



LOW CARBON LIVING
CRC

Precinct Information Modelling Outcomes Report



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We also wish to acknowledge the contribution of the five panellists who willingly shared their insights during the PIM Symposium Panel Session.

Andrew Curthoys - Dept of Infrastructure, Local Government and Planning, Qld (DILGP)

Liz Partridge - NSW Health Infrastructure

Alex Sommers - UrbanGrowth NSW

Antony Sprigg - Infrastructure Sustainability Council of Australia (ISCA)

Roger Swinbourne – AECOM

Their insights form the basis of this Outcomes Report.

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The CRCLCL recognises the value of knowledge exchange and the importance of objective peer review. It is committed to encouraging and supporting its research teams in this regard.

The author(s) confirm(s) that this document has been reviewed and approved by the project's steering committee and by its program leader. These reviewers evaluated its:

- originality
- methodology
- rigour
- compliance with ethical guidelines
- conclusions against results
- conformity with the principles of the [Australian Code for the Responsible Conduct of Research](#) (NHMRC 2007),

and provided constructive feedback which was considered and addressed by the author(s).

Contents

Acknowledgements	2
Disclaimer.....	2
Peer Review Statement.....	2
Contents.....	3
Acronyms	4
Background.....	5
Exemplar Precincts	6
Badgerys Creek Airport	6
Brisbane Cross River Rail Project	6
Landcom & UrbanGrowth NSW Development Corporation	6
Health Facilities	6
Project Opportunities.....	7
Urban & Regional Planning	7
Subterranean Communities.....	7
Urban Densification and Open Data	7
PRECINX – Sustainability Assessment for Urban Districts.....	7
Local Government Precinct Management.....	7
Health Facility Precincts	7
Model creation	7
Overlay data.....	7
PIM for Linking to Open Data Sources	7
Key Messages.....	8
Reduced Risk	8
Diversity of Standards	8
80-20 Rule	8
The Carbon Story – Spatial Questions	8
Next Steps.....	9
Developing Project Proposals.....	9

Acronyms

AHIA	Australasian Health Infrastructure Alliance
BA	Building Application
BIM	Building Information Modelling
bSI	buildingSMART International
CBD	Central Business District
CRCLCL	Cooperative Research Centre for Low Carbon Living
DA	Development Application
DILGP	Department of Infrastructure, Local Government and Planning, Qld
EIS	Environmental Impact Statement
IFC	Industry Foundation Classes
ISCA	Infrastructure Sustainability Council of Australia
ISO	International Standards Organisation
LEP	Local Environment Plan
LHD	Local Health District
OGC	Open Geospatial Consortium
PIM	Precinct Information Modelling
QWB	Queens Wharf Brisbane

Background

The work undertaken in the CRCLCL PIM Project (RP2011) was presented at an Industry Symposium on 15 September 2017. The aim was to demonstrate how Precinct Information Modelling (PIM), based on an open information exchange standard, can enable more effective urban planning, design and management at a precinct scale. The objectives of the event were:

- To present key aspects of the precinct data model and related processes and outputs (including a database interface and a concept PIM 3D visualisation tool) developed as part of the PIM project.
- To demonstrate the application and relevance of that work for the wider community within the CRCLCL.
- To launch a Position Paper that articulates the efficacy of modelling the built environment at the scale of a precinct.
- To showcase the utilization opportunity and potential for long-term impact of the approach to information exchange standards undertaken in the PIM project.
- To review the outcomes of the Empowering Broadway Phase 1 project (a project to empower precinct scale initiatives to drive transitions to low carbon energy and water use)
- To outline both the need and opportunity for on-going work in the development of PIM, as well as potential funding opportunities.

The event concluded with a Panel Session, facilitated by Professor Peter Newton, that sought to identify utilization opportunities and next steps that could build on the work completed. There were five invited panelists:

- **Andrew Curthoys**
Dept of Infrastructure, Local Government and Planning, Qld (DILGP)
- **Liz Partridge**
NSW Health Infrastructure
- **Alex Sommers**
Landcom
- **Antony Sprigg**
Infrastructure Sustainability Council of Australia (ISCA)
- **Roger Swinbourne**
AECOM

This report summarizes the outcomes from the discussion during the Panel Session, drawn primarily from the contributions of the panel members. This is done under three sections: possible exemplar precincts that may be used to implement/test aspects of the PIM approach; project opportunities that could serve to explore specific aspect of PIM; and key messages that emerged out of the discussion.

Exemplar Precincts

Badgerys Creek Airport

The Environmental Impact Statement (EIS) was released on 15 September 2016¹. The project is still in the early stages of planning and, with appropriate support from existing contacts, could provide an opportunity for the application of PIM to that project.

