Welcome from the Pro-Vice Chancellor (Research)

University of the Sunshine Coast (USC) is Australia’s youngest and fastest growing University, with the aspiration of becoming a great regional University within the Australian Higher Education sector.

Established in 1996, USC has a longstanding reputation for excellence in education, as evidenced by being the only Queensland public University to consistently receive five stars for teaching quality, also winning more than its share of national teaching awards.

More recently, the University is striving to develop a high performance research culture, so as to enable a realisation of its vision of becoming a great regional University in Australia. In this context, the University is committed to a focusing of its research into three broad areas of regionally relevant, yet nationally and internationally significant research; namely, sustainability, aquaculture and forestry leading to the establishment of the Sustainability Research Centre and Genecology Research Centre through the University’s first policy framework to shape the development of nationally and internationally competitive research in these University flagship areas. Furthermore, these broad areas of research in the life and social sciences also capture University activity such as soil and water science, conservation, animal behaviour, as well as all aspects of sustainable environments and communities. Credence for the effectiveness of this broad strategy was evident in the Excellence in Research for Australia 2012 research quality evaluation framework where the University achieved an above world standard rating in agriculture and veterinary science, as well as a world standard rating in biological science.

With my appointment as the University’s inaugural Pro Vice-Chancellor (Research) in 2011, I have been focused on the next phase of development of the University’s research agenda as part of the broad University vision. My major focus has been the further development and broadening of research capacity within existing areas of research strength, including the identification and development of new areas, building productive research partnerships with national and international research leaders allied to USC’s area of research focus, as well as the recruitment and retention of excellent research staff to position the University for sustained growth and high performance in the short, medium and long term.

By reading the Winter 2013 and first edition of the USC Research Bulletin, you will see that the University is well on track to achieving its imperatives of becoming a great regional University. Moreover, this Research Bulletin is focused on the new Research Centres, Research Clusters and Emerging Research Themes that have been established at the University over the past two years, and I commend the excellent stories about the exciting and cutting edge research undertaken within these research concentrations at USC. Last but not least, as a University that is committed to servicing its region and the community, we are also focused on research that makes a difference, or research that leads to practical and tangible outcomes of benefit to the community, government and industry, and this flavour of USC’s research comes through clearly in the documented research narratives.

The $60 million Skills and Academic Research Centre within the $2 billion Sunshine Coast University Hospital has provided the University and the region with a huge opportunity for development and growth. Accordingly, USC is presently focused on the development of excellence in research in the health and biomedical disciplines, so as to align with and capitalise on the ensuing opportunities when the Hospital opens in 2016.

It is an exciting phase of growth and development at USC, and we are presently experiencing an enhancement in our reputation, regionally, nationally and internationally, and this is augmenting significantly the quality and impact of research at USC.

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## Contents

- USC Research Bank ............................................................... 4
- Using technology to solve social challenges .......................... 4
- Underwater communication ................................................ 5
- Source code ........................................................................... 5
- Research at USC: Centres, Clusters and Emerging Themes .......... 6
- Building capacity .................................................................... 8
- Growing our research ............................................................ 8
- USC Health Improvement Cluster joins forces with new hospital ... 9
- Translating research to improve quality of life .......................... 9
- Shared vision underpins success in sustainability ..................... 10
- Understanding Indigenous communities’ responses to environmental change .... 10
- Forest Industry Futures .......................................................... 11
- Designing safer cities ............................................................ 11
Using technology to solve social challenges

A wide variety of professionals from social workers through to IT experts and game designers form the basis of a new research cluster set to tackle society’s challenges with interactive technology. The Engage Research Cluster, which was established earlier this year, tackles a range of community related issues through innovative user-based design and technology.

Currently, the researchers are addressing a range of topics including child abduction, child sexual abuse, alcohol misuse, poor indigenous health, youth mental health, Alzheimers, Autism and impacts of climate change upon society. Each research topic has a technological focus, where technology is used to uncover the concerns and opinions of people being affected, and to enable and empower society to find solutions.

Associate Professor and Leader of the Engage Research Cluster, Christian Jones has endless enthusiasm when it comes to technology and research. Before joining USC in 2006, Dr Jones was a lecturer in computer science at Heriot-Watt University in Edinburgh, Scotland as well as the founder and CEO of Affective Media, a UK-based emotion engineering company.

"The Engage Research Cluster is about finding real solutions to real problems felt by real people," Dr Jones said.

