UTS

Institute for Sustainable Futures

2018

Annual Review

The path to a just, prosperous and sustainable world can only be achieved by working together. Our research and engagement with partners in industry, government and the community in 2018 made an impact by creating change towards sustainability, addressing a range of challenges facing Australia and the world.

The just transition to a clean energy future recognises that there are social as well as economic and environmental goals to consider. Our Solar Gardens project with the Community Power Agency showed how low-income households and tenants can benefit from the rooftop solar revolution.

ISF research supported by the Australian Renewable Energy Agency on how to increase fairness for supply and demand investment by electricity networks was instrumental in persuading the Australian Energy Regulator to adopt the Demand Management Incentive Scheme, and influenced network businesses to support this initiative. The scheme has resulted in a $200m per year allowance for network businesses to invest in non-capital demand management options over five years.

In 2018 the institute was awarded four significant grants to further the work of our international development team on water, sanitation and hygiene and gender. Funded by the Australian Department of Foreign Affairs and Trade's Water for Women program, this work aims to support improved health, equality and wellbeing in Asian and Pacific communities through socially inclusive WASH projects.

The One Earth Climate Model, a plan to keep the temperature increase from human-induced climate change to less than 1.5 degrees Celsius, was published as a major contribution to the global debate on responses to the threat of climate change. Funded by the Leonard DiCaprio Foundation, this work was the culmination of an exhaustive effort led by the institute in collaboration with the German aerospace agency DLR and the University of Melbourne.

Throughout the year we continued to champion the goal of a circular economy through partnerships and research for state governments. This included findings being incorporated into the NSW circular economy policy to support improved product design, procurement and innovative reuse.

Our researchers also edited a second book on transdisciplinary research, highlighting case studies from UTS across Australia and internationally.

Our people are leaders in their field and many were recognised as such in 2018. Professor Juliet Willetts was named in the Australian Financial Review's 100 Women of Influence, Dr Helen Lewis received the Waste Management Association of Australia's Women in the Environment Award and Professor Cynthia Mitchell was recognised as a Legend of Water by the Australia Water Association. Her academic contribution was also acknowledged with the title of Distinguished Professor. Dr Michelle Zeibots and her interdisciplinary research team won the UTS Vice-Chancellor's Award for Research Excellence through Collaboration for the innovative Responsive Passenger Information Systems project with Downer and Transport for NSW.

The institute continued to pioneer applied research, with colleagues in the Faculty of Engineering and IT, in the area of smart cities, by deploying Internet of Things solutions for urban livability, as well as responsive passenger information systems for the urban train network to reduce platform congestion.

The UTS 2027 Strategy was launched in 2018, and has strong resonance with the Institute's work and achievements, including the key objectives 'delivering excellent research with impact', 'working in partnership' and of course 'building a sustainable future'.

In 2019, we will be building on our achievements, deepening and extending our partnerships and maximising the generation and communication of our research impact.

Professor Stuart White
Director
Institute for Sustainable Futures

Our clients

In 2018 our research was commissioned by:

> ISF's interdisciplinary approach helps stakeholders of the projects to understand the comprehensiveness of the project and find innovative solutions.
>
> Ministry of Planning, Indonesia

Our people

47 Higher degree research (HDR) students

90 Research and professional staff

32 Adjunct professors, associates and visiting scholars

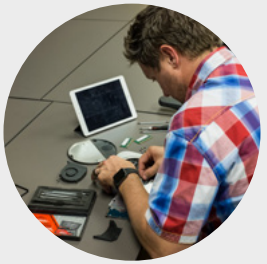
> ISF staff have a wealth of knowledge in integrated water management. Their expertise was highly valued in thought-provoking discussions and in challenging traditional processes for water management planning.
>
> Sydney Water Corporation

Highlights

Key research

NSW circular economy policy

In October 2018 the NSW Government released a draft policy statement and discussion paper on transitioning NSW to a circular economy. ISF and international partner Ricardo informed the policy's development and this resulted in invitations to advise other state governments on circular economy best practice.



One Earth Climate Model

ISF led one of the most detailed climate and energy studies ever produced, funded by the Leonardo DiCaprio Foundation as part of its new One Earth initiative. The model details a pathway for staying below a 1.5°C temperature rise by transitioning to 100 per cent renewable energy and implementing natural climate solutions.

Enterprise in WASH

Our six-year Enterprise in WASH research project wrapped up in 2018, having assessed the motivations and barriers of entry for micro, small and medium enterprises to establish WASH businesses. The initiative resulted in significant impact in the countries in which ISF worked, shaping policy, building capacity, filling gaps in knowledge and contributing to improved evidence and practice.

Smart Cities

Our ground-breaking Technology for Urban Liveability Program (TULIP) harnesses the Internet of Things (IoT) to build more liveable cities with technologies designed, integrated and delivered around the needs of communities. More than 110 environmental monitoring devices, are being deployed in Lake Macquarie and the City of Sydney, making it the largest mixed-device near-real-time environmental sensor network in Australia.

$7m

External research income

192

Published research outputs, book chapters, journal articles, conference papers and reports

215

Interviews and mentions in Australian and international media

155

Projects

Setting the agenda for change

Events

We are committed to maximising the impact of our research by sharing knowledge in academia, policy debates and public discourse. ISF researchers are frequently called-upon as sustainability thought leaders in mainstream and industry media, and we organise and take part in public events so that our work can have maximum impact towards positive change.

Australia-Finland Innovation Forum

ISF and the Embassy of Finland co-hosted this event in which representatives from Australia and Finland came together to discuss ideas for improving living standards in cities through innovation. Mr Mika Lintilä, the Minister for Economic Affairs of Finland, was a special guest with a delegation of leading Finnish companies. The Lord Mayor of Sydney Clover Moore gave the keynote address and panellists joined ISF's Professor Stuart White and Professor Damien Giurco to discuss the opportunities for advancing connected cities in a circular economy. Held at EnergyLab, this was the 4th Annual Australia-Finland Innovation Forum.

