

CELEBRATING TEN YEARS OF rCITI

UNSW Research Centre for Integrated Transport Innovation





ADDRESS

rCITI Office - Level 1, Room CE110
UNSW School of Civil and Environmental Engineering
Civil Engineering Building (H20)
UNSW Kensington Campus

ENQUIRIES

Tel: 61 (2) 9385 5721
Fax: 61 (2) 9385 6139
Email: rciti@unsw.edu.au
Web: rciti.unsw.edu.au

RCITI PROJECT COORDINATOR

Sylvia Brohl

CONTENT COORDINATOR & WRITER

Mary O'Connell

GRAPHIC DESIGN

Marylouise Brammer
mbrammer@bigpond.net.au
<https://indd.adobe.com/view/61504118-a435-46e4-b180-67ad9c4d3608>

PHOTOGRAPHY

Maja Baska, Kate Brown, Sai Chand, Kurt Douglas, Mike Gal, Elli Irannezhad, Maria Lee, Tanapon Lilasathapornkit, Jacquie Manning, Ted Robson, Susan Trent, rCITI Archives, UNSW Engineering.

CONTENTS

OUR VISION	5
DIRECTOR'S WELCOME	7
rCITI BEGINNINGS	8
GLOBAL IMPACT	10
RESEARCH IMPACT	17
rCITI CURRENT & PAST STAFF	24
SOCIAL IMPACT	26
EDUCATIONAL IMPACT	30
PhD GRADUATES	34
OUTLOOK	38
PEOPLE SNAPS	40

OUR VISION

rCITI's vision is to be a world-leading organization in integrated interdisciplinary transport research, development and education.

We are dedicated to pursuing high level research and development through interdisciplinary investigations of sustainable approaches to transport infrastructure and operations, and through extensive engagement with industry and government.

We provide critical expertise and experience in mobility planning, analytics, operations and technology, with a core objective to drive Efficiency, Equality and Emerging technologies (3Es) in mobility systems.

rCITI pursues globally leading interdisciplinary solutions for transport planning and management that integrate three critical aspects for societal impact:

- Emerging mobility technology
- Human behaviour & choice
- Institutional / market landscape



“

This is but a glimpse of what rCITI has achieved and the impact we have had globally.

”

DIRECTOR'S WELCOME

■ On 22nd November 2011, rCITI came to be. It has been an amazing and impressive trajectory that began with the initial support from NICTA (now CSIRO's Data61), Evans and Peck (now Advisian) and UNSW Engineering.

I still vividly remember excitedly setting foot on Australian soil to join rCITI under our founding Director Travis Waller. I remember him saying to me in a café in Austin, Texas, before he left for Sydney, "We are going to build something special, that will have a global impact and outlive us."

We are now 10 years in and have developed into one of the best Transport Engineering programs in Australia, with our students working across the world (Australia, U.S., India, China, Middle East) in world-renowned academia, government and industry across the world. A legacy that I know will outlive me, and I am inspired to continue building on.

This would not have been possible without our wonderful students, collaborators, and partners at universities around the world, as well as industry (Suncorp Group, IAG, Nexport, Google, to name a few) and government partners (amongst them Transport for NSW, Ministry of Road Transport & Highways – India) who have trusted us.

The memories are plentiful, and whereas this booklet is a walk down memory lane and a celebration of the diverse and expansive research and education we have undertaken, it is but a glimpse of what rCITI has achieved and the impact we have had globally.

Please join me in celebrating the past while aspiring for the future!

Professor Vinayak Dixit

IAG Chair of Risk in Smart Cities
Director, rCITI



rCITI BEGINNINGS

“rCITI’s vision was to reshape the field of multi-modal transport engineering and planning”

■ The UNSW Research Centre for Integrated Transport Innovation (rCITI) was officially launched in November 2011 by Professor Mary O’Kane, NSW Chief Scientist and Engineer, in the presence of supporters from government, industry and across the university.

From the beginning, its aims were high – its stated mission was, and is, to be a world-leading organisation in integrated interdisciplinary transport research and development.

rCITI’s vision was to reshape the field of multi-modal transport engineering and planning, by introducing new innovative techniques and technologies. The Centre based its research activities around five core research pillars: Transport Planning – ITS Communications – Infrastructure – Energy/Fuel – Computational Sustainability.

rCITI’s first Director Professor S. Travis Waller came from the Department of Civil Engineering at the University of Texas at Austin. Waller was an expert in transport systems and planning, and also had extensive grounding in the fields of electrical and industrial engineering. As the Evans & Peck Chair for Transport Innovation, he would be a visionary and most active leader.

rCITI was supported by other ambitious visionaries, including the then Head of School of Civil & Environmental Engineering, Professor David Waite, and the Chair of its Industry Advisory Committee, Ian McIntyre, a principal at Evans & Peck - an international infrastructure-based advisory company (now Advisian). Other financial supporters of the brand new Centre included NICTA, now Data61 at CSIRO as well as the UNSW Faculty of Engineering.

FIRST STAFF

Professor Waller’s new team included Sylvia Brohl as Centre Manager, with academics Dr Vinayak Dixit, Dr David Fajardo, Dr Lauren Gardner, and Dr Upali Vandebona Dixit, previously the Associate Director of Research, Gulf Coast Research Center for Evacuation and Transportation Resiliency at Louisiana State University, became the Deputy Director of rCITI in 2012.

rCITI began its innovative work immediately. In November 2011 rCITI hosted an introductory workshop at UNSW on electric vehicles. Attendees included Australian and international academics, and representatives from national scientific organisations, business and government.

The NSW Minister for Transport, The Hon. Gladys Berejiklian visited in March 2012 for a presentation and discussions about rCITI. During her visit, Ms Berejiklian appointed

Professor Waller an invited member to the Transport Specialist Advisory Group for Transport for NSW.

Key achievements for 2012 included the signing of an Umbrella Deed with the NSW Government Roads and Maritime Services (RMS), as well as a Memorandum of Understanding with GoGet, the car share company, and Better Place, an electric car charge network.

In 2012, Dr Taha Hossein Rashidi from the University of Toronto, Canada, and Dr Lavy Libman from UNSW Computer Science and Engineering joined rCITI’s core academic staff. Dr David Rey joined rCITI in 2013 from IFSTTAR (French Institute of Science and Technology for Transport, Development and Networks) in France. And in 2012 Dr Lauren Gardner received a UNSW Engineering research grant for her eerily prescient work on the health impacts and risks of international transport including disease propagation.

SECOND YEAR TRIUMPHS TRACSLAB

In 2013 rCITI won its first Australian Research Council (ARC) grant with partners at the University of Sydney and iCinema (UNSW) with the award of a 2013 Linkage Infrastructure, Equipment and Facilities (LIEF) Grant for an innovative driving simulation laboratory, TracsLab.

The Travel Choice Simulation Laboratory TRACSLab would become a world-first facility, able to observe collective travel choice in a realistic lab environment, with a focus on travel choice, networked interaction and strong teaming. Dr Zhitao Xiong joined rCITI in June 2013 to deploy his expertise in driving simulation and driving behaviour to focus on TRACSLab.

Other significant achievements for 2013 included two successful ARC Linkage Project Grants – one with industry partners GoGet CarShare, and the second with TSS Transport Simulation Systems Australia which aimed to improve the capabilities of transport planning techniques.

The Centre was also involved in building up UNSW’s transport education and training capabilities. Two new transport undergraduate courses as well as a Master of Engineering Science (MEngSc) Transport specialisation were approved by the university in 2013. The latter would enable industry professionals to keep up to date with the cutting-edge research being carried out by the Centre.

TfNSW

The NSW state government continued to be impressed. In 2013 TfNSW entered into a three-year partnership with funding to rCITI of \$500,000 per year. The collaboration was to "Develop and Deploy Novel Integrated Network Techniques to Enhance the NSW Transport System" and involved close ongoing interaction between UNSW researchers and students with TfNSW staff.

Meanwhile the core academic team supervised and supported 13 PhD students, 3 Masters by Research and 18 Honours students. The first PhD students would graduate in 2014, with a steady stream ever since, amounting to a critical mass of brilliant researchers now working in academic and professional fields.

A prodigy from the beginning, by the end of only its second year rCITI had developed multiple key relationships with industry, attracted global attention for research performed at UNSW, worked on internationally funded projects, led global consortia, received substantial funding from the Australian Research Council and built a world-class staff of researchers and educators.

The rest, as they say, is history ... so read on...



