bello is investigating contemporary types of ransomware attacks and seeking to understand patterns in the

NEED TO KNOW

- Ransomware is a cyberattack where a user's files are made inaccessible until a ransom is paid.
- There are gaps in cybersecurity awareness and education.
- Abubakar Bello is trying to develop proactive defence strategies against such attacks.

behaviour of the attackers. He has a strong interest in the role that cyber security has on performance and satisfaction, including security in social networks.

An important aspect of Bello's project is to link Western Sydney University's cybersecurity work with local corporations and government organisations to provide cybersecurity audits and risk management services. This includes Gridware, one of the few firms in Australia at the forefront of cyber defence. Gridware's involvement in the project will include the development of artificial intelligence and machine learning based monitoring and reporting technologies, as well as incident response and management control frameworks.

"My research has been about the chance to make a critical difference in our increasingly digital world," says Bello. "With my research in areas such as the IoT and ransomware, I believe I am providing a vital support service for the vast number of businesses, individuals and organisations targeted by cyber criminals." ■





MAKING A SUSTAINABLE DIFFERENCE

Australian enterprises are working towards a just, sustainable, and financially viable economy.

It is possible to be both ethical and profitable,

according to several case studies involving Australian manufacturers.

While industrial manufacturing is a key driver for economic growth, it is also a major contributor to climate change, and growing social inequality.

To find out how manufacturers can help solve global challenges, Dr Stephen Healy, and colleagues from Western Sydney University and the University of Newcastle, surveyed 10 manufacturers with bases in Australia, including makers of mattresses, furniture, and carpet, a dairy producer, a blueberry processing plant, a mattress recycling enterprise, a niche clothing producer, as well as an engineering firm, and an e-waste recycling plant.

Healy says that businesses chosen for the study shared two common values: a commitment to thinking beyond the bottom line and demonstrated concern for their workers. Healy and the team say that these values are reflected by the term 'just sustainability' in which a better quality of life is sought in a just, equitable manner. The term was coined by social science academics and could describe emerging cultures of

the manufacturing sector in Australia, the researchers say.

One of the companies, Interface, the world's largest manufacturer of carpet tiles which has a manufacturing plant outside Sydney, started minimising its environmental impact in the 1990s. It has since removed carpet waste by reusing each part of the product, is powered entirely by renewable energy and is now on track to eliminate oil from the production of synthetic carpet tiles by 2020 as part of a plan they call Mission Zero™.

Varley Group, an engineering firm that builds specialised vehicles and equipment for spacecraft, specifies that suppliers provide everything needed for a

production run in kits that are tailored for the job, as part of its efforts to minimise waste.

Soft Landing is a mattress recycling social enterprise that recycles about 75% of an innerspring mattress that would otherwise end up in landfill. Soft Landing takes mattresses apart so the individual components of steel, wood and fabric can be used in other products such as roof sheeting, garden mulch and acoustic panelling.

In terms of caring for workers, Interface collaborates with an NGO that works with villagers in the Philippines and Cameroon to collect discarded nylon fish nets to be reused in the carpet production line. Soft Landing proactively employs disadvantaged people, while Varley Group's strategy helps find jobs for ex-offenders, Indigenous people and people suffering from mental health issues.

"This commitment to work force integration was part of the ethos. It was treated as a condition for enterprise viability," Healy says.

But how do businesses stay profitable while being ethical? The



researchers point out that

a decision made at a critical time for a company's survival was often linked to values associated with just sustainability.

When Interface's plant in Sydney burnt down in an accident, rather than ceasing carpet production and shrinking the workforce, employees were involved in helping with design of the new setup; production workers moved temporarily into customer service; and others did community projects in and around the company's location all on full pay. All were assured continuing roles in the business. Not only did this retain rare textile skills within the company but added strength in existing services while it rebuilt the site.

Through ethical operation, these enterprises are redefining business common sense, the researchers say. Enterprises that can be associated with just sustainability could help realise a regenerative, circular economy in Australia that is based on caring for people and the environment. Further research should investigate how the concept of just sustainability can be adopted to other sectors and regions. ♥

NEED TO KNOW

- Businesses can be both sustainable and profitable.
- An Australian team surveyed 10 manufacturing companies who value 'just sustainability.'
- Future research should examine other sectors.

