

# National SMART Infrastructure Research Summit

25 March 2011

---

REPORT OF PROCEEDINGS APRIL 2011

**smart**  
infrastructure facility

University of Wollongong



Australian Government

Department of Infrastructure and Transport

# CONTENTS

Executive summary	3
Background and purpose	5
Introduction to the summit – Ms Sharon Bird MP	5
National perspectives on infrastructure – The Hon Nick Greiner AC	6
The state of UK infrastructure – Professor Brian Collins CB	6
The future for infrastructure in Australia – panel perspectives	8
Challenges	8
The way forward	9
Research priorities	10
Whole of city or region planning	10
Issues	10
Research priorities	10
The way forward	10
National infrastructure data requirements	11
Issues	11
What is required?	11
The way forward	11
Better use measures, funding and project prioritisation	12
Issues	12
Research priorities	12
The way forward	12

# 1. EXECUTIVE SUMMARY

The National Infrastructure Research Summit held on 25 March 2011 at Parliament House in Canberra was fully subscribed, with more than 160 senior members of the industry, covering Federal and State government agencies, universities, and business.

The purpose of the Summit was to start the process of developing a national collaboration framework, so that we can scale up our scholarship in infrastructure research to better match the size of the challenges facing our country. These sectors came together to hear insightful presentations and work through the issues that act as barriers or facilitators to collaboration and more effective applied research.

There was a clear and concise call to action from all participants for a more coordinated and collaborative applied research to address the big long-term issues impacting Australia with respect to infrastructure planning, procurement and operation.

Based on the feedback from participants, the event fostered high quality interaction and set the foundation stone of greater understanding and sense of common endeavour amongst the attendees, as individuals and as institutions. This is a critical first step in progressing a collaboration framework across the sector.

The Summit's international guest, UK Chief Science Advisor Professor Brian Collins provided a valuable case study in problem identification and developing a responsive national infrastructure plan.

Professor Collins indicated that the UK had agreed to undertake immediate work in critical areas: systems thinking; infrastructure interdependencies; observational data for smart infrastructure; the impact of regulation; international benchmarking; and developing the skills required in this sector. The requirements on technology, engineering and design also need to be acknowledged. New demands have been placed on government and organisations to respond in more holistic ways to complex problems in managing and designing infrastructure networks. A complete response to the infrastructure challenge will be formed only through collaboration between government, industry and academia.

These observations aligned with the Australian national perspective put forward by the Honourable Nick Greiner (Chairman SMART Infrastructure Facility Advisory Council) who acknowledged the Federal Government's important actions of fostering applied and scaled-up infrastructure research as an important part of the solution. The Chairman also emphasised the importance of focusing on the behavioural aspects of infrastructure as well as the technical components. The productive workshops on the day have produced an important and useful set of ideas, tasks and approaches that will positively guide infrastructure research and collaboration. The outcomes of these are now gathered in this document. The notes summarise the outcomes of the three-part approach to each of the workshops: "What are the issues?"; "What is required?"; and "The way forward".

## Priority actions arising from summit

### I. National infrastructure research register

SMART will support the Department of Infrastructure and Transport to develop a national register of research endeavour, covering for example; areas of interest, key personnel, funding sources and international linkages. The register is intended to improve discoverability of people, skills and subject matter that can champion stronger inter-institutional collaboration to support best practice research methods and outcomes in applied infrastructure research.

### II. Longer term research collaboration framework

The Department of Infrastructure and Transport together with SMART and other leading organisations supporting the Summit will explore a purposeful framework for setting research priorities and funding sources. This is expected to get underway in Spring 2011.

### III. National infrastructure seminar series

The SMART Infrastructure Facility will convene a national roundtable leadership series in the major state capitals to inform longer-term national research priorities. The roundtables will provide a consultative platform to identify the State specific opportunities and challenges associated with long-term integrated infrastructure planning and management.

## **2. BACKGROUND AND PURPOSE**

The SMART Infrastructure Facility co-hosted with the Department of Infrastructure and Transport, the National SMART Infrastructure Research Summit at Parliament House, Canberra, on the 25th of March 2011. The objective of the Summit was to bring people together in the infrastructure research area to create a stronger and purposeful network of researchers that can work more collaboratively together in supporting a national agenda.

The Summit assembled infrastructure thought leaders from across Australia. They assessed the challenges, issues and priorities for future infrastructure research, particularly in areas that will support a more integrated approach to long-term planning and management of infrastructure. This document is a summary of the outcomes from the Summit.