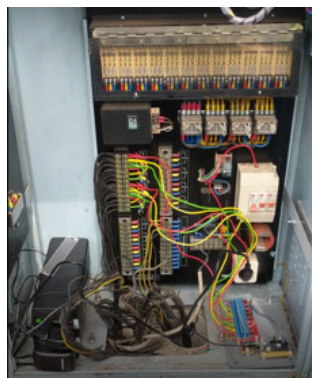
↑ rCITI Team 2011
L - R: Melissa Duell (PhD),
Dr Vinayak Dixit, Prof Travis
Waller, Dr David Fajardo,
Sylvia Brohl, Dr Lauren Gardner,
Dr Upali Vandebona

↑ rCITI Launch: L - R: Mr Ian McIntyre (Principal, Evans & Peck), Professor Hugh Durrant-Whyte (CEO, NICTA), Professor T. David Waite (HoS, Civil and Environmental Engineering), Professor S. Travis Waller (Evans & Peck Professor of Transport Innovation and Director, Research Centre for Integrated Transport Innovation, rCITI), Professor Mary O’Kane (NSW Government Chief Scientist and Engineer), Professor Les Field (Deputy Vice-Chancellor, Research), Mr Les Wielinga (Director General, Transport for NSW)



GLOBAL IMPACT

Translating our expertise into positive real-world solutions - for all the world.



REDUCING TRAFFIC CONGESTION IN INDIA AND INDONESIA

■ rCITI's work has contributed to crucial improvements in traffic management and planning in India and Indonesia. Working with government authorities in India and Indonesia respectively, tools and technology developed at rCITI have significantly reduced congestion in key large and densely populated cities as well as resulted in substantial cost savings. Our successful trials resulted in adoption of technology across other congestion areas as well as other cities.

- Leveraging crowd-sourced data sets in combination with specifically developed algorithms, to anticipate traffic flow more accurately.
- Scientifically proven reduction in traffic delays in usually high congestion traffic areas. For example, the traffic queue length was reduced by 30%-35%.
- Signal device technology was produced at a fraction of the cost of previously utilised devices.
- Improved traffic management and planning in key locations and informed policymaking going forward.

Moreover, rCITI's guidance and education to local authorities and staff have augmented the continuity and effective running of the implemented improvements.



UN PROJECT – REDUCING TRAFFIC CONGESTION AND AIR POLLUTION IN THAILAND.

■ The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) is currently undertaking analytical and capacity development activities that will:

- Assess the links between climate change, air pollution and sustainable development.
- Mainstream clean air measures at the urban level through the development of city-level air pollution mitigation plans, in cooperation with other UN system partners.

For the transport component of this project, rCITI academics Divya Jayakumar Nair (pictured) and Vinayak Dixit have been engaged for:

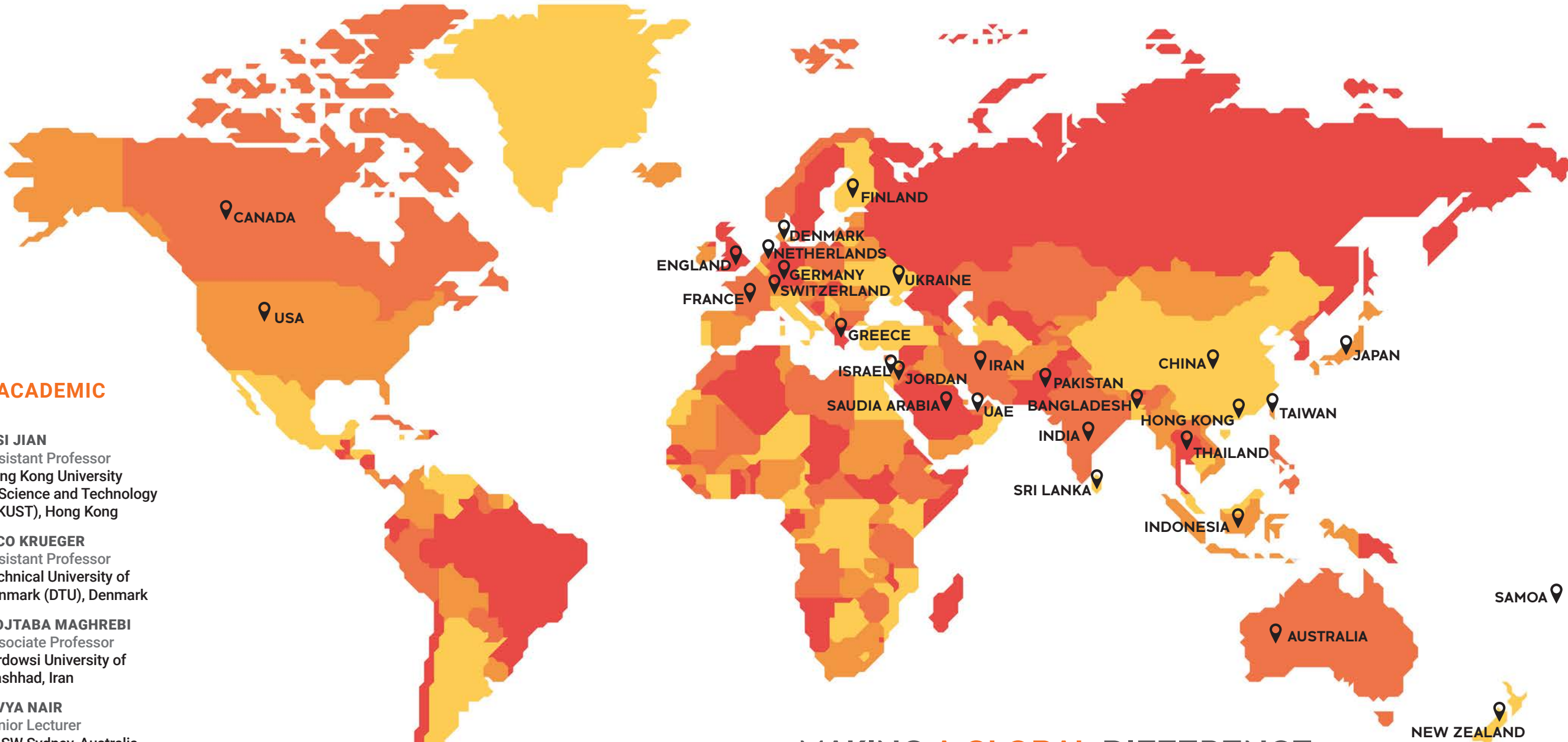
- 1 Development of knowledge products relating to innovative methods to analyse traffic congestion and air pollution in selected cities (Bangkok and Chiang Mai) in the ESCAP region.
- 2 Further development of methodology to analyse traffic congestion patterns and correlations in data trends.
- 3 Provision of data to be integrated into air pollution modelling and analytical efforts by other team members.
- 4 Policy advisory services and training material to support mainstreaming of urban aspects of air pollution solutions.

The project has different stages, and the first significant achievement has been the development of a transport model that can be integrated into UN ESCAP's master air pollution model.



U.S. DEPARTMENT OF TRANSPORTATION PROJECT

■ In 2012, rCITI was part of an international team that won a \$1.3M project from the Federal Highway Administration (FHWA) of the United States Department of Transportation (US DOT). The team consisted of Booz Allen Hamilton (lead), rCITI, University of California Riverside and the University of Arizona. This research project represented a major FHWA initiative to investigate the "Identification and Evaluation of Transformative and Environmental Applications and Strategies". rCITI led the network modelling component of the research and developed innovative network evaluation methodologies for active traffic management where environmental impact was the primary issue.



GRADUATES ON THE ACADEMIC GLOBAL STAGE

- RAED ALSALHI**
Assistant Professor
Qassim University,
Saudi Arabia

SAI CHAND CHAKKA
Assistant Professor
IIT Delhi, India

ALIREZA FARD FINI
Senior Lecturer
University of Technology
(UTS) Sydney, Australia

MILAD GHASRIKHOZANI
Senior Lecturer
UNSW Canberra, Australia

ZIYUAN GU
Associate Professor
Southeast University, China

AHMED HAMMAD
Senior Lecturer
UNSW Sydney, Australia

MD. KAMRUL ISLAM
Assistant Professor
King Faisal University,
Saudi Arabia
- SISI JIAN**
Assistant Professor
Hong Kong University
of Science and Technology
(HKUST), Hong Kong

RICO KRUEGER
Assistant Professor
Technical University of
Denmark (DTU), Denmark

MOJTABA MAGHREBI
Associate Professor
Ferdowsi University of
Mashhad, Iran

DIVYA NAIR
Senior Lecturer
UNSW Sydney, Australia

KASUN WIJAYARATNA
Senior Lecturer
University of Technology
(UTS) Sydney, Australia

XIANG ZHANG
Professor
Dalian Maritime University,
China

MAKING A GLOBAL DIFFERENCE

rCITI conducts research with governments, institutions, business and university partners around the world. We collaborate with international visiting scholars, and our brilliant PhD graduates serve society as transport practitioners, researchers and academics around the world.