10 REDUCED INEQUALITIES



RAISING THE ROOF ABOUT HOUSING INSECURITY

Using the stories of society's most vulnerable to effect positive change for renters.

Single, older women who rent on low income and with no support, live in constant fear of eviction and often have to rely on charities for food so they can pay their rent. Western Sydney University's Dr Emma Power has gathered first-hand accounts from these women and is using their stories to lobby for change in tenancy laws.

One of the most striking accounts Power heard was that of a Sydney-based tenant in her late 60s. Afraid of eviction,

the tenant hesitantly asked her landlord to repair a leaking roof. By the time he acted, after two years of requests, her rental accommodation was mouldy and 40%, including the bedroom, was uninhabitable. After fixing the property, the landlord increased the rent by 20%, which forced the tenant to move.

While recent amendments to the NSW *Residential Tenancies Act 2010* now mandate minimum standards to be maintained

throughout a tenancy, it is still very difficult for poorer, older tenants to negotiate with or challenge landlords to repair things because they fear rental increases or retaliatory eviction.

"Single, older women are facing a housing crisis. They are one of the fastest growing groups of homeless people in the country," says Power.

This grim statistic prompted Power to find out more about the experiences these women had in securing housing, their interactions with landlords and real estate agents, and how rental insecurity affected their sense of home and their capacity to care for themselves.

She interviewed 46 female Sydney-based renters, aged from 55 to their early 80s, who were either on Newstart (an Australian government scheme providing income support for unemployed people), the disability or aged pension, or had very low or erratic earnings. Three of the women had previously been homeless and lived in cars.

The soaring Sydney property market meant that a large proportion of their income was absorbed by rent. To make do, many women cut down on electricity, heating or food. Some relied on food handouts from charities or food banks.

Power described a woman who worked in a low paid community services job. The woman relied on vegetables the

NEED TO KNOW

- Single, older women are one of the fastest growing groups of homeless people in Australia.
- Emma Power conducted interviews to find out more about their experiences.
- She is lobbying for changes to NSW tenancy laws.

local greengrocer bundled and discounted before throwing out. In winter, when heating bills were high, she relied on a local church with a weekly food pantry. This food, which was donated by local supermarkets and community members, was frequently past its best before date. As a low paid community worker living in an area with a significant number of disadvantaged families, she collected food alongside her clients.

Power is writing a report for policy-makers and key stakeholders, who are trying to drive change in the sector. She would like to see changes to NSW tenancy laws so minimum standards of housing are quantified, as they are in New Zealand, and an end to evictions without grounds. ■

With rental prices soaring, many single, older women on low incomes in Sydney have to cut down on food and other necessities.



11 SUSTAINABLE CITIES
AND COMMUNITIES

RESTORING THE HERITAGE OF LANGTANG

An interactive exhibition will help preserve the history of Nepal's Langtang valley.

When Western Sydney University researchers, Hayley Saul and Emma Waterton left Langtang, Nepal, on the morning of the 25th of April, 2015, their contacts in the remote Himalayan village bid them a fond farewell, already anticipating their return the following year. But two hours into their hike back to Kathmandu, an earthquake struck, triggering deadly landslides across the region. Langtang, and the community that had lived there for hundreds of years, was almost destroyed.

Saul and Waterton, who were led to safety by local guides, have been using their research into the culture and history of the region to create an interactive heritage trail around the valley that will tell the story of its people and their past. The first exhibition hut was opened last year, and another two are under construction.

Langtang is a region of the Nepalese Himalayas just north of Kathmandu, on the border with Tibet. Langtang village sits at 3,400 metres above sea level in a narrow valley beneath the region's highest peak, Langtang Lirung. It was once a thriving community of more than 400 people, including many porters who guided trekking tourists.

Saul, an archaeologist, first visited Langtang in 2011, after

a non-government organisation (NGO) worker with Community Action Nepal invited her to see an ancient monastery in dire need of repair. "This was an opportunity to observe restoration work carried out locally, and the traditional methods used." When Saul began talking to the monks at the monastery, she heard about other sacred landmarks dotted around the region that held historical or mythical significance to the people of Langtang. Fascinated, Saul returned each subsequent year to document Himalayan heritage by gathering stories that had been passed down through generations.