### **2.1. Introduction to the summit – Ms Sharon Bird MP**

The Chair of the House of Representatives Standing Committee on Infrastructure and Communications, Ms Sharon Bird, MP opened the Summit by acknowledging the importance of SMART's focus on the four key infrastructure sectors on which Parliament will focus. These are energy, transport, communications and water. Ms Bird also highlighted the importance of a systems-wide approach to Infrastructure for both the Minister, the Hon. Anthony Albanese MP and for the nation.

Ms Bird noted the key role SMART will have in a new focus on Infrastructure in Australia, and signalled the need for the adoption of smart technologies and an integrated focus on the environmental impact of infrastructure projects.

## 2.2. National perspectives on infrastructure – The Hon Nick Greiner AC

The Chairman of the SMART Advisory Council, Mr Nick Greiner, observed there has been a breakdown in public trust in infrastructure policy and planning and that to restore this trust a bipartisan, long-term approach to policy and planning is required. This approach must be whole-of-government to remove silos within and between governments, and demonstrate intellectual leadership rather than isolated funding. The Chairman also indicated that the human dimension of infrastructure must be understood, and that research must focus on the behaviour of users rather than treating infrastructure solely as an engineering exercise. The Chairman defined the purpose of SMART as providing a national and collaborative perspective, and that the Facility will take a network and systems approach to infrastructure, including modelling and cost benefit analysis. Maintaining independence and transparency will be critical if SMART is to help shape the infrastructure agenda, particularly in issues requiring whole of government approaches.

Data collection, sharing and access is critical for infrastructure planning and there is a clear need to have a national 'best in class' research focus for infrastructure. SMART, therefore needs to produce results by applying research to infrastructure beyond traditional modes and asking new questions for Australian infrastructure. An example of this new approach is to focus on understanding of the human dimension of infrastructure. In addition the ways in which to deal with the quality of stock across the nation have to be addressed. Above all, collaboration and integration must be signature features of the SMART Infrastructure Facility.

## 2.3. The state of UK infrastructure – Professor Brian Collins CB

There exist many parallels between the UK and Australia in terms of key challenges and issues, not the least being the need for good infrastructure; including high availability services which must be provided (energy, waste, transport, water, information) and shared at a national and regional scale; and the importance of the infrastructure system (as opposed to the individual assets alone) and its interdependencies to long-term security and ensuring community confidence and support.

Good infrastructure provision needs to address all of these matters and must also be of a sufficient quality to support a developed society. By its very nature good infrastructure must be resilient to shock and be well managed. This all needs to attract continuous investment – funding capital, intellectual capital, and political capital. In the UK today, infrastructure is largely privately owned. This means that the purpose and efficiency of infrastructure is determined by the market, and that governments are locked out of systemic review and oversight of infrastructure facilities. For the UK the provision of good infrastructure faces many challenges, including;

- Neglected intellectual capital
- Ageing infrastructure
- Significant unregulated growth in interdependency
- Population growth and radical change in ways of living in last 50 years
- Privatisation and internationalisation of infrastructure
- No central governance of infrastructure as a system

- Little investment in resilience
- High levels of road freight
- High levels of road congestion
- Approaching maximum port capacity
- Air way congestion
- Political responses hampering infrastructure planning and implementation

To respond to these challenges the UK is implementing platforms for change in infrastructure, including high speed rail, low carbon bus system, a re-examination of the use of coastal shipping, and better water management systems. These changes on the entire infrastructure will be done from an economic, societal and environmental way. The UK's government program for infrastructure (IUK) formed in 2009 and produced the first national infrastructure plan (NIP1) in 2010, with NIP2 being developed soon. This agency will be instrumental for the UK government research programs on energy and the digital economy, amongst other research areas required to address the challenges in UK infrastructure. Some of the research needed includes:

- Systems thinking
- Infrastructure Interdependencies
- Observational data for smart infrastructure
- Impact of regulation (including risk management)
- International benchmarking and exchange of ideas and approaches
- Developing the skills in this complex sector
- Technology research
- Plastic electronics
- Composite materials
- Embedded connectivity
- Adaptive systems
- Novel sensors
- Engineering research
  - Resilience
  - Low carbon
  - Social acceptance
  - Economic performance
- Design research
  - Moving society beyond consumption to consumption and conservation
  - Consequences of conservation to collaboration?
  - Media role
- Interdependency research
  - Treating ICT and energy as a critical system?
  - Water, waste and transport criticality

The Professor also indicated that to combat an infrastructure crisis, a culture which values infrastructure modernisation must be developed and the government's role forming the infrastructure agenda must be defined.