COLLABORATION WITH ARGONNE NATIONAL LABORATORY, CHICAGO

■ A long-term collaboration with Argonne National Laboratory, Chicago has seen several studies undertaken, for instance

(a) to investigate attitudes towards AVs - as an emerging transport mode, aiming to develop behavioural models to measure and analyse how time-use and the valuation of travel time may change by potential implications and usage of AV technologies, and

(b) understanding the dynamics of households' behaviour on home and occupation, and conducting a comparison between two cities (Sydney and Chicago) to understand households' behaviour in residential relocation timing – a topic of great importance in the field of transport engineering and economics.

BIO-SECURE MOBILITY

■ Dr Lauren Gardner was a founding member of the rCITI team in 2011. Her key research areas included cross-disciplinary system interaction (e.g., health impacts of transport including disease propagation due to air travel) and congestion pricing for transportation networks.

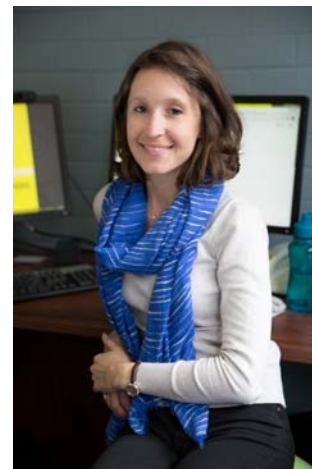
In 2015 Lauren was a key member of a UNSW cross-disciplinary team with Prof Raina MacIntyre and Dr Anita Heywood from UNSW Public Health and Community Medicine, working on a NHMRC funded project, 'Real time models to inform prevention and control of emerging infectious diseases.' The research focused on the development of optimization-based network models for predicting outbreak behaviour and developing control measures.

Through her work, bio-secure mobility became one of rCITI's core research pillars. Hard working, innovative, and communicative, Lauren's return to the United States in 2019 was a loss to the Centre and a gain to John Hopkins University. Which turned out to be a gain for the whole world.

In 2020 Lauren developed the real-time website, the Johns Hopkins University (JHU) COVID-19 dashboard which has been the go-to resource to track the global pandemic. It provided real-time developments and status with transparent and local-level data sources, providing understanding of the world outbreak situation as it unfolded. It went online on 22 January 2020, and by early March, it was accessed more than a billion times per day. Lauren was included in "The 100 Most Influential People of 2020" list by Time magazine.

The dashboard was accessed and utilised by large variety of stakeholders and users, e.g. public health authorities to guide policies, researchers for predictive analyses, media for global reporting. Its collation and accessibility have been critical for further understanding and research, e.g. predictive analyses.

Lauren is now an rCITI Visiting Senior Research Fellow.



“Through her work, bio-secure mobility became one of rCITI's core research pillars”



CENTRE OF EXCELLENCE TO ENABLE CAPACITY BUILDING IN INDIA

■ In 2020 UNSW Vice-Chancellor Ian Jacobs and the Director of the Indian Academy of Highway Engineers (IAHE), Shri Sanjeev Kumar, signed an agreement at a virtual ceremony to establish the Centre for Advanced Transportation Technology and Systems (CATTS). The Hon. Union Minister of Road Transport and Highways Shri Nitin Gadkari, Hon. Minister of State for Road, Transport, Highways and Civil Aviation Shri V. K. Singh and other dignitaries from the Government of India attended the ceremony. The agreement is for a project for capacity building, technology transfer and creation of an environment to establish a centre of excellence.

At the ceremony, Prof. Jacobs acknowledged the hard work of rCITI Director Professor Vinayak Dixit, who leads the UNSW team, and of IAHE Director Shri Sanjeev Kumar in bringing the project to fruition. The IAHE, which sits under the Ministry of Road Transport and Highways (MORTH), executes many of the ministry's projects as well as provides training for government civil engineers.

The scope of work involves research and development for a national economic and a local transport model to help inform decision-making to reduce congestion and investment to improve accessibility. The project also involves a substantial educational element to train future engineers in the government.

For more than a decade, Dixit has worked closely with the Government of India across ministries, including Road Transport and Commerce and Logistics. He said it became clear, during a project with the government for Delhi, that there was a need to incorporate modelling as an evidenced-based mechanism.

“Models help scale up good decisions because you can replicate them, and some really remarkable progress has been made in the infrastructure space in India,” Prof. Dixit said.

“For example, they are building around 37 kilometres of four-lane highways a day – it's an incredible rate that's breaking world records. They are also able to identify critical links and infrastructure. A new bridge across the Feni River between India and Bangladesh has reduced travel times by 25 per cent.”

“Models help scale up good decisions because you can replicate them, and some really remarkable progress has been made in the infrastructure space in India”

Prof. Dixit said these are the decisions they want to be able to capture in models. They can then be used at a national level to help inform cost-benefit analyses of projects and build confidence to create more industry and private investment into transportation infrastructure. They also demonstrate the opportunities and jobs that have been created.

The new Centre will be a collaboration between industry, international and Indian academics and the Government of India to help fast track new technologies, new models and new simulations into the field, to facilitate field trials. The second aspect of the Centre is training, delivering UNSW certified micro-credentials to engineers to give them opportunities to undertake degrees and postgraduate studies.



→ L - R:: Winning the Pyke Johnson Award
Ali Najmi, S. Travis Waller,
Milad Ghasri, Taha Rashidi

INTERNATIONAL AWARDS

THE PYKE JOHNSON AWARD

In 2018 the USA Transportation Research Board (TRB) Executive Committee awarded the annual Pyke Johnson Award for the best paper in the area of transport systems planning and administration to the rCITI paper, "How Should Travel Demand and Supply Models Be Jointly Calibrated?" authored by Ali Najmi, Melissa Duell, Milad Ghasri, Taha Hossein Rashidi, and S. Travis Waller.

Winning the Pyke Johnson Award is a great honour and privilege. Previous winners are from leading global universities such as MIT, University of California – Santa Barbara, Eindhoven University of Technology, MIT-Singapore, Technical University of Denmark, University of Texas – Austin.

ERIC PAS AWARD

Ali Najmi (above left) was awarded a very prestigious High Commendation in the 2020 Eric Pas Dissertation Competition by the International Association for Travel Behaviour Research (IATBR) Executive Board for his dissertation titled, Interaction of demand and supply in transport planning model systems: a comprehensive revisit. (Supervisors Taha Rashidi & Travis Waller).

IISE AWARD

In 2019 the international Institute of Industrial and Systems Engineers (IISE) awarded rCITI academic Dr Divya Nair the Scheduling and Logistics Best Paper award for her paper on "Fair allocation and cost-effective routing models for food rescue and redistribution" co-authored with David Rey & Vinayak Dixit. The award was presented in Florida to Divya by IISE President Dr Jamie Rogers.

This humanitarian engineering paper presented three objective functions: utilitarian, egalitarian, and deviation-based for efficient and fair food allocation, and presented a goal programming-based formulation combining cost-effective routing and allocation objectives to obtain balanced solutions.



RESEARCH IMPACT

CORE RESEARCH PILLARS

■ In 2011 we began our journey with five core research pillars: Computational Sustainability; Energy/Fuel; Integrated Transport Systems Communications; Transport Infrastructure; Transport Planning.

In 2019 we reviewed our research pillars and reshaped them to reflect emerging trends as well as our core research strengths, all underpinned by our collaborations with Government and industry as well as academic research developments. The six core research pillars are:

- Integrated Infrastructure Strategic Planning.
- Bio-Secure Mobility.
- Engineering Smart Cities & Logistics.
- Connected Mobility Services.
- Deep Data, Digitisation & Decisions.
- Human-centred and Automated Systems Design.

OUR RESEARCH CAPACITY RECOGNISED BY AUSTRALIAN GOVERNMENT

■ rCITI's research capabilities and expertise are extensive. As engineering researchers, we are real-world oriented, working with industry on many externally funded projects - including over 20 global sponsors. But we are also very active in our international research community, producing 400+ high value technical papers – published in peer-reviewed quality research journals around the world.



“
Since our foundation, rCITI has been awarded 17 highly sought-after ARC research grants
”

Our research capacity and achievements formed an integral part of the 5 out of 5 ERA ranking achieved by UNSW Civil & Environmental Engineering in 2015. This was the highest possible ranking by the Australian Government’s Excellence in Research for Australia (ERA) 2015 –confirming our ‘outstanding performance well above world standard.’

Our achievements have led to multi-million dollar investment in the work of rCITI by peak scientific funding bodies including the U.S. National Science Foundation, Australian Research Council (ARC) and National Health & Medical Research Council (NHMRC). Since our foundation, rCITI has been awarded 17 highly sought-after ARC research grants including 5 Discovery, 8 Linkage, 3 DECRA, and 1 LIEF to the value of \$6M.