Waterton, a heritage specialist, joined Saul on a visit to Langtang in April 2014 and together they travelled with the locals to significant places

in the valley, recording tales of the folklore written into the surrounding landscape. They discovered how the local people engaged with the past, both

physically and emotionally. The pair returned to Langtang in April 2015 to continue their research. During that trip, one of their new friends, Son Norbu, invited Saul and Waterton to help build a Himalayan Heritage Museum in the village. They parted ways with heads already buzzing with ideas.

Saul and Waterton were already hiking back to Kathmandu when the ground began to shudder. The 7.8 magnitude earthquake shook loose an immense chunk of rock from Langtang Lirung mountain, which toppled onto a glacier and sent a wave of rock, ice and mud down the valley. Langtang village was blown away by the shockwave and whatever remained was buried under 100 metres of rock. Only one home survived, along

NEED TO KNOW

- Langtang village was almost destroyed by the April 2015 earthquake.
- Researchers from Western Sydney University are helping to restore the heritage that was lost.
- The first exhibition space opened in 2018 and two more are under construction.

© Quentin Peilleter / 500px/500Px Plus/Getty



The Lirung glacier in Langtang valley

with a handful of people who had found shelter. More than 200 people died in Langtang that day, including some 70 tourists trekking in the scenic valley. Approximately 2,900 historical sites were damaged or destroyed. For the Himalayan communities, rebuilding these sacred sites was a priority.

In the aftermath of the quake, Saul and Waterton raised funds to help rebuild Langtang, but they wanted to contribute something more than financial aid. They owed their lives to the local guides who had led them to safety, one of them was the brother of Son Norbu. They realised their anthropological research could be used to protect and pass on the lost heritage. In December 2016, Saul and Waterton visited Langtang for the first time since the tragedy and began planning the commemorative museum they had agreed to help the villagers build, 18 months before.

“Instrumental to our work on the Langtang Heritage Trail project has been our collaboration with the NGO, Flagstaff International Relief Effort (FIRE),” says Waterton. Spearheaded by Meredith Potts, FIRE has been working with Saul and Waterton for the past three years, collecting oral histories and survivor stories, and working with the local community to site the three exhibition huts.

The design for the exhibition is simple and sustainable. It will comprise three huts, built in the traditional style, that use mountain streams to turn a prayer wheel and generate hydroelectricity. In each hut,



Emma Waterton (left) and Hayley Saul (right) at Langtang in 2014.

an iPad, powered by nature, will play back the stories of local people. Visitors will be guided to the special sites relating to each story as they wander along a carefully laid heritage trail. “Each hut can be a rest stop for weary travellers,” says Saul, “but also a place to learn and reflect on the cultural history of the area.”

But simple design does not always translate to simple delivery. “Because the area is so remote,” explains Saul,

**THEY OWED
THEIR LIVES
TO THE LOCAL
GUIDES WHO
HAD LED THEM
TO SAFETY.**

“everything must be brought up by porters, donkeys, or helicopter, which makes

building an infrastructure like this extremely expensive.” The project initially received \$20,000 via a Western Sydney University Vice-Chancellor’s Research Award, and will receive another \$40,000 each year for three years. “When we opened the first exhibition hut in 2018, the locals’ reaction was overwhelming. Everybody came out to celebrate with us, bringing tea and cakes. They presented us with traditional white scarves called khada and then paraded with us all the way around our tour of the sites.”

The researchers’ culturally-sensitive approach has already inspired other heritage projects in the region. “For the mountain communities of Nepal, natural and cultural heritage sites provide spirituality, sanctity and security,” says Dr Anu Kumari Lama, a tourism specialist at the International Centre for Integrated Mountain Development (ICIMOD). “The project in Langtang will generate positive outcomes for tourism, heritage conservation and community wellbeing”.

Saul is now working with ICIMOD on a Kailash Heritage Route in Humla, Nepal, which is the gateway to the sacred Mount Kailash. They want to create a similar interactive exhibition that is eco-friendly, sustainable and respectful of local culture. “Himalayan communities and their regions are prone to natural disasters, poor living conditions and weak economic foundations,” says Dr Lama, “making them some of the most sensitive heritage sites and therefore extremely important for protection and preservation.” ■

11 SUSTAINABLE CITIES AND COMMUNITIES



CONSTRUCTIVE CONVERSATIONS

Robots working alongside builders could be the key to meeting Australia's housing construction challenges, if the industry can be persuaded to embrace the new technology.



