



LOW CARBON LIVING  
CRC

# Catalogue of Higher Degree Research

Edition 2



## This catalogue

Our higher degree researchers (HDRs), PhD and Master's students, undertake unique, thorough and important research that underpins our vision of transforming Australian communities to a low carbon future.

Our higher degree research program builds upon traditional higher degree research training by integrating evolving industry needs with professional development to produce 'industry-ready' graduates that have had a collaborative, deep, applied and collegiate learning experience.

This catalogue summarises the research conducted by each of our HDRs. The research is either stand-alone or part of a larger project within one of our three complementary research programs:

<b>Integrated Building Systems</b>	Developing new low-carbon products and services and finding ways to communicate best practice design through rating tools, standards and display homes.
<b>Low Carbon Precincts</b>	Creating models, guidelines, standards and data for delivering low carbon developments at a precinct level and communicating best practice sustainable city planning through exemplar precinct developments and tools.
<b>Engaged Communities</b>	Capturing and building a new community appetite for low carbon living.

If you would like details of our projects and their outputs, please refer to our project catalogue which is available on our website.

## The CRC for Low Carbon Living

We are Australia's only end user driven national research and innovation hub whose core purpose is to transform the built environment to a low carbon future. Our mission is providing industry and government with collaborative research which captures community imagination and creates opportunities for low carbon technologies, materials, design and planning innovations. These social and technology solutions, and policy evidence will facilitate the transition to a low carbon built environment.

## Contact us

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#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
	First	Last						
<b>PROGRAM 1 INTEGRATED BUILDING SYSTEMS</b>								
RP1001	Mehrdad	Farshchimonfared	UNSW	<b>PV/T air systems for residential buildings in Australia</b>	<p><u>Context</u> The integration of photovoltaic thermal (PV/T) heating and cooling systems into Australian residential buildings has considerable potential in reducing energy demands and thus carbon emissions. However, further research is required to understand the optimum design parameters for different housing typologies, air mass flow rates and climate.</p> <p><u>Research question</u> What are the optimum design parameters for generic PV/T air systems for different types of residential houses and climates?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Monitor and analyse an experimental BIPV/T and solar thermal air system</li> <li>• Investigate the sensitivity of the PV/T air system thermal energy outputs across a wide range of air mass flow rates</li> <li>• Develop and validate a steady state model</li> <li>• Use the model for parametric optimization analysis</li> <li>• Model and validate the BIPV/T air system in TRNSYS.</li> </ul>	This research will support designers, builders and developers understand and implement the best PV/T solutions to heat and cool residential houses.	PV/T air system, thermal energy, air mass flow, BIPV/T, steady state model, residential houses	Nov 2018
RP1002	Ali	Shirazi	UNSW	<b>Thermal modelling of solar absorption systems for air-conditioning applications in large buildings</b>	<p><u>Context</u> Solar heating and cooling (SHC) systems are currently under rapid development and deployment due to their potential to reduce fossil fuel consumption and greenhouse gas emissions in the building sector. Absorption chiller technology (traditionally powered by natural gas in large buildings) can be retrofitted to run fully, or in part, on solar energy. Multi-effect absorption chillers can operate more efficiently than single-effect chillers when coupled with high-temperature solar thermal collectors. Although these have been on the market for a while, experimental testing, standardisation, and systematic comparative investigations of their performance and viability are lacking.</p> <p><u>Research question</u> What is the techno-economic feasibility of solar-assisted single-, double-, and triple-effect absorption chillers against a common set of energetic, economic, and environmental metrics from a holistic perspective?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Couple LiBr-H<sub>2</sub>O single-, double-, and triple-effect absorption chillers with solar thermal collectors.</li> <li>• Model chiller configuration with different design options in a transient system simulation environment (TRNSYS 17).</li> <li>• Investigate the impact of solar beam radiation to global radiation ratios on the size of the solar field</li> <li>• Develop a detailed multi-objective optimisation model for the design, control scenarios and operational modes of the systems</li> <li>• Prototype a solar cooling double-effect chiller.</li> </ul>	<p>This research will provide insight into the real-world performance of multi-effect chillers when coupled with high-temperature concentrating solar thermal collectors.</p> <p>The model developed will compare the energy, environmental, and economic performance of various configurations to identify optimal designs. Occupant thermal comfort and the influence of the latent loads on the system performance will also be addressed.</p> <p>This research will be of benefit to building designers and facilities managers.</p>	Solar heating and cooling (SHC) systems, absorption chillers	Aug 2016

#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
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RP1009	Christian	Criado-Perez	UNSW	<b>Evidence based decision making</b>	<p><u>Context</u> Evidence-based decision-making (EBDM) is not widely practised and not to its full potential. As a result, valuable opportunities are being lost, including opportunities to create better buildings and increase the expertise of the professionals who make pivotal decisions.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What is EBDM?</li> <li>• Does ethical practice demand EBDM?</li> <li>• What contextual and individual factors predict EBDM?</li> <li>• What are the organisational outcomes from adopting EBDM?</li> </ul> <p><u>Methodology</u> Lab experiment, longitudinal survey and interviews.</p>	The research will help foster the adoption of EBDM and will be valuable for policy makers, industry bodies, managers and team leaders.	Decision-making, evidence-based practice, evidence-based design	Mar 2021
RP1009	Subhadarsini	Parida	Curtin	<b>The effect of green buildings on performance, productivity and wellbeing: study of office buildings</b>	<p><u>Context</u> Building users' behaviour is influenced not just by the space they occupy, but by their feelings, intentions, attitudes and expectations, and the social context in which they operate. It is possible to have 'green' buildings with 'grey' occupants. User experience offers a better understanding not only of how behaviour is influenced by the environment, but also how users act on their environment and how such behaviour redefines the user-building relationship.</p> <p><u>Research question</u> What is the impact of green buildings on employees' productivity and wellbeing?</p> <p><u>Methodology</u> Mixed methods sequential explanatory design.</p>	<p>This research offers a new conceptual perspective on the socio-cultural and psychological factors influencing employees in green buildings. Prior research has been confined to the technical factors such as indoor environmental quality, temperature, lighting, and acoustics.</p> <p>This research will benefit developers, policy-makers and tenants occupying green buildings.</p>	Green office buildings, green organisational function, organisational culture, green behaviours, employee performance	Oct 2018
RP1010	Zichao	Meng	UNSW	<b>Investigating the gap between simulated and measured performance of a low energy house in Sydney</b>	<p><u>Context</u> Research studies have suggested that the real-world energy performance of residential developments differs to the predictions of pre-construction performance models.</p> <p><u>Research question</u> How can we improve the validity of residential development energy performance assessment models?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Identify the performance gap of an energy efficient detached two-storey house (CSR House, Sydney) using blower door tests, thermal imaging and co-heating tests</li> <li>• Assess the influence of air-tightness, insulation, thermal mass and ground temperature</li> </ul>	This research will assist building designers, builders and developers deliver homes whose energy efficiency better matches expectations and provide insights into what building elements should be focussed upon to maximise efficiency gains.	Residential home energy efficiency, performance models, thermal mass, blower door, air-tightness, insulation, U value, R value	Mar 2018

RP1011	Malay	Dave	UNSW	<b>High performance prefab housing: Towards an evaluation framework for environmental sustainability and economic affordability</b>	<p><u>Context</u> Provision of adequate and affordable housing is a major challenge in both emerging and established economies, especially in the context of climate change and other environmental issues. Prefabricated (prefab) housing can play a key role in addressing the challenges, however there are research gaps in design for optimal performance.</p> <p><u>Research question</u> How can design in prefab housing lead to high performance in sustainability and affordability?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• International industry survey</li> <li>• Targeted Australian case studies</li> <li>• Semi-structured interviews of experts</li> <li>• Develop and validate a decision-support framework</li> </ul>	<p>This research offers a new insight into the performance and perception of economic affordability and environmental sustainability in prefab housing.</p> <p>The outcome of this research is expected to benefit the prefab building industry. It will aid the industry in design evaluation, comparison and decision making, and in delivering more effective response to the pressing needs for housing by developing solutions for high performance low carbon and affordable housing.</p>	Prefabrication, housing, design, environmental sustainability, economic affordability	Dec 2018
RP1013	Hua	Fan	UNSW	<b>Modelling of distributed energy demand, efficiency, storage, and generation for residential smart grid integration</b>	<p><u>Context</u> The residential sector represents approximately 30% of global electricity consumption, but the underlying drivers are still poorly understood. The drivers are many, varied, and complex, including local climate, household demographics, household behaviour, building stock and the type and number of appliances. There is considerable variation across households and, until recently, often a lack of good data.</p> <p><u>Research question</u> How can we model and influence residential energy behavioural and demand response?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Drawing upon a detailed household dataset from the Australian Smart Grid Smart City project, develop and compare models to simulate various strategies for annual and peak demand reduction, and socioeconomic evaluations at a city (Sydney) scale</li> <li>• Investigate annual demand reduction interventions using feedback systems</li> </ul>	<p>The research will develop and test two statistical models for household annual electricity demand and half-hourly peak electricity demand.</p> <p>These models will be useful for a range of stakeholders, including individual households trying to understand the potential implications of different choices and utilities looking to better forecast the impact of different possible residential trends. The model would also be very helpful to grid operators seeking better reliability while avoiding augmentation and to policy makers seeking to improve householder's energy efficiency through targeted policies and programs.</p>	Residential energy sector, demand-response, peak electricity demand, forecasting	Jan 2017
RP1014	Jianzhou	Zhao	UNSW	<b>Impact of energy efficient pool pumps on peak demand, energy costs and carbon reduction</b>	<p><u>Context</u> Residential swimming pool pumps use significant amounts of energy. At present, about 10% of Australian homes have a swimming pool that contribute ~0.5% of Australia's total annual greenhouse gas emissions (~3 Mt of CO<sub>2</sub>). Despite this, there are few studies that investigate the energy saving potential of variable speed swimming pool pumps.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What energy efficiencies can be generated by using variable speed pool filter and pool solar heating pumps?</li> <li>• What are the associated impacts on key system components?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Experimental work on residential swimming pools.</li> <li>• Develop simulation models</li> <li>• Validate models against in-field data</li> </ul>	<p>If all solar pool heating systems in Australia operate at a lower flow rate and low pump speed as proposed by this project, it could save approximately 180 GWh of electricity per year, which corresponds to approximately 150 kilotons of carbon emission abatement.</p> <p>The targeted end-users are residential pool owners. Other end-users like governments, local city councils, and industry partners can also benefit from the research outcomes.</p>	Solar collector, residential swimming pool, low speed pumping, high-efficiency pumping	Aug 2018

RP1015	Jinyi	Guo	UNSW	<b>Utilisation of flat plate photovoltaic thermal (PV/T) technology for a low temperature desiccant air dehumidification and cooling system</b>	<p><u>Context</u> Utilising solar energy as the main energy source for air conditioning systems can reduce coal fired electricity consumption and greenhouse gas emissions. Combining desiccant air dehumidification and cooling systems powered by solar energy are a novel solution that has considerable potential to maximise the use of this renewable resource.</p> <p><u>Research question</u> What is the feasibility of utilising flat plate PV/T collectors as the main energy source for desiccant cooling systems?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Separately test a desiccant cooling system and a flat plate PV/T water heating application</li> <li>Develop and validate theoretical models against experimental results.</li> <li>Examine a novel ground coupled flat plate PV/T desiccant cooling cycle</li> </ul>	This research will reveal the parameters that influence the performance of desiccant air dehumidification and cooling systems, and thus how their design can be optimised for use with solar energy. This will be invaluable for building designers, operators and developers.	Flat plate, PV/T collectors, desiccant air dehumidification, cooling systems	Mar 2018
RP1015	Simao	Lin	UNSW	<b>Combining a building integrated PVT system with a low temperature desiccant cooler to drive affordable solar cooling</b>	<p><u>Context</u> Affordable solar powered cooling can be advanced through novel solutions that combine PVT and desiccant cooling to produce efficient solar thermally driven heating, ventilation and air-conditioning (HVAC) systems.</p> <p><u>Research question</u> Can an integrated PVT and desiccant air system provide cost effective cooling in summer and heating in winter?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Create and validate a building thermal model</li> <li>Design a solar desiccant wheel and IEC HVAC system based on the simulated results of the model.</li> <li>Combine the building thermal model and the system to estimate the energy performance</li> <li>Examine broad application of the solution by establishing a commercial building thermal model based on a shopping centre</li> </ul>	<p>This research will create a complete PVT and desiccant heating, ventilation and air-conditioning (HVAC) system.</p> <p>This novel combination has the potential to significantly reduce HVAC energy demands in both commercial and residential applications. The use of the desiccant allows the creation of optimum humidity levels.</p>	Desiccant cooling, IEC cooling, solar desiccant cooling, PVT, dehumidification	Mar 2018
RP1015	Xingchao	Zhou	UNSW	<b>Internally water cooled desiccant wheel</b>	<p><u>Context</u> Photovoltaic panels convert between 5-15% of the incoming solar radiation into electricity. About 80% of the remaining solar radiation is dissipated as waste heat. This waste can be harnessed.</p> <p><u>Research question</u> How can we develop an internally cooled desiccant wheel for use in the heating and cooling of buildings?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Build a mathematical model to simulate the performance of the internally cooled desiccant wheel</li> <li>Prototype, test and improve the wheel's design</li> </ul>	This research investigates the ability to cool buildings using waste heat from photovoltaic/thermal (PVT) collectors to drive a desiccant based thermal cooling system. An integrated and efficient desiccant and PVT air conditioning system has the potential to reduce energy use by more than 50%. Accordingly, this research will be of value to developers and building owners seeking to reduce a building's energy consumption.	Desiccant wheel, non-adiabatic process, dehumidification, air-conditioning	Jan 2019