Linkage Projects involve industry or community partners, while Discovery Projects are traditionally ‘blue-sky’ research projects supported by the Australian Government in national research priority areas.

rCITI Discovery projects include:

- Adaptive Stochastic Dynamic Traffic Assignment, S.Travis Waller, 2014
- Investigating travel choice behaviour: a new approach using interactive experiments with driving simulators, S.Travis Waller, Vinayak Dixit (rCITI, UNSW), with colleagues Prof Michiel Bliemer (USyd) (Chief Investigator), Prof David Hensher (USyd), Prof Elisabeth Rutstrom (Georgia State), Prof Stephane Hess (Uni Leeds) and Prof Hans Van Lint (TUDelft Netherlands). 2014
- Incentivised strategic traffic assignment: bi-level transport optimisation, S. Travis Waller, David Rey (rCITI, UNSW), with Prof Carolina Osorio (MIT). 2018
- Quantifying Ethics-related Metrics for Transport Network Systems, S. Travis Waller, Taha Hossein Rashidi, David Rey, Divya Nair, Sisi Jian (rCITI, UNSW). 2020 Improving the design of transport network services to augment the social benefits to relevant user groups will help in positioning Australia as a global leader in the field of ethical transport network systems.
- Rethinking walking infrastructure: AI-assisted footpath network modelling Meead Saberi (rCITI, UNSW), with Prof Majid Sarvi (Uni Melb), Dr Patricia Sauri Lavieri (Uni Melb), and A/Prof Marta Gonzalez (UC Berkeley). 2022.

TEN YEARS OF RCITI RESEARCH

- 400+ Journal papers published,
- 180 Refereed Conference papers published
- 5 Discovery Projects Awarded
- 8 Linkage
- 3 DECRA
- 1 LIEF

OUR THREE DECRA

■ A Discovery Early Career Researcher Award (DECRA) is specifically to support and advance promising early career researchers.

ASSOCIATE PROFESSOR TAHA RASHIDI - INTEGRATING SOCIAL MEDIA WITH CONVENTIONAL DATA SOURCES TO MODEL LAND USE.

DE170101346 \$375,000 Commenced 2017, completed 2019.

Taha Rashidi’s project aimed to design a framework linking urban pattern development to changing demographics. This multi-level modelling framework for housing, job and school searches was linked to a demographics evolution module providing information about household lifestyle changes.

The research project developed and provided insights about preferences of people with regard to different aspects of land use, with a special focus on residential and job relocation decisions. Several emerging data sources were explored to extract the most amount of information to enhance the predictability of the developed models. The data sources included data provided through classical data sources, social media data, crowdsourced data and adaptive dynamic survey instruments reflecting the evolution of behaviour of people.

DR WEI LIU - QUANTIFYING AND MANAGING THE NETWORK IMPACTS OF TRANSPORT SHARING SERVICES.

DE200101793 \$423,000 Commenced 2020.

Wei Liu’s project aims to address the challenge of effectively modelling multiple transport sharing services (e.g., ridesharing and parking sharing) in a multimodal network, and efficiently operating these services, and incentivising people to use them. The project expects to generate new knowledge in shared transport by developing an innovative approach to systematically reproducing and optimising network impacts of sharing services on travel choices, sharing demand-supply matching patterns, movement trajectory features and traffic dynamics. Expected outcomes include new models and strategies to improve decision support for transport planners and operators. This should provide significant benefits for human mobility and city sustainability.

DR MILAD HAGHANI - A NOVEL APPROACH IN CROWD EVACUATION PLANNING: BEHAVIOURAL INTERVENTION.

DE210100440 \$431,000 Commenced 2021

The ability to rapidly and safely evacuate crowds can mean the difference between death and survival in mass emergencies. While the immediate reaction of the public to an emergency is paramount for their survival, their role in crisis management is often not fully harnessed. Milad Haghani’s project establishes an innovative and pragmatic approach in urban emergency planning: optimising evacuations through behavioural training. Pioneering empirical steps will be taken to discover optimum strategies that individual crowd members should adopt, and to establish the extent to which modifying crowd responses can be effective. The outcomes will result in educational guides that will increase public awareness and community preparedness for public emergencies.





THINK GLOBAL, ACT LOCAL

WORKING WITH TRANSPORT FOR NSW

Les Wielinga, Director General of Transport for NSW (TfNSW), was present at rCITI's launch in November 2011, and four months later the NSW Minister for Transport, The Hon. Gladys Berejiklian visited the School of Civil and Environmental Engineering for a presentation about the new research centre. Impressed by Professor Waller and his vision, Ms Berejiklian promptly appointed him as an invited member to the Transport Specialist Advisory Group for TfNSW.

In 2013 rCITI entered into a three-year partnership with Transport for NSW with funding to rCITI of \$500,000 per year. Work on project tasks immediately commenced. The collaboration brief was to develop and deploy novel integrated network techniques to enhance the NSW transport system, and involved close ongoing interaction between UNSW researchers and students with TfNSW staff.

Since then, rCITI and the government have worked on a variety of projects together, including an ARC Linkage project 'Understanding impact of autonomous vehicles on behaviour and interactions'. rCITI has also significantly contributed to TfNSW guidance documents, especially to improve safety and reduce congestion. Examples include "Mesoscopic and Hybrid Modelling Guidelines" and "Driving Behaviour Parameter Study".

As part of TfNSW's on demand trials, rCITI's David Rey's collaboration with Keolis Downer saw the trial of on-demand bus services to provide affordable, flexible and safe mobility with wider reach and to encourage the use of public transport, with a successful first trial at the Northern Beaches, followed by a second trial in the City of Ryde / Macquarie Park precinct.

rCITI CityX researchers, collaborating with Cardno, successfully participated in TfNSW's Safety After Dark Innovation Challenge, while A/Prof Meead Saberi has also worked closely with TfNSW to develop machine learning based models to predict walking and cycling volumes across the Sydney metropolitan area.

SMART CITIES AND SUBURBS - WORKING FOR LOCAL GOVERNMENT

Key rCITI researchers: Taha Rashidi, Travis Waller, Vinayak Dixit, Wei Liu, Milad Ghasri, Kasun Wijayaratna, David Rey, Meead Saberi

A joint application with Randwick City Council, rCITI and BaseUp under the Australian Government's Department of Industry, Innovation and Science competitive grant scheme 'Smart Cities and Suburbs Program' has seen the project "Integrated Smart Parking System: Emerging and Shared Approaches" come to fruition. The aim was to optimise the efficiency of parking policies and the use of smart technologies. rCITI researchers developed an agent-based parking model to simulate the parking lot selections in a realistic dynamic framework. This model was then used to investigate the effects of different parking policies and demand scenarios on parking utilisation and system performance. Smart parking policies and technologies have been successfully piloted in the Eastern Suburbs of Sydney to better manage public parking in high-demand areas and reduce congestion associated with drivers looking for a place to park.

THE HUMAN FACTOR - PROFESSOR MICHAEL REGAN

■ In 2018, rCITI welcomed Professor Michael (Mike) Regan as Professor – Human Factors, to establish a group in this critical domain which has significance and collaborations into multi-disciplinary areas such as transport, psychology, AI and law.

A psychologist and Human Factors specialist with more than 20 years' experience as a transport safety researcher - in Australia, Europe and the US, Mike has spent much of his career researching driver distraction and inattention, and driver interaction with automated vehicles. His current research projects include ARC Linkage projects on 'Ageing drivers: Cognitive ageing and technology,' and 'A Road Out of Motion Sickness in Autonomous Vehicles,' the latter project with Vinayak Dixit and industry partners Ford Motor Company. Mike was also a key contributor to a new UNSW Engineering undergraduate course, Engineering Design and Professional Practice with an emphasis on Human Factor knowledge as integral to successful engineering design.

In 2021 Mike was awarded the prestigious Australian College of Road Safety (ACRS) Fellowship. In presenting the award, ACRS President Mr Martin Small said "Professor Regan's body of work has re-oriented our focus ... reminding the world that we must always place humans at the very centre of our safety thought and action".

“ This model was then used to investigate the effects of different parking policies and demand scenarios on parking ”



“ Professor Regan's body of work has re-oriented our focus ... ”





RETHINKING WALKING INFRASTRUCTURE

■ Associate Professor Meead Saberi leads rCITI's CityX research lab (www.cityxlab.com) which focuses on scientific understanding of cities through modelling, simulation, data analytics, and visualization.

Saberi's research team are currently investigating numerous and diverse mobility topics such as autonomous vehicles eco-driving, optimal pricing in ride-sourcing systems, modelling carpooling systems, optimal traffic signal timing for complex continuous flow intersections, and pedestrian and sidewalk network modelling.