One such problem is child protection. Engage researchers are approaching this challenge in an innovative manner by harnessing children’s natural affinity with computer games.

Another important research area is indigenous health. Providing community members with the opportunity to communicate and solve problems using smart phones, games and social media. Communities are then empowered to find their own solutions to the problems each may face.

The primary vision of the Engage Research cluster is to find solutions for complex social challenges, in partnership with community and industry, and using innovative tools and approaches.

"Our multidisciplinary team get together with community members to listen to the issues and challenges. Then working with discipline experts we design solutions to overcome these problems and develop interesting and engaging interactive technologies," Dr Jones said.

Technology is rapidly changing and ubiquitous. The Engage Research Cluster is at the forefront of researching, designing, using and evaluating the very latest technologies from computer games to full motion tracking immersive environments.

Research collaborations are varied and include the Queensland Police Service, The Daniel Morcombe Foundation, Queensland Health, Telstra as well as many leading national and international academic and industry partners.

With a wide range of projects and disciplines such as mental health, positive psychology, nursing, public health, health promotion, social sciences, counseling, planning, art and design, IT, game design, education, engineering, HR and business, the Engage Research Cluster is rising to the challenges of the 21st century.

"Our researchers develop the latest technologies and collaborate with world leaders in their discipline. In Engage Research, we provide an exciting and rewarding research experience for HDR students, early career researchers, research fellows and also our collaborating partners."

PhD student Ben Rolfe using Electroencephalography (EEG) to record electrical activity in the brain.

PhD student Colleen Stieler-Hunt, Associate Professor Christian Jones, PhD student Ben Rolfe.

Looking for a publication by an author at the University of the Sunshine Coast?

USC Research Bank provides an open access showcase of the University’s scholarly research outputs.

USC Research Bank makes research easily accessible and promotes collaboration.

Wherever possible, access to the full text of the publication is given, in line with copyright permissions.

Go to: research.usc.edu.au
A pheromone is a secreted or excreted chemical factor that triggers a social response in members of the same species. The nature of the chemical and the type of behavioral patterns that are induced in aquatic animals is the subject of Dr Cummins’ investigation. Pheromone research can cover a wide range of species and activities including, for example, squid aggression, fish maturation and frog mate attraction.

Dr Cummins and colleagues published a seminal research paper on the marine sea sponge genome in Nature (2010). This was followed up by review paper on aquatic pheromones written by Dr Cummins and Professor John Bowie published in Natural Products Reports (2012) that will be used as a resource for those interested in aquatic animals, olfactory communication, and developing methods for the discovery of other aquatic pheromones.

"As with most in-depth research papers, there are challenges in finding and collating all of the relevant information that date back many years," Dr Cummins said.

"Humans have the luxury of five strong sensory options, with the sense of smell being supported by sight along with the other senses. However, for a majority of animals, smell is linked with a survival mechanism and is an essential part of transmitting information between species."

This is principally important for aquatic animals where vision can often be limited in the murky depths.

Dr Cummins is enthusiastic when it comes to decoding the ‘molecular toolkit’ that underpins animal chemical communication systems especially in aquatic animals. Dr Cummins has conducted a series of postdoctoral studies within this area of research at The University of Texas Medical Branch and The University of Queensland, before arriving at The University of the Sunshine Coast in 2011.

It was at the University of Texas that Dr Cummins first began to realise the importance of pheromones to aquatic animals. It was his involvement in the identification of the sea slug’s attraction pheromones and squid aggression pheromones which taught him that most aquatic animals are likely to have their own pheromone messages.

‘Discovering this is the equivalent to learning a new language, in which we can now eavesdrop through the release of their chemical pheromones and know what they are talking about to each other.’

‘So as a consequence I am very passionate about decoding other pheromone messages.”

After 50 years of a steady accumulation of literature on communications between aquatic animals and the use of pheromones Dr Scott Cummins (ARC Future Fellow) from the University of the Sunshine Coast and Co- Author Professor John Bowie have taken the topic to a new level of understanding.

A pheromone embedded in squid eggs elicits extreme aggression between male squid (photo: Roger Hanlon).

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Source Code

When asked what do genetics, physiology and ecology have in common, it might sound to some that there is a comic punch line coming next, when in fact the answer is a lot more serious and influential.

The answer is the GeneColagy Research Centre at USC with over 80 researchers involved in a variety of activities covering tree and forest science, soil and water science, aquaculture, microbiology as well as conservation and animal behaviour.