RP1017	Marini	Samaratunga	UNSW	<b>Modelling residential energy consumption behaviour</b>	<p><u>Context</u> The Building Sustainability Index (BASIX) is a sustainability planning measure to improve energy and water efficiency for all new residential buildings in NSW. The decision to meet or exceed BASIX minimum standards is usually made by builders and supply chain actors in the design-construction process. These minimum standards are sometimes seen as the 'ceiling' rather than the 'floor', resulting in a lack of motivation for builders and home buyers to go beyond minimum standards.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What behaviours contribute to residential energy consumption?</li> <li>• What are the attributes that influence residential energy consumption behaviour?</li> <li>• How can the evidence on potential energy consumption behaviours and their attributes, inform sustainability assessment, dwelling design and policy decisions?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Monitor 23 free standing houses and seven apartment units with BASIX certification in the Greater Sydney region.</li> <li>• Face to face interviews in both cool and warm seasons.</li> <li>• Thematic data analysis.</li> </ul>	<p>Research outcomes will help improve sustainability assessment tools such as BASIX as well as building designs by incorporating human behavioural factors, which ultimately would contribute to low carbon living (LCL) targets.</p> <p>Government departments such as NSW Department of Planning and Environment, Office of Environment and Heritage, City of Sydney council and Department of Industry and Science are partners of this project and will benefit from this study.</p>	Building Sustainability Index (BASIX), energy consumption behaviour in dwellings, evidence-based behaviour modelling	Mar 2019
RP1017	Krishna	Munsami	UNSW	<b>A diagnostic model for thermal performance assessment of the building model</b>	<p><u>Context</u> Buildings are major consumers of energy for heating and cooling. The number of buildings is growing rapidly with demand for energy. To reduce consumption, governments worldwide have implemented codes, standards, and building practices. In New South Wales, Australia the planning department introduced a web-based energy-modelling tool intended to increase the thermal performance of the residential building's envelope prior to development applications. The modelling tool, Building Sustainability Index (BASIX) was introduced in 2004. Building codes and standards in themselves are not perfect instruments but guidelines to achieve building objectives. However, there is evidence in literature stating that buildings are not achieving the predicted results in thermal performance leading to increased energy consumption.</p> <p><u>Research question</u> How will building envelope conditions such as infiltration, thermal break and insulation affect the actual energy performance of residential buildings?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Investigation of the thermal performance of the building envelope against predicted outcomes</li> <li>• Development of a diagnostic model for thermal performance</li> <li>• Diagnostic and analysis of a set of BASIX-affected dwellings</li> <li>• Identification of the improvements of the building envelope to achieve higher thermal performance.</li> </ul>	Understanding the expected building thermal energy performance against actual performance has utility for builders, developers and designers as well as government decision-makers responsible for implementing building performance standards.	Building Sustainability Index, BASIX, thermal performance, energy efficiency, building envelope	Mar 2019
RP1020	Kirubajiny	Pasupathy	Swinburne	<b>Laboratory and field investigation of geopolymers using non-destructive</b>	<p><u>Context</u> Geopolymer concrete is a low carbon alternative to traditional concrete. However, studies on its long-term durability in the real-world are limited.</p>	Geopolymer concrete is a positive low carbon cement alternative, with one tonne of its production releasing around 0.184 tonnes of CO <sub>2</sub> , compared to one tonne of CO <sub>2</sub> for	Durability, field environment, carbonation	Oct 2018

				<b>and destructive methods</b>	<p><u>Research question</u> Is geopolymer concrete durable in real environments?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Collect core specimens from in-field geopolymer concrete structures</li> <li>Evaluate the durability of geopolymer concrete using laboratory testing methods.</li> </ul>	<p>traditional concrete. This research will measure the durability of low carbon geopolymer concrete in real-world applications.</p> <p>Construction industries will benefit from this research.</p>		
RP1020	Jin	<b>Dang</b>	UNSW	<b>Investigation of serviceability and durability of geopolymer concrete by embedded sensors</b>	<p><u>Context</u> Geopolymer concrete (GPC) is a low carbon alternative to cement that is made from ordinary Portland cement (OPC). The substitution of GPC can result in a reduction of carbon dioxide emissions of up to 80%. However, there is limited research on the performance and durability of GPC.</p> <p><u>Research question</u> What is the serviceability and durability of GPC?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Install a structural monitoring system in a GPC composite bridge.</li> <li>Monitor performance via an embedded vibrating wire strain gauge were embedded in the bridge deck (strain and</li> <li>Measure thermal conductivity of GPC</li> <li>Develop a finite element model (FEM) to verify the monitoring data.</li> <li>Perform saturation tests on the GPC to study the relationship between pH and moisture</li> <li>Develop a calibration model to correct the sensors for moisture effects</li> </ul>	<p>This research will assess the performance of GPC and impact of thermal loading. It will also consider whether the existing Australian Standard AS5100 specifications are suitable for GPC, and report on the utility of in-situ sensors for measuring the performance of GPC. This knowledge will be useful for building designers and builders, as well as concrete manufacturers.</p>	<p>Geopolymer concrete (GPC), ordinary Portland cement (OPC), durability, serviceability, embedded sensors</p>	Aug 2016
RP1020	Seyed	<b>Mahdi Babae</b>	UNSW	<b>Durability of geopolymer concrete in the marine environment</b>	<p><u>Context</u> A reduction in carbon emissions of up to 80% can be achieved using the geopolymer concrete (GPC). However; as a new engineering material, there are concerns over its durability and long-term performance.</p> <p><u>Research question</u> What is the durability and performance of different types of GPC?</p> <p><u>Methodology</u> Experimental and numerical studies of a range of GPC recipes.</p>	<p>This project will inform the development of a GPC manual published by Standards Australia. The manual will support uptake of GPC by industry stakeholders, particular local government, developers and transport authorities who are developing concrete-based infrastructure.</p>	<p>Geopolymer concrete, GPC, marine environments, concrete, durability, performance</p>	Jan 2017
RP1021	Robert	<b>Enker</b>	Curtin	<b>The role of building regulation as a policy instrument for accelerating transition to a low carbon built environment</b>	<p><u>Context</u> A persuasive, well documented case can be made for addressing the performance of buildings to deliver abatement of greenhouse gas emissions in tandem with economic, strategic and societal benefits; however, progress cannot be made in this domain until more effective policy instruments are deployed within a comprehensive policy context.</p> <p><u>Research question</u> What Government policy measures will be effective in reducing greenhouse emissions from the building sector?</p> <p><u>Methodology</u> Review and benchmark international best practice, particularly in the EU and US compared to Australian approaches.</p>	<p>Overall, findings are expected to inform the wider public policy debate around the public costs and benefits of environmental regulation, as well as challenging the notion of regulation as economically constricting red tape.</p> <p>This research is expected to be used by agencies involved in the development and implementation of national building codes. It will also provide a basis for evaluating the stringency and effectiveness of Australia's National Construction Code.</p>	<p>Buildings, regulation, climate change, energy efficiency, policy</p>	Dec 2018

RP1023	Baran	Yildiz	UNSW	<b>Load forecasting and home energy analysis in residential energy management solutions</b>	<p><u>Context</u> Households with solar and batteries have a lot of potential to reduce and effectively manage their electricity consumption. However, easy to use forecasting tools are required.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What are the most effective methods to forecast electricity loads for individual households?</li> <li>• How can we utilise load forecast information within smart home energy management solutions?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Use statistical and machine learning methods to analyse household loads and forecast electricity loads.</li> <li>• Use optimisation methods to integrate load forecasts into simple appliances and analyse potential savings.</li> </ul>	<p>Accurate electricity load forecasts will enable smart home energy management systems to effectively optimise household appliance operations and PV use. This has significant potential to reduce the household energy use and related CO<sub>2</sub> emissions.</p> <p>The research could be used by households and energy companies.</p>	Load forecasting, smart homes, smart grids, machine learning	Oct 2018
RP1023	Bibek	Joshi	UNSW	<b>Forecasting distributed photovoltaic (PV) generation and home energy analysis</b>	<p><u>Context</u> PV generation forecasts are crucial for electricity grid management. However, studies on its value for residential energy management are limited.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What are the most effective methods for forecasting distributed PV generation?</li> <li>• What is the value of PV generation forecasts for residential energy management?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Improve the existing methods of PV generation forecasting using statistical and machine learning methods.</li> <li>• Integrate PV generation forecasts into residential PV electricity system using optimisation methods and analyse the impacts of different attributes of forecasts on potential savings.</li> </ul>	<p>The research will be of interest to PV system owners, PV system monitoring service providers, PV power plant operators and electricity network managers.</p> <p>Accurate distributed PV generation forecasts will facilitate effective energy management in grids and enable home energy management systems to optimise energy consumption and usage of PV power.</p>	PV generation forecasting, Solar irradiance forecasting, Numerical Weather Prediction, Machine learning	May 2019
RP1032	Sharon	Young	UNSW	<b>Scenario modelling of the effects of high penetration household distributed energy according to electricity tariff type</b>	<p><u>Context</u> There has been a high uptake of household solar photovoltaic (PV) in Australia. A similar trajectory for household battery storage is equally possible depending upon the governments' policy approaches, particularly in relation to tariffs.</p> <p><u>Research question</u> How do different electricity tariff regimes impact the uptake of household battery storage and how does that affect the energy industry?</p> <p><u>Methodology</u> Scenario modelling using different tariff structures and market penetration.</p>	<p>The research will inform distributed energy market models, facilitating better usage of distributed energy resources in Australia.</p> <p>Key users of the research include distribution networks, AEMC/AEMO, advocacy groups and energy utilities.</p>	Distributed generation, storage, tariffs.	Aug 2018

RP1036	Luke	<b>Marshall</b>	UNSW	<b>Decentralised electricity markets</b>	<p><u>Context</u> Renewable energy and distributed energy technologies are on the rise but have not been considered in the design of market mechanisms – the tools by which operational and investment decisions are made in Australia's electricity network.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How will renewable energy and distributed energy resources interact with the electricity market?</li> <li>• What are the key areas for market reform to support decarbonisation</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Use machine-learning to assist in mining NEM datasets for evidence of market power and the impact of renewables</li> <li>• Apply algorithmic game theory to assess the ability of existing market mechanisms to incorporate various renewable energy scenarios</li> <li>• Test findings using a computational economics approach.</li> </ul>	The research will produce a software simulation tool to help identify key areas of reform for decarbonisation in the electricity sector.	Mechanism design, artificial intelligence, machine learning, algorithmic game theory	Dec 2019
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#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
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<b>PROGRAM 2 LOW CARBON PRECINCTS</b>								
RP2002	Giles	Thomson	Curtin	<b>Transitioning to regenerative urbanism</b>	<p><u>Context</u> The global impact of human lifestyles and activities is unsustainable. Regenerative urbanism is an emerging planning approach that seeks to deliver liveable and sustainable urban spaces.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How can we mainstream the transition toward regenerative urbanism?</li> <li>• How can governance deliver and manage regenerative urban development outcomes?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Scoping study of national and international initiatives for low carbon precincts</li> <li>• Case studies comparing the performance of various urban morphologies</li> </ul>	The research outlines a range of recommendations for policy makers and industry to support regenerative urbanism.	Local authorities, key building stakeholders and consultants involved with urban design projects.	Oct 2016
RP2002	Ivan	Iankov	UniSA	<b>Developing greenhouse gas emission rates for traffic on Australian roads</b>	<p><u>Context</u> Reliable and robust greenhouse gas emission (GHG) rates for light vehicles is necessary for understanding and forecasting transport GHGs, and for developing appropriate emission mitigation strategies.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What are the confidence intervals for tank-to-wheel greenhouse gas emission rates for light vehicles (e.g. passenger car) traffic in Australia?</li> <li>• What is the influence of vehicle size, year of manufacture and traffic condition on emission rates for Australian road traffic?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Assess the greenhouse gas emission rates for light vehicle traffic loads</li> <li>• Utilise cost forecasts to predict the Australian market for new light vehicles.</li> <li>• Model expected manufacturing costs for fitting fuel-efficient technologies to light vehicles</li> <li>• Model expected running cost of light vehicles fitted with fuel efficient technologies</li> </ul>	This research will provide valuable information for determining the efficiency of light vehicles in Australia (1990-2030) and discuss the influence of vehicle size, year of manufacture and traffic condition on emission rates for Australian road traffic. This knowledge will assist transport and city planning professionals.	Light vehicles, traffic, road, vehicle	Dec 2016
RP2002	Steven	Percy	UniMelb	<b>Demand simulation and microgrid design for low carbon precincts</b>	<p><u>Context</u> Internationally, the residential sector makes up 31% of global energy use. In 2015, Australian households were responsible for 23.5% of Australia's total net electricity demand annually. Coal-fired generation is projected to continue to supply the bulk of Australia's electricity requirements to 2035. However, the residential sector has the potential to move to a low carbon future through the increased application of distributed generation and distributed storage, microgrid systems, new demand response methods, innovative passive building designs and improved energy efficiency. Improved modelling and optimisation can reduce financial risk and improve the business case for the deployment of such technologies.</p>	<p>The research will develop integrated models to optimise the costs of and opportunities for a low carbon energy supply enabled by distributed energy and microgrid solutions. This information will support developers, precinct planners and local governments.</p> <p>Although the focus is on Australian energy demand and microgrid opportunities, the techniques and methodologies are applicable more broadly.</p>	Electricity demand, microgrid, PowerFactory, battery storage, distributed generation.	Jan 2017