One of Associate Professor Saberi's recent research projects showed that 70% of the Indigenous population in the City of Sydney live in neighbourhoods with lower-than-average walkability. There are great health and social benefits in having a more walkable place to live. Reducing transport inequality and improving walkability in Indigenous communities are necessary to help close the health and social gap.

Currently the CityX team are working with researchers from University of Melbourne and Berkeley on a major ARC Discovery project 'Rethinking walking infrastructure: AI-assisted footpath network modelling.' This project will deliver a step-change in transport planning for walking infrastructure that will lead to increased active transport and improved urban infrastructure planning, thereby resulting in significant gains in population and environmental health.

FUTURE FORWARD

WELCOMING DR ELNAZ (ELLI) IRANNEZHAD

■ We continue to expand our team with the next generation of future leaders and welcomed Dr Elnaz (Elli) Irannezhad in 2022 as Senior Lecturer, who will be teaching and researching in the field of logistics optimisation, freight transport modelling, and critically specialises in emerging technologies such as blockchain, automated zero-emission heavy vehicles, and artificial intelligence applications in freight transportation.

Elli's research contributes to the advancement of science in cross-disciplinary fields, including logistics, supply chain and freight transportation, agent-based modelling, Mobility and Logistics as a Service, automated vehicles, and blockchain technology. Elli undertakes her research closely with industry to ensure a good alignment with real-world needs and industry uptake.

She has already taken leadership of rCITI's weekly seminar series which brings together esteemed academics, industry as well as students to present and share knowledge, further fostering collaborations and cross-disciplinary outreach.

Actively engaged in the Bridging Transportation Researchers (BTR) initiative and BTR's recent conference, Elli has also been managing the BTR Special Issue in the Journal of Transport Planning and Technology as the guest editor.

Welcome to the team, Elli!



rCITI RESEARCH FACILITIES

■ Our laboratories and facilities underpin our research as well as enabling fruitful collaborations with domestic and international academia, government and Industry.

MORTY LABORATORY

rCITI's overlaying MObility Research and Technology (MORTY) Laboratory, provides an excellent platform for technology development and use case opportunities:

- Developing new technology to support real time adaptive traffic systems that help reduce congestion, improve safety and reduce emissions.
- Development of in-vehicle applications to help reduce motion sickness,
- Developing tunnel technologies, that improve safety and autonomous vehicles.
- TRACSLab

TRACSLAB A WORLD FIRST FACILITY

In rCITI's very first year of operation, a research team led by Professor Waller and Dr Dixit won an ARC Linkage Infrastructure, Equipment and Facilities (LIEF) grant to deploy a Travel Choice Simulation Laboratory (TRACSLab).

TRACSLab was a world-first facility - able to observe collective travel choice in a realistic lab environment. The lab was unique due to the focus on travel choice, networked interaction and strong teaming, including partners at the University of Sydney, Professor Michael Bliemer and Professor Dennis Del Favero, Director of the UNSW iCinema (UNSW).

The findings of the lab would support a new generation of transport analysis techniques for emerging issues such as sustainability, reliability, and intelligent transport systems (ITS). It enabled multi-subject and multi-modal interaction in addition to remote international collaboration, and paved the way for further extensive research and development in transport technologies.

CITYX VIRTUAL LABORATORY

An additional facility, since 2018, is CityX Virtual Laboratory which focuses on the development and application of data-model driven methods to better plan, manage and operate urban transport systems. Using urban data visualization, analytics, modelling, and simulation, CityX, led by Associate Professor Meead Saberi, is improving our scientific understanding of smart cities, with an overarching aim to mitigate urban traffic congestion and improve urban liveability.

“The findings of the lab would support a new generation of transport analysis techniques for emerging issues”



CELEBRATING TEN YEARS OF OUR PEOPLE rCITI **CURRENT & PAST STAFF**

CURRENT STAFF

Director: **Professor Vinayak Dixit**
Deputy Director: **Associate Professor Taha H Rashidi**

ACADEMIC STAFF

Dr Milad Haghani
Dr Elnaz (Elli) Irannezhad
Dr Divya Nair
Associate Professor Meead Saberi

EMERITUS PROFESSORS

Professor John Black
Professor Michael (Mike) Regan

ADJUNCT ACADEMICS

Dr David Ashmore, Adjunct Research Fellow
Dr Melissa Duell, Adjunct Associate Lecturer
Dr Lauren Gardner, Senior Visiting Fellow
Dr Hanna Grzybowska, Adjunct Lecturer
Dr Wei Liu, Adjunct Senior Lecturer
Dr David Rey, Adjunct Senior Lecturer
Professor S Travis Waller, Honorary Professor
Dr Xiang Zhang, Adjunct Lecturer

PROFESSIONAL & TECHNICAL STAFF

Sylvia Brohl, Project Officer
Maria Lee, Centre Manager
Julius Secadiningrat, TRACSlab Manager & Research Associate
Aleksa Zlojutro, Software Engineer

RESEARCH STAFF

Dr Tanapon Lilasathapornkit
Dr Ali Najmi
Dr Siroos Shariari
Dr Amarin Siripanich
Dr Maziar Yazdani

PAST STAFF

Founding Director: **Professor S Travis Waller**,
Director 2011 - 2018, Executive Director 2018 - 2020
Founding Deputy Director: **Professor Vinayak Dixit**, 2012 - 2018

PAST ACADEMIC STAFF

Dr Lauren Gardner, 2011 - 2019
Dr Milad Ghasrihouzani, 2017 - 2019
Dr Lavy Libman (CSE/CVEN), 2012 - 2015
Dr Wei Liu (CSE/CVEN), 2018 - 2020
Professor Michael (Mike) Regan, 2018 - 2020
Dr David Rey, 2016 - 2021
Dr Upali Vandebona, 2011 - 2016
Dr Kasun Wijayaratna, 2018 - 2019

PAST ADJUNCT ACADEMICS

Dr Nima Amini, Adjunct Associate Lecturer
Dr Chen Cai, Conjoint Lecturer
Dr Ken Doust, Adjunct Senior Lecturer
Jamye Harrison, Adjunct Professor
Dr Upali Vandebona, Honorary Senior Lecturer
David Yee, Adjunct Senior Lecturer

PROFESSIONAL STAFF

Sylvia Brohl, Centre Manager 2011 - 2014

PAST RESEARCH STAFF

Dr Mahmood Akhtar, 2017 - 2019
Dr Ali Ardeshiri, 2018 - 2021
Dr Saeed Bastani (CSE/CVEN), 2013
Dr András Bóta, 2015 - 2017
Dr Sai Chand Chakka, 2018 - 2022
Dr Melissa Duell, 2015 - 2017
Dr David Fajardo, 2011 - 2012
Dr Hanna Grzybowska, 2014 - 2019
Dr Ziyuan (Frank) Gu, 2019 - 2021
Dr Sisi Jian, 2017 - 2019
Dr Mojtaba Maghrebi, 2014 - 2017
Dr Emily Moylan, 2014 - 2018
Dr Divya Nair, 2017 - 2019
Dr Prasanna Prabhakaran, 2018 - 2021
Dr David Rey, 2013 - 2015
Dr Edward Robson, 2018 - 2020
Dr Neeraj Saxena, 2017 - 2020
Dr Kasun Wijayaratna, 2016 - 2018
Dr Zhitao Xiong, 2013 - 2019
Dr Xiang Zhang, 2018 - 2021

What can we say? How to express our gratitude? rCITI could not have done any of it without any of you, and we benefitted from every single one of you! Thank you for your work.

The Centre's ability to grow and have significant educational and research impact would not have been possible without the solid foundations and support from our professional and technical staff. Our Centre Manager Maria Lee has guided the team administratively and operationally for almost nine years. Maria facilitates the day-to-day management of our operations and anything in between. Sylvia Brohl was part of rCITI's founding team as a Centre Manager at its initiation and helped navigate rCITI through the start-up phase. Sylvia later returned to rCITI to facilitate project management and partnerships.

Our R&D activities wouldn't have reached where we are without the extraordinary support from our technical staff, which include Dr Zhitao Xiong during the inception, followed by significant initiatives that were undertaken after Julius Secadiningrat had taken over as our lab manager in 2018; with great support from Aleksa Zlojutro as the Software Engineer.

We also could not have achieved all that we have without our supportive colleagues in UNSW Civil & Environmental Engineering and across Faculty. We could not have done it without our adventurous collaborators across campus, as we worked with UNSW Business, Psychology, Medicine and Aviation, to mention just a few. We could not have done it without our international research colleagues, our innovative and generous industry partners, and our students.

We salute all of you! And thank you again.