The inter-disciplinary nature of the Centre is a key advantage, and one of the reasons why it attracts a large number of Higher Degree by Research (HDR) students.

Synergies between research interests create opportunities not otherwise possible. Both aquaculture researchers and tree and forest researchers, for example, are addressing similar challenges of sustainable production, albeit in different organisms.

The soil, water, aquaculture as well as tree and forest themes all have joint interests in carbon sequestration, chemistry compounds and biosensors.

The work of the Genealogy centre has received both international and national attention. Time Magazine in November 2009 recognised a significant breakthrough in the breeding of Southern Bluefin tuna, naming it one of its 50 best inventions in 2009.

The soil, water, aquatic and terrestrial science and the large range of scientific research pursued within the Genealogy Centre includes ecology, microbiology, molecular biology (functional genomics and proteomics), biochemistry and biomodelling. When applied across a range of animal and plant life cycles, this enables multiple projects and a variety of outcomes, ultimately in pursuit of a more sustainable, diverse and vibrant planet.
Sustainability Research Centre
SRC’s research focuses on societal responses to emergent local and global change forces in sustainability. It adopts a transdisciplinary collaborative approach broadly aligned with human geography, embracing the disciplines of social, behavioural, economic and management sciences.

Forest Industries Research Centre
Focusing on issues relating to the forestry value chain, economic and environmental sustainability of forest industries, tropical and sub-tropical forestry through to the processing of novel commercial species.
GeneCology Research Centre
Focused on areas of genetics, ecology, genomics and physiology. Researching sustainable production of aquaculture, horticulture and forestry systems, biodiversity conservation and sustainable urban forestry and horticulture.

Engage Research Cluster
Concentrating on finding collaborative solutions to challenging social problems through innovative digital technologies. This includes computer games, Smartphone/tablet applications, social networks and interactive media and artwork.

Cluster for Health Improvement
Focusing on health care sustainability, nutrition, quality of life and wellbeing, as well as health care training and education. To be spearheaded by the new Skills, Academic and Research Centre (SARC) within the new Sunshine Coast University Hospital opening in 2016.

Inflammation and Healing Research Cluster
Focusing on easing human suffering and the significant burden of health care costs by investigating the molecular, immunological and physiological mechanisms underlying dysfunctional inflammatory responses leading to common chronic and autoimmune diseases.

Indigenous Studies
Focusing on the inter-disciplinary area of Indigenous studies including land/territory, social, historical and place-based aspects of identity as well as socio-cultural practices, knowledge and institutional systems that advance the aspirations of Indigenous peoples.

USC Accident Research
Developing a leading capability in accident and safety-related research with a core focus on human factors and system performance in order to improve safety and remove threats to public health.
Building capacity

Attracting talented researchers to the beautiful Sunshine Coast region isn’t that difficult given the wonderful location, however an additional $5.45M injection from the Federal Government’s Collaborative Research Networks (CRN) program certainly helped.

The three year CRN program which commenced in 2011 has created the opportunity for 17 additional researcher positions to be located at the three partner universities: University of the Sunshine Coast (10), Griffith University (3) and University of Tasmania (4). These researchers are actively building research collaborations in the areas of aquaculture, marine and coastal ecology, forest sciences and sustainability. This program is part of a broader strategy by USC to build greater research capacity along with powerful collaborative networks that will create long term effects; the impacts of which are starting to show already.

Growing a University’s research portfolio is a complex task, particularly in the modern world of competitive funding. The recently introduced USC Research Fellowship scheme has been targeted to provide a complementary and sustained approach, offering a research focused approach for talented early career and mid-career academics. With a growing team of researchers year on year, it isn’t possible to acknowledge everyone, however a variety of researchers and disciplines were recently welcomed in 2012 including the following.

Professor Mark Brown, who is brokering major industry partnerships and securing significant funding for the Forest Industries Research Centre, featured on page 11

Associate Professor Paul Salmon, who is building an accident research focus at USC. Professor Salmon’s integrated traffic planning approach is featured on page 10

Dr David Macmillan, a microbiologist who is focused on population genomics and understanding why different strains of infection result in different disease outcomes.

Associate Professor Chris Askew, an exercise physiologist with an interest in pathophysiology and treatment of exercise intolerance in people with chronic disease.

Dr Steve Ogbourne, an integral member of the Genecology team, participating in biodiscovery projects that include plant and animal derived natural products for healing and cosmetic purposes.