The Gill Owen Memorial Lecture

The Gill Owen Essay Prize competition invites emerging voices to offer their perspective on the future of energy efficiency and social equity. The competition is in honour of Dr Owen, pictured, who was a tireless campaigner in these fields. Dev Tayal was announced as the overall winner of the inaugural competition at a memorial lecture at the State Library of Victoria in February. The competition is in its third year in 2019.

The End of Investment as Usual Debate

Responsible investment is transforming businesses aligned with a high growth green economy. Renowned US environmentalist Bill McKibben was joined by a panel of investment experts to discuss the readiness of Australian business to join this transition and benefit from this shifting investment landscape. The event was a collaboration between the UTS Centre for Business and Social Innovation, ISF and 350.org.

Groundbreaking Book Launched

The UTS Chancellery hosted the launch of: *Transdisciplinary Theory, Practice and Education: The Art of Collaborative Research and Collective Learning*, edited by Associate Professor Dena Fam. With contributions from nearly 50 of the world's leading thinkers in transdisciplinary research, practice and education, the book calls for a shift from siloed disciplinary thinking to transdisciplinary methods and collaborative learning in order to more effectively deal with our planet's most pressing issues.

Energy Transition After the NEG

The NEG (National Energy Guarantee) is dead – but it seems an energy transition is happening in Australia without, or despite, policy intervention from the Federal Government. This UTS public forum hosted by ISF and the Climate Justice Research Centre drew upon industry commentators' opinions and the real-life experiences of communities undergoing transition.

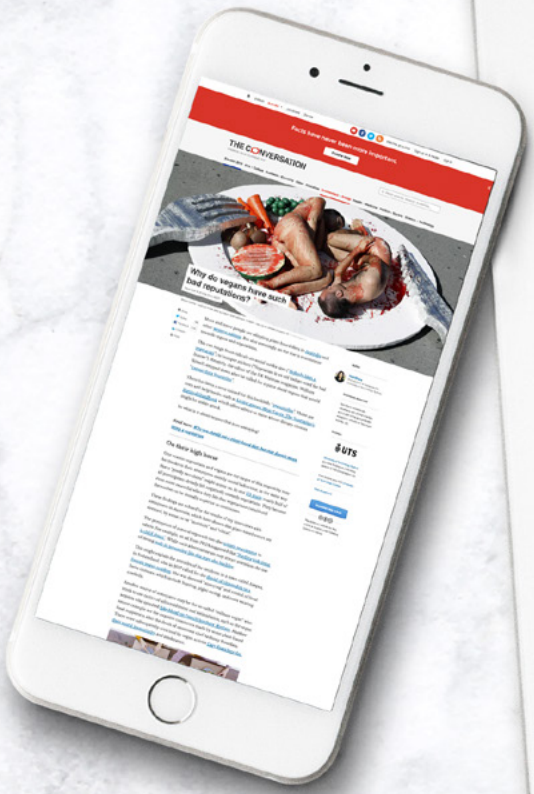
UTS Big Thinking Forum: Consuming the world

Traditional Aboriginal cultures survived for over 65,000 years by appreciating the concepts of sustainability, reciprocity and respect. Today, we live in a society where it's commonplace to engage in consumerism without considering the consequences. ISF research consultant Jenni Downes spoke on waste and consumerism alongside artists as part of Sydney Festival.

Stay updated with our latest research, news and events via **Twitter**, **LinkedIn** and **Facebook** and by signing up to our monthly newsletter the Wrap at **isf.uts.edu.au**

Setting the agenda for change

News



ISF researchers are regularly published by independent global media site The Conversation. In 2018, eight articles were published featuring new research and expert commentary on hot topics. ISF PhD candidate Tani Khara's article **'Why do vegans have such bad reputations?'** resonated with readers - it ranks as UTS's top article on the site, with 136,000 reads and 545 comments at the time of printing.

ISF researchers appeared in 215 stories and interviews in Australia and around the world.

Sydney's housing demand is swallowing farms on the harbour city's fringes

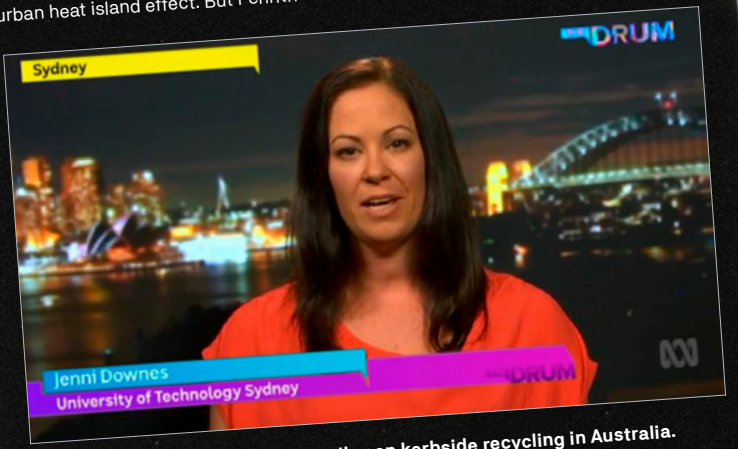
Relentless urban sprawl in the harbour city is swallowing farms on the city's fringes so quickly produce from the Sydney Basin will be almost non-existent within 15 years.
- ABC

Cities adapting to climate change: Penrith plans ahead to beat the heat

Penrith in Western Sydney is feeling the heat of climate change and the urban heat island effect. But Penrith City Council is already reducing climate change impacts and driving down the carbon emissions that contribute to global warming.
- The Fifth Estate

Is the IEA underestimating renewables?

Scenarios from the International Energy Agency (IEA) have failed to predict the growth of renewables and overestimated the role of nuclear. Critics say that's a political choice.
- Deutch Welle



The impact of the 'China Sword' policy on kerbside recycling in Australia.
Senior Research Consultant, Jenni Downes featured on ABC's the Drum

Read the latest ISF news

High quality research

We are committed to producing high-quality, globally-respected research that transcends disciplinary and professional boundaries.

