

### Leadership



**Nasser Khalil**  
RIIS Hub Director &  
Lead Chief Investigator

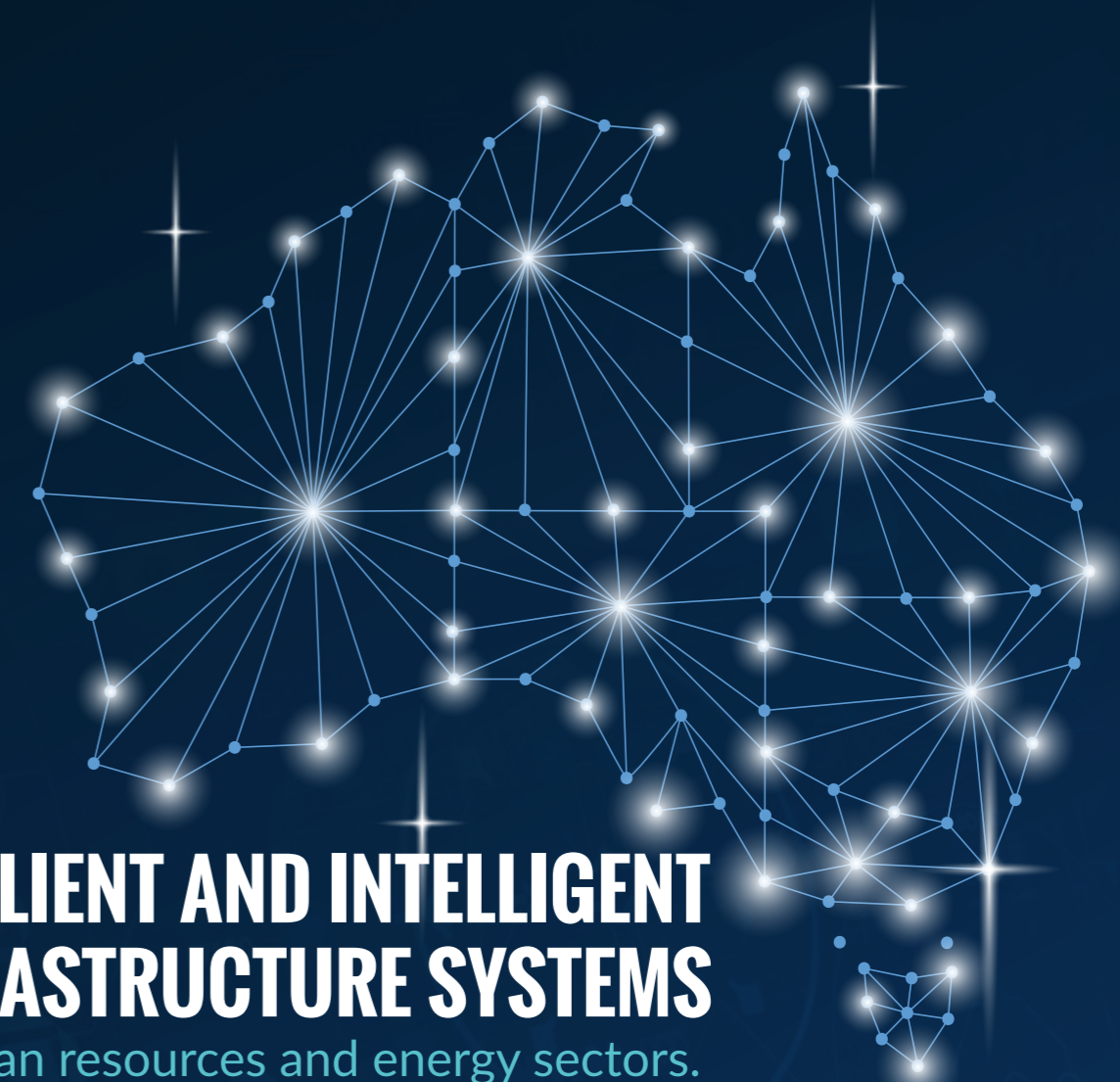


**Abbas Rajabifard**  
RIIS Hub Deputy Director  
and Lead Chief Investigator

### Funding

Industrial Transformation Research Hub for Resilient and Intelligent Infrastructure Systems (RIIS) in Urban, Resources and Energy Sectors is funded by Industry Partners and the Australian government through the Australian Research Council.

The funding is for 5 years and includes:



# RESILIENT AND INTELLIGENT INFRASTRUCTURE SYSTEMS

in urban resources and energy sectors.