Dr Renfu Shao, making great gains in the understanding of the evolution and function of mitochondrial genomes.

Dr Joanne Macdonald (Queensland Fellow), a molecular engineer whose passion includes the intentional design of molecules beyond their narrow range of conditions, and their incorporation into new functions.

Dr Kate Mounsey (ARC DECRA Recipient), researching immunopathology and host parasite interactions.

Dr Scott Cummins (ARC Future Fellow), integrating genomic, proteomic, cell biology and behaviour methods to answer fundamentally important biological questions. Featured on page 5.
USC Health Improvement Cluster joins forces with new hospital

At the University of the Sunshine Coast, the student population is not the only sector to experience unprecedented growth in recent years. As the University has significantly increased its range of teaching programs it has attracted an abundance of professional teaching staff and Higher Degree by Research (HDR) students, particularly within the health services domain.

Inspired by a unique opportunity to pool together the new knowledge and experiences offered by new staff; members of the School of Health and Sports Sciences including Discipline Leader for Occupational Therapy, Professor Marion Gray, proposed the development of a research cluster focused on the theme of health sciences and improving quality of life on a regional, national and international scale.

This vision came into fruition and 2013 welcomes the introduction of the Cluster for Health Improvement, encompassing a mix of experienced, early career researchers and students from across the fields of allied health, public health, sport and exercise science as well as nursing.

Cluster Leader Professor Gray suggests the breadth of knowledge possessed by those within the team will provide a solid foundation for the development of innovative applied research in health. Research outcomes delivered by the Cluster will allow for translation into result driven health practice.

Despite recently forming, the Cluster has already strategically connected with the Sunshine Coast University Hospital and Health Service (see illustration above) to enable the collaboration around research which will assist with the delivery of effective health services.

Professor Gray believes that the benefits of this collaboration are enormous, not only with regard to the provision of services but for the delivery of health improvement research, particularly in the areas of chronic disease, tobacco, alcohol and obesity worldwide.

As the Cluster for Health Improvement is still in an early growth phase, there are ample opportunities for new members to join the team. Professor Gray invites students, researchers and industry partners with an interest in health improvement to consider joining the Cluster and aid in finding collaborative solutions to challenging issues around health.

Translating research to improve quality of life

Harnessing the talents of professional biomedical and public health researchers, the Inflammation and Healing Research Cluster undertakes a multidisciplinary approach to investigate key causes underlying dysfunctional inflammatory responses leading to common chronic autoimmune diseases. In short, the research team seeks to ease human suffering and improve the quality of life (see illustration below).

Creating results that are of benefit to the broader community is the primary focus. The outcomes from the efforts of the researchers aim to inform the development of improved diagnostics and a better understanding of the causal nature of inflammatory responses, which in turn will lead to appropriate management tools. Translational research is a term used to describe scientific research that helps to make findings from science useful for practical applications that enhance human health and well-being.

USC Associate Professor of Immunology and Leader of the Inflammation and Healing Research Cluster, Shelley Walton has a long-standing personal passion for translational research. Therefore it is no surprise that this concept forms the backbone for the vision for the Cluster.

“I get a kick out of research that gives you the ability to help people in a practical and useful way”

“I get a kick out of research that gives you the ability to help people in a practical and useful way,” said Dr Walton.

After obtaining her PhD from the University of Sydney and Menzies School of Health Research in 1999, Associate Professor Walton has 15 years experience in scabies research and Indigenous health including the establishment and successful leadership of the Skin Pathogens Research Laboratory.

Associate Professor Walton accepted the position of immunology lecturer at the University of the Sunshine Coast in 2010 and has maintained strong links with research groups on a national and international stage, particularly on the topic of Indigenous health.

All research topics within the Cluster are integrated and range from a molecular to an environmental (macroscopic) aspect. The Cluster centres on the need to shift from specific disciplinary interests to trans-disciplinary outcome focused research for regional, national and Indigenous health improvements.

Providing excellent opportunities to build and expand upon existing cooperative efforts, the cluster welcomes the opportunity to work with Honours and HDR students interested in inflammatory health processes and translational delivery.

“One of our other goals is to get university students involved as much as we can, and to be able to give them the high quality work experience they need in key areas of the national health agenda,” Dr Walton said.