### **3. THE FUTURE FOR INFRASTRUCTURE IN AUSTRALIA – PANEL PERSPECTIVES**

Two panel discussions were held. The first topic was ‘why a collaborative framework for cross institutional infrastructure research is a national priority,’ and the second ‘cross institutional perspectives on research collaboration.’

#### **Panel members**

Mike Mrdak, Secretary, Department of Infrastructure and Transport & Member, SMART Advisory Council

Garry Bowditch, Director & CEO, SMART Infrastructure Facility, University of Wollongong

Professor Martin Betts, Executive Dean, Faculty of Built Environment and Engineering, QUT

Michael Deegan, Infrastructure Coordinator, Infrastructure Australia

Professor Andrew Parfitt, Pro Vice Chancellor and Vice President: Division of Information Technology, Engineering and the Environment, UniSA

Tony Shepherd, Chairman, Transfield Services & Member, SMART Advisory Council

Professor Bob Stimson, Director, AURIN, University of Melbourne

#### **3.1. Challenges**

The January 2011 Queensland floods and the widely discussed infrastructure issues in Sydney highlight aspects of the challenges for Australia’s infrastructure. There is an obvious need for integrated approaches to infrastructure management at a system level and for research to underpin new styles of planning and decision-making.

The role of researchers in delivering critical elements to any new solution infrastructure needs to be highlighted. There is not always effective alignment between the work of researchers and the needs of decision makers. For example better configuration of the researcher’s role would be to engage them at the early stages of programs, projects or policy development, to ensure the benefits that their work generates are best used. Another approach would be to have a nationally acknowledged research focus supported across governments and stakeholders.

It is important that researchers and the community more widely engage in the national conversation about productivity and to understand the fundamental drivers that shape our economy and society. This knowledge should then be used in all aspects of research activity – from funding to report writing.

For researchers, there are few incentives to overcome the plethora of silos in government, academia, and industry and the short-term imperatives of much research funding. Multidisciplinary research is insufficient to overcome the problems in infrastructure planning – multi-system research across government, industry and academic is required. Collaboration is a worthy objective for infrastructure research and there is a need to recognise as a case study the positive and productive collaborative research endeavours of medicine and biological sciences. Collaborative efforts require the recognition that relevant expertise exists in multiple institutions, the implementation of rewards for multidisciplinary work such as tying funding to multidisciplinary projects, and above all, strong leadership. Issues were noted in relation to the disparate engagement of academia in infrastructure research and policy formation. It was emphasised that the academic community is dependent on isolated funding grants which can lack an system wide overarching objective. Consequently, broader areas such as productivity, which are in great need of investigation, may be neglected or approached on an ad hoc basis.

Research for the future is required at three levels:

- Foundation disciplinary research
- Multidisciplinary research
- Integrated systems research

SMART can make a significant contribution in the area of integrated systems research.

### **3.2. The way forward**

Australia needs to develop closer links between research and policy through a clear sense of national purpose and long-term vision for infrastructure. There are many new infrastructure problems to be solved requiring new research, new science and real innovation including a methodology for prioritisation of infrastructure projects as well as new funding and business models.

Data is key to evidence based decisions and planning – research has an important role to play in rigorous data collection and analysis.

The SMART Infrastructure Facility will need to be a catalyst for fostering a culture of collaboration that breaks down silos and establishing an agenda to build a strong analytical research ethos to meet the long-term challenges confronting infrastructure related public policy in Australia.

## 4. RESEARCH PRIORITIES

### 4.1. Whole of city or region planning

#### 4.1.1. Issues

- Understanding population projections and regional/city economic drivers to broadening the concept of benefits beyond financial impacts to include social, environmental benefits as well as the beneficiaries. This requires transparency and more sophisticated ways of engaging with communities (that is beyond publishing)
- Understanding what actually exists in terms of structural and infrastructure links
- Developing an understanding of how systems, and systems of systems interact, including synthesising the results of analysis, modelling and data mining
- Shifting the focus of assessment of a project to include its locus within a system or network and analysis of costs and benefit analysis.
- Governance of infrastructure was widely seen as critical to restoring trust in infrastructure (across all facets, including post project implementation, i.e. Did the community receive the desired outcomes?) including long-term planning across political and electoral cycles. There is a need to garner political and social support for long-term planning for which research has an important role to play.
- Independence of commercial and political interests is essential for research and the SMART Infrastructure Facility along with the university sector generally are the best place for this work to take place.