Our researchers collaborate locally and around the world with clients and partners to publish widely in high-impact academic books and journals, as well as in more innovative, accessible and real-world formats tailored to make significant economic, environmental, cultural and social impact.

Publication highlights in 2018

REPORT

Sustainable Supply Chain Relationships

ISF research team:
Alison Atherton, Dr Suzanne Grob, Dr Scott Kelly, Isabel Sebastian

ISF was commissioned by Stewart Investors to develop an understanding of how companies are implementing sustainable supply chain relationships (SSCR) and to ascertain important issues affecting sustainable supply chain relationships.

We performed a sustainability assessment of nine organisations against a performance framework developed for the project. Findings showed that publicly available information may not represent reality, and regional regulatory context can have a strong influence on sustainable supply chain relationships.

Read the report

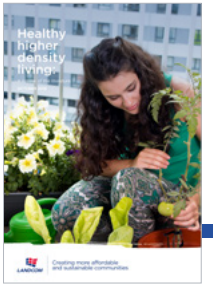
REVIEW

Healthy higher density living: A review of the literature

Authors:
Irena L. C. Connon (UTS), Jason H. Prior (UTS), Jennifer L. Kent (USyd), Leena Thomas (UTS), Susan M. Thompson (UNSW), Erica McIntyre (UTS), Jon Adams (UTS), Anthony Capon (USyd), Chris Rissel (USyd), Harriet Westcott (USyd)

This literature review was undertaken as part of the Healthy Higher Density project which will provide new knowledge and tools to address gaps in the planning of healthy higher density precincts. The project is conducted by Landcom in partnership with UTS, the University of Sydney and the University of NSW.

Read the report



Publication highlights in 2018

47 –

Peer reviewed publications*

(books, book chapters, journal articles, conference papers)

REPORT

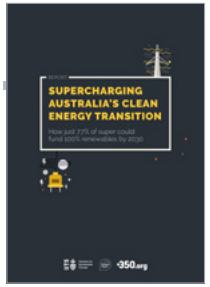
Supercharging Australia's clean energy transition

ISF research team:
Dr Yohan Kim, Dr Scott Dwyer, Dr Sven Teske, Dr Scott Kelly

Lead Author: *Simon Corbell*

The transition to a 100 per cent renewable energy future by 2050 presents a clear and increasingly low-cost pathway for Australia to meet its Paris Climate Agreement commitments, particularly when compared to the decarbonisation challenges in other sectors of the Australian economy. 350.org and Future Super commissioned ISF to assess how Australia's transition to a 100 per cent renewable energy system by can be funded by a proportion of the nation's retirement savings. We found that Australia could achieve a 100 per cent renewable electricity sector (stationary power) by 2030 with investment of just 7.7 per cent of total superannuation holdings.

Read the report



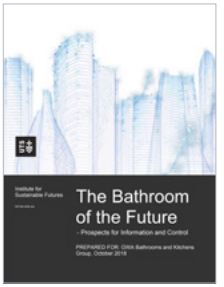
REPORT

The Bathroom of the Future – Prospects for information and control

ISF research team:
Dr Rachel Watson, Jay Falletta, Associate Professor Pierre Mukheibir, Associate Professor Simon Fane

We developed this discussion paper to demonstrate the value and potential applications of smart water management technologies specifically focused on commercial bathroom products. The paper, commissioned by the GWA Bathrooms and Kitchens Group, was developed using available knowledge, with a literature scan of fixture driven innovations, innovations in collecting and using data from fixtures and other monitoring devices. Preliminary data provided by GWA from digital fixtures installed in a commercial application were reviewed by ISF to reveal trends and insights, and to envisage the way future bathrooms could leverage data and thereby control functions to create efficiencies well beyond that of water savings.

Read the report



REPORT

Gender Transformative Climate Change Action in the Pacific

ISF research team:
Dr Keren Winterford, Tamara Megaw, Associate Professor Joanne Chong, Anna Gero

Plan International Australia (PIA) commissioned ISF to undertake research to define what gender transformative climate change action looks like, in order to inform future programme design of Plan's climate resilience projects. The research sought to inform the development of a framework or model for PIA's gender transformative climate change programming, as well as user-friendly tools to inform this programming.

Read the report

 *Research Outputs Collection status as of 30 April 2019

192

Total research outputs

55

Research reports

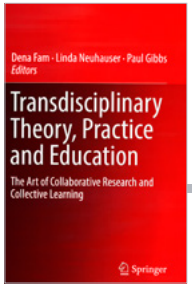
BOOK

Transdisciplinary Theory, Practice and Education: The Art of Collaborative Research and Collective Learning
Springer, 2018

Editors:
Associate Professor Dena Fam (UTS), Professor Linda Neuhauser (University of California), Professor Paul Gibbs (Middlesex University)

This state-of-the art book reviews, explores and advocates ways in which collaborative research endeavours can, through a transdisciplinary lens, enhance student, academic and social experiences. Drawing from a wide range of knowledges, contexts, geographical locations and internationally renowned expertise, the book provides a unique look into the world of transdisciplinary thinking, collaborative learning and action.

Buy the book



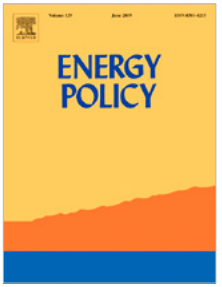
JOURNAL ARTICLE

Local network credits and local electricity trading: Results of virtual trials and the policy implications
Energy Policy Volume 120,
September 2018, Pages 324-334

Authors:
Jay Rutovitz (UTS), Sebastian Oliva (University of Chile), Lawrence McIntosh (UTS) Dr Sven Teske (UTS), Alison Atherton (UTS), Dr Scott Kelly (UTS), Ed Langham (UTS)

Current charging methods for network infrastructure and recompense for distributed energy may not result in optimum system solutions. This paper examines the effects of Local Electricity Trading (LET) and Local Network Credits (LNCs) on different stakeholders in four virtual trials of medium scale distributed generation projects around Australia, and the implications for policy. They found the large value gap between behind the meter systems and grid exports may lead to duplication of network assets, inefficient sizing and operation of distributed generators, and a lack of incentive for dispatchable generators to operate at peak times. The trials indicated that in most circumstances, the combination of LNC and LET addresses all four problems identified to some degree.