Organisations working collaboratively with The Inflammation and Healing Research Cluster at the University of the Sunshine Coast
- The University of Queensland
- Queensland Institute of Medical Research
- Telethon Institute for Child Health Research
- Queensland Government Department of Agriculture, Forestry & Fisheries
- Latrobe University
- Eskitis Institute
- Griffith University
- The Royal Brisbane and Women's Hospital
- The Prince Charles Hospital
- University Copenhagen, Denmark
- University of Otago, New Zealand
- Moredun Research Institute, Edinburgh

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Shared vision underpins success in sustainability

With a focus on encouraging sustainable environments amongst communities on a domestic, national and international scale, the Sustainability Research Centre is one of the three major research centres at the University of the Sunshine Coast. Under the guidance of an executive committee, the 60 plus member research cohort is currently engaged in over 20 social science based research projects, committed to fostering a social shift in sustainability perception.

Since its inception in 2007, the Sustainability Research Centre has been internationally recognised for its substantial contribution to sustainability research. Over the last five years, the centre has delivered a number of key projects centred on themes of coastal management, climate change and water governance in seven countries.

Sustainability Research Centre researchers working on climate change adaptation

Director, Professor Tim Smith attributes the Centre’s progressive accomplishments such as the Climate Change and Water Governance (CADWAGO) Global Challenges Program, to the team’s collective vision to be a recognised leader in the provision of high quality research, and the collaborative networks, which underpin the Centre’s research outcomes.

While the research specialty varies between each of the members of the team, Professor Smith praises the centre’s social scientists, and their ability to work in synergy to perform transdisciplinary research. By sharing their extensive knowledge, the team has been able to focus their understanding of social adaptation, with a view to establishing how society responds to regional environmental change.

Through the attainment of this knowledge, securing competitive research grants, and producing high quality academic research publications, the Sustainability Research Centre team has assisted with the growth and development of sustainability frameworks.

Professor Smith suggests that, as the capacity of the Centre and breadth of knowledge has increased, the team has been provided with an invaluable opportunity to build mutually beneficial partnerships with key national and international bodies including CSIRO, and the Stockholm Environment Institute, Sweden.

While these organisations play a pivotal role in providing knowledge and educational support, these organisations, which are closely aligned with the Centre, also provide vital funding to ensure the adequacy and longevity of measurable research projects.

Understanding Indigenous communities’ responses to environmental change

Collaborative learning and interdisciplinary research are two concepts frequently used to describe research projects; however it isn’t until you meet Dr Tristan Pearce (CRN Fellow) at the University of the Sunshine Coast that the true meaning of both becomes evident.

From Prince George in British Columbia, Canada, Dr Pearce arrived in Australia in July 2012 with considerable research connections and two sizeable research projects in the Canadian Arctic working with local indigenous communities to examine the role of traditional environmental knowledge (TEK) in adaptation to the human health impacts of climate change.

Collaborating with the University of Guelph, McGill University, USC and Griffith University, Dr Pearce is working with Higher Degree by Research (HDR) students in Canada and Australia to better understand how physical changes in the environment associated with climate change translate to affect human health and adaptation options.

Inuit (Indigenous peoples living in the Canadian Arctic) continue to depend on hunting, fishing and trapping for part of their livelihoods and changes in the sea ice, land and weather have already affected their ability to perform these activities with implications for food security, health and wellbeing.

“What makes this project exciting is that we are drawing together a variety of disciplines and sources of knowledge to address a common research question,” said Dr Pearce.

“We have a journalist, specialising in narration using film, a biologist, a planner and a geographer, working together with Inuit research partners to address this research problem.”

“The International community looks to the Arctic as a barometer of climate change and the Arctic environment is changing dramatically, something Inuit have been telling us for decades.”

“Inuit live in close association with their environment and have been adapting to changes in the environment for thousands of years. The changes occurring today, however, are unprecedented and some traditional adaptation strategies are no longer feasible. Our research will explore how adaptation is occurring, including the drivers and sources of adaptation, which will inform adaptation decision making at various levels.”

Dr Pearce is also applying his experience in the Canadian Arctic to address similar research questions in the Pacific region, including Australia. A new project underway for Dr Pearce and his colleagues is examining the impacts of climate change on food security in Pacific Island Countries and adaptation options.

“An element of this research is the integration of Indigenous knowledge with western scientific knowledge to develop a better understanding of how global environmental processes like climate change, translate to impact livelihoods and adaptation options.”