#### UNIVERSITY PARTNERS



#### INDUSTRY PARTNERS



School of Civil and Environmental Engineering  
Rm 548, Hilmer Building, E10  
Kensington, New South Wales, 2033  
[riis@unsw.edu.au](mailto:riis@unsw.edu.au)  
+61 2 9348 0771



Australian Government  
Australian Research Council

## Vision

# Towards productive, connected, sustainable and smart infrastructure

RIIS is an industry and ARC funded research and innovation hub for smart infrastructure. It engages with industry, government, and the community to develop and implement science-based policy and integrated practical solutions to the current and future challenges facing Australia's urban resources and energy infrastructure.

## Aim

RIIS will deliver transformational technologies to address Australia's critical infrastructure needs. It will integrate advances in sensor technology, connectivity, data analytics, machine learning, robotics, smart materials, and reliable models to deliver resilient and adaptive infrastructure systems in urban, energy and resource sectors - sectors critical to Australia's prosperity and well-being.

The Hub will provide opportunities for industry and university partners to develop, co-design, develop, and enhance technologies suitable for safe and sustainable operations, further enhancing the resilience and intelligent capability of existing and new infrastructure, transportation networks, distribution systems, minerals and energy sectors, and other hard infrastructure.

## Research and Innovation Themes

The RIIS hub has the potential to transform advanced manufacturing, service and infrastructure engineering in Australia focussing on five main themes:

### Ubiquitous Sensing, Intelligent and Adaptive Systems

- Robust, low energy sensors and actuators
- Ubiquitous positioning, sensing & communications
- Internet of Things (IoT) & sensing platforms
- Signal processing, network and sensing optimization

### Data collection, security, and integration

- Robotics, satellite, UAV, autonomous systems for data collection
- Big data management storage & transmission
- Data security, robustness and reliability

### Modelling, simulations and prognostics

- Predictive modelling simulation & performance assessment
- Physics-informed artificial intelligence machine learning & explanation
- Real-time analytics - adaptive decisions

### Infrastructure health monitoring and predictive maintenance

- Degradation quantification & failure prediction
- Risk & safety
- Service life assessment
- Remedial & renewal technologies

### Spatial data, Digital Twins and decision support

- Integration & structuring of data & prognosis
- Digital twins & decision support
- Visualisation, virtual reality & interactive guidance systems
- Adaptive, intelligent & resilient design

## Context

Critical surface and subsurface infrastructure and physical assets such as buildings, roads, bridges, rail lines, tunnels, utilities, processing plants, refineries as well as resource industries form the backbone of Australia's productivity. Yet, according to the Australian Infrastructure Audit (2015) most infrastructure used in 2030 will be in a substandard state of repair, well below par with other OECD nations.

With demand for new infrastructure in all sectors for our growing population, combined with impacts of climate change and aging infrastructure, there is an increasing need for new technologies to predict infrastructure rehabilitation and renewal needs, pre-empt failure and prolong life as well as new systems to deliver sustainable, resilient, and cost-effective infrastructure.

RIIS will leverage a suite of innovative and integrated technologies to monitor, model and improve our urban infrastructure, transport, water, resource, and energy management in order to achieve economic, sustainable and low-carbon development.

## Deliverables

The Hub will engage with industry, government, and the community to unlock scientific roadblocks, deliver foundational skills for industry professionals and researchers, and translate research and development into real-world commercial opportunities.

**Deliver** the next generation of sustainable technologies for design, real-time performance analysis and life-management of Australia's critical infrastructure in urban, energy and resources sectors.

**Solve** current industry challenges and translate research and development into commercial opportunities.

**Design** novel and powerful health-monitoring technologies including non-destructive, non-contact dynamic diagnostic systems for asset protection

**Enable** creating a collaborative environment for government, industry, and academia to testbed the innovative ideas and support the government for a data-driven and evidence-based decisions and strategies

**Develop** Australia's next generation of fully validated robust, commercially viable, digital technologies for design and delivery of the nation's hard infrastructure to achieve competitiveness in domestic and export markets.

**Leverage** technologies in IoT and robotics, autonomous systems, big data, and high-level computing to build fit-for-purpose mobility platforms to cope with tasks in structured and unstructured environments, particularly assets located in remote regions

**Train** a cohort of highly competent and motivated young professionals through research and development programs carried out in partnership with participants from all sectors of the infrastructure industry

**Assist** in creating a cohesive innovative technical skills supply chain to address the future technological requirements of the industry, with improved planning, decision making and safe operations and resiliency

**Disseminate** discoveries and advances in technology and facilitate adoption through effective engagement with the engineering partner organisations, peak bodies, businesses, stakeholders and broader engineering and scientific communities.