Visualisation of a construction robot assisting with bricklaying.

The growth spurt of Australia's largest cities

shows no sign of slowing. By 2036, the NSW state government predicts that almost 1.75 million new residents will call Greater Sydney home — an unprecedented expansion rate for the city.

Housing all these people is a daunting challenge, but the construction industry could make use of new methods that might help. Although it may be a while off, there are early signs that tradespeople could soon be joined on site by robot assistants, able to take on some of the heavy lifting of

building new homes.

Allocating robots some of the more mundane and repetitive tasks of house building, as well as some of the more dangerous roles, would boost

safety and productivity.

To help facilitate the adoption of robots as the latest tool on building sites, the New South Wales Government's land and property development organisation, Landcom, sponsored CoBuilt 4.0, a project to bring together researchers from across Sydney to develop collaborative robots to work with tradespeople to help meet the state's housing goals.

"Sometimes when you bring universities together, it's just a really good fit," says Professor Kerry London, Dean of the School of Built Environment, who is leading Western Sydney University's contribution to the project. The University of Sydney and UNSW Sydney researchers are developing

This research was funded by Landcom. © Maciej Frolow/Photodisc/Getty Images

the robot technology. “Our role is to mobilise the connection to industry and to investigate adoption barriers and enablers,” London says.

London and her Western colleagues, including Dr Yingbin Feng and Dr Karyne Ang, investigated the human side of the equation. “I have expertise in adoption of new technologies in the construction industry and have completed nationally funded research studies over the past 15 years on all manner of innovations,” London says. “One of the greatest challenges, and the biggest opportunities, revolves around people embracing the change”, she says. “For me, it has always been about the people.”

London began her career as an architect before moving into capital works project management with the Northern Territory government. There, she experienced first-hand the interactions between government organisations and the construction industry, which are especially nuanced at times of change — whether it be new ways to fund major projects, such as the development of public-private partnerships; or new technologies, such as the move toward off-site manufacturing as a method of building construction. “Government can play a role as a major client, as a regulator, and also as an influencer,” London says.

Understanding of the way government could encourage positive change in the industry was limited, which, in 2002, led London to another career shift. “I went into academia, to do my PhD at Melbourne University, to investigate the underlying structure and behaviour of the construction industry, specifically

to enact transformative change.”

London made case studies of six major projects ongoing at the time, including Melbourne’s Federation Square, to map the supply chains and to establish what the power structure of each chain looked like. Power might lie in the hands of major multinationals through their sheer volume of purchase, or with small or medium companies that are one of a few suppliers of a particular aspect of the build or who are extremely skilled in their particular field, London explains. Understanding construction industry supply chains by mapping power structures has informed everything she has done since. “How do we understand the power structure to mobilise the introduction of something like collaborative robotics?”

**“WHEN PEOPLE
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First, the team looked at any research already carried out into the potential of construction robotics. “The most interesting trend, which shaped our work, was that the old idea of robots coming on site and replacing most or all the people, and the whole site being highly automated, although enticing for safety reasons, has never taken off”

NEED TO KNOW

- Sydney’s expansion shows no sign of slowing.
- Robots could help the construction industry keep up with demand for housing.
- Western researchers are investigating the industry’s adoption of this technology.

A far more realistic picture, she says, involves collaborative robots taking over specific tasks that people don’t want to do. Mundane and repetitive tasks such as laying a straight row of bricks at ground floor level, or high-risk tasks such as constructing a roof, would be particularly suited to robotics, leaving people to do the more interesting, problem-solving, creative tasks in a safer environment.

Starting the discussion with the construction industry was the next step. “We did two really significant workshops, primarily with contractors, just trying to identify what they thought would be the challenges, and areas where they thought this might be a great idea.”