SOCIAL IMPACT

“I’m of the opinion that engineering research is only engineering research if it makes an impact out in the world. If it doesn’t, then it’s not engineering research”

S Travis Waller, rCITI

DRIVING A NEW TRANSPORT MODEL

Key rCITI researchers: Vinayak Dixit, S. Travis Waller, Taha Rashidi, Lauren Gardner, and Bruce Jeffreys (GoGet)

■ GoGet and rCITI first joined forces in an ARC Linkage grant in 2013, to determine how best to implement the innovative one-way car-sharing scheme. Car-sharing schemes that integrate with public transport systems can have a major impact on cluttered roads by reducing the number of vehicles both on the road and off, also reducing parking congestion.

Analysing the GoGet data, rCITI was able to develop rich models of how drivers behave and how they choose their routes, also looking at cost, mobility and transit usage.

↑ L - R: Taha Rashidi, Lauren Gardner, Vinayak Dixit and David Rey

GoGet’s co-founders Nic Lowe and Bruce Jeffreys continued to welcome the opportunity to explore further new technology and new ideas. With additional funding from the UNSW School of Civil & Environmental Engineering, rCITI researchers set up one of GoGet’s fleet vehicle with an on-board computer, front and side radar detectors and a forward facing intelligent camera. The software collects and analyses traffic data to evaluate crash risk propensity and fuel efficiency of driving.

It was also the first step towards creating a self-driving car...

Another rCITI, GoGet and other industry supported Linkage project in 2016 aims to further develop an Integrated Intelligent Vehicular System (IIVS), seeking to understand the potential impact of autonomous vehicles on driver behaviour and interactions.

This project, which is being conducted with the support of other universities, the Australian Road Research Board (ARRB), GoGet, VICRoads, TfNSW, and a number of insurance companies, is at the forefront of using technology to influence human behaviour and promote safer and more fuel efficient behaviour through incentive mechanisms, and is expected to influence transportation and insurance policies.

Most importantly, this project will contribute towards a broader framework for Intelligent Transport Systems.

Key rCITI researchers: Vinayak Dixit, Travis Waller, Michael Regan.

SUPPORTING SUSTAINABLE FOOD SYSTEMS- OZHARVEST

■ In 2015 rCITI won an ARC Linkage grant to develop an innovative holistic mathematical model of the vehicle routing problem for OzHarvest’s food rescue and distribution system.

Key rCITI researchers: Vinayak Dixit, Divya Jayakumar Nair, Taha Rashidi, & David Rey.

Millions of tonnes of fresh food are thrown into landfill each year, but not-for profit organisations like Foodbank and OzHarvest seek to combat such costly environmental and social waste, collecting quality surplus food from a variety of food businesses, and delivering it to charities that help feed people in need.

The concept is, however, more complex than it might seem – with operational constraints including multiple pick-ups and drop-offs; speedy timeframes for the delivery of perishable goods; working around the catering schedules of homeless shelters; needing to distribute food equitably; and having limited resources and funds. Effectively working out the most efficient routes to pick up and distribute the donated items was a huge logistical challenge.

COLLABORATION AIMED AT DRIVING EFFICIENCY

Since 2014 rCITI researchers have collaborated with Foodbank and OzHarvest to enhance their planning and management systems of food rescue by developing a decision support system for the real time recovery and distribution of surplus food – taking into consideration the uncertainties in recovery and fairness in distribution.

The core research conducted in the domains of demand modelling, clustering and dynamic vehicle routing algorithm development, simulation and optimisation. Specific applications include a recovery prediction model, a distribution model accounting for equity and fairness, and a dynamic clustering and routing model which incorporates the uncertainty in recovery.

rCITI’s collaborative work with the food rescue agencies has resulted in more food being delivered to more people, more efficiently, using less resources. What’s more, its algorithms can be adapted for use by humanitarian organisations around the world.

“This project is at the forefront of using technology through incentive mechanisms”

”



↑ Dr Divya Nair’s PhD topic was the logistics of surplus food rescue and distribution.

→ L - R: James Orchard,
Executive General Manager
Innovation, IAG, Vinayak Dixit,
IAG Chair of Risk in Smart
Cities, Cecilia Warren, Director,
Research & Development, IAG



“As researchers, we are a bastion in an empire of knowledge, and we are part of a supply chain of innovation”

■ In November 2019 Professor Vinayak Dixit was appointed as the IAG Chair of Risk in Smart Cities. This position was established with the generous support of IAG (Insurance Australia Group), the parent company of some of the largest insurers in Australia and New Zealand.

Mr James Orchard, IAG Executive General Manager, Innovation and Ms Cecilia Warren, Director, IAG Research & Development emphasised the fruitful research relationship with rCITI which had developed over the previous three years and were delighted to see their Academic Outreach Program result in another milestone with the establishment of an inaugural Chair position at UNSW.

“That expertise that sits in industry is really, really critical,” Dixit said, reflecting on the exponential benefits of industry collaboration. “As researchers, we are a bastion in an empire of knowledge, and we are part of a supply chain of innovation.”

In collaboration with the Chair of Risk, and with a focus on the development of safer, more resilient and better connected communities, IAG are investigating how people and systems will interact in Smart Cities of the future.

”

SAFETY AFTER DARK
rCITI Research Lead: Dr Meead Saberi

■ In 2020 rCITI partnered with Cardno to deliver a game changer project for Transport for NSW (TfNSW) to empower women to make informed choices about their travel, that could improve their safety after dark.

As part of their Safety After Dark Innovation Challenge TfNSW trialled innovative data and technology ideas to improve safety for women travelling at night in Greater Sydney. The innovative idea presented by the UNSW-Cardno team identified the key factors in safety after dark for women as being passive surveillance and the comfort it can bring.

Passive surveillance is essential in a transit environment after dark, because it reduces opportunities for crimes against women to occur, and at the same time improves personal safety perception.

The team quantified passive surveillance in a web and/or mobile application that can be used by women to make informed choices on their travel. A passive surveillance index for each street would be determined through a multi-criteria assessment of the closing times of street level establishments (restaurants, shops, services, etc.) and other contributing factors.



Providing knowledge of areas with higher passive surveillance invites women to more freely participate in the community at night. The project produced for TfNSW an action plan that can be used to implement design, technology and behavioural changes to improve safety.

UNSW/Cardno were among the winners of the Challenge, alongside other successful projects from the University of Wollongong’s SMART Infrastructure Facility, data sharing platform She’s a Crowd, and safety technology vendors Guardian LifeStream. The NSW Minister for Transport Andrew Constance said that “The winners were chosen for their potential to meaningfully address real safety issues, and their ability to use creative and sophisticated new technologies to make a real difference.”

ZERO-EMISSIONS TECHNOLOGIES FOR ELECTRIC BUSES

■ In 2021 rCITI entered into a memorandum of understanding (MOU) with emerging Australian electric vehicle (EV) producer and supplier Nexport to develop a joint laboratory for zero emissions and sustainable transport initiatives,

Under the terms of the agreement, UNSW and Nexport will jointly create the purpose-built TechnoLogistics Lab for UNSW students and researchers to design and progress sustainable zero emissions technologies for electric buses.

The Lab will enable researchers to engage in real-world development of zero emissions transport, to create the capacity and new technology that will put Australia at the forefront of zero emissions transport.

rCITI Director Professor Vinayak Dixit said, “We are looking to use new materials, electrical and battery systems and transport management driven by key expertise from UNSW Design Next to develop zero emissions technology that incorporates fundamental design principles”.

Over a three-year timeframe research will focus on creating a platform for shared zero emissions logistics and mobility, electronic transport and grid infrastructure integration, human factor design, automotive development and battery swapping functionality, energy management software and hydrogen storage systems for heavy vehicles.

Nexport CEO Michel van Maanen said the TechnoLogistics Lab will allow Nexport and UNSW to foster innovation and “tap some incredibly bright minds to challenge conventional wisdom in a growing and ever-changing sector.”





EDUCATIONAL IMPACT

rCITI staff provide a unique program on transport engineering in Australia, within UNSW Civil and Environmental Engineering, with courses on transport planning, modelling, design, operations and management. Our staff have integrated innovative techniques and technologies into their teaching. Our students have shone!

SETTING THE COURSE: UNDERGRADUATES

■ The undergraduate course package starts with the first-year course ENGG1400 (Engineering Infrastructure Systems) which introduces fundamental engineering systems concepts and methods to first year students with real-world projects related to critical contemporary issues. The course includes lectures on the following topics: complex systems, network modelling, system dynamics, optimization methods, infrastructure system design and behaviour and decision making.

An overview about transport engineering, road design and environmental engineering is offered in the second year through the CVEN2401/2402 (Sustainable Transport & Highway Engineering / Transport Engineering & Environmental Sustainability) courses. Topics include an introduction to four step transport planning process, transport network principles and their applications, transport demand models and sustainable transport strategies.