#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
	First	Last						
					<p><u>Research question</u> How can we develop an integrated modelling and optimisation framework to design, build and test the business case for low carbon microgrid precincts with storage and distributed generation technologies at their core?</p> <p><u>Methodology</u> Develop a modelling framework of four components:</p> <ul style="list-style-type: none"> <li>• An electricity demand model for the estimation of household and precinct load behaviour in urban precincts.</li> <li>• A standalone solar and battery model for analysing impacts on demand, costs and selecting optimal capacities.</li> <li>• A microgrid model for comparing distributed and utility storage options, and analysing impacts of installed capacity on grid demand and cost.</li> <li>• A microgrid network model using PowerFactory software for verifying the network voltage levels and losses of the microgrid designs.</li> </ul>			
RP2002	He	He	UniSA	<b>Input-output analysis on relationships between Australian economic system and waste management</b>	<p><u>Context</u> Innovative approaches to waste treatment are required to support the sustainable development of cities, in particular the transition from a linear economy to a circular economy.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What are the relationships between the Australian economy and waste flows?</li> <li>• How does the development of the Australian economy and environmental policies affect waste generation and treatment?</li> <li>• How does household consumption affect waste generation and treatment?</li> <li>• What are the major macroeconomic drivers for waste generation?</li> <li>• How does the development of these drivers affect the trend of waste generation?</li> </ul> <p><u>Methodology</u> Input-output analysis.</p>	This research will provide insights for policy-makers on how the Australian economy interacts with waste generation and treatment in Australia. This will inform, for example, better formulation of waste levies.	Environmental economic, input-output analysis, waste management, structural decomposition analysis	June 2017
RP2005	Gertrud	Hatvani-Kovacs	UniSA	<b>Urban heat stress resilience</b>	<p><u>Context</u> As heatwaves are becoming more common and persistent, our communities are increasingly turning to airconditioners to keep cool. However, this adds to energy costs, energy poverty and carbon emissions. Airconditioning units also create heat, adding to urban heat island effects.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How can negative heatwave impacts be assessed across climates?</li> <li>• What are the interrelationships between heat-related well-being and heat stress resilience?</li> <li>• How do these interrelationships vary among different housing typologies?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Analyse the connections between heatwave intensity and impact</li> </ul>	<p>This research has produced a policy guideline addressing responses to heatwaves.</p> <p>It also makes recommendations regarding heating and cooling thresholds for residential buildings and has been referenced in the NCC 2019 Consultation Regulation Impact <a href="#">Statement</a>.</p> <p>It has also validated the utility of the Excess Heat Factor (EHF) in Adelaide (as a predictor of the likely number of heat-related hospitalisations)</p> <p>Policy makers and professional in urban planning and infrastructure, building</p>	Heatwaves, resilience, sustainable building design, wellbeing, energy and water demand, heat related morbidity	Mar 2017

#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
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					<ul style="list-style-type: none"> <li>Assess community vulnerability and adaptation to heat stress</li> <li>Validate the Excess Heat Factor</li> <li>Compare the heat stress resistance of dwellings with different energy star ratings (AccuRate energy simulation software).</li> </ul>	construction and public health will benefit from this research.		
RP2005	Jonathan	Fox	UNSW	<b>The effect of facades on outdoor microclimates</b>	<p><u>Context</u> Urban areas experience artificial heat increases, known as the Urban Heat Island (UHI) effect. The effect is mainly caused by the trapping of incoming solar radiation by hard urban surfaces (roofs, walls and pavements), generation of anthropogenic waste heat, and a reduction in evaporative cooling due to lack of vegetation.</p> <p><u>Research question</u> What are the microclimate impacts of the architectural design of building facades?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Ground based remote sensing.</li> <li>Field measurements.</li> <li>Numerical (statistical modelling).</li> </ul>	The research will develop a predictive model that will quantify the impact of individual design decisions on outdoor climate and thermal comfort. The tool will support policy and practice towards cool cities.	Urban heat island, urban heat mitigation, building facades, outdoor thermal comfort, climate sensitive building design	Mar 2019
RP2005	Ehsan	Sharifi	UniSA	<b>Resilience to heat stress in public space. An exploratory case study of outdoor thermal discomfort and activity patterns in Sydney, Melbourne and Adelaide</b>	<p><u>Context</u> Urban greening can reduce carbon emissions, facilitate adaptation and support social inclusion and public health.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>What are the impacts of heat stress on public life?</li> <li>What are the benefits of urban greening?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Quantify the heat sensitivity of outdoor activities</li> <li>Identify and assess measures for public space resilience</li> <li>Triangulate through a mix of quantitative and qualitative methods</li> <li>Develop three Australian urban microclimate scenarios (Adelaide, Melbourne, Sydney) based on regional warming and heat resilience probabilities in 2030 and 2090.</li> </ul>	This research will provide landscape designers and planners, and other professionals with an understanding of the spatial heat resilience (SHR) in Australian cities. SHR is the ability of a space to support its normal activities when experiencing stressful thermal conditions. Comparisons will be made between areas with tree canopy against artificial-hard landscapes. This knowledge will assist plan Australian urban precincts more resilient to heat stress.	Urban greening, spatial heat resilience (SHR), tree canopy, urban heat island	Feb 2017
RP2006	Judy	Bush	UniMelb	<b>Cooling cities with green space: policy perspectives</b>	<p><u>Context</u> Cities are grappling with impacts of urban heat and heatwaves. There is an increasing role for integrating green spaces. These provide biophysical functions such as mitigating urban heat, stormwater management, biodiversity habitat, and contributing to human health and wellbeing and social and cultural processes. However, the available space for greenery is threatened as cities grow in size, density and population.</p> <p><u>Research question</u> How does policy contribute to retaining and maximising urban green space?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Develop a policy analysis framework integrating theories of sustainability transitions</li> </ul>	<p>The research will highlight the role of overarching, shared narratives in transition from monofunctional infrastructure to multifunctional systems in nature-based cities.</p> <p>Policy makers in the design, development and implementation of urban environmental sustainability policy and planning will benefit from this research.</p>	Urban green space, policy analysis, urban heat, sustainability transitions	Dec 2017

#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
	First	Last						
					<ul style="list-style-type: none"> <li>Assess the strategic, tactical, operational and reflexive aspects of policy processes and content</li> <li>Draw upon data from federal, state and local government policies for Melbourne's green spaces</li> <li>Interview policy makers and elected officials</li> <li>Compare London's green space policies.</li> </ul>			
RP2006	Jemma	<b>Green</b>	Curtin	<b>Disruptive innovation and mainstreaming low-cost and low carbon housing</b>	<p><u>Context</u> Most greenhouse gas emissions are produced in cities and towns across the world. The shift from a fossil-fuel based global economy to a low-carbon economy requires significant technological and behavioural shifts. As the urban system is predominantly fossil-fuel dependent it will require disruptive innovations in the form of technologies, business models and governance frameworks, to enable the kind of rapid transition that is necessary to keep climates within safe limits</p> <p><u>Research question</u> How can disruptive innovation contribute towards mainstreaming low-cost and low-carbon housing?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Analysis of literature about disruptive innovation</li> <li>Assessment of two new niche technologies for low-cost and low-carbon housing (modular construction and solar-storage)</li> <li>Examination of the policy and governance barriers to low-cost, low-carbon housing and solutions to overcome them.</li> </ul>	<p>Through five published journal papers, this research will examine key leverage points for understanding how disruptive innovations associated with solar-storage and modular construction can deliver low-cost and low-carbon housing, with a focus on underpinning rapid mainstreaming globally.</p> <p>This knowledge is invaluable to developers, especially of multi-dwelling units, strata bodies, and local and state government decision makers.</p>	Disruptive technologies, disruptive innovation, blockchain	Dec 2016
RP2007	Soo Huey	<b>Teh</b>	UNSW	<b>Integrated carbon metrics and assessment for the built environment</b>	<p><u>Context:</u> Even though embodied emissions of building material production constitute a significant additional proportion of emissions, less quantification work has been done in this area compared to direct operational emissions of buildings. Furthermore, inconsistent methodological frameworks, and inaccurate or incomplete life cycle inventory data have hindered the adoption of methods to quantify the embodied emissions of building materials.</p> <p><u>Research question</u> What is an effective and efficient method to assess the embodied carbon emissions of the Australian built environment?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Integrate different data and methods such as life cycle assessment, input-output analysis and material flow analysis</li> <li>Calculate the embodied carbon emissions of conventional and low carbon alternatives for construction materials in Australia.</li> </ul>	<p>This research will produce a hybrid database of embodied carbon life cycle inventory for building and construction materials in Australia.</p> <p>The research outcomes will be useful for construction companies, architects, designers, planners, developers, consultants and local and regional governments.</p>	Climate change, built environment, construction materials, embodied carbon emissions, hybrid life cycle assessment	Mar 2018

RP2007	Monique	Fouche	UniMelb	<b>Developing a framework for integrating life cycle environmental and economic assessment of buildings</b>	<p><u>Context</u> There is growing concern about the effect that buildings are having on the environment. Mitigation strategies tend to focus on one life cycle stage, usually the operational stage, leaving the other life cycle stages, such as manufacturing and construction, largely ignored. The slow uptake of whole life cycle design is further hindered by the uncertainties associated with the economic implications of life cycle environmental optimisation.</p> <p><u>Research question</u> How can we develop integrated building life cycle perspective tools such as life cycle assessment (LCA) and life cycle costing (LCC) to evaluate building design options with a focus on simultaneously optimising life cycle environmental and economic performance?</p> <p><u>Method</u></p> <ul style="list-style-type: none"> <li>• Develop and test a comprehensive environmental and economic framework for evaluating building life cycle assessment and costing</li> <li>• Assess the uncertainty associated with life cycle studies and highlight the various sensitivity parameters, such as period of analysis and discount rate</li> </ul>	The research will develop and test a comprehensive environmental and economic building life-cycle assessment framework. The framework will allow building designers to investigate different design options and base their final selection on options that maximise environmental performance, while providing an understanding of the economic implications of this optimisation. This should lead to the adoption of building strategies that consider the whole building life cycle and improve the environmental performance of the built environment.	Life-cycle assessment (LCA), life-cycle, life cycle costing (LCC)	Dec 2017
RP2007	Guangwu	Chen	UNSW	<b>City-scale carbon accounting and mitigation analysis</b>	<p><u>Context</u> Cities accommodate more than half of the global population, consume 70% of global energy and are responsible for 80% of global greenhouse gas (GHG) emissions, and thus play a crucial role in climate change mitigation. Global cities are linked together through international trade and join forces against climate change through global networks.</p> <p><u>Research question</u> How can multi-scale city carbon footprint (CF) accounting be conducted and facilitate mitigation policies that tackle transboundary emissions and relate to economic sectors across different scales?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Introduce a 'city carbon map' concept which shows all origins and destinations of embodied emissions</li> <li>• Assess the complexity of interconnections between cities and their hinterlands in terms of embodied emissions.</li> <li>• Establish as case studies, sectors and regions located upstream or downstream of urban supply chains in Australian and Chinese</li> <li>• Model suburb-specific carbon intensity accounting (both production and consumption) in different suburbs.</li> </ul>	This research will provide a comprehensive city-scale Carbon Footprint (CF) framework to facilitate the implementation of mitigation policies across different scales. For the first time a consumption-based accounting method will be proposed that combines the three scopes of standard emissions accounting. The city CF networks model will assess emissions embodied in trade between cities within and across nations. The application of spatial and sectoral linkage analysis will help to identify key sectors for urban carbon transformation. The thesis will contribute to the debate on carbon footprints and urban density from a sectoral perspective.  This information will be especially useful for urban planners and developers.	Cities, carbon footprint, urban planning, input-output analysis	Mar 2017
RP2008	Chin How	Goh	UniSA	<b>Quantifying greenhouse gas emissions and determining the soil carbon sequestration potential of stockpiled biosolids in South Australia</b>	<p><u>Context</u> The processing and treatment of biosolids produces greenhouse gas (GHG) emissions, however these have not been properly quantified. There is also an opportunity to reuse biosolids in agricultural applications to sequester carbon.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How can we effectively assess the GHG emissions of biosolids?</li> <li>• What is the market interest in accurate GHG emissions quantification?</li> <li>• How can biosolids be used in agricultural soils for carbon</li> </ul>	This research will accurately quantify the GHG emissions of biosolid processing and treatment. This will allow for better management and implementation of emissions strategies.  It will also investigate the reuse of biosolids in agricultural soils to offset emissions which could generate carbon credits tradeable on the domestic and global markets.	Biosolids, soil carbon sequestration, greenhouse gas emissions	Dec 2017