Read more



JOURNAL ARTICLE

Risk factors associated with rural water supply failure: A 30-year retrospective study of handpumps on the south coast of Kenya Science of the Total Environment

Authors:
Tim Foster (UTS), Professor Juliet Willetts (UTS), M Lane (Rural Focus Ltd, Kenya), P Thomson (Oxford University), J Katuva (Oxford University), R Hope (Oxford University)

An improved understanding of failure risks for water supplies in rural sub-Saharan Africa will be critical to achieving the global goal of safe water for all by 2030. This retrospective cohort study applies survival analysis to identify factors that predict failure risks for handpumps installed on boreholes along the south coast of Kenya from the 1980s. The analysis is based on a unique dataset linking attributes of hundreds of water points at the time of installation with their operational lifespan over the following decades.

Read more

Key project

Enterprise in WASH

Universal access to water and sanitation is a fundamental human right recognised by the United Nations (Sustainable Development Goal 6). Despite this, nearly a billion people worldwide lack access to these provisions. At ISF we have been addressing this issue for more than two decades through applied research in Water, Sanitation and Hygiene (WASH). One long-term research initiative, Enterprise in WASH, concluded in June 2018.

Enterprise in WASH looked at the emerging role of private enterprise in the provision of water and sanitation services to the poor. The original scope of the research, from 2012 to 2016, focused on the role of private and social enterprises in Indonesia, Vietnam and Timor-Leste, understanding the influences on private sector roles and the motivators, drivers and barriers for enterprises. A key question behind ISF's research was if and how these enterprises were serving the poor.

The second phase, 2016-2018, focused on key research gaps identified during the first phase. This involved a focus on issues of gender and entrepreneurship, associations and other business support mechanisms, life cycle costs for private water enterprises, and entrepreneurship models supporting rural water sustainability.

The initiative resulted in significant impact in the countries in which ISF worked, shaping policy, building capacity, filling gaps in knowledge and contributing to improved evidence and practice.

ISF Research Director Professor Juliet Willetts says one of the key successes of the research was robust evidence on how the poor may be systematically excluded: "Our research showed, for both water services and for sanitation, that whilst private enterprises play a critical role, strengthened regulation and complementary measures are needed to ensure that the poor are not excluded."

Outputs have been widely accessed and used by target audiences with more than 19,000 unique visitors to the project website. Below are just a few examples of impact achieved through engagement with government, CSOs, university partners and other WASH stakeholders.

- Plan Indonesia adjusted their approach to sanitation marketing in Eastern Indonesia as a direct result of research findings, using a new strategy to target private sector government agencies and increasing their focus on gender inclusivity in their enterprise work.
- The Vice-Minister of the Ministry of Agriculture and Rural Development (MARD) Vietnam instructed more than 300 representatives from Provincial Governments to implement the recommendations of our research to support more equitable rural water services.
- SNV Vietnam directly used research findings (that remote communities are expensive to reach and need for alternative approaches to reach these populations) in their subsequent large-scale work with The World Bank across 9 provinces in Vietnam.

Enterprise in WASH was funded through the Australian Government's Australian Development Research Awards Scheme (ADRAS). Collaborators were local universities in Vietnam, Indonesia and Timor-Leste, and Plan International, Thrive Networks, SNV, WaterAid and the Overseas Development Institute.
It resulted in more than 15 peer-reviewed publications, 17 research reports, five policy briefs, six guidance briefs, five in-country national government stakeholder workshops, 16 international conference presentations, three webinars and six training workshops.

SDG 6:
Ensure availability and sustainable management of water and sanitation for all

ISF research partner Rokhima Rostiana from Universitas Gadjah Mada, Indonesia interviewing a water, sanitation and hygiene social enterprise.

2018 was a pivotal year for the International Development team at ISF, who have now won four WASH Research Awards, part of the Government's Water for Women Fund.

Funded by the Department of Foreign Affairs and Trade, the Water for Women Fund aims to support improved health, equality and wellbeing in Asian and Pacific Communities through socially inclusive and WASH projects.

More than $110 million is being invested over four years to deliver 19 implementation projects in 16 countries, as well as 10 research projects with ISF leading four of the latter.

waterforwomen.uts.edu.au

Working in partnership

Achieving our mission of change towards sustainable futures requires genuine connections across all levels of industry, government and civil society. We work hard to build and foster innovative, robust and effective collaborations focused on mutual learning that inform and add value to our research. Here are some examples.

ADAPTING TO CLIMATE CHANGE

Partner: *NSW Office of the Environment and Heritage*

How can urban and rural communities best adapt and respond to climate change? What support should government provide to help promote transformational change? Over five years in collaboration with CSIRO and the NSW Office of the Environment and Heritage, the **Adaptive Communities Node** directly engaged approximately 2,000 people in education, awareness raising and consultation on adaptation issues for the NSW Government's Climate Adaptation Research Hub. The research program continues to inform and influence multiple state and local government climate adaptation policies and initiatives.

REIMAGINING ORGANIC WASTE STREAMS

Partners: *Flow Systems, JLL, Active Research, Avac, City of Sydney*

In 2018 we **investigated the feasibility** of using anaerobic digestion to manage organic waste streams at Sydney's iconic One Central Park. Most waste from residential and commercial tenants is currently lost to landfill and sewers, or transported out of Sydney for processing. Researchers found that capturing and treating food waste, sewage and trade waste on-site could provide residents with renewable energy to supply up to 20 per cent of their electricity needs or 50 per cent of hot water at their apartments.