In the third year students are offered a project-based course on traffic operations on a realistic transport network in the Civil Engineering Practice (CVEN3031) course. Fourth year undergraduate students have the option of enrolling in the Transport Systems - Part 1: Network Analysis (CVEN4402) course in which they are presented with in-depth knowledge about behaviour of travellers on transport networks. Further, 4th year students can enrol in the CVEN4701 (Sustainable Infrastructure Planning) course which deals with designing a city in a sustainable manner, including sustainably designing the transport network by looking at pollution, equity and energy consumption.

In 2019, the Centre extended its teaching curriculum by introducing a new fourth-year elective course in Human Factors for Civil and Transport Engineering (CVEN4405) which encompasses the field of engineering psychology and will equip students with the fundamental knowledge and skills necessary for human-centred design. In 2020, the Centre introduced a new undergraduate practice-oriented course on Engineering Design And Professional Practice, (DESN2000) which is the first of its kind in Australia. Professor Mike Regan was a key contributor to this Faculty-wide course, emphasising to all engineering students that Human Factor knowledge is integral to engineering design.

MOVING ON: ADVANCED STUDY AND CAREER ENRICHMENT

■ In 2014, the Centre successfully introduced the first and only Master of Engineering Science (8338) of Transport Engineering in Australia, designed for both recent graduates and industry professionals to develop deep skills in modelling and analysing transport systems, both passenger and freight.

Advanced study options include transport planning, ITS and land use and risk management and safety, through to network design, demand estimation and sustainability, emissions and health. The typical two-year program comprises open-ended enquiry-based projects as well.

Five Transport Specialisation postgraduate courses are CVEN 9405 Urban Transport Planning Practice, CVEN9407 Transport Modelling, CVEN 9415 Transport Systems Part 2, CVEN9421 Transport Logistics Engineering and CVEN9422 Traffic Management & Control.

Two of the above courses were designed by rCITI staff. The first new course introduced in 2014 by Travis Waller was CVEN9407 Transport Modelling which covers methods required in travel demand modelling and accident analysis. In later years, operations research expert David Rey was involved in the design of Transport Logistics Engineering (CVEN9421) which explores advanced methods applied to transport systems such as network algorithms, mathematical optimization and integer programming. This new unit filled the gap in transport logistics within the curriculum.

TEACHING INNOVATION

Long before Covid forced the tertiary sector to go almost fully online, in 2015 rCITI's Taha Hossein Rashidi and Lauren Gardner rose to the challenge of teaching one of the School's largest ever classes with a grant to implement online assessment for their course. The first of their assessment tools allowed students to design roadway geometry in a 3D environment. The second allowed students to use an Agent-based Demand and Assignment Model in their road network design assessment.

The online assessment platform developed as part of the Teaching Initiative Grant enabled Dr Lauren Gardner and Dr Taha Rashidi to generate personalized road design assignments for the 700 students in the course. "The platform also provided a means



“The platform also provided a means for the students to submit all course assignments online”

“None of which would have been possible for such a large class under the traditional assignment submission process.”



for the students to submit all course assignments online, and for the lecturers to automate the marking process and provide rapid but still personalized feedback,” explained Dr Lauren Gardner, “none of which would have been possible for such a large class under the traditional assignment submission process.”

In the same year, a School Teaching Equipment grant enabled Vinayak Dixit and Taha Rashidi to purchase multiple traffic simulation software for students to be used for civil engineering practice, demonstration purposes and class projects. They successfully incorporated these simulations in a game-based environment to provide students an understanding of the theoretical underpinnings through experiencing the phenomena through simulation and virtual reality.

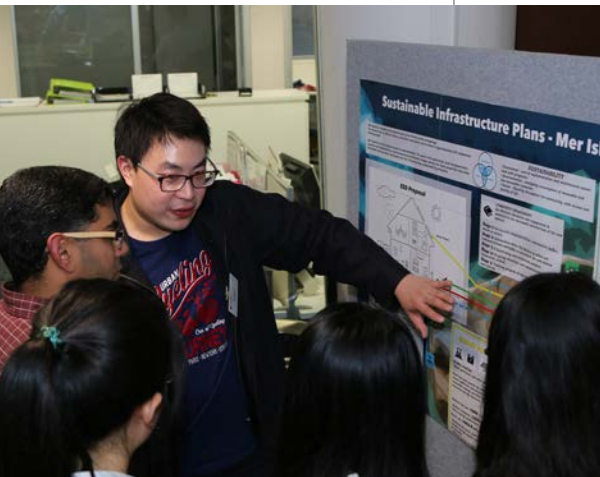
VICE CHANCELLOR’S AWARD FOR TEACHING EXCELLENCE

In 2015 Taha Rashidi won a UNSW Vice Chancellor’s Award for Teaching Excellence (Team Award) for “Approaches to teaching that influence, motivate and inspire students to learn” and an Award for Excellence in Engineering Education Engagement (Team Award), from Engineers Australia Australasian Association for Engineering

Education, for his role in the fourth-year course CVEN4701 ‘Planning Sustainable Infrastructure’.

This ground breaking course collaborated with the people of Mer Island, the Torres Strait home of Eddie Mabo, (the architect of Australia’s modern land rights movement), in finding sustainability solutions for their energy supply, water treatment, waste management and transport systems.

Student designs were to consider the whole picture, taking into account the environmental, economic, social and cultural needs of the island community.



BUILDING SUPPORTIVE AND SHARING NETWORKS

rCITI staff were active in the establishment of the Transport Research Association for New South Wales (TRANSW) in 2018 – a collaboration between UNSW, University of Sydney, UTS, and Transport for NSW (TfNSW). TRANSW aims to foster and support cohesive cross-disciplinary and cross-institutional excellence in transport research and practice, and provide a bridge between academic research, policy institutions and industry so as to create knowledge and understanding in transportation which benefits Sydney and Australia as a whole.

The Inaugural Symposium was held at University of Sydney on the 3 December 2018. A large number of rCITI PhD students and early career researchers presented at this and subsequent conferences. <https://transw.org.au/>



SHINING STUDENTS!

Since rCITI’s formation, five of our brilliant students have been awarded the annual Institute of Transportation Engineers Australia and New Zealand (ITEANZ) Undergraduate Award, made on the basis of the most outstanding piece of individual work by an undergraduate student at a participating Australian or New Zealand university.

2013 Aaron Hargraves

2016 Navreet Viridi

2018 Jessica Athayde

2019 Aaron Tomlins

2021 Zhaohan (Jack) Wang

The ITEANZ Postgraduate Award is given to the most outstanding postgraduate student from a tertiary institution in Australia or New Zealand, based on the quality of his or her research and potential to make a significant contribution to the traffic and transport engineering profession.

In 2015 PhD student Melissa Duell made us proud with her award based on her thesis research topic Strategic Traffic Assignment: Models and Applications to Capture Day-to-Day Flow Volatility. (Supervisors Lauren Gardner & Travis Waller).

In 2016 it was a double whammy when alongside Navreet Viridi and his Undergraduate Award, Kasun Wijayarathna won the ITEANZ Postgraduate Award, for his research work on modelling disrupted transport network behaviour. (Supervisors Vinayak Dixit & Travis Waller).

In 2021 Shantanu Chakraborty won the UNSW Dean’s Award for outstanding PhD theses for his thesis titled - Dynamic Traffic Assignment Models for System Optimal Future Mobility Analysis. (Supervisors David Rey & S Travis Waller).



↑ L - R: Navreet Viridi and Kasun Wijayarathna

PhD GRADUATES

“Your children are not your children. You are the bows from which they as living arrows are sent forth.” Kahlil Gibran

Our PhDs are winging their way through the world, working as advisers, analysts, consultants, modellers, planners and strategists, as academics at global universities, as tech start-up founders, as independent consultants, or as valued members of large complex state, national and international scientific and government organisations. Brilliant, passionate and determined, we know they share our aims - to improve lives globally, through creative partnerships, innovative research, transformative education and steadfast commitment to a just society.