The team then conducted the second focus group interview with sub-contractors. Some tradespeople could immediately see potential benefits. “You could have it set up with voice recognition, so you could yell out a number and it would be able to cut this timber for you,” said one carpenter from a major construction company. “It would be useful for timber pre-cutting,

and for passing timber for someone in the roof, so that you don’t need the ladder. In the session the ideas really began to flow.”

As with any disruptive new technology, there were legitimate concerns, including the costs and complexities of training people to use the new machines, and worry over needing to be ‘computer smart’ to operate them. Discussing potential training modes was a key part of the workshops.

Ultimately, says London, there will be a whole range of mindsets, and understanding how to navigate that to help drive the change is where the supply chain structure comes in. Contractors in comfortable ‘power positions’ are probably not going to move until the technology becomes an industry norm. The early adopters are likely to be contractors in highly competitive parts of the supply chain seeking a commercial advantage over rivals, who see the market opportunity and invest in the technology.

“As researchers, when we look at innovative technologies we imagine possible scenarios - and then we open up discussion,” London says. “Sometimes”, she says, “people take the innovation in a direction you never foresaw.”

“One contractor, who builds high-rise residential apartments, said one repetitive task that really takes up time is doing inspections in each room,” London says. “He got pretty excited trying to work out how he could use robots to do these inspections to free up people for many other tasks,” she says.

“When people adapt the innovation to their own situation - that’s when really exciting things happen.” ♥

RESEARCH FOR A BETTER FUTURE

KYLIE BUDGE >>
Research Theme Fellow
- Urban Living Futures
and Society

SEBASTIAN PFAUTSCH
Research Theme Fellow -
Environment and Sustainability
>>

>>
LYN TIEU
Research Theme Fellow
- Education and Work

>>
**JENNIFER
MACRITCHIE**
Research Theme Fellow
- Health and Wellbeing

Western Sydney University Research Theme Fellows discuss their work's impact.

Dr Kylie Budge, a creative arts researcher, Dr Lyn Tieu, a linguist, Dr Jennifer MacRitchie, a cognitive scientist, and Dr Sebastian Pfautsch, a tree physiologist, are among Western Sydney University's best and brightest academics. Their work is helping to shape a greener, smarter, healthier, inclusive, and creative future. These researchers recently came together to share their thoughts on their work's potential for creating impact in the world.

FUTURE COMMUNICATORS

Linguistics wasn't at the front of Lyn Tieu's mind when she began her university studies, but she quickly became fascinated by what the scientific study of language could reveal about society. Her work focuses on how children acquire meaning, and how they interpret a particular feature of language called linguistic inferences — the messages we sometimes don't even realise we're conveying through our choice of words and phrasing.

For example, the sentence 'girls are as good as boys at maths' seems to be an equitable statement. But Tieu, Research Theme Fellow in Education and Work, says some studies have shown that the implicit inference that comes from the way that statement is ordered is that girls are not as naturally gifted as boys are at maths. "So if teachers are saying things that convey additional messages

beyond what they're attempting to convey, that could have an impact on how children are interpreting the content that we're delivering," she says.

In seeking to understand how children interpret these linguistic inferences, Tieu is hoping her research can help "bridge that gap between our scientific understanding and children's actual educational experiences."

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She also believes that linguistics has much to offer in terms of moving society towards greater equality, because it recognises that all languages are equal. "Prescriptive authorities will have you believe that there is some standard version of a language that you must attain, but the danger with that is that people then use that to create prejudices, to marginalise," she says. "In linguistics we learn that that's not true — different languages and dialects are equally important and valid, and can offer rich

insights into the mind. If linguistics could actually be taught earlier in the curriculum, not only would you get the scientific benefit of learning about scientific inquiry and hypothesis testing through linguistic studies, it could actually change attitudes."

FUTURE SPACES

Changing attitudes is something that Kylie Budge is working hard to do in the creative arts field; in particular, antagonism towards selfies and Instagram culture in museums.

"People like myself are arguing there is some kind of benefit to this Instagram culture because it's a platform where people can creatively express their experience, their engagement with the space, and with the artefacts that are on display," says Budge, Research Theme Fellow in Urban Living Futures and Society. "It's a way to upend the power balance that has perhaps existed for too long, where museums have told people what they should think, what they should look at and how they should think about certain exhibits or space."