Next steps are to capture actual data of organic waste streams and identify a plan, potentially with the installation of a demonstration plant. By using this collaborative approach, leveraging research and conducting further investigations, the partners have an opportunity to provide leadership on anaerobic digestion organics management.

One Central Park. Image: Murray Fredericks

ISF and SNV staff in Nepal for rural water sustainability project.

INTERNATIONAL IMPACT

Partner: *SNV Netherlands Development Organisation*

ISF has a long-standing partnership with not-for-profit international development organisation SNV, working together on research and learning activities across their urban sanitation, rural sanitation and rural water supply programs. We merge leading thinking with practical experience to build evidence towards effective, inclusive and sustainable service delivery and strengthened government and market systems.

Our partnership currently spans three programs addressing issues like water supply, sanitation and hygiene in Nepal, Indonesia, Tanzania, Zambia, Bangladesh, Bhutan and Laos. Highlights of our partnership in 2018 included a **comparative study** of approaches to reaching all in rural sanitation across five countries, and participation in a global learning event on inclusive rural water supply.

Working in partnership

ADVANCING CIRCULAR ECONOMY

Partner: *NSW Government*

The 'China Sword' policy brought the waste crisis right to the doorsteps of Australians in 2018. ISF played a key role in government response to this, **informing the development of a circular economy policy statement for NSW**. Drawing on international best practice, our collaborative work with Ricardo went beyond recycling and the waste hierarchy to reimagine and transform how we produce, procure, and use products and services. This work directly informed the Draft NSW Circular Economy Policy that launched in October 2018 and was finalised in February 2019. ISF's reputation as thought leaders in this space was recognised by further invitations to advise other state governments on circular economy best practice.

IMPROVING PACKAGING PRACTICES

Partner: *Australian Packaging Covenant Organisation (APCO)*

We've worked with APCO since 2016 to study **the harmful impact of packaging on the Australian environment** and provide opportunities for industry to improve their practices. Last year we released an innovative packaging sustainability framework and tool enabling companies to benchmark their performance in meeting packaging sustainability targets. They receive immediate feedback on their strengths and weaknesses and can benchmark their performance within their sector. More than 1,000 Australian businesses are using the tool, with international interest.

REPHOKUSING ON PHOSPHORUS

Partners: *Lancaster University, the Agri-Food and BioSciences Institute (Northern Ireland), the Centre for Ecology and Hydrology at Wallingford, the University of Leeds and the University of Technology Sydney*

Phosphorus is a key nutrient required for crop and livestock production, but global reserves of phosphate rock from which fertilisers and feeds are derived are a finite resource. ISF researchers have joined international experts to undertake the first ever phosphorus vulnerability assessment of the UK's food system and co-design a national adaptation strategy.

RePhoKUs aims to re-focus phosphorus use in the UK food system in order to achieve sustainable phosphorus use and deliver valued ecosystem services such as clean water and biodiversity. This transdisciplinary research project forms part of the UK's Global Food Security program. It is funded by the BBSRC, ESRC, NERC and the Scottish Government. The £4.9 million research project is funded by the Global Food Security's 'Resilience of the UK Food System Programme' with the UK's Biotechnology and Biological Science Research Council, the Economic and Social Research Council, the Natural Environment Research Council and the Scottish Government.

INNOVATIONS IN ENERGY

Partners: *A2EP, EnergyLab and Climate-KIC Australia*

ISF is a principal research partner of the **Australian Alliance for Energy Productivity** (A2EP), a not-for-profit coalition of research, business and government leaders promoting a more energy efficient and productive economy.

Last year we partnered with A2EP on the **Renewable Energy and Load Management** (REALM) study, working with some of Australia's largest businesses including IKEA, Woolworths and Schneider Electric. Funded by ARENA, the feasibility study showed that simple investments in load management and existing storage options like chilled water tanks can increase the value from on-site solar power – and deliver low-cost flexibility to help energy markets and networks integrate higher levels of renewable energy.

We led the process for UTS becoming the founding NSW university member of **Climate-KIC Australia**, a knowledge innovation community dedicated to creating a climate resilient and thriving Australia. In 2018, Climate-KIC, WWF-Australia, ARENA and ISF launched the **Business Renewables Centre Australia**, a resource centre and online marketplace platform making it easier for businesses to adopt renewable energy. Already, over 7,000MW of projects listed are on the online marketplace platform, with more than 175 members.

