



## Capability Statement

# Infrastructure planning

The University of Wollongong (UOW) is a leader in applied infrastructure policy, planning and delivery. We believe in community-driven research that is technology-enabled, allowing us to turn data into knowledge and improve liveability for residents.

UOW's SMART Infrastructure Facility is a world-leading research institution dedicated to helping governments and businesses better plan for the future.

SMART contributes to infrastructure planning in Australia through truly independent research coupled with deep academic rigour to ensure policy makers and industry partners receive high quality and timely advice on major projects.

This major research entity is committed to collaborating with industry to develop innovative solutions and technologies that deliver real impact. The Facility's academic rigour is complemented by industry experts, resulting in a compelling and productive intellectual partner for industry.

The wide range of projects SMART has worked on includes mass transit systems in Hong Kong, flood disaster management in Jakarta, regional transport planning in Australia, and the deployment of low-power wide-area networks (LPWAN).

Since opening, SMART has built an international profile working with government agencies in Australia and around the world, and has developed a strong network of global collaborators.

SMART's spoke-and-hub organisation augments its core capability in artificial intelligence, advanced simulation and smart technologies with a network of 30 state-of-the-art laboratories and associated experts in energy efficiency, water conservation, future mobility, urban planning and infrastructure economics.

SMART's Advisory Council is led by Philip Davies, former Chief Executive of Infrastructure Australia, and consists of some of Australia's most influential infrastructure leaders from industry and government. The Council advises and guides

the SMART Infrastructure Facility in its vision to deliver integrated infrastructure planning solutions for Australia and internationally.

### GLOBAL CONNECTIONS

To date, UOW's SMART-led capability in infrastructure planning partners with nine domestic and 11 international universities, 21 domestic and two international government agencies and departments, and 31 domestic and six international private sector companies.

SMART is a founding member of the International Symposium for Next Generation Infrastructure (ISNGI) with University College London, the University of Oxford, Delft University of Technology and Virginia Tech. ISNGI is a unique global partnership aimed at fostering an international dialogue on the latest innovations in infrastructure research and policy and to mentor the next generation of experts who will have to design, implement or manage infrastructure systems around the world.

Between 2013 and 2016, SMART partnered with Twitter Inc and the Jakarta Disaster Management Agency (BPBD) to deliver the ground-breaking and award-winning PetaJakarta project. The project - funded by World Vision Indonesia, Department of Foreign Affairs and Trade, and Australian National Data Service - delivered a crowd-sourced and real-time flood mapping system to BPBD's control room. The system is powered by an open-source and Cloud-based engine (Cognicity) entirely designed by SMART's researchers and engineers.

SMART also makes significant contributions to National Research Initiatives including the NESP-funded Clean Air and Urban Landscapes Hub, the NCRIS-funded Australian Urban Research Infrastructure Network (AURIN), the Future Fuels CRC, and the Digital Health CRC.

Researchers from SMART will also contribute to the \$56 million Australian Research Council (ARC) Special Research Initiative in Excellence in Antarctic Science by using smart sensing technologies to remotely monitor Antarctic ecosystems.

## RESEARCH THEMES

SMART's spoke-and-hub organisation includes four outcome-driven themes and three enabling platforms.

**SMART Water & Energy:** This theme is dedicated to creating innovative and sustainable solutions to protect our environment from contamination, developing waste to energy pathways and securing affordable and reliable zero-carbon electricity supply. It comprises two research groups - Water & Bioresource Technologies and Energy & Resource Efficiency.

**SMART Cities & Transport:** This theme uses a wide range of tools, such as modelling, optimisation, simulation and data analytics to create the cities of tomorrow by addressing the challenges of today. It comprises the two research groups of Smart Cities & Communities and Future Transport & Mobility.

**SMART Systems & Logistics:** This theme aims to provide in-depth analyses of intertwined supply chains and logistics in order to improve efficiencies, as well as sophisticated modelling frameworks to represent and emulate complex asset management systems in various industries. The theme comprises the two research groups of Asset Management & Infrastructure Systems and Supply Chains & Logistics.

**SMART Health & Education:** This theme draws on data, smart technologies, modelling and simulation techniques to support innovation and change in two of the fastest growing industry sectors in Australia today. It comprises two research groups - Digital Health and Smart Aged Service, and Smarter Schools & Digital Technologies.

## SMART ENABLING PLATFORMS

**Data Analytics Lab:** The Data Analytics Lab develops novel approaches for decision-making problems, based on machine learning and optimisation methods. It also applies advanced analytics and optimisation to infrastructure systems, logistics and supply chains, healthcare, and emergency response management.

**Advanced Simulation Lab:** The Advanced Simulation Lab aims to improve processes, methods and tools for decision-making in complex and uncertain domains where stakeholders have differing perspectives, or no optimal solution is available.

**Digital Living Lab:** The Digital Living Lab is a technology-agnostic innovation hub providing a testbed for a wide range of end-to-end Internet of Things projects.

## SMART AND IoT TECHNOLOGY

Since 2016, UOW has deployed and maintained a free-to-air Internet-of-Things (IoT) network across the Illawarra region. This ten gateways-strong network is managed by SMART's Digital Living Lab and is accessible to local communities, start-ups, SMEs and authorities.

The system uses a LoRaWAN communication protocol (low power and long range technology) to connect smart sensors

to dedicated applications. So far, the network has supported the successful development of various applications such as Smart Keg that provides information on location and content of beer kegs (Binary Beer); or FloodAware that provides real-time data rainfall and water level information during flood events.

The Digital Living Lab (DLL) also hosts an IoT Hub, an open and collaborative space for researchers, students and community members to share ideas, design prototypes and solve problems. DLL runs a unique program with local schools, called *Smarter Schools for a Smarter Planet*, whereby teachers and students are guided through the creation and deployment of their own smart environmental project.

The Digital Living Lab has won a number of awards including Best Community Initiative at the 2018 Committee for Sydney Smart City Awards, for the *Smart Pedestrian Liverpool* project. This project, co-delivered with Liverpool City Council and industry partners, uses a combination of smart computer vision, air quality monitoring, WiFi signal detection and LoRaWAN transmission to identify mobility patterns and exposure to air pollution in Liverpool CBD. Related projects are being rolled out in Campbelltown, Penrith, Blue Mountains and Cumberland Councils, making SMART a leader in IoT-focused R&D projects.

## MONITORING MOVEMENT IN PANDEMIC

SMART is helping governments better understand and anticipate people's mobility changes during the COVID-19 pandemic in a collaborative research project with Meshed IoT.

In this partnership, SMART researchers are accessing anonymised nCounter data from nearly 100 locations to monitor people's movement at transport hubs, public spaces, community facilities, walking trails, parks and beaches.

This project highlights the critical role smart technologies and the IoT can play in building more resilient communities and it also demonstrates the power of collaboration between universities, the IoT industry and governments to deliver timely solutions to critical issues.

**SMART brings together experts from fields such as rail, infrastructure systems, transport, water, energy, economics and modelling and simulation.**

## UOW WELCOMES THE OPPORTUNITY TO WORK WITH GOVERNMENT AND INDUSTRY PARTNERS TO DELIVER EXCEPTIONAL OUTCOMES

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