"There are still a lot of people who won't go to a museum or gallery, and feel like that's not a place for them," says Budge. But she argues that allowing digital expression in these traditionally non-digital spaces can open these spaces up to new audiences who might otherwise not experience them.

(Left) © Anna Kucer; Photo of Jennifer MacRitchie taken by Monica Pronk. (Background) © oxygen/moment/Getty Images

Another area where attitudes are changing, but not always for the better, is around the concept of maker spaces. These communal spaces with shared equipment are popping up in cities around the world – and particularly in China, where they are viewed as hothouses of creativity and innovation.

There is growing awareness of the importance that these spaces have in encouraging innovation. “These are about participating, making, and contributing to society, rather than just consuming.”

“I think policy-makers and governments sometimes presume that somehow innovation occurs in an abstract vacuum,” Budge says. “Different support mechanisms and spaces need to be provided and created to allow innovation to flourish. It doesn’t just happen.”

Creativity and divergent thinking are nourished in maker spaces, but the spaces themselves need protection and support. Australia has a few maker spaces — one of the most well-known in Sydney is in light industrial estate land in Marrickville — but, many are under threat from development pressure. Budge hopes that her work will contribute towards greater understanding and appreciation of and access to these spaces in Australian cities, particularly outside metropolitan regions.

FUTURE CREATIVITY

Music is a familiar expression of creativity, but Dr Jennifer MacRitchie, Research Theme Fellow in Health and Wellbeing, believes it also could have significant health and wellbeing benefits, particularly in the elderly. Having studied electrical

engineering and music, she was working on motion capture technology to study the movement of pianists’ fingers when she became interested in the processes by which we acquire musical skills.

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“Your brain has to process symbols on a page if you’re reading music notation, decide on an action, a set of fine-motor commands that you use to manipulate the musical instrument, listen to the sound being produced, and then refine the next set of actions accordingly and you’re doing that at such minute time scales,” she says. “Playing a musical instrument is such a beneficial task for your brain, so we started wondering, why is it not something more people can have access to and benefit from.”

It has long been established that these skills have to be acquired early in life, but MacRitchie and her colleagues have recently published research results that show that the elderly

are just as capable of taking up music for the first time, and there are significant benefits in doing that.

But some older people can face additional challenges in learning music; for example, having restricted movement due to stroke or arthritis, or cognitive decline experienced as part of dementia. Practical and economic concerns to accessing a musical instrument may be enough to put off potential learners. This is another area where technology is breaking down barriers; MacRitchie gives the example of new musical interfaces that can be used on an iPad.

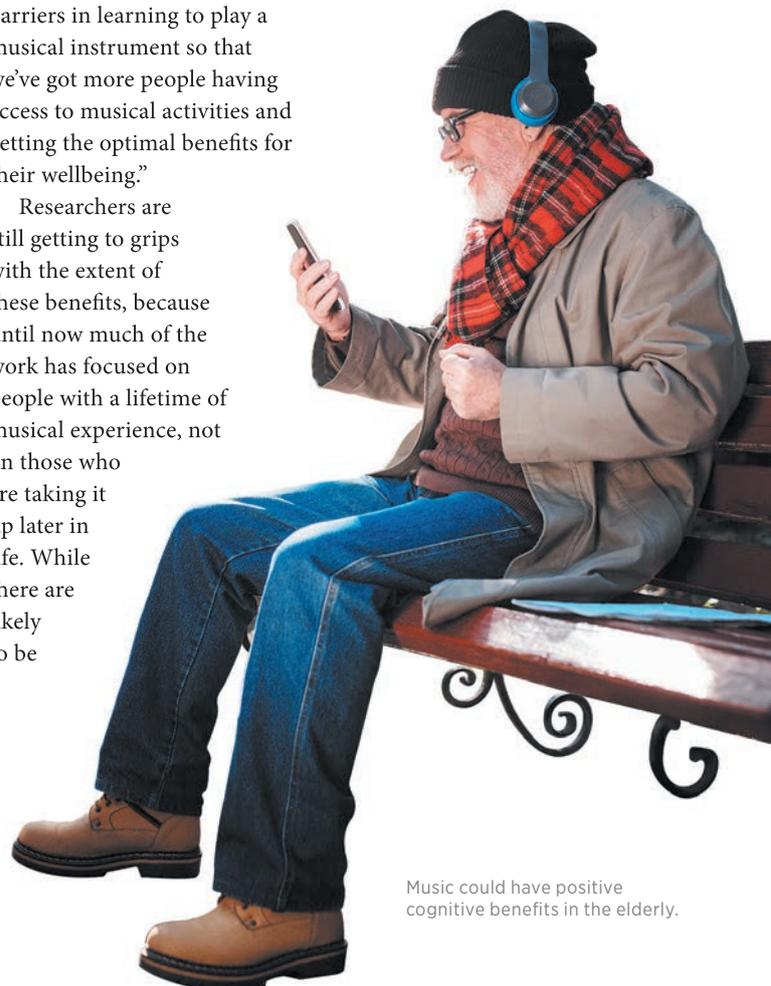
“A lot of my research is trying to devise ways to reduce some of those cognitive and physical barriers in learning to play a musical instrument so that we’ve got more people having access to musical activities and getting the optimal benefits for their wellbeing.”