#### 4.1.2. Research priorities

- Define and agree the problem we are trying to solve before modelling
- Understand the needs and values of multiple communities of interest and keep all stakeholders engaged. Research needs to be developed in line with common and agreed national priorities.
- Recognise the limits of modelling and tools
- Clarify who sets the priorities for research and the role of the community and government in setting priorities
- Develop an understanding of asset management

#### 4.1.3. The way forward

- Building on the energy and momentum of this Summit, continue the bringing of stakeholders together. Department of Infrastructure and Transport supported by SMART will scope out a national steering committee for infrastructure research in consultation with other research institutions, government, business and the community.
- Clarify exactly what SMART intends to achieve and communicate this widely.

## 4.2. National infrastructure data requirements

### 4.2.1. Issues

Key considerations in the development of a national infrastructure framework include:

- Security – to whom and to what extent is access to data available?
- Privacy – how to make personal and commercial data anonymous?
- Interoperability across databases – how to unify semantics, scales, consistency and quality?
- Maintenance – National frameworks are high maintenance requiring in ongoing and sustainable collaboration. What is the cost of data? What are the benefits?
- Governance and leadership – how to overcome political and institutional barriers? Government is sitting on too much data that needs to be released from its silos and deployed into holistic research endeavours.

### 4.1.2. What is required?

A National Framework that represents what is in place and is useful for disseminating data across the system and based on semantics. Such a Framework needs to have clear imperatives, compelling outputs, address live issues and take a ‘project based approach’ to secure maximum engagement from stakeholders. It should enable Australia to unlock the social value of data (including bio-physical movement and human behavioural data which are equally important to infrastructure systems) while respecting the nature of both commercial and personal privacy and security.

Using a distributed model that builds on the skills and data that already exist and identifies the custodians of this data, a National Infrastructure Research Framework could provide the basis for a network for collaboration, rather than this being focused in an institution.

### 4.1.3. The way forward

- Clarify problems and outputs to be addressed by the National Infrastructure Research Framework and develop a taxonomy or index
- Undertake a stock take of relevant data and gaps and partner with those with existing data
- Ensure effective leadership and governance of the Framework, such as through the formation of a National Infrastructure Research Steering Committee.
- Learn from those organisations that have already responded to these types of challenges (e.g. CRC for Spatial Information).
- Education of data managers about new technologies and providing data to general education/research arenas through data mash-ups and using visualisation.

## **4.3. Better use measures, funding and project prioritisation**

### **4.3.1. Issues**

It is important to:

- Build a better understanding of the connections between the infrastructure system and risk mitigation
- Develop the data and protocols to integrate and understand what is available
- Educate clients in the use of modeling
- Build capacity and capability to model system level issues
- Ensure stakeholders fully understand cost-benefit appraisal (CBA) and its role.

### **4.3.2. Research priorities**

- Integration of different models – linking underpinning disciplines and purposes as well as the technical aspects and language
- Develop a language for non-technical professionals (i.e. planners, CEOs, government employees and the public)
- Harness real world data – overcoming intellectual property issues
- Understand key risk parameters so they can be built into models
- Develop indices of welfare and liveability with respect to infrastructure
- Understand the cost of doing nothing.

### **4.3.3. The way forward**

SMART will examine the establishment of a national repository concerning infrastructure data, methodologies, frameworks and case examples to enable more in-depth research into the development of cost benefit analysis and other project prioritisation tools for policymakers and investors.

Identify a large, reasonably complex project to which visualisation and modelling can be applied and engage stakeholders in the design and procurement process. Use the process to learn from mistakes and to educate people across the sector.



University of Wollongong



**SMART Infrastructure Facility**

**smart.uow.edu.au**

Phone: +61 2 4221 5031

Fax: +61 2 4298 1489

Email: smart-facility@uow.edu.au

University of Wollongong, Northfields Ave, Wollongong NSW Australia 2522

Sydney Office: Gateway Building, 1 Macquarie Place, Sydney 2000

**Join the SMART Infrastructure Facility online community  
to network, collaborate & exchange information**

**twitter**

**facebook.**

**You**Tube****

**flickr**