					sequestration and carbon credits?  <u>Methodology</u> <ul style="list-style-type: none"> <li>Investigate the available empirical models to quantify the GHG emissions of biosolids?</li> <li>Examine how these models can be improved</li> <li>Assess the difference between measured and predicted GHG emissions</li> <li>Explore the application of biosolids in agricultural applications and p</li> <li>Field research in South Australia.</li> </ul>	Research outcomes are relevant to utilities and facilities that process biosolids as well as to the end-users of biosolids.		
RP2008	James	Hayes	UNSW	<b>The effect of arduous odours on the community</b>	<u>Context</u> Environmental malodour remains a major source of complaints from communities. These are likely to increase as the urban sprawl steadily encroaches into odour emitting industries. This is true in relation to the odours created by wastewater treatment and associated biosolids application.  <u>Research question</u> How can we better understand wastewater malodours and how communities respond to them?  <u>Methodology</u> <ul style="list-style-type: none"> <li>Literature review</li> <li>Assess the industry-community interactions of six wastewater treatment plants (WWTPs)</li> <li>Analyse complaint management analysis and compare to odour reports</li> <li>Improve the ecological validity of gas chromatography-mass spectrometry/olfactometry (GC-MS/O)</li> <li>Survey community and industry</li> <li>Qualitative research of plant managers and land owners</li> <li>Develop an online tool for dynamic community engagement.</li> </ul>	This research will assist water utilities and communities engage to better address the impacts of malodours. It will also broaden methodologies for GC-MS/O.	Arduous odours, wastewater treatment plants (WWTPs), community engagement, complaint management, of gas chromatography-mass spectrometry/olfactometry (GC-MS/O)	Mar 2017
RP2010	Juliana	Bedggood	Swinburne	<b>Transitioning towards a state of sustainable momentum: Councils as champions to encourage benchmark practices in the built environment.</b>	<u>Context</u> The Australian built environment industry can assist in reducing global warming through actions commensurate to the impact of their activities. This requires low carbon project outcomes to exceed minimum regulatory standards. Local government can play a decisive role in influencing positive change.  <u>Research questions</u> <ul style="list-style-type: none"> <li>What is the role of local government in large-scale development?</li> <li>How does local government influence low carbon outcomes in Australian large-scale development?</li> <li>How can organisations in the construction supply chain be motivated to adopt low carbon practices beyond minimum standards?</li> </ul> <u>Methodology</u> Exploratory qualitative research using: <ul style="list-style-type: none"> <li>Semi-structured interviews</li> <li>Triangulation of data using organisational documentation</li> </ul>	The research will create a conceptual understanding of the role of local government in the built environment sector, and its ability to influence the delivery of low carbon outcomes beyond minimum standards (BMS).  This will enable local government practitioners to implement strategies that harness their market influence in relation to large-scale development projects. This will also help establish low carbon outcomes BMS as an industry norm.	Low carbon, large-scale development, council, beyond minimum standards, built environment, influence	Mar 2019

					<ul style="list-style-type: none"> <li>Data analysis using a mixed inductive-deductive approach.</li> </ul>			
RP2011	Otto	Newhouse	UNSW	<b>Capturing land use diversity for reduced local energy demand: an information modelling approach</b>	<p><u>Context</u> Effective precinct information modelling can yield significant reductions in energy intensity in urban areas. However, the existing precinct information modelling schema limits effective outcomes.</p> <p><u>Research question</u> How can we improve the Australian precinct information modelling standards to support effective energy planning and design in new precinct developments?</p> <p><u>Methodology</u> Extend the precinct information modelling schema using the Tonsley Park, South Australia low carbon precinct as a case study.</p>	This research will inform effective precinct planning and design. It will be useful for urban designers and planners, utility companies and government policy makers.	Precinct Information Modelling, planning, urban design, carbon footprint	Sept 2018
RP2014	Parisa	Pakzad	UNSW	<b>Developing an indicator-based model for assessing sustainability performance of green infrastructure</b>	<p><u>Context</u> Green infrastructure is an integrated multiscale network of green spaces within, beyond, and around a city. It provides important ecosystem services for human and environmental health. The planning, design and installation of "green infrastructure" at the local and city level has been identified as a nature-based solution to achieving greater urban sustainability and resilience. However, further research is required to understand the performance of different types of green infrastructure.</p> <p><u>Research question</u> How can we develop an indicator-based model using a mixed-method approach to evaluate the performance of urban green infrastructure?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Undertake semi-structured interviews and/or surveys of Australian experts and national and international stakeholders from representative fields</li> <li>Develop a green infrastructure performance model based upon 16 key indicators within four subcategories: ecological; health and well-being; sociocultural and economic.</li> <li>Test and validate the model via a Sydney case study.</li> <li>Analyse and visualise results using ENVI, iTree Eco and ArcGIS.</li> </ul>	This research will deliver a quantitative model that can establish the performance of existing or proposed green infrastructure against 16 sustainability indicators. This indicator-based model will help developers, landscape architects, and governments understand and make better decisions regarding the complex multidimensional structure of urban green spaces.	Green infrastructure performance model, indicators, assessment matrix, sustainability assessment, ecosystem services, ecosystem health and human health	Mar 2017
RP2017	Benjamin	Thwaites	UNSW	<b>Optimisation of aerobic granular sludge for energy efficient waste water treatment</b>	<p><u>Context</u> Wastewater treatment in Australia produces substantial fugitive greenhouse gas (GHG) emissions. These emissions could be reduced by switching from conventional activated sludge to an emerging alternative technology, Aerobic Granular Sludge (AGS). AGS technology also offers the potential to extend the infrastructure life of existing infrastructure. However, AGS has not been comprehensively validated in Australia.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>What are the fugitive emissions of AGS compare to the conventional activated sludge process?</li> <li>What impact does the conversion to AGS have on the microbial community and does this result in changes to GHG emissions?</li> <li>Does the change in operating parameters result in substantial changes to plant energy efficiency?</li> </ul>	This work can help optimise wastewater treatment operations, saving money and reducing GHG emissions. It is highly relevant to the wastewater treatment industry.	Wastewater treatment, activated sludge, greenhouse gas emissions, energy efficiency	Mar 2019

					<ul style="list-style-type: none"> <li>How does the conversion to AGS impact on downstream water recycling process performance?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Growing of AGS biomass at a wastewater treatment site in Adelaide</li> <li>Monitoring GHG emissions using standard industry procedures</li> <li>Microbial analysis.</li> </ul>			
RP2017	Ilda	Clos	UniSA	<b>Optimising energy use performance in wastewater treatment and recycling for low carbon precincts</b>	<p><u>Context</u> Wastewater treatment plays a significant role in safeguarding public and environmental health, however existing processes are energy intensive. The application of an energy benchmarking approach presents opportunities for wastewater treatment plants (WWTPs) to reduce costs.</p> <p><u>Research question</u> How can optimise the energy use of wastewater treatment and water recycling processes in Australia?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Critical review of the European energy benchmarking model</li> <li>Assessment of the use of the model to Australian scenarios.</li> <li>Assess process level energy consumption and optimisation potential at WWTPs</li> <li>Development and calibration of energy benchmarks for Australian operations.</li> </ul>	The research will benefit members of the water sector seeking to minimise energy use and associated GHG emissions. Research outputs will also be of value to the research community interested in energy efficiency in the context of wastewater treatment and recycling.	WWTP, benchmarking, energy efficiency, energy saving measures, process level optimisation, operational personnel, energy check, detailed energy analysis, target values, guide values, state-of-the-art technology,	Aug 2018
RP2018	Ruth	Fisher	UNSW	<b>Influence of biosolids processing on the production of odorous emissions at wastewater treatment plants</b>	<p><u>Context</u> Biosolids, the solid product from wastewater treatment, often produce unpleasant odours, a source of community complaint and thus a barrier to widespread use. Currently in NSW the majority of biosolids are applied to agricultural land, either directly or after composting as a valuable source of nutrients and soil conditioner. However, odorous emissions from biosolids limit their widespread application.</p> <p><u>Research question</u> What is the relationship between the operation of the wastewater treatment plants and the generation and emission of odour compounds (odorants)?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Analysis of chemical and olfactory properties of biosolid and sludge emissions</li> <li>Monitoring wastewater treatment plant performance and biosolids and sludge physical and chemical properties.</li> </ul>	<p>The research will identify the odorants that contribute to bad odours, why they are present, and how they are formed.</p> <p>It will also develop tools to assist with the detection, communication and mitigation of odour emissions.</p> <p>This knowledge will be of particular interest to wastewater utilities.</p>	Wastewater treatment plants; biosolids, re-use; resource recovery, odours; odorants, process operation, community impact'	Aug 2017
RP2019	Alex Jaimes	Castillo	Swinburne	<b>The microbial ecology of urban organic waste treatment (compost)</b>	<p><u>Context</u> Urban food waste landfill releases methane, a potent greenhouse gas (GHG). These GHGs can be avoided by diverting food waste and composting it using on-site systems.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>How do compost inputs affect its quality?</li> <li>How do we develop a composter that produces high quality pathogen free compost for commercial volumes of food waste?</li> </ul>	<p>This research will develop a commercial-scale onsite composter that can reduce landfill and GHGs and produce a valuable by-product (compost) that can be used or sold.</p> <p>The research could be used by the government to create new policy on organic waste management, ultimately to improve environmental quality of urban areas and human behaviour towards its environment.</p>	Compost, in-vessel composter, microbial ecology, food waste, municipal organic waste.	May 2020

					<p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Measurement of food waste composition</li> <li>• Measurement and optimisation of compost processing parameters (temperature, pH, electrical conductivity, moisture content, C:N ratio, and volatile organic compounds and cellular microbial communities).</li> </ul>			
RP2021	Jana	<b>Perkovic</b>	UniMelb	<p><b>Using SNAMUTS (spatial network analysis for multi-modal urban transport systems) to plan for transitions</b></p>	<p><u>Context</u> The Spatial Network Analysis for Multi-modal Urban Transport System (SNAMUTS) is a planning and decision-making support tool to determine a city's transport accessibility performance. It has been used for land-use/transport planning and an opportunity exists for its application in supporting low-carbon urban transitions.</p> <p><u>Research question</u> How can SNAMUTS be used to strategically plan land use and transport systems to achieve low carbon outcomes?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Desk-top review of integrated land-use/transport strategic planning processes in Victoria</li> <li>• Semi-structured interviews (pre- and post- workshop) with Victorian planners</li> <li>• Observation of participant behaviour when using SNAMUTS.</li> </ul>	This research will inform strategic planning for low carbon urban transitions. It will benefit private and government planning practitioners.	Urban transitions, planning for transitions, accessibility instruments, SNAMUTS	Jun 2018
RP2021	Karen	<b>Wright</b>	Swinburne	<p><b>Analysis of active transport implementation utilising a path dependence framework</b></p>	<p><u>Context</u> Effective active transport policy, programs and infrastructure can reduce greenhouse gas emissions and increase the wellbeing of community members. However, uptake is slow and there is a poor understanding of what the barriers are and how they can be overcome.</p> <p><u>Research question</u> Understanding barriers to active transport implementation in Canberra, ACT utilising a path dependence framework</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Interview of key influencers in active transport</li> <li>• Coding and analysis of data for thematic content</li> <li>• Identification of gaps, barriers and opportunities through thematic analysis of the interviews</li> <li>• Assessment of the infrastructure, influential programs/policy and institutional settings that could contribute to path dependency or critical junctures.</li> </ul>	The research will provide recommendations on overcoming barriers and adapting to challenges faced in active transport implementation and adoption. The impact will be an increasing mode shift to active transport away from sole occupant car trips, contributing to greenhouse gas emission reductions. Benefits to government will include an improved understanding and greater evidence-base of policy or practice change that can facilitate the greater uptake of active transport. This will include recommendations on actions that can contribute to the uptake of active transport.	Active transport, transport mode shift, public policy, walking, cycling, behaviour change, active transport infrastructure	Aug 2018
RP2021	Callum	<b>Sleep</b>	UniSA	<p><b>The potential for a transport mode shift to improve the sustainability of travel in the suburbs of Adelaide, South Australia</b></p>	<p><u>Context</u> Private vehicle journeys account for 8.3% of Australian carbon emissions. There is therefore a strong case for encouraging people to switch to public transport options. However, further research is required to understand behavioural drivers and applicable strategies that will support relevant initiatives.</p> <p><u>Research Question</u> What are the key barriers in shifting travellers from private vehicles to public modes of transport.</p>	This research is expected to be used by government agencies to encourage the uptake of low carbon transport choices.	Transportation, public transport, suburban, stated preference, smart card data, mode choice, behaviour change	July 2018