Researchers are still getting to grips with the extent of these benefits, because until now much of the work has focused on people with a lifetime of musical experience, not on those who are taking it up later in life. While there are likely to be

physical and cognitive benefits, MacRitchie is also interested in the emotional and social benefits. “By doing a lot of group musical activities, you’re giving people avenues to share something together and identify as part of a group,” she says. “That helps reduce loneliness, for which older adults tend to be at risk.”

FUTURE CITIES

The elderly, immobile and very young are more vulnerable than most to the effects of heat, and that’s where Dr Sebastian Pfautsch’s research comes in. As Research Theme Fellow in Environment and Sustainability, he’s looking at how urban green



Music could have positive cognitive benefits in the elderly.



(Left) yacobchuk/Stock /Getty Images Plus; (Right) © Anna Kucera

Budge, Pfautsch and Tieu
at Western's Parramatta
South Campus.



(left to right) Kylie Budge, Sebastian Pfautsch, Lyn Tieu, and panel moderator Bianca Nogrady at the Research Theme Fellow Panel.

infrastructure could help address the growing issue of urban heat.

Urban green infrastructure describes anything green in an urban space; from the grass, shrubs and trees along roads and in parks, to living walls and rooftop gardens. It's increasingly recognised that urban green infrastructure plays a vital role in cooling the urban environment.

Pfautsch and colleagues deployed temperature data loggers across several western

Sydney councils, and found that a street with just 10% canopy cover experienced 12 days above 40°C in summer, while a street with 30% canopy cover had fewer than half that — experiencing just five days of summer above 40 degrees. “It’s a huge difference that not only impacts the wellbeing of people living in tree-lined streets but also impacts power consumption for air conditioning in their houses,” he says. “You have

add-on effects once you start increasing urban canopy, where you reduce heat and energy bills in households.”

But there are other benefits to increasing urban green infrastructure, Pfautsch says. “While green infrastructure helps make cities liveable, it also has benefits in biodiversity, liveability, public health, and even helps with reducing crime, and increasing property values,” he says.

The challenge is how, where and what to plant to best combat the urban heat island effect combined with the climate crisis that is already seeing temperatures in Australia’s major cities approach dangerous levels during summer months. But there’s only so much that urban green infrastructure can do.

“If western Sydney gets hit by a heatwave, trees won’t help cooling these very hot air masses, especially if they have no access to water that supports transpiration,” he says. “We have to look at other ways to cope with these new conditions of repeated heat waves and low rainfalls. We’re exploring how thermal benefits can be generated by different surface materials and colours used in urban design.”

Pfautsch hopes his work can help guide local and state governments towards creating more liveable cities in the face of a heating climate. “We urgently need to expand green infrastructure, but we have to be smart about it if we want maximum cooling benefits in times of rapid urbanisation and a heating climate.”

(Top) © Anna Kucera; (Bottom) © zetter/istock/Getty Images Plus





**AUSTRALIA
NEW SOUTH WALES**

- Hawkesbury
- Penrith
- Liverpool City
- Campbelltown
- Nirimba
- Westmead
- Parramatta
- Parramatta City
- Sydney Olympic Park
- Sydney City
- Bankstown

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DISCOVERY**

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