Brisbane Cross River Rail Project

The State has allocated \$5.4 billion in funding to this project, viewing it as a “digital spine” linking other elements in the CBD. It will form another key element of the Queensland Rail Brisbane Metro network and will have linkages to gas, electricity, water and waste water utilities and other asset owners, such as the Queens Wharf Brisbane (QWB) project.

Landcom & UrbanGrowth NSW Development Corporation

Following a recent restructure to separate Landcom and UrbanGrowth NSW, the latter’s role is to promote, coordinate, secure and manage the development of five growth centres in metro Sydney, and Landcom is now focussed on supporting the NSW government’s housing affordability agenda and delivering the local infrastructure for new communities. PIM is seen as an excellent approach, especially for greenfield and infill sites. There is a big opportunity to refine civil earthworks projects to reduce costs for this expensive component for many of their projects before handing over to developers. PIM presents one way to model superlots.

Health Facilities

Health Infrastructure has a 4 year, \$7.7 billion, workload at present. Big initiative to derive better value out of the capital works process. BIM has been in place since 2013. Have some experience in measuring BIM outcomes, so the PIM approach, though ambitious, is very credible.

¹ Badgerys Creek Airport EIS: <http://westernsydneyairport.gov.au/media-resources/resources/environmental->

[assessment/index.aspx#eis-2016.](#)

Project Opportunities

Urban & Regional Planning

Industry, Government and academic research is currently directed towards the challenges that face planning in Queensland, particularly when dealing with the disparity in quality of cadastral and ownership data between the south east region and the rest of Queensland. PIM could provide a critical link in addressing these issues, but Local Government needs education and capacity building to make use of it.

Subterranean Communities

Queensland's hot and humid climate may be an opportunity for a subterranean city, cf. Singapore and Edmonton, Canada. Program over 2020/30/35 enabling community plus councils to create digital models. Initiative to move planners from clerical role to a planning and thinking role.

Urban Densification and Open Data

Queensland Government Architect (Malcolm Middleton) is looking at densification in Brisbane, while the Queensland government is making more data available to the public, but has not finalised a vision for how it would be accessed, so PIM could provide a critical methodology to support such initiatives.

PRECINX – Sustainability Assessment for Urban Districts

UrbanGrowth NSW (through Landcom) has been a leader in using PRECINX for precinct planning to reduce emissions, total water and energy, thereby leading to reduced costs of living and sustainable outcomes. Shared data acquisition with other state PRECINX users has enabled the benchmarking of measures since 2009. Common assumptions are needed for data improvement therefore need standards of the kind proposed by the PIM project. A particular challenge is to verify that sustainability targets are being met (same is true for BASIX) in the delivery of built form, post land sale.

Local Government Precinct Management

It was noted that Local Governments lack appropriate tools (and the resources) to manage their urban/suburban portfolios. PIM offered an integrated information repository, and can commence in an incremental way building up data, based on benefits and identified needs.

How will the public spaces on the Barangaroo/Darling Harbour sites be managed over time? PIM could be the mechanism to capture the diverse operational and maintenance data for these "left over" tasks.

Health Facility Precincts

There are two potential uses of PIM.

Model creation

There is sometimes very limited information about the spaces between buildings on hospital campuses. Challenge is developing a base model on historical/current campuses/sites. Air space (helicopter access, etc.) is a key consideration. Mapping existing utility and building services are the hardest task and the highest risk. A recent exercise was undertaken at the Randwick Campus to model data for the existing campus. To continue this kind of modelling requires the data to be applicable and of ultimate value in order to be fundable. PIM is a powerful vision, IFC open data is good and already a format for deliverables required by NSW Health Infrastructure.

Overlay data

PIM could be useful in developing a 'campus wide' approach to the assessment of energy usage. Hospitals use large amounts of energy. There is big variability in energy uses across space types. For example, from an energy use perspective, small clinics can behave like a commercial office, but a hospital has very high energy consumption. The Australasian Health Infrastructure Alliance (AHIA) has commissioned the creation of a version of NABERS Tool for Hospitals, where PIM would be used to integrate the whole health campus. PIM could assist with assessing town planning submissions. A Local Health District (LHD) may have a number of sites: PIM could include all the data for strategic asset planning. LHDs need tools to assist with strategic asset planning processes- PIM appears to be a candidate as it supports health campus planning. The challenge is how much value versus effort. The availability of data always re-measuring.

PIM for Linking to Open Data Sources

The challenge on any project is getting access to reliable data, which is always different, costly to acquire and a repetitive task. Standard data sets would solve this - government policy? PIM would improve transparency, lead to better evidence-based planning and project execution. Some of the issues to be addressed with respect to open data:

- Ownership of data is very important; therefore, a government protocol/strategy is essential.
- Art and science lead to organic systems - must be careful about fake data (cf. statistical manipulation of results). Federal government has just commenced a \$150 million data program.
- Who are the influencers / decision makers on PIM projects / repositories?
- Application of data depends on the role of PIM client.