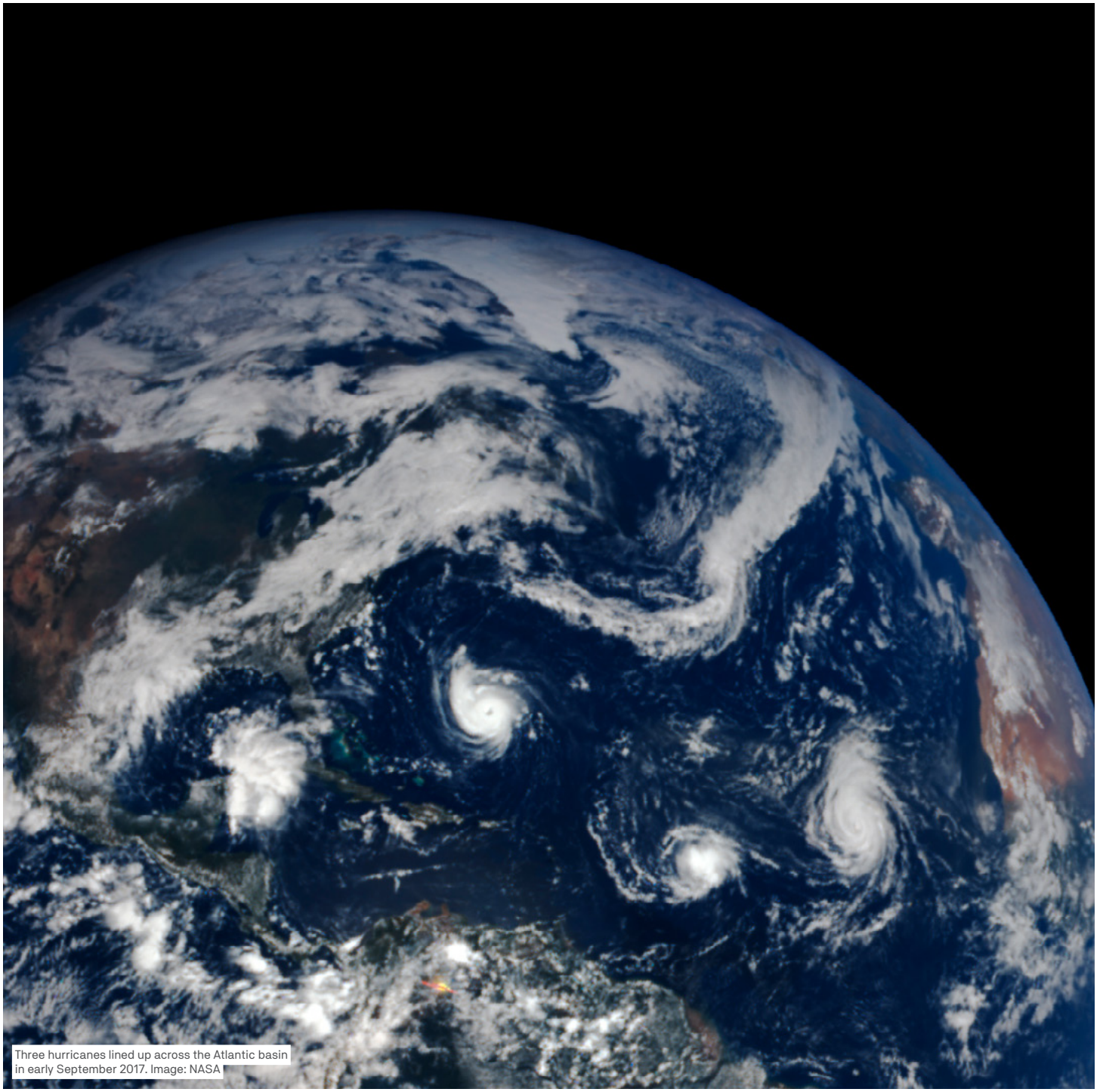
ISF has also continued to support **EnergyLab**, Australia's leading platform for launching energy startups which was set up at UTS in 2017.

A workshop with Hunter Water colleagues

WATER SOLUTIONS

Partner: *Hunter Water*

When **Hunter Water** shifted its purpose in 2017 to 'enabling the life its communities desire', it triggered a shift in our long association with them. We became a trusted partner, asking challenging questions and finding the answers together. Since then, we've engaged on very diverse fronts: our Three Horizons workshop fed into staff's re-envisioning of the organisation; our resilience workshop created a base for a new way of thinking about what matters in water planning. In 2018, our circular economy research and staff capacity building helped create an argument for a decisive shift in wastewater management, biosolids disposal and energy generation; our systems analysis of recycled water revealed significant internal barriers; and throughout, our learning development work provided the scaffolding for significant cultural change.



Three hurricanes lined up across the Atlantic basin in early September 2017. Image: NASA

Key project

One Earth Climate Model

We are already seeing the devastating consequences of global warming, with ever-rising sea levels, extreme storms, prolonged droughts and intensifying bushfires. After two years of research and modelling, 17 researchers at ISF, the German Aerospace Centre and the University of Melbourne have come up with a ground-breaking new framework for achieving – and even beating – the Paris Agreement target of limiting warming to 1.5°C.

SNAPSHOT

How do we keep global warming to 1.5°C?

1. Increase capacity to generate electricity, mostly through solar and wind power. Enable the electrification of all energy uses including power, heating, transportation and industrial uses.
2. Increased storage capacity in the form of battery arrays and pumped hydroelectric (which uses excess generation to pump water up to a reservoir, releasing the energy when needed).
3. Energy efficiency – decreasing overall energy consumption, especially in the developed world, by making buildings, cities, and vehicles more efficient.
4. Repurposing the existing gas pipeline and storage infrastructure to deliver hydrogen produced by renewable sources.
5. Gradual retraining of the energy workforce to participate in the burgeoning green economy.
6. Reforestation and forest restoration.

Funded by the Leonardo DiCaprio Foundation (LDF), the **One Earth Climate Model** shows that the 1.5°C target can be achieved by 2050 through a rapid transition to 100 per cent renewables alongside a major conservation effort to increase the resilience of natural ecosystems and help ensure greater food security. It is the first model to achieve the required emissions reduction without relying on expensive or unproven technologies to draw down greenhouse gases out of the atmosphere.

Researchers, led by ISF's Dr Sven Teske, conducted one of the most detailed climate and energy studies to date, with 72 regional energy grids in hourly increments through to 2050. The model includes a comprehensive assessment of available renewable resources such as wind and solar, and configurations for meeting projected energy demand and storage most efficiently for all sectors over the next 30 years.

Welcoming the framework, LDF founder Leonardo DiCaprio said: "This ambitious and necessary pathway shows that a transition to 100 per cent renewable energy and strong measures to protect and restore our natural ecosystems, taken together, can deliver a more stable climate within a single generation."