					<u>Methodology</u> <ul style="list-style-type: none"><li>• Community survey across six suburbs in the greater Adelaide region</li><li>• Investigation of public transport use</li><li>• Analysis of behavioural motivations behind the transport mode choices.</li></ul>			
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<b>PROGRAM 3 ENGAGED COMMUNITIES</b>								
RP3007	Franziska	Mey	UNSW	<b>Development of community renewable energy and the role of institutional factors: a three country comparison</b>	<p><u>Context</u> Throughout the world, community initiatives are becoming a common form of engagement in renewable energy while being recognised for their ability to deliver social, environmental and economic benefits. In particular, community renewable energy has emerged as a sub-field of the energy sector and has the potential to deliver significant low carbon benefits.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• Why and how do community renewable energy fields emerge?</li> <li>• What institutional drivers and challenges contribute and constrain their development?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Apply of the strategic action fields framework to explore the development of community renewable energy based on case studies of Denmark, Germany and Australia</li> <li>• Investigate relationships between related actors - bottom-up (mobilisation) and top-down (decisive role of state and its institutions) dynamics</li> <li>• Compare the three case studies to identify development principles</li> <li>• The design qualitative and quantitative data from surveys and semi-structured interviews.</li> </ul>	The research will offer policy recommendations to support the establishment, growth and legitimisation of community renewable energy initiatives.	Community renewable energy; grassroots,	Dec 2017
RP3008	Che	Biggs	UniMelb	<b>Households as change agents in Australia's electricity sector</b>	<p><u>Context</u> Efforts across government and the energy sector to shift Australia from a dependence on fossil fuels to renewable energy have been slow. However, change has been relatively rapid at the household scale with a trend of increasing adoption of solar PV. This trend is destabilising the electricity sector and has potential to evolve further. Households may therefore have a key role to play in catalysing the shift to a low-carbon society.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What are the motivations behind household solar PV adoption in Australia?</li> <li>• What is the role of household PV adoptions in the low carbon transformation of Australia's electricity sector?</li> </ul> <p><u>Methodology</u> An integrated research methodology - a combination of exploratory qualitative and quantitative techniques. Key methods include in-depth interviews, randomised and targeted surveys and the integration of quantitative (cluster, multinomial regression) and interpretive analysis.</p>	<p>This research will provide an understanding of what motivates household to take up PV, how they are interacting with energy providers and what future systems may look like.</p> <p>The primary end users of this research are organisations supporting domestic low-carbon innovations (MEFL, solar citizens, local governments) and energy retailers promoting domestic solar and battery adoption.</p>	Energy transitions / transformations, social innovation, domestic solar adoption, distributed innovation, behaviour change, distributed living labs, distributed systems.	May 2019
RP3008	Jennifer	Witheridge	Swinburne	<b>Future challenges and pathways for open space in Australian suburbs</b>	<p><u>Context</u> Infill housing developments in established Australian suburbs are reducing the amount of private open space and increasing the demands on public open space. On average, green space is reduced by 50%, representing losses of 2.5Ha-16Ha. The effective management and configuration of public and private open spaces will assist support the ecosystem services green</p>	<p>The research will provide a framework to assist in maintaining effective open spaces as more intensive housing development occurs in Australian suburbs.</p> <p>This research will be useful to policy makers</p>	Open space, green space, infill housing, planning, public policy, suburban	Dec 2018

#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
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					<p>spaces provide such as urban heat island mitigation, stormwater management, biodiversity and liveability.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What are the political, economic and social dynamics that influence open space distribution and management?</li> <li>• How is open space land use changing due to urban infill?</li> <li>• What are the land use policy and management options for creating resilient open spaces?</li> </ul> <p><u>Methodology</u></p> <p>Case study using mixed methods including interviews, a survey and historical, policy and spatial analysis.</p>	and practitioners involved in open space design, planning and management and residential development.		
RP3008	David	<b>Bennett</b>	UNSW	<b>Shaping suburbia: Towards the suburbs of the future</b>	<p><u>Context</u></p> <p>Walking as a form of exercise provides high return health benefits. There is evidence that cities with multiple destinations that are close to homes correlates with increased walking activities. In many cases, this has been interpreted as a call for high density development. However, many Australian home buyers prefer detached houses, a land use pattern that reduces walking activity.</p> <p><u>Research question</u></p> <p>How can we design and retrofit our cities to deliver health outcomes as well as being low carbon and economically productive?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Assessment of built-environment walkability data</li> <li>• Assessment and comparison of physical activity data.</li> </ul>	This research will be of use to town planners, precinct developers and health professionals. It will provide insights into the way the built form of our cities influences walkability and thus health outcomes.	Walkability, walking, built form, city design	Oct 2017
RP3009	Christine	<b>Eon</b>	Curtin	<b>The home system of practice</b>	<p><u>Context</u></p> <p>High performance homes often do not meet their full potential due mainly to the behaviour of their occupants. We need to understand how people interact with their homes and others to ensure that energy efficient homes deliver their expected benefits.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What is the carbon emissions performance of low energy residential houses and what influences these outcomes?</li> <li>• How does design and occupant behaviour affect home energy use and how can these behaviours be influenced?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Develop a behaviour change intervention strategy and implement across 10 houses (living labs) in WA.</li> <li>• Monitor energy, water, temperature, PV for two years</li> <li>• Interviews and energy and water audits</li> <li>• Evaluate house designs and occupant practices.</li> </ul>	End users of this research include utility companies and local and state government.	System of practice, house design, energy efficiency, ZEH, home, behaviour, users, living laboratory.	Nov 2017

RP3009	Jane	Loveday	Curtin	<b>Rating the thermal performance of a residential landscape</b>	<p><u>Context</u> There is a dearth of research addressing the amount heat (radiant energy) produced by a domestic garden, including the contribution from various landscape elements. This information can be used to help address the urban heat island effect.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What is the effect of landscape design on heat in a residential garden?</li> <li>• Can a low-cost instrument be developed to measure the thermal performance of multiple residential garden elements concurrently?</li> <li>• What are the relative amounts of the different energy types (emitted and reflected radiation) from various residential garden elements?</li> <li>• How do material properties such as albedo, emissivity, surface conduction, heat capacity, colour, and evapotranspiration impact on the thermal performance of residential gardens?</li> <li>• Can a simple model be developed to quantify and compare the thermal performance of landscape elements?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Develop and test a black painted temperature sensor (iButton) to detect incident radiation</li> <li>• Using this sensor, conduct field tests over four seasons on 23 different landscape elements (LE) and around 3 houses with different landscaping</li> <li>• Model the data to show that the sensor is a suitable instrument to use and to provide quantification of radiant energy from the different LE and different gardens.</li> </ul>	<p>If the radiant energy from landscaping in residential gardens can be reduced it will decrease the amount of cooling energy required to maintain thermal comfort. Human comfort, health and general wellbeing will also be supported. The research is useful to landscape architects/designers, developers and councils in planning and designing residential landscapes for heat management.</p>	<p>Microclimate, urban heat, landscape, radiant energy, measurement</p>	<p>Aug 2018</p>
RP3011	Darren	Sharp	Curtin	<b>Urban experiments for sustainability transitions</b>	<p><u>Context</u> The community can play a major role in transitioning Australia to a low carbon urban future. However, further research is required in relation to the processes of community empowerment.</p> <p><u>Research question</u> How can urban experiments be used to drive sustainability transitions through the uptake of low carbon initiatives?</p> <p><u>Methodology</u> Case studies applying action research, transformative social innovation and transition management approaches.</p>	<p>This research will provide policy makers and planners with case studies of how a range of urban experiments can be utilised to deploy low carbon initiatives.</p>	<p>Action research, transition management, living labs, urban governance, sharing cities, transformative social innovation</p>	<p>July 2018</p>
RP3012	Rebekah	Anderson	UniMelb	<b>The social psychology of low-carbon behaviour: modelling and predicting carbon-relevant household behaviour</b>	<p><u>Context</u> About one-third of carbon emissions are from household activities. Interventions at the household behaviour level present a large opportunity to reduce emissions. However, there are shortcomings in the existing models employed to understand the psychological processes governing behaviour.</p> <p><u>Research question</u> How can we build upon current psychological models (e.g. the Reasoned Action Approach, Social Practice Theory) to develop an improved behaviour prediction model for interventions to promote adoption of low carbon behaviour?</p>	<p>By providing a guide as to how to intervene in household behaviours to save energy there is a high potential to reduce carbon emissions.</p> <p>The research will also be of use to government departments, environmental organisations and anyone dealing in behaviour change.</p>	<p>Behaviour, RAA, SPT, attitude, norms, intention, perceived behavioural control</p>	<p>April 2018</p>

					<p><u>Methodology</u> Experimental.</p>			
RP3015	Mohammad Hossein	Sherkat	UniMelb	<p><b>Emotionalism within people-oriented software design</b></p>	<p><u>Context</u> People's emotional goals are an important element of predicting and motivating behaviour. Establishing desired emotional goals using digital innovations such as computer-based apps have the potential to motivate low carbon outcomes. However, there is little practical advice on how to do this.</p> <p><u>Research question</u> How can we design and develop digital products that promote individual emotional low carbon goals?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Identify and prioritise target users</li> <li>Develop a framework to understand and capture users' emotional requirements</li> <li>Develop a computer application to operationalise the model</li> <li>Test the app in two case studies.</li> </ul>	<p>A team- and game-based mobile learning application will be developed which will equip and motivate tradespersons and other professionals in the building sector to adopt low carbon actions. This will also be valuable for use by government, the education sector and software engineers.</p>	<p>People-Oriented Software, requirements engineering, emotional goals, EG-SAT</p>	<p>Sept 2018</p>
RP3015	Tomi	Winfree	Swinburne	<p><b>Integrated Building design: An Australian case study of interprofessional collaboration</b></p>	<p><u>Context</u> Integrated building design (IBD) has the potential to reduce global building energy demand by 30-40% by 2050. Technologies such as simulation and modelling software need the support of collaborative interprofessional teams. Research is required to understand how collaborative processes across professional boundaries can improve integrated design practice.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>How do interprofessional design teams collaborate toward integrated building design?</li> <li>What are the impediments?</li> <li>How can collaboration toward integrated design be improved?</li> </ul> <p><u>Methodology</u> An interpretive qualitative case study approach informed by cultural historical activity theory.</p>	<p>The in-depth and holistic nature of this research offers design professionals, organisations and professional institutions an opportunity to reflect on their collaborative design practices to facilitate improvements in integrated building design.</p>	<p>Integrated building design, sustainable design, inter-professional, collaboration, professional practice</p>	<p>Sep 2018</p>
RP3017	Aaron	Davis	UniSA	<p><b>Toward an understanding of the optimal conditions for the application of co-creation in the built environment: a values based approach.</b></p>	<p><u>Context</u> An important benefit of living laboratories is their capacity to explore co-creation in the development of building projects. Co-creation aims to bring stakeholders together for mutually beneficial outcomes. However, broad uptake of co-creation methodologies in the built environment sector is limited by the lack of quantification of their value.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>What are the costs and benefits of a co-creation approach?</li> <li>What are the optimal conditions for broader adoption of co-creation as a process in urban development?</li> </ul> <p><u>Methodology</u> Case study approach combined with a value network analysis.</p>	<p>This research will provide evidence supporting processes in the built environment that explore and capture value for a broader range of stakeholders. The research will be of benefit to the construction industry, living laboratories and the local government sector.</p>	<p>Co-creation, living laboratories, value network analysis</p>	<p>Feb 2019</p>

RP3017	Catherine	Kain	UniMelb	<b>The value proposition of low carbon sustainable housing development: a property developer's perspective</b>	<p><u>Context</u> We have the technical knowledge and capabilities to achieve low carbon, sustainable housing but the buy-in and support of property developers is needed for broad uptake. Barriers include a lack of knowledge of what to do, and no consensus surrounding priorities.</p> <p><u>Research question</u> What is the value proposition of low carbon medium-density residential development in Australia, from the property developer's perspective?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Expert panel focus group to inform a 3-round Delphi survey</li> <li>• Quantitative analysis of apartments using multiple impacts of energy efficiency approach versus traditional approach</li> <li>• Semi-structured interviews.</li> </ul>	The research will support property developers to make strategic investment decisions in energy efficient housing. This knowledge will benefit medium-density property developers and inform policy.	Energy efficiency, residential, medium-density housing, value proposition, sustainable development	Mar 2019
RP3020	Portia	Odell	Curtin	<b>Decarbonising schools: the role of school decarbonisation in the community</b>	<p><u>Context</u> Schools are often pro-active in their approaches to sustainability, but these are often fragmented and rarely quantify their carbon emissions. Schools, are also facing increasing resource costs. Assisting schools in relation to low carbon living can support their sustainability agendas and reduce their resource costs.</p> <p><u>Research question</u> How can schools contribute to the reduction of carbon emissions within the community?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Quantitative data collection and analysis of 15 schools</li> <li>• Multiple case studies</li> <li>• Surveys to parents and school personnel</li> <li>• Theory-based evaluation and logic model.</li> </ul>	The research can be used by school managers, councils and governments with guides as to how schools can take action to reduce emissions. It also has the potential to involve and inspire students and parents alike.	Carbon footprint, social impact, intergenerational influence, pro-environmental behaviour, school carbon reduction	Nov 2018
RP3021	Aggeliki	Aggeli	Swinburne	<b>The Australian home renovation process: Media and low carbon design choices</b>	<p><u>Context</u> Home renovations are an ideal opportunity to encourage the uptake of low carbon innovations. However, there is a lack of understanding of the technical, financial and personal choices available to households to produce low carbon outcomes.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How do home renovation practices emerge, reproduce and sustain themselves in Australian households?</li> <li>• How does the media and intermediaries influence home renovation practices?</li> </ul> <p><u>Methodology</u> Qualitative methodology and in-depth interviews.</p>	<p>This research will illuminate what influences households when making renovation choices and thus the interventions that could be made to encourage low carbon renovation practices.</p> <p>The research will be of use to building industry professionals (architects, builders and contractors, designers), suppliers and policy makers.</p>	Home renovation, media, social practice, design, design anthropology, low carbon	Aug 2018
RP3021	Shae	Hunter	Swinburne	<b>The dynamics of media and home renovation: shaping carbon futures</b>	<p><u>Context</u> There is considerable activity in the Australian home renovation market which may be due in part to the influence of media and home renovation show. There is also a trend of increasing carbon emissions by Australian homes which is contributing to climate change. Understanding the role that the media plays in the renovation market can assist the development of</p>	This research will help us understand the key dynamics that lead to increasing carbon emissions from renovated homes, more targeted interventions can be designed. This knowledge will be useful for policy makers and media specialists.	Renovation, carbon, media, life politics, reflexive practices, social practices	July 2018