Better Building Partnership (City of Sydney) is an excellent model of shared collaboration for CBD owners.

Key Messages

Reduced Risk

In selling the idea of PIM, don't talk first about PIM, BIM or 3D prototyping, but focus on the opportunity to reduce risk. A good example is tunnelling, a major element of infrastructure developments in NSW, but which is considered very high-risk work. The use of 3D/4D visualization alone as a risk management strategy would open up significant operational benefits. Productivity gains are not the key benefit, but rather risk mitigation, particularly at the operational phase, providing the greatest benefit of digital technology. Begin with visualization, then show the further opportunities of information modelling.

Diversity of Standards

The proposed standards development for precincts, undertaken in the PIM Project and developed as an extension of the IFC standard for buildings, stands as one significant contribution to information sharing at a precinct scale. It is essential to note the existence of other standards that contribute to effective information management, in particular, coming out of the work of the Open Geospatial Consortium (OGC). This includes CityGML, IndoorGML and InfraGML. The challenge is to understand how to integrate with those, rather than duplicate or endeavour to supersede them.

80-20 Rule

It was considered that a pragmatic approach that focusses on outcomes is the best implementation strategy. For example, the Department of Infrastructure, Local Government and Planning (DILPG) in Queensland has established draft BIM principles that will contribute to the digital elements (e.g. vertical and linear projects) within a city concept as a first step, leading to the possibility to build on that with the concept of PIM and ultimately the integration of DA submissions into that vision.

The Carbon Story – Spatial Questions

PIM has a clear role to play in solving some of the wicked carbon problems that we face within precincts. Both embodied carbon (materials and carbon sinks) and operational carbon (energy, water, waste and transport) are multiplied within precincts through the interaction of complex systems (urban heat, water systems, electric vehicles, energy storage, etc.). Three factors come into play and need to be managed at a precinct scale: assets that impact carbon; governance that influences outcomes; and costs that incentivise action.

Next Steps

Peter Newton summed up his key take-home message as, “the quickest entry for PIM is via an explicit role in *major* projects, with potential for *replication*...and becoming an exemplar method for managing information on a ‘precinct’ project”.

Roger Swinbourne summed up the CRC LCL perspective saying, “As we look to the process of transitioning our cities and precincts [to low carbon] we will increasingly have the opportunity and challenge around how we use data in defining and enabling more sustainable outcomes. This will require better standards around how we collect, share and apply data.”

What are some examples of the next steps?

The PIM project has identified and demonstrated prototypes of some of the key underlying digital systems required to host PIM data.

We believe small pilots focussed on a targeted outcome will give owners and clients practical experience in the new technology, provide quick feedback under 1-2 years, and be a strong learning for senior management and practitioners involved of the benefits.

On these assumptions candidates are:

- Modelling a **small urban centre**, (for example, on the scale of **Lindfield Suburban Centre**, NSW), where some major new facilities are being developed in a community setting, creating for the local government team a prototype while assisting several of the partner developers, consultants and construction teams;
- Undertaking a feasibility study for major project sites (for example **Darling Harbour public space precinct**, **Brisbane Cross River Rail Digital Spine**, **Badgerys Creek**, or other major commercial development), incorporating all the diverse individual existing, new and planned developments to integrate life-cycle operational and management functions;
- A pilot on a **major health campus** to represent the health services capacities and planning parameters for current and future operational monitoring;
- A national approach to **land use classification and planning zones** would be a foundation of internet accessible built asset development data, enabling PIM developments and other innovations such as BIM based DA/BA submissions and model based sustainability assessment;
- Developing the information requirements and process for a **DA and BA BIM assessment using a BIM model**, incorporating a digital LEP with cadastre, planning zones, and development controls;
- Developing the information requirements and process for **BASIX assessment for a model based submission**, assisting the implementation of IFC format interface for AccuRate and developing standardised product data for an extended set of materials and products, etc.;

- Using either of the two current precinct models, **Tonsley Park** or **Broadway**, take parts of them to the next stage of implementation, with a direct collaboration with respective Councils (Marion City and City of Sydney), and state planning departments;
- Developing a Local Government **asset management data specification** to support operations and management of Council owned built assets in a BIM, PIM or Digital Engineering context.

The PIM Project Team see these next round of pilots as the key to the effective implementation and adoption of this work in the short to medium term, alongside ongoing engagement with international standards organisations including buildingSMART, OGC and ISO.

Developing Project Proposals

If you have an idea for a project of your own, or based on the examples above, please contact either Stephen Summerhayes (s.summerhayes@unsw.edu.au, mob: 0414 933 362) or any member of the PIM Team, Jim Plume (j.plume@outlook.com, mob: 0414 321 796), David Marchant (david.marchant@woodsbagot.com, mob: 0417 000 024) or John Mitchell (john.mitchell@cqr.net.au, mob: 0410 318 131).