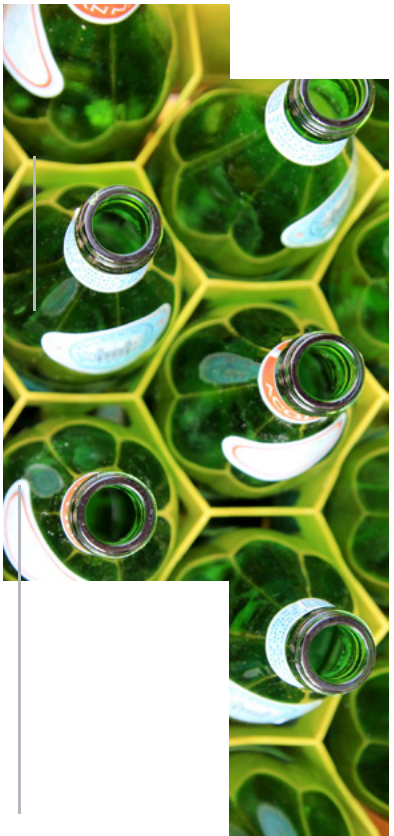
"Scientists cannot fully predict the future, but advanced modelling allows us to map out the best scenarios for creating a global energy system fit for the 21st century," says Dr Teske. "With momentum around the Paris Agreement lagging, it's crucial that decision-makers around the world can see that we can, in fact, meet global energy demand at a lower cost with clean renewables."

The One Earth Climate Model was published as an open access book by Springer in February 2019 and has been downloaded 58,000 times.

Explore the One Earth climate model at: oneearth.uts.edu.au

A lifetime

Our society is transforming to a lifetime of learning. We're driving this change by curating and supporting personal learning opportunities for our students throughout their lives. We've expanded our offerings to include more flexible, real-world and personalised learning experiences that will help create a global community of adaptive learners and thinkers.



Open online courses

Our free course in Systems Thinking was one of the most heavily subscribed online courses of 2018. Systems thinking gives us powerful ways to engage with messy situations and complex challenges and this course provides tools for tackling the problems of today to create a sustainable tomorrow.

Short courses

In 2018 we ran a pilot for a program of short courses on sustainability, offering:

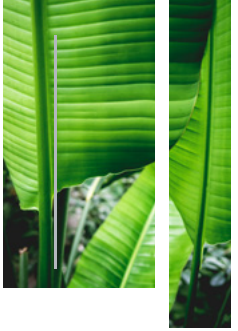
- Behavioural Insights 101 - an introduction to the use of behavioural insights to improve the effectiveness of sustainability behaviour change and engagement projects with a focus on resource efficiency.
- Integrated Transport and Land Use - how transport networks and land uses combine to influence accessibility, land values and housing affordability.

Both were well received and we are planning our next phase of short course offerings.

Award courses

ISF staff codeveloped, coordinated and contributed to the new Bachelor of Creative Intelligence and Innovation. This combined degree encompasses high-level critical and creative thinking, invention, complexity, innovation, future scenario building and entrepreneurship.

A new subject called The Environment, Health and Sustainability (part of the Bachelor of Health Sciences) was taught for the first time in 2018 thanks to the expertise in ISF and UTS Faculty of Health. ISF researchers also contributed to the Faculty of Design, Building and Architecture's Graduate Certificate and Diploma in Property Development, and Graduate Certificate and Diploma in Planning with the Sustainable Urban Development subject.



I liked the variety of activities, the strategies used to communicate with the group and the opportunities to ask questions and provide feedback. It was the most effectively structured and presented course I have ever attended!

Attendee of Behavioural Insights 101 short course

# of learning

Scoping and planning interdisciplinary degrees

Associate Professor Dena Fam and Dr Scott Kelly, under the guidance of Professor Lesley Hitchens, scoped the potential and provided recommendations for the introduction of interdisciplinary degrees at UTS. This was achieved by scanning local and global best practice in the delivery of interdisciplinary programs in research, teaching and learning as well as through strong engagement with senior management throughout the two-year process. An implementation strategy was developed, in consultation with key faculty, to trial two to three pilot interdisciplinary postgraduate degrees.

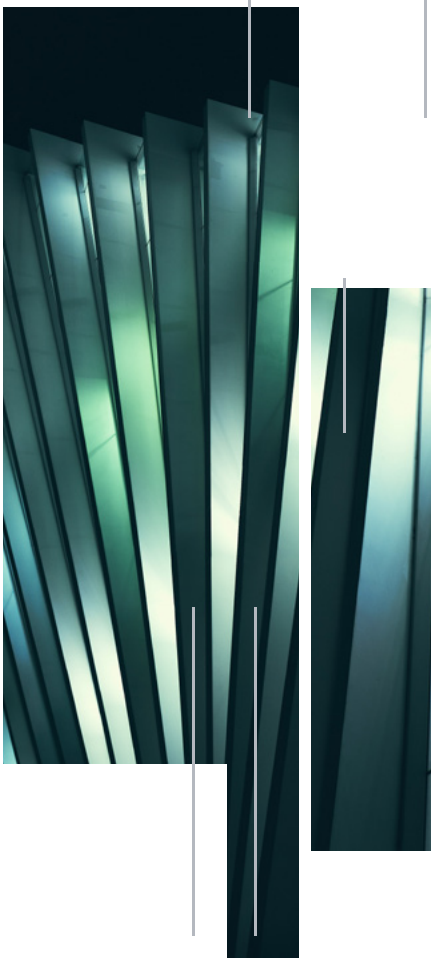
Professor Fam was also involved on the working group to develop a UTS Masters of Global Issues (PRAC). This subject looks at different theories and sector approaches for addressing the creation of sustainable futures.

UTS Teaching and Learning Grant

This grant, led by Associate Professor Fam, will support academics to take transdisciplinary approaches in designing, teaching and evaluating learning experiences for their students, whether at undergraduate, postgraduate or PhD level. Its significance lies in building staff capability as UTS begins to scale up transdisciplinary offerings and collaborating with and contributing to international networks to progress this field.

DAB Design Studios

Associate Professor Fam worked with the Faculty of Design, Architecture and Building in 2016-17 to design and deliver two Interdisciplinary Design Studios. In collaboration with UTS Facilities and Operations staff, NSW EPA, and waste industry partners, students designed a food waste management system at UTS to manage 100 per cent of food waste on campus. The design studios won Associate Professor Fam a UTS Green Hero award in 2018 and she was nominated as a finalist in the 2018 Australian Campuses Towards Sustainability awards.