				<p>targeted interventions that support the uptake of low carbon technologies and processes.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How does the media influence the decisions of home owners across all stages of a renovation?</li> <li>• What are the implications for reducing carbon in the residential building sector?</li> </ul> <p><u>Methodology</u></p> <p>Qualitative interview-based methods.</p>			
RP3023	Jarra	Hicks	UNSW	<p><b>Community Power: Understanding the outcomes and impacts from community-owned wind energy projects in small regional communities</b></p> <p><u>Context</u></p> <p>There is increasing interest in the potential for community initiatives to supply goods and services while simultaneously addressing multiple social and environmental challenges. Community-owned renewable energy (CORE) is a form of renewable energy deployment in which communities initiate, develop, own, operate and benefit from the enterprise. Little is understood about the more elusive and relational outcomes from CORE, such as empowerment, and the project features that affect their realisation.</p> <p><u>Research question</u></p> <p>Can CORE, as a form of social enterprise, support social and environmental outcomes as well as deliver renewable energy?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Analyse four community-owned wind energy projects across Australia and Scotland</li> <li>• Qualitatively assess the projects' 'enterprise design': community engagement practices, economic arrangements and governance structures.</li> </ul>	<p>This research will be valuable to community organisations and governments alike by informing them how community renewable energy initiatives can assist a transition to renewable energy, and also contribute to economic opportunities, democratisation, community-building, empowerment and community mobilisation.</p>	<p>Community-owned renewable energy (CORE), enterprise design, renewable energy, transition, community</p>	Dec 2017
RP3028	Sarah	Fiess	Swinburne	<p><b>Circles of women: sustainable consumption and digital media.</b></p> <p><u>Context</u></p> <p>Digital media is ubiquitous, however, there is little research on its influence on sustainable consumption. For example, we do not understand the impact of digital media on low carbon decision making behaviour of mothers; and it is mothers who have significant influence in family purchasing decisions.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How are sustainable consumption practices of mothers shaped by digital media?</li> <li>• To what extent does the practice of blogging for mothers influence sustainable consumption?</li> <li>• To what extent do Facebook groups influence a mother's decisions about sustainable consumption?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Qualitative semi-structured interviews</li> <li>• Facebook group "Yarraville Mums" analysis</li> <li>• Qualitative focus group</li> <li>• Data analysis.</li> </ul>	<p>This research will add to the emerging body of research on mothers' digital media use and sustainable consumption practices.</p> <p>It will contribute to a greater conversation around an Australian mother's sense of identity and how mothers create community online, thereby generating discussion on making social change through increases in sustainable consumption practices.</p> <p>This research could specifically benefit both government and community organisations that are designing behaviour change programs with mothers as a key demographic.</p>	<p>Sustainable consumption, digital media, motherhood</p>	Dec 2019

RP3031	Ann	Godfrey	UNSW	<b>What does disclosure do? Information disclosure, energy efficiency investment and commercial office workspace tenure</b>	<p><u>Context</u> Disclosure policy that mandates the sharing of information between parties to commercial office workspace sales and lease contracts can help remove barriers to investment in energy efficiency.</p> <p><u>Research question</u> What are the effects of disclosure policy upon levels of energy efficiency investment in different forms of commercial office workspace tenure?</p> <p><u>Methodology:</u></p> <ul style="list-style-type: none"> <li>• Case-study analysis and embedded mixed method</li> <li>• Obtain quantitative data about the energy efficiency of workspaces managed by Brookfield Global Integrated Solutions (BGIS).</li> <li>• Measure the relationship between tenure contract type, theoretical propensity to Principal-Agent problems, and energy efficiency levels</li> <li>• Embed the quantitative data-set within a qualitative data-set gathered through interviews with BGIS facilities managers.</li> </ul>	The practical application of this research is to inform disclosure policy.	Disclosure, energy efficiency, commercial office buildings, tenure	Mar 2019
RP3033	Tanya	Babaeff	Curtin	<b>Community participation in the co-creation of a residential precinct with innovations for sustainability</b>	<p><u>Context</u> The built environment sector has been reluctant to move away from traditional planning processes and practices that lead to low density, homogenous housing outcomes, towards more sustainable neighbourhoods and communities.</p> <p><u>Research question</u> How can community engagement and participation, in the early planning and subsequent activation of an infill residential precinct, influence sustainability innovation within the precinct?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Case study of the White Gum Valley (WGV) residential precinct.</li> <li>• A comparative-historical analysis (timeline, narrative, network analysis, path dependence analysis, and causal narrative)</li> <li>• Application of a participatory place making model.</li> </ul>	The research will support urban planning and policy practitioners achieve low carbon and socially sustainable residential infill precincts. It will do so by developing understanding regarding critical points in the urban planning process, where decisions can be made that influence a development's trajectory toward sustainability, and how community participation can support this.	Urban planning, community engagement/participation, social sustainability, process, innovation, place activation	Nov 2018

#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
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<b>STAND ALONE RESEARCH</b>								
SP0014	Paula	Hansen	Curtin	<b>Uptake of a shared solar storage innovation: dynamics and dimensions</b>	<p><u>Context</u> Solar PV is being rapidly adopted across Australia. However, to date, beneficiaries are predominantly freehold dwellings, with multi-unit dwellings (medium- to high-density residential developments) being left behind. As multi-unit dwellings make up about 30% of Australia's housing stock, enabling these buildings to use solar energy is essential in transitioning to a low carbon future. Suitable governance models are required to support multi-unit dwellings take advantage of solar power and thus support reduced costs and carbon emissions.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What lessons can be drawn from a solar energy trial in a multi-unit setting at White Gum Valley (WGV), Perth, particularly:</li> <li>• How do project stakeholders interact?</li> <li>• What are the elements of an effective shared solar storage system?</li> <li>• How can the solar storage system and the stakeholder interactions be translated into an agent-based model?</li> <li>• How can the shared solar storage set-up be operated and managed effectively?</li> <li>• Can a scaleable shared solar storage model be created?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Analysis of the solar energy governance model at WGV</li> <li>• Interviews with stakeholders</li> <li>• Quantitative analysis of energy data generated at WGV</li> <li>• Agent-based modelling.</li> </ul>	The research will produce an assessment of how favourable outcomes (financial, energy and carbon savings) of the governance structure can be reached in terms of the relationships between actor interactions and resource flows. This will be of particular interest to policy-makers, strata schemes and community groups.	PV, dwellings, WGV, White Gum Valley	Dec 2018
NP1002	Sleiman	Farah	UniSA	<b>Photovoltaic-thermal system for off-grid zero energy homes</b>	<p><u>Context</u> Off-grid homes are typically powered by fossil fuels rather than renewable energy sources.</p> <p>There are no clear design methodologies for a solar system with energy storage for off- grid homes.</p> <p><u>Research question</u> Can the use of PV/thermal (PVT) provide a more economical solution for off-grid homes?</p> <p><u>Methodology</u> The research is based on a series of computer simulations that consider the interaction between the different components of the solar system.</p>	<p>The research will demonstrate the usefulness of using renewable energy for a challenging application (off-grid homes), promoting the use of renewable energy to reduce CO<sub>2</sub> emissions.</p> <p>The research will be utilised by engineers, households and architects.</p>	Off-grid, photovoltaic, photovoltaic/thermal, thermal storage, battery	Jan 2019
NP1003	Kirrilie	Rowe	UniSA	<b>Tailoring renewable energy systems to communities, with a focus on retirement living</b>	<p><u>Context</u> The number of Australians reaching retirement is increasing which is driving demand for more retirement precincts. An opportunity exists to optimise their energy use.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How can we design efficiency energy systems for retirement villages?</li> </ul>	The research will provide a methodology for retirement communities to optimise their energy use. The method can be used by government organisations, community groups, planners and, in particular, a retirement village proposed in Tumby Bay, SA.	Embedded electricity networks, community tariffs, storage, renewable energy, retirement	Sept 2018

#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
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					<ul style="list-style-type: none"> <li>What mechanisms can be employed to reduce emissions by sharing energy use, generation and storage services?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Analysis of detailed energy data from households at Lochiel Park, South Australia</li> <li>Modelling of the energy use of low-energy retirement housing</li> <li>Develop a retirement village energy model.</li> </ul>			
NP1004	Sormeh	Sharifi	UniSA	<b>Evaluating and improving thermal comfort on the top-floor of multi-level dwellings</b>	<p><u>Context</u> Despite a variety of rating schemes and compulsory building codes around the world, some energy-efficient dwellings are prone to overheating.</p> <p>This research aims to reduce home overheating which generally happens during peak electricity consumption in summer.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>What are the reasons of the overheating in the top-floor in multi-level dwellings especially during heat events?</li> <li>How can the level of thermal comfort during extreme weather events be evaluated?</li> <li>What sorts of passive or hybrid systems in Australia can be employed to achieve thermal comfort during heatwaves and how effective they are?</li> </ul> <p><u>Methodology</u> Monitoring: 8 detailed-monitored houses in Lochiel Park (4 years) Survey: 13 suburbs of Adelaide (169 questionnaires) Simulation: AccuRate software.</p>	<p>This research could reduce the overheating hours which generally happens during the peak electricity consumption in summer. Therefore, it reduces the need for high capacity electricity generators that produce greenhouse gas (GHG) emissions.</p> <p>Target end-users of this research include the Australian Building Codes Board and Standards Australia.</p>	Overheating, thermal comfort, energy-efficient building, energy rating, building code, climate change	Jan 2019
NP1005	Charles	Ling	UniSA	<b>Food waste diversion in Australia – modelling approaches for GHG reduction and abatement of commercial and industrial food waste</b>	<p><u>Context</u> It is estimated that 40% of food grown in Australia is lost or wasted along the food supply chain - from paddock to plate. Food disposed to landfills generates methane, a potent GHG.</p> <p>Diverting food waste from commercial and institutional kitchens is ad-hoc. Market solutions exist but it is not clear to policy-makers and food waste producers which emerging options have the smallest carbon outcome.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>Does composting post-consumer food waste generate less GHG than landfill disposal with best-case methane recovery installed, on a full material flow basis?</li> <li>Does onsite composting of post-consumer food waste generate less GHGs than centralised offsite composting, on a full material flow basis?</li> <li>Is soil carbon sequestration or avoided landfill methane generation, the largest contributor of GHG reduction in an onsite composting and food production system on a plate-to-plate basis?</li> </ul>	<p>The research can be utilised by governments, industry and business. It will be able to rank established and emerging food waste processing options in Australia (e.g. composting, anaerobic digestion) based on their carbon footprint at city-scale and thus assist policymakers (e.g. Sustainability Victoria) to identify and support those options with the least GHG emissions.</p>	Food waste, food organics, waste hierarchy, composting, anaerobic digestion, vermiculture, waste-to-energy, landfill, carbon footprint, industrial ecology, multi-objective optimisation, linear programming, hybrid LCA, waste input-output analysis, rectangular-choice-of-technology.	Dec 2018

#	Name		Node	Thesis title	Abstract	End users and impact	Keywords	Submission date
	First	Last						
					<p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Desktop review of food waste diversion in Australia.</li> <li>• Multi-objective optimisation model for least carbon diversion.</li> <li>• Waste-Input-Output model using ABS national accounts data.</li> <li>• Rectangular-Choice-of-Technology model using ABS national accounts data.</li> <li>• Compare the outcomes of the different models</li> <li>• Develop a GHG food waste tool and technical report.</li> </ul>			
NP1006	Hulya	Gilbert	UniSA	<p><b>Child friendly precinct design for low carbon living: improving policies and decision making tools</b></p>	<p><u>Context</u> The use of private cars to transport children to school and related activities is increasing.</p> <p>Better access to active and public transport initiatives may allay this trend. However, children's rights to sustainable mobility are commonly overlooked in the transport planning discourses.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What are the carbon emission outcomes of child related private car use?</li> <li>• What role do child friendly social and built environments play in reducing car use?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Review of Australian policies on sustainable mobility and child friendly cities</li> <li>• Surveys (with children and parents)</li> <li>• Travel diaries by children.</li> </ul>	This research will inform decision making for sustainable communities by schools, local and state planning authorities.	Active transport, sustainable mobility, child and youth friendly environments, car dependence, transport policies.	March 2019
NP2002	Agata	CabaneK	Curtin	<p><b>Mainstreaming biophilic urban design</b></p>	<p><u>Context</u> Cities are facing pressure from increasing density and rising population. As the land in cities becomes scarce, quality green spaces become rarer which in consequence negatively impacts residents' health and well-being. Biophilic urban design is an approach which can deliver multiple benefits such as contributing to urban liveability, increasing well-being of residents, mitigation of climate change related issues such as the heat island effect, and carbon sequestration.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What objectives, approaches and dynamics can lead to successful biophilic urban projects?</li> <li>• How can we mainstream biophilic urban design in the planning system?</li> <li>• What are the methods of financing biophilic urban projects?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• A case study of biophilic projects – both in Australia and overseas</li> <li>• A comparison of their dynamics and performance</li> <li>• Semi-structured interviews with industry stakeholders.</li> </ul>	This research investigates different approaches, dynamics and objectives leading to successful planning, design and execution of biophilic projects in urban settings. It will make recommendations for policy-makers and industry to support biophilic urban design. This research will also highlight opportunities for low carbon urban design and planning innovations.	Biophilic urban design, biophilic landscape design, liveability, well-being, climate change, planning innovations	April 2019