AHMADIAN FARD FINI, ALIREZA
Supervisor: S T Waller, A Akbarnezhad & TH Rashidi
Optimizing Crew Performance through Integration of Human Resource Strategies into Planning of Construction Activities
2017 PhD



ALSALMI, RAED ABDULRAHMAN H
Supervisor: V Dixit
The Relationship between Traffic Safety and Macroscopic Fundamental Diagram (MFD)
2018 PhD



ALSULTAN, ABDULMAJEED SULAIMAN M
Supervisor: ST Waller & V Dixit
Macroscopic emission modelling for urban networks
2019 PhD



AMINI, NIMA
Supervisor: L Gardner & ST Waller
Alleviating the negative side effects of ramp metering: development of a supplementary ramp metering algorithm
2018 PhD



ARBIS, DAVID
Supervisor: V Dixit & TH Rashidi
Modelling the Strategic Interactions of Driver Manoeuvres
2017 PhD



ASHFAQ, MUDABBER
Supervisor: ST Waller, M Saberi & L Gardner
Modelling Traffic Congestion Propagation As A Spreading Phenomenon
PhD 2022



BARBARA, MIKEL
Supervisor: D Nair & TH Rashidi
Modelling and Optimisation Methods for Public School Networks
2022 PhD



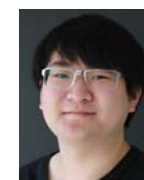
BUI, CHAU MINH
Supervisor: Raina MacIntyre, L Gardner, S Lim & A Clements
Investigating the spread of emerging Avian Influenza viruses using cross-disciplinary and computational approaches
2019 PhD



CHAKKA, MOHANA NAGA SAI CHAND
Supervisor: ST Waller & V Dixit
Evaluating Fluctuations in Urban Traffic Data and Modelling Their Impacts
2019 PhD



CHAKRABORTY, SHANTANU
Supervisor: D Rey & S T Waller
Dynamic traffic assignment model for network design with autonomous vehicle lanes and endogenous demand
2020 PhD



CHENG, ZESHENG
Supervisor: ST Waller, T Hossein Rashidi, M Maghrebi, & S Jian
Novel modeling methodologies that utilize emerging data sources for transport network planning
2021 PhD



CUNHA DIAS, FERNANDO HUGO
Supervisor: D Rey & ST Waller
Mathematical optimization methods for aircraft conflict resolution in air traffic control
2021 PhD



DONG, XIAOTONG (SHARON)
Supervisor: D Rey & ST Waller
New Formulations and Solution Methods for the Dial-a-ride Problem
2022 PhD



DUELL, MELISSA
Supervisor: L Gardner & ST Waller
Strategic Traffic Assignment: Models and Applications to Capture Day-to-Day Flow Volatility
2015 PhD



FIDANOSKI, FILIP
Supervisor: A Ortmann & V Dixit
Eliciting latent risk preferences, across contexts
2022 PhD



GHASRIKHOUSANI, MILAD
Supervisor: ST Rashidi & ST Waller
Disaggregate behavioural land use modelling: Integration of housing search, job search and households' dynamics
2019 PhD



GU, ZIYUAN
Supervisor: M Saberi & ST Waller
Dynamic Congestion Pricing in Urban Networks with the Network Fundamental Diagram and Simulation-Based Dynamic Traffic Assignment
2019 PhD



HAMMAD, AHMED
Supervisor: A Akbarnezhad & D Rey
Reducing Urban Noise Pollution Through Multi-Objective Optimisation of Site Layout and Facility Locations
2017 PhD



HASSAN, MOHAMMAD NURUL
Supervisor: TH Rashidi & ST Waller
A Comprehensive Analysis of Discrete Choice Modelling Specifications for Modelling Route and Stop Choice Behaviour of Transit Users
2019 PhD



LI, XUN
Supervisor: V Dixit & ST Waller
Fairness in Transportation System
2018 PhD



ROBSON, EDWARD NGUYEN
Supervisor: V Dixit & ST Waller
Computable general equilibrium modelling for urban transport planning and appraisal
2018 PhD



VIRDI, NAVREET SINGH
Supervisor: ST Waller & H Grzybowska
Development of a Connected and Autonomous Vehicle Modelling Framework, with Implementation in Evaluating Transport Network Impacts and Safety
2020 PhD



ISLAM, MD KAMRUL
Supervisor: U Vandebona
Stochastic Modelling for evaluation of impacts of headway variability wof public transit performance
2014 PhD



LILASATHAPORNKIT, TANAPON
Supervisor: M Saberi & ST Waller
Network Modeling for Walking Infrastructure: Developing Pedestrian Traffic Assignment Methodologies for Large-Scale Footpath Networks
2022 PhD



SAXENA, NEERAJ
Supervisor: ST Waller & V Dixit
Modelling the Effect of the Number of Stop-&-gos on the Route Choice Behaviour of Car Drivers
2018 PhD



WEN, TAO
Supervisor: ST Waller & L Gardner
Methodologies for Origin-Destination travel demand estimation within a strategic traffic assignment model
2017 PhD



JAYAKUMAR NAIR, DIVYA
Supervisor: V Dixit & TH Rashidi
Logistics of Surplus Food Rescue and Distribution
2017 PhD



MAGHREBI, MOJTABA
Supervisor: ST Waller & C Sammut
Using Machine Learning to Automatically Plan Concrete Delivery Dispatching
2014 PhD



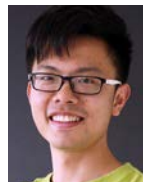
SHAHRIARI, SIROOS
Supervisor: TH Rashidi, S Sisson & E Robson
Cycling Infrastructure Usage Prediction Model
2022 PhD



WIJAYARATNA, KASUN PRADEEPA
Supervisor: V Dixit & ST Waller
Modelling disrupted transport network behaviour
2016 PhD



JIAN, SISI
Supervisor: V Dixit & ST Waller
Understanding and Optimising Carsharing Systems
2017 PhD



MAO, TUO
Supervisor: V Dixit & C Chen
Intelligent Transport System Based Freeway Management and Control
2017 PhD



SHAKEEL, KIRAN
Supervisor: T Rashidi & ST Waller
Optimisation of Travel Activity Schedule to Maximise Active Transport Use and Health Benefits: Application of a Smartphone App
2021 PhD



XI, HAONING
Supervisor: ST Waller, W Liu, H Aziz & P Kirby
Optimization Methods for Mobility Resource Allocation, Pricing and Demand Management in Mobility-as-a-Service Systems
2022 PhD



KRUEGER, RICO
Supervisor: TH Rashidi, ST Waller, & A Vij
Hierarchical Bayesian models for travel demand analysis: theory, inference and applications
2020 PhD



NAJMI, ALI
Supervisor: TH Rashidi & ST Waller
Estimating an Integrated Framework for Modelling Demand and Traffic Assignment in a Unified Structure
2020 PhD



SINHA, AMOLIKA
Supervisor: V Dixit
Evaluating Risks Associated With Automated Driving Systems
2021 PhD



YAZDANI, MAZIAR
Supervisor: M Mojtahedi, V Dixit, M Loosemore & D Sanderson
Developing an Evacuation Support System for Healthcare Infrastructure in Australia in Response to Major Flood Events
2022 PhD



LI, CHENYANG
Supervisor: V Dixit
Perception and decision making in vehicle following: modelling, calibration, validation and simulation
2018 PhD



RANAWEERA KANKANAMGE, MALITH PRASANGA
Supervisor: V Dixit & D Rey
Data Substantiation in Mobility
2021 PhD



SIRIPANICH, AMARIN
Supervisor: TH Rashidi, ST Waller & E Moylan
Land use modelling and demographic modelling using agent based approaches
2021 PhD



ZHANG, XIANG
Supervisor: ST Waller & D Rey
Multi-objective network design: Road capacity expansion and multi-modal recharge facility location
2017 PhD



“
”

People are at the heart of what we do.

FUTURE OUTLOOK

■ Mobility is a fundamental need for any flourishing society that enables people to access resources and opportunities. Transportation infrastructure lasts generations, we still use historical routes discovered by our elders to create a lifeline that supports our nation's economy and society.

We recognize the privilege we have been afforded to educate and train future professionals and leaders who will shape the society into the future. These connections have enabled a collegiate group that has been in developing and designing transportation infrastructure to establish a safer, equitable and efficient mobility system. This collegiality is the foundation we can stand and extend our horizons without fear.

People are at the heart of what we do, and one of rCITI's core strengths is enabling start-ups and industry, through knowledge dissemination, research and development and advice. rCITI is striving to provide solutions which demonstrate a holistic approach and consider and contribute to all four areas (economy, society, environment, culture). Above all our work contributes to the economic and societal aspects as well as education.

We continue to expand our team with the next generation of future leaders, in areas in the field of logistics optimisation, freight transport modelling, and critically specialising in emerging technologies such as blockchain, automated zero-emission heavy vehicles, and artificial intelligence applications in freight transportation.

Collectively, rCITI's research will significantly contribute to developing cleaner, safer, and more efficient transport systems. Critical contributors to this societal challenge are rCITI's cutting-edge research and development of technology and tools in bio-secure mobility, human factors, integrated transport planning and management, connected mobility and smart cities as well as complex multi-criteria and multi-disciplinary data-driven decisions. The Centre is at the forefront of shaping Australia's transport future as well as contributing to global transport solutions and education.

Mobility and transport are critical to our everyday lives, connections, collective economy and productivity as well as quality of living. Our purpose is to create and enable a cleaner, safer, equitable and efficient means for mobility.

PEOPLE SNAPS



Let us take you there!

rCITI is your connection with tomorrow's transport!



rCITI

UNSW

Research Centre for Integrated
Transport Innovation