With so many parallels among different cultural contexts, it is only natural that a collaborative learning and interdisciplinary approach, involving multiple countries and peoples, is helping lead the way and create a better understanding of adaptation.
Forest Industry Futures

The entire forest industries value chain is the strategic focus of the new Forest Industries Research Centre at the University of the Sunshine Coast. The team is focusing on the right genetics for the right tree, at the right place, coupled with understanding the appropriate growing and harvesting strategies and subsequent processing options.

Primarily focusing on tropical and sub-tropical species, the research Centre brings together multiple disciplines to design the forests of the future, based on a thorough understanding of the supply chains of these future forests.

Commercial forestry is a long term business, and when researching the new tree species of the future, it is essential that this research is linked to value-added processing opportunities such as solid wood, composites and biorefinery products.

Professor and Director of the Forest Industries Research Centre, Mark Brown has significant forest industry knowledge and understands the commercial imperatives, having been surrounded by the industry whilst growing up in Canada. After studying at the University of New Brunswick, Professor Brown continued with his passion for forestry and in 2007 took on a program leader position at the CRC for Forestry in Australia.

With a move to the Sunshine Coast in 2012, Professor Brown maintained his CRC Forestry role and industry connections and established the Australian Forest Operations Research Alliance (AFORA) pulling together commercial organisations to fund selected forest industry research.

The Forest Industries Research Centre was created to take a leadership role in Australian forest industry research after the wrap up of the CRC for Forestry in 2012. Drawing together researchers from across Australia, in particular University of the Sunshine Coast and the Department of Agriculture, Fisheries and Forestry Queensland (DAFF-Q), the Centre is quickly developing a national and international reputation.

The main focus of the Centre's current research is in forest health, supply chain logistics, harvesting systems and wood processing, all being grown through a strong collaborative relationship with DAFF-Q.

“The Centre is built largely around an applied collaborative research model so the ideas are closely linked within the related industry,” said Professor Brown.

“In addition to producing traditional research publications, the Centre is also driven towards applied on-the-ground outcomes.

“The Centre will apply practical solutions within each related forest industry sector, solutions built on the new knowledge created and delivered through practical tools, management models, workshops and/or group implementation projects.”

With knowledge transfer as the primary goal, forest industry managers and operators will be keen to take the extra step to work with researchers, particularly when they see the results affecting the bottom line.

“Being a new Centre it can sometimes be a challenge, but nothing we, as a collaborative group cannot overcome. I am excited by the opportunities, the student access, synergies, and a wider teaching opportunity at USC for the benefit of our industry” Professor Brown said.

Designing safer and healthier cities

With around 1.2 million people killed annually and between 20 and 50 million injured, road trauma is a significant problem, particularly in rapidly developing nations.

The United Nations has created a decade of action for Road Safety (2011-20) in order to raise awareness and develop strategies to minimize road deaths and injuries across the world.

USC’s Associate Professor Paul Salmon (NHMRC Postdoctoral Training Fellow and leader of the USC Accident Research Team) is part of a team comprising leading transport, land use, and public health researchers that are examining the extent to which better land use and transport system design can be used to optimize public health. This includes designing cities to reduce road trauma, but also using more holistic designs that lead to increased physical activity and reduced emissions.

Whilst the goal of reducing road trauma can be met, far reaching benefits to public health can also be realised using an integrated approach. The team are working on a series of papers for the Lancet, one of the oldest and most respected medical journals.

This research series addresses road trauma from a land-use planning perspective, to aid the design of better cities. Associate Professor Paul Salmon led the creation of a complex systems model that describes the interactions between land use, transportation, and health. The model will be showcased in the series to drive evaluations of the impact of different designs on road trauma and public health.

“Instead of focusing on the road trauma itself, we wish to assist the design of a land-use transportation system that optimises physical activity whilst at the same time reducing the risk of road accidents,” said Associate Professor Salmon.

“By optimizing physical activity such as cycling and walking there are greater health outcomes, including a decrease in congestion and pollution as well as a reduction in injuries.”

The approach has certainly piqued the interest of many, and the full details are under wraps until the series is published.

With links to freight travel, passenger travel and integral links to local economies, the team is exploring the many variables and complex relationships to discover what the cities of the future should look like.

The model is currently being applied to different types of cities around the world to evaluate and compare the outputs.

With applications across multiple disciplines, it is expected that the approach will have significant impact into the future, and not only address road trauma, but also address overall health and well being in our cities.