NP2003	Mike	<b>Burbridge</b>	Curtin	<b>Partnerships for evidence-based innovation</b>	<p><u>Context</u> The UNEPs Intergovernmental Panel on Climate Change (IPCC) research shows that universities are not implementing their own climate research in the running of their organisations. If all universities positively responded to the IPCC research and policy advice, this would save 250,000 tons of carbon a year.</p> <p><u>Research question</u> How can universities, government and industry collaboratively drive low-carbon innovation and transition?</p> <p><u>Methodology</u> Heuristic enquiry.</p>	Government, universities and professional services consultants and construction companies could utilise this research.	Living labs, campus development, triple helix, low carbon innovation	Nov 2018
NP2004	Sebastian	<b>Davies-Slate</b>	Curtin	<b>Zero carbon public-private partnership (PPP) transit to greater Curtin</b>	<p><u>Context</u> There is an opportunity to harness the expected value uplift in real estate surrounding new infrastructure projects to fund the construction of the infrastructure itself.</p> <p><u>Research question</u> How do you fund railway infrastructure using land development around railway stations?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Conceptual model: the "Entrepreneur Rail Model"</li> <li>• History of private sector infrastructure, with case studies from Western Australia</li> <li>• Interviews with key officers in the public and private sector</li> <li>• Modelling of development outcomes and railway infrastructure costs.</li> <li>• Review of emerging "trackless tram" technology.</li> </ul>	Government departments, developers and sustainable transport advocacy groups will utilise the research. The impact will help increase the proportion of travel undertaken by sustainable modes to help decarbonise transport.	Public-private partnerships, light rail, trackless tram, transit-oriented development, joint development, value capture	Jan 2019
NP2005	Lionel	<b>Hebert</b>	Curtin	<b>Industrial precinct transition to solar</b>	<p><u>Context</u> Power utilities have been providing electricity as a service to the public and industry for more than a century. They are vertically integrated with minimal competition. However, the decline in the price PV and energy storage technologies now threaten the business model of utilities. Research is required to enable utilities to transition to renewable energy.</p> <p><u>Research question</u> How can a privately owned industrial precinct best transition from a fossil-fuel powered, centralised, vertically integrated electricity business model to a renewable distributed energy business model?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Analyse and understand the current business model of power utilities.</li> <li>• Understand the disruptive competition brought by distributed energy resources (rooftop solar and batteries).</li> <li>• Explore new business models and governance structures</li> <li>• Propose a new business model for non-residential precincts</li> <li>• Apply this new business model on the microgrid of an industrial precinct.</li> </ul>	This research can help utilities transition to renewable energy. It can unlock the barriers that keep non-residential precincts from introducing renewable energy into their networks.	Renewable energy, microgrid, electricity network, utilities, business model, transition, distributed energy resource.	Nov 2018

NP2006	Jessica	Breadsell	Curtin	<b>Integration of design, technology and practices in low carbon precincts</b>	<p><u>Context</u> Cities are major contributors to greenhouse gas emissions and urban planners play a pivotal role in developing solutions to address related impacts. Previous studies have focussed on the energy, water or transport practices of residents at one point in time. There is also a lack of understanding of how residents utilise technology in low carbon precincts and its effectiveness.</p> <p><u>Research question</u> What are the implications of household design on user practices and resource flows on sustainability?</p> <p><u>Methodology</u> A "before and after" investigation using White Gum Valley, Perth as a case study.</p>	<p>The impact of this research will be to influence residential resource use and who is attracted to low carbon precincts and why.</p> <p>The research can be utilised by local and state governments and utility companies.</p>	Practice theory, household resource use, sustainable housing, low carbon precincts, household metabolism.	May 2019
NP3003	Katharine	Thornton	Swinburne	<b>A sociological analysis of low carbon food waste practices</b>	<p><u>Context</u> Approximately half the municipal waste that goes to landfill is food waste. Recycling this food and other organic waste into compost can help our transition to low carbon living by reducing the emission of greenhouse gases, improving carbon storage and promoting a closed-loop approach to resource recovery and reuse.</p> <p>It is impractical to make compost from municipally-collected food waste if there is no market for it. Accordingly, this research will discover challenges and opportunities for markets for recycled organic composts in Victoria and South Australia.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What does compost use mean in commercial Australian horticulture?</li> <li>• What kinds of compost are used by Australian growers?</li> <li>• How are composts used in commercial horticulture?</li> <li>• How do growers become compost makers and/or users?</li> <li>• How do growers describe their growing, soil health and fertility practices?</li> </ul> <p><u>Methodology</u> An application of actor-network theory (ANT) - compiling detailed case studies – and social practice theory.</p>	<p>By identifying barriers to the sale and use of compost, this research will contribute information that the recycled organics and agricultural advisory industries can apply in practice.</p> <p>In identifying ways to develop the market for composts made from municipally-collected organic materials, the research could also stimulate the discussion around policies and programs to divert food waste from landfill.</p>	Compost, horticulture, recycled organics, food waste, market development, social practice theory, actor-network theory.	June 2019
NP3004	Tom	Haynes	Swinburne	<b>Visionary design: identifying collaborative opportunities at the inception-stage of the integrated building design process</b>	<p><u>Context</u> At the inception stage of major architectural building projects, that are using an Integrated Design Process (IDP), there are significant opportunities to influence collaborative outcomes around areas such as climate change, biodiversity and social and population change. For example, a building can connect into a highly integrated network of communication technologies, distributed energy and manufacturing production system, and transportation modalities to enhance the outcomes for a range of stakeholders</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What are the key processes that support collaboration in the inception stage of IDP within major architectural projects?</li> <li>• How can the integrative aspects of ritual theory help to identify IDP</li> </ul>	Local authorities, key building stakeholders and consultants that facilitate design charrettes (public meetings) and IDP processes on major architectural projects will benefit from this research.	Integrated design process, early stage, collaboration, integration, ritual theory.	Nov 2019

					improvement opportunities?			
RP3005	Gerry	McLoughlin	Swinburne	<b>Sleep walking to disaster? Land use and transport planning decision making reviewed against climate change priorities in contemporary Australian cities</b>	<p><u>Context</u> Melbourne continues to face conflicts between urban sprawl, car dominated transport systems and weak climate policy objectives and targets. Reconciling these conflicts will create a more sustainable and liveable city.</p> <p><u>Research question</u> What are the land use, transport decisions reviewed against climate priorities in Melbourne?</p> <p><u>Methodology</u> Content Analysis of publicly available documents and Critical Discourse Analysis.</p>	This research will be valuable to policy makers, decisions makers, researchers and the community at large. It will provide a better understanding of the relationship between climate and urban land use and transport.	Critical discourse analysis, land use, transport, decision making	June 2019
NP3006	Elisa	Casagrande	Swinburne	<b>Urban objects and precincts and their performance under urban heat scenarios</b>	<p><u>Context</u> The urban heat island (UHI) effect alters a city's surface energy, radiation and water balance and perpetuates a series of chain reactions affecting the human system, the natural environment, ecosystem services, and the built environment. There is an absence of a shared agenda in between academia and the professional sector and no holistic approach to addressing UHI which is limiting the uptake of UHI research into practice.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How can the complexity of UHI be best represented?</li> <li>• What are the possible precinct level interventions to mitigate the effects of increasing temperatures?</li> </ul> <p><u>Methodology</u> Develop a model to describe UHI and its key linkages and impacts with the city subsystems in three phases: data collection; data conceptualisation and theory creation.</p>	The research can inform the development of decision support tools for local government and industry organisations in the planning and design sectors.	Urban heat island, urban complexity, urban objects, microclimate, holistic approach, grounded theory.	February 2019
NP3007	Damian	Moffatt	Swinburne	<b>Development and evaluation of low carbon mobility solutions through harnessing disruptive technologies</b>	<p><u>Context</u> Around 20% of carbon emissions are due to transportation with 98% of that related to private vehicle trips. A small reduction of private vehicle trips would thus equate to a large reduction in greenhouse gas emissions.</p> <p><u>Research question</u> How do we reduce greenhouse emissions by implementing low carbon mobility solutions at a local government level?</p> <p><u>Methodology</u> Development of a calculator that can assess a council's existing carbon emission for transport trips and estimate what mode shift is required to achieve a specified carbon reduction goal.</p>	<p>The research will develop a calculator aimed at local governments and policy makers.</p> <p>The calculator will help to inform users as to where funding should be focused to reduce the carbon emissions of private vehicle trips.</p>	Low carbon mobility, traffic modelling, carbon intensity,	April 2019
NP4002	Carlos Antonio Alonso	Bartesaghi-Koc	UNSW	<b>Assessing the thermal performance of green infrastructure on urban microclimate</b>	<p><u>Context</u> Green infrastructure (GI) is effective in reducing urban temperatures and moderating the negative effects of the urban heat island (UHI) effect. However, more research is needed to determine which compositions, amounts and spatial distributions of GI are most effective. There is an urgent need for evidence-based guidelines to inform policy and to support practitioners on the best strategies to design and implement GI into new and retrofitted urban precincts.</p>	Carlos' research will produce a green infrastructure design guideline for reducing UHI for use by government departments and agencies, developers, urban planners, urban designers, architects, and landscape architects.	Urban heat island, microclimate, green infrastructure, urban greening, ecosystem services, heat mitigation, urban cooling, airborne remote sensing.	March 2018

					<p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What is the thermal performance of different GI typologies on urban microclimate</li> <li>• Which GI typologies and amount of greening are most effective in reducing UHI?</li> <li>• How can GI be classified for climatic studies?</li> <li>• What typologies and amount of GI optimise surface temperature reduction?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Airborne remote sensing and spatial and numerical statistics</li> <li>• Airborne remote sensing data collection (LiDAR, thermal, multi-/hyper-spectral imagery) and mobile transects</li> <li>• Calculation and estimation (a) structural, (b) functional, and (c) configurational indicators</li> <li>• Spatial and statistical analysis.</li> </ul>			
NP4003	William	<b>Craft</b>	UNSW	<b>Towards 'proactive' retrofitting: developing a regenerative framework for building retrofits</b>	<p><u>Context</u> Regenerative design and development seeks to go beyond sustainability approaches of doing less harm, towards an approach which actively improves our surrounding natural environment. This approach is beginning to be seen in new buildings and developments, but further research is required to explore how regenerative concepts can be integrated into redesigning existing buildings.</p> <p><u>Research question</u> How we can transition to regenerative building retrofit design approaches?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Develop a regenerative framework for building retrofits</li> <li>• Develop set of retrofit design principles to guide how the retrofit can interact with and improve its surroundings.</li> </ul>	This research will produce a regenerative retrofit framework with accompanying design principles that will assist designers, builders and other relevant trades design retrofits that enhance their surroundings.	Regenerative frameworks, regenerative design, retrofit	Aug 2017
NP4004	Sardar Masud	<b>Karim</b>	UNSW	<b>Co-benefits of low carbon policies in the built environment: an Australian investigation into local government co-benefits policies</b>	<p><u>Context</u> In Australia, co-benefits rarely enter policy discourse and have so far failed to gain traction in climate change-related policy debates. This is due to the limited understanding on the part of policy-makers about the policy implications of a 'co -benefits approach' as a way of addressing multiple policy goals including climate change impacts, sustainable development, and enhancing health, wellbeing and liveability.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How have Australian local governments adopted a co- benefits approach in their low carbon policies?</li> <li>• What considerations guide policy-makers in low carbon policies and how do they generate co-benefits?</li> <li>• What interventions are necessary to plan, generate and promote co-benefits in local government policy processes?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• A desktop review of NSW councils' web sites and their climate change related policies</li> </ul>	The research will help to effectively integrate co-benefits into the policy processes of local government and will help to increase its uptake of low carbon policies and programs.	Australia, built environment, climate change, co-benefits, health and wellbeing, liveability, local government, low carbon policy, urban planning	August 2018