A Lifetime of Learning

Our post-graduate

We develop research leaders of the future through our post-graduate research program.

Students undertaking their Masters or Doctoral research degree integrate knowledge from diverse academic disciplines to create new perspectives on sustainability challenges. This helps them build a better future in their chosen area.

14

students joined the program in 2018

47

students supervised

PROFILE

Isabel Sebastian (2018)

Looking beyond Corporate Social Responsibility through a holistic systems lens

Dr Isabel Sebastian's PhD thesis examined Corporate Social Responsibility (CSR) in international and Bhutanese businesses to explore how businesses can move beyond conventional CSR practices. Bhutan's Gross National Happiness (GNH) philosophy and its influence on business ethics and sustainability practices highlighted five key dimensions that differentiate 'beyond CSR' from 'conventional CSR' businesses.

Isabel developed the 'Beyond CSR Maturity Model' (BCMM) which allows mapping of businesses against the five dimensions to understand their level of CSR maturity and identify ways to move beyond conventional CSR.

program

8
students
graduated
in 2018

PROFILE

Stephen McGrail (2018)

The roles and use of prospective knowledge practices in sustainability-related transitions

Dr Stephen McGrail's PhD thesis presents an evaluative case study of CSIRO's multi-stakeholder 'futures forums' and analyses forward-looking knowledge practices in transitions. His thesis argues that social, political and reasoning factors strongly condition the use and effects of these prospective practices, often resulting in unintended consequences and less impact than hoped for. The thesis presents related theory-informed lessons for practitioners wanting to harness the potentially productive roles of forward-looking exercises under real-world conditions and provides a novel example of theory-driven impact evaluation.

PROFILE

Laure-Elise Ruoso (2018)

Understanding place identity and productive landscapes peri-urban environments

Dr Laure-Elise Ruoso's PhD thesis examined the politics of place identity and the role of productive landscapes in the peri-urban. Using a framework to describe the different dimensions of place identity, Laure-Elise conducted a case study of Wollondilly Shire in NSW to investigate how these dimensions affected decision-making about urban planning and agriculture. Her research highlighted potential ways the role of agriculture land uses in peri-urban areas can be renegotiated and adapted to exist in harmony with developing peri-urban environments.

PROFILE

Kevin Morrison (2018)

The tale of two taxes: a study of mineral and petroleum resource taxation in Australia

Kevin Morrison's Masters thesis aimed to understand why two mineral resource taxes introduced by the Australian Government based on the same economic theory achieved such different outcomes. The Mineral Resource Rent Tax (MRRT) in 2010 attracted hostility from industry and state governments, split political parties, and perturbed the general public, yet the Petroleum Resource Rent Tax (PRRT) received industry backing and bipartisan political support. Kevin's study adopted an agenda building framework that examined the policy positions of the then Federal Labor Government and the resources sector, and an additional framework based on regulatory capture to fully explain the different outcomes.

Find out more and apply to our post-graduate program

Key project

TULIP blooms in smart cities

Our ground-breaking Technology for **Urban Liveability Program (TULIP)** is helping create smarter, safer and more liveable communities.

TULIP is a government funded initiative led by UTS researchers from ISF and the Faculty of Engineering and IT. It harnesses the Internet of Things (IoT) to build more liveable cities with technologies designed, integrated and delivered around the needs of communities.

How does it work?

TULIP uses networks of sensors to measure environmental variables such as urban heat, air quality and noise, as well as people counting. This data is used to improve planning, design and management of public spaces and services, optimise operations and foster a digitally engaged community.

New LoRaWAN (Long Range Wide Area Network) smart city network technology uses inexpensive battery powered sensors to build a network of connected data points that enables high definition mapping of real time environmental conditions. Data is accessible to everyone thanks to an IoT network that anyone can connect to on their smart device.

Andrew Tovey, ISF Senior Research Consultant and TULIP Manager says the project is allowing UTS to play at the forefront of smart city development. “This technology not only has the potential to revolutionise the way we design and manage cities, but it also places communities front and centre, and that’s a game changer,” says Andrew.

“People can get direct access to this technology and to the data it produces. I think we’re about to see an explosion of citizen science and community advocacy in this space that will spark significant discussions about urban liveability, environmental justice and climate adaptation.”

Smart neighbourhoods

TULIP now has two LoRaWAN gateways deployed in Lake Macquarie and two on the UTS campus, serving the Sydney CBD. They connect to The Things Network, a global movement for open access community that enables anyone to connect devices for free. The project is already engaging community members and schools in Lake Macquarie, who can host LoRaWAN connected sensors that collect data on urban heat, helping them to understand extreme heat events and mitigate their impacts. The project has also delivered three public art installations in partnership with Lake Macquarie City Council, that use smart LEDs that respond to real time data on temperature, air quality, rain, wind and severe weather warnings.

With 90 environmental monitoring devices being deployed in Lake Macquarie, and another 18 in the City of Sydney, this is the largest mixed device, near real time environmental sensor network in Australia. Data collected will be shared online, enabling anyone to devise innovative ways to use the information to benefit the community.

ISF Senior Research Consultant Andrew Tovey (right) with School of Civil and Environmental Engineering Lecturer Dr Nic Surawski (left)

In 2019 TULIP expanded to include two more programs:

We're working with **Lake Macquarie City** and **Northern Beaches Councils** to make beaches safer and improve public amenities.

- Smart infrastructure will monitor wave and swell movement to detect dangerous conditions while visitor activity will be monitored to gauge which beaches and amenities are busiest.

We've partnered with **Parramatta Council** and **PAYCE** property developers to develop a climate responsive neighbourhood at Melrose Park, a residential build of up to 10,000 apartments.

- Seventy sensors will provide data on climatic events and construction impacts which will be used to manage environmental performance on-site and support the delivery of a clean, cool and quiet community. Project partner ESRI GIS will deliver realtime visualisation of TULIP data, helping people to better understand and respond to it.

A smart temperature sensor being installed in Charlestown

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