					<ul style="list-style-type: none"> <li>Comprehensive online survey and interviews</li> </ul>			
NP4005	Adriana Sanchez	Gomez	UNSW	<b>Long-term urban resilience: a policy framework</b>	<p><u>Context</u> Long-term urban resilience refers to the capacity of cities to cope with challenges, like climate change, in an integrated and proactive way. To date, urban resilience-related research has been technology-oriented and highly localised, focusing on current and predicted challenges. On the policy side, new frameworks are required that allow cities to cope with challenges in a more dynamic, proactive and effective way while striving to achieve long-term goals.</p> <p><u>Research question</u> How can we develop urban policy approaches to long-term resilience challenges at the metropolitan scale?</p> <p><u>Methodology</u> The research combines three qualitative methodologies: literature review, expert consultation and international case studies.</p>	Climate change is one of the main challenges for long-term city resilience. This research will develop a resilience policy framework for local and regional government, researchers and consultants.	Urban, resilience, policy.	August 2019
NP4007	Heriyanto	Heriyanto	UNSW	<b>Glass recycling for waste reduction in built environment</b>	<p><u>Context</u> Conventional glass recycling technologies are limited by the need to separate waste glass into glass types and the extreme sensitivity of the re-melting process to contamination.</p> <p>The research aims to address these limitations, transforming mixed waste glass into high-value building materials.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>How can glass recycling address the different melting points of reclaimed glass mixes (tempered glass, borosilicate glass, float glass etc.)</li> <li>How can an innovative, energy efficient and sustainable low carbon products be created from waste glass?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Investigate the process of recycling of end-of-life glass from buildings</li> <li>Identify methods to identify and remove contaminants from reclaimed glass</li> <li>Undertake thermodynamic analysis to evaluate what processes are possible to recycle reclaimed glass.</li> </ul>	This research will support the reuse of glass and will be of use to business and governments alike.	Polymeric glass composites (PGC), wood plastic composite (WPC), calcium silicate compound, waste glass recovery	Feb 2019
NP4008	Samir	Marzban	UNSW	<b>An evolutionary approach to single-sided ventilated façade design</b>	<p><u>Context</u> The energy use of the residential sector is a major contributor of carbon emissions in Australia, with half the energy used for heating, ventilation and air conditioning (HVAC) (38%) and lighting (7%) systems.</p> <p>Building envelopes (the physical separator between the interior and exterior of a building) have a key role in a building's exposure to outdoor elements and thus have a significant impact on energy efficiency and indoor environmental quality.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>What are the design variables that may affect single sided ventilated (SSV) façade ventilation efficiency, energy efficiency?</li> </ul>	<p>The research will provide guidance on the optimum façade designs to maintain thermal comfort whilst reducing heating/cooling loads and thus carbon emissions.</p> <p>The information will be of benefit to architects and government.</p>	Façade, residential, genetic algorithm, thermal comfort, natural ventilation, energy efficiency, day lighting	August 2018

				<ul style="list-style-type: none"> <li>How can we optimise SSV facade design?</li> </ul> <p><u>Methodology</u> A genetic algorithm- based optimisation method will determine a set of optimal solutions of the facade features for the performance targets of energy consumption, thermal comfort and ventilation rate.</p>			
NP4009	Claudio	Diaz	UNSW	<p><b>Potential of building surface evaporative cooling using rainwater in the hot humid tropics</b></p> <p><u>Context</u> The last two decades have seen increasing interest in the use of evaporative cooling (EC) strategies, not only for indoor comfort and energy savings of buildings, but also for urban heat island mitigation, stormwater restoration and water cycle restoration.</p> <p>The hot humid tropics have significant potential for using EC by harnessing rainfall, however we need to better understand its benefits to thermal/energy performance, human comfort and the water cycle.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>Why isn't water used more beneficially for cooling buildings in tropical regions?</li> <li>How does building surface EC perform across the range of climates in the hot humid tropics?</li> <li>How much rainwater can optimally be used for building surface EC in hot humid climates?</li> <li>What are the predicted impacts of widespread use of building surface EC?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Systematic literature review to understand current findings, evidence and gaps on the efficacy of building surface evaporative cooling (BSEC) in hot humid locations</li> <li>Field experiments and simulations (e.g. hygrothermal).</li> </ul>	<p>This research will provide quantitative information on the temperature reductions, energy savings, discomfort mitigation and runoff reductions that can result from evaporative cooling at the building envelope in hot humid tropical locations. It will also provide evidence of the benefits of surface evaporative cooling on the energy and water balance of hot humid tropical locations.</p> <p>Building designers, urban planners, urban climatologists, urban hydrologists, urban ecologists and local governments will make use of this research.</p>	<p>Building cooling, evaporative cooling, tropics, hot humid climates, precipitation, rainwater harvesting, runoff reduction, water-energy balance</p>	Aug 2018
NP4010	Siliang	Yang	UNSW	<p><b>Studies on optimal application of building integrated photovoltaic/thermal system for commercial buildings in Australia</b></p> <p><u>Context</u> Building facade with poor thermal insulation increases the energy demand for heating and cooling. A combined system of building integrated solar photovoltaic/thermal (BIPV/T) collectors and a double skin facade (DSF) have the potential to improve energy efficiency for buildings especially commercial buildings However, little research or real application of the hybrid mechanism of BIPV/T and DSF has been conducted.</p> <p><u>Research question</u> Is a hybrid BIPV/T and DSF building facade system able to create energy efficient Australian commercial buildings with good thermal comfort?</p> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>Experimental field measurement and computational simulation will be undertaken</li> <li>Create a building model with BIPV/T-DSF system in TRNSYS to determine the key variables and parameters</li> <li>Validate results via in-situ measurements of a mock-up building.</li> </ul>	<p>Building facades are a key component linking buildings and the outdoor environment, which significantly affects air-conditioning energy use for heating and cooling.</p> <p>Exploring high performance building facades can help improve the energy efficiency of commercial buildings and hence reduce carbon footprints.</p> <p>The outcomes of this research will be particularly useful to SMEs.</p>	<p>Building-integrated photovoltaic/thermal system, double-skin facade, energy efficiency, indoor thermal comfort</p>	Feb 2019

NP4011	Mike	Roberts	UNSW	<b>Opportunities for increasing deployment of photovoltaics on multi-unit residential buildings in Australia</b>	<p><u>Context</u> Australia leads the world in residential solar photovoltaic (PV) deployment, but the 2.3 million Australians who live in apartments are largely excluded. These residents therefore do not benefit from distributed renewable energy, despite the potential advantages of aggregating load profiles and sharing the costs and benefits of PV.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How big is the opportunity for PV on apartments?</li> <li>• What is the value for households, electricity distribution networks, society and the environment?</li> <li>• How can different technical and financial arrangements ensure equitable distribution of costs, risks and benefits?</li> <li>• What regulatory changes are needed to make this happen?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• 3D building models and aerial images of urban centres</li> <li>• Technical and economic modelling of solar generation to supply apartments and common property electricity loads</li> <li>• Modelling of the distribution of costs and benefits under a range of technical and financial scenarios</li> <li>• Case studies and stakeholder interviews</li> <li>• Analysis of regulatory arrangements.</li> </ul>	<p>The research and its ongoing engagement with Commonwealth and State energy regulators aims to influence policy development to support renewable energy deployment for use by apartment residents, strata bodies, energy consumers, local councils and energy regulators.</p>	<p>Apartments, photovoltaics, distributed energy, embedded networks, community energy</p>	<p>Dec 2018</p>
NP5002	Paris	Hadfield	UniMelb	<b>Urban renewable energy transitions: local financial innovations for just and transformative development</b>	<p><u>Context</u> There is limited research addressing how urban interventions contribute to the scaling up of decarbonisation within and across urban areas. A key knowledge gap is how finance is being leveraged to drive renewable energy generation and supply to the city and the concomitant costs and benefits. Understanding the possibilities, limitations and implications of urban-scale renewable energy initiatives and how finance can be leveraged to scale up renewable energy generation and use by local stakeholders, such as local governments and community organisations.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• How do novel financial mechanisms for renewable energy development in cities: <ul style="list-style-type: none"> <li>○ facilitate just and transformative shifts to renewable energy systems?</li> <li>○ reconfigure relations between energy consumers, energy supply and the built environment?</li> <li>○ advance renewable energy development?</li> <li>○ generate social equity outcomes?</li> </ul> </li> <li>• What is the role of government in the financing of renewable energy systems?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Comparative case studies across national contexts.</li> <li>• Qualitative data collection via in-depth semi-structured interviews to understand the roles of different stakeholders, financial arrangements, the material components of the renewable energy systems, the governance context, and the distribution of costs and benefits.</li> </ul>	<p>The research will contribute to informed development of local renewable energy initiatives and policies, particularly regarding the opportunities and limitations of emerging financial models. It can be used by local governments, state government energy and climate departments, community energy organisations and other non-governmental organisations, charities and financial firms, energy utilities and private consultancies.</p>	<p>Sustainability transitions, finance, cities, local government, renewable energy</p>	

NP5003	Panawannage Thanuja Dilrucshi	<b>Nandapala</b>	UniMelb	<b>Resilient walking cities</b>	<p><u>Context</u> Future cities increasingly face problems relating to climate change and fossil fuel scarcity, traffic congestion and health problems. There is a knowledge gap in what actions city planners and designers can take to address these problems.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• What are the key urban place characteristics (KUPC) that improve walkability and resilience in the built environment?</li> <li>• Do these KUPCs exist in the neighbourhood case studies and to what extent?</li> <li>• If KUPCs exist in neighbourhood case studies, how do they improve walkability and resilience?</li> <li>• How do KUPCs provide directions for urban interventions in the existing settlement?</li> </ul> <p><u>Methodology</u> Convergent parallel mixed qualitative and quantitative methods.</p>	The results of the research will inform policies used to plan cities and neighbourhoods. It will be useful to government departments and agencies.	Walkability, urban place characteristics, resilient, innovation	March 2019
NP5004	Angela Maria	<b>Rojas Arevalo</b>	UniMelb	<b>Effect on greenhouse gas emissions from alternative infrastructure: Modelling low carbon transitions</b>	<p><u>Context</u> Alternative infrastructure such as distributed, localised energy networks, can potentially reduce greenhouse gas emissions (GHGEs) and improve urban resilience. However, alternative infrastructures bring the scale of analysis to a different level, its configuration will depend on the geographic and demographic characteristics of the area under study and may require new actors, roles, organisational forms and institutional settings to support their adoption. The dynamics of emerging socio-technical systems at different scales are poorly understood requiring further research to understand the appropriate configurations.</p> <p><u>Research question(s)</u></p> <ul style="list-style-type: none"> <li>• How can a scalable model representing socio-technical systems for energy provision from household to precinct level be developed?</li> <li>• How do different configurations impact upon GHGEs?</li> <li>• What key policy interventions will facilitate desired socio-technical transitions?</li> </ul> <p><u>Methodology</u></p> <ul style="list-style-type: none"> <li>• Design a conceptual framework</li> <li>• Develop a model and simulation tool</li> </ul>	This research will develop a framework which will assist inform policy makers, especially those in local government, on the best combinations of energy infrastructure to support low carbon transitions.	Socio-technical, transitions, policy decision making	May 2019
NP5005	Craig Alexander	<b>Burton</b>	UniMelb	<b>Behaviour change via social sanctions and shared electricity</b>	<p><u>Context</u> Renewable energy sources can be better utilised through the integration of supply with energy demand management systems. This allows occupants to conserve energy by shifting loads to different times of the day or week.</p> <p><u>Research questions</u></p> <ul style="list-style-type: none"> <li>• Can distributed renewable energy (DRE) assets be purchased economically by consumer groups?</li> <li>• What are the impacts of group ownership and operation of DRE assets?</li> <li>• Can home energy consumers modify their behaviours to make efficient use of grid energy.</li> </ul>	<p>The research will produce software that informs home occupants about how they can conserve electricity and successfully shift loads.</p> <p>This research will be valuable to consumers, energy providers and academics.</p>	Energy demand management, urban renewable energy, energy commons, commons theory, consumption feedback	April 2018

					<p><u>Methodology</u> In home display simulation and surveys.</p>			
NP5006	Lawrence	<b>Seyers</b>	UniMelb	<p><b>Theories and practice of urban transition: Melbourne's wicked transport planning environment</b></p>	<p><u>Context</u> Melbourne is planning to grow from 4 million in 2016 to 8 million by 2051. Its transport planning decision making and governance is complex which can result in sub-optimal community and environmental outcomes.</p> <p><u>Research question</u> How can better transport planning decisions be made in a highly complex (wicked) environment?</p> <p><u>Methodology</u> The research uses a case study methodology (of the controversial East West Link project) to explore Melbourne transport planning decision making.</p>	<p>The expected impact of the research includes long-term consensus-based transport planning guidance that minimises conflict for use by government departments, public ministers, public servants and the academic community.</p>	<p>Transport planning, governance, strategic planning, community consultation, decision making</p>	<p>Oct 2018</p>
NP5007	Andrés	<b>Aguirre</b>	UniMelb	<p><b>Critical assessment of the management of water sensitive urban design assets at three selected city councils within greater Melbourne.</b></p>	<p><u>Context:</u> Water Sensitive Urban Design (WSUD) takes a holistic approach to supporting the urban water cycle. The adoption of WSUD is fragmented and performance differs. Research is required into what WSUD systems and technologies work and in what situations.</p> <p><u>Research question</u> How are WSUD assets being managed, monitored and evaluated at three selected councils within Greater Melbourne?</p> <p><u>Method</u> Qualitative research will be conducted, based on multiple and holistic case studies. The data collection will consist of stakeholder interviews. Data management, coding, and analysis will be based on pattern matching and cross-case synthesis techniques.</p>	<p>This research will assist in planning and assessment of WSUD initiatives and thus improvement of the water cycle such as stormwater management.</p> <p>The research can be utilised by local councils, water authorities and state governments.</p>	<p>Water management, stormwater, management frameworks, WSUD, asset management</p>	<p>Oct 2018</p>