Spatially enabling urban planning for city growth and housing production in Australia: an imperative for evidence-informed policy

Concurrent session theme: Housing and the Planning System (4)

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ABSTRACT

In Australia, as in other countries, tension is growing between advocates of compact city development (national and some state strategic planners) and opponents of this view (some developers and residents). A resolution of this tension involves supporting each view with convincing evidence. Spatially enabled information provides an essential tool to achieving this. However, most datasets reside with agencies on a standalone basis: they are not efficiently utilised across and between governments and do not facilitate evidence-informed policy making. Where these infrastructures are available, too much focus has been placed on data collection and sharing as an end, rather than as a means to an end, in supporting the appropriate decisions. The focus is often on the development of ‘cadastral fabrics’ which arguably are necessary, but not sufficient for the kind of rigorous analyses required for analysis of housing. This paper highlights the importance of spatially enabling building and urban planning information to facilitate land delivery for housing production. The research design involves the use of a case study containing interviews and secondary datasets. The exploratory study establishes the need for evidence informed policies and decisions. The analyses reveal what is needed to promote the spatial enablement of society. It concludes that components in addition to ‘cadastral fabrics’ are necessary.

Keywords: spatial enablement, land use planning, housing production, data infrastructure
1.0 Introduction

Land use planning activities have acted and will continue to act as an interface between city growth, land delivery and housing production. Land use planning is an enterprise that is focused on making appropriate decisions about how rural and urban land is put to optimal use (Brueckner, 2007). Essentially, it is all about making the right decisions. What is however, considered right decision is varied, contextual and contestable. Initiatives to make decision making less contestable involve linking information to a specific location, in what is today known as ‘spatial enablement’. In other words, information about building and land location and the corresponding attributes, is required to be geo-referenced or mapped, made available and linked with strategic planning and development assessment activities in a more integrated and coordinated fashion.

Within this frame, a society is considered spatially enabled when ‘location and spatial information are regarded as common goods made available to [government departments and agencies] citizens and businesses to encourage creativity and product development’ (Wallace et al, 2006:3; Rajabifard, 2008). Realising this objective involves developing an overarching vision and a set of tools. From the perspective of Wallace et al, (2006) the vision involves establishing an enabling infrastructure that will facilitate the linking of business transactions [across land administration functions and between different levels of government] to a place or location. This is considered to have the potential to support government actions, decisions and polices. This perspective is consistent with the views and direction of Councils of Australian Government (COAG) as expressed in the national criteria for assessing strategic planning of Australian cities (COAG, 2009).

Making informed decisions, regarding the contemporary nature of land use planning and the dynamics of land and housing development, therefore requires the adoption of strategies to spatially enable and spatially integrate planning and urban development in Australia (NHSC, 2011). This is based on the expectation that it will facilitate the assessment of policy effectiveness, improve understanding of housing needs, and address the broader issues of residential development, infrastructure provision and access to services (Major Cities, 2010).

However, linking spatial data with location to enable informed-decisions about land use that respond appropriately to the requirements of smart growth policy is challenging (McDougall, 2007). This demands inter-agency collaborative arrangements to bring together information, processes and policies to facilitate the realisation of spatially enabled society.
Set within the urban growth management framework, this paper explores the importance of spatially enabling urban planning and then examine and demonstrate how this supports evidence-informed policies and decisions to facilitate land delivery for housing production.

A review of literature and a description of the case study areas introduce a general discussion of the methodology. The later parts focus on the analysis and present the research findings. A discussion of the major findings and suggestions for further research conclude the paper.

2.0 Understanding the data services and infrastructure required for spatial enablement

This section reviews the requirements for spatial enablement and the on-going discussions on compact growth policy in Australia. This provides a framework for understanding the link between strategic planning and the statutory planning and what data services and infrastructure required to support requisite evidence for effective policies. To progress these, it is desirable to explore what counts as evidence within the context of land delivery for housing, and how evidence is converted or used to make informed-decisions or to develop policies.

2.1 What counts as evidence?

Evidence is defined as the available body of facts or information indicating whether a belief or proposition is true or valid (Greenhalgh et al, 2003). This means, for facts and information to count as evidence they must be available and valid - admissible. This is also consistent with the description of spatial enablement as common goods made available to citizens, government departments and agencies as suggested by Wallace et al, (2006:3).

How findings are made available to policy and decision makers, how they use results to make expected changes, and whether a willingness to question ways of doing things through inherited bodies of knowledge, need to be understood.

The way information develops into knowledge is based on the experience of the consumers. This is underpinned by the context within which information is interpreted and used. Data infrastructure, as an integral part of spatial enablement, allows data to be developed into information within a particular context and information to be discovered, accessed, used and integrated then converted to knowledge through interaction. This then provides sufficient basis for the formulation of appropriate policies for the future. The modeling and visualization
capabilities of spatial data allow alternatives to be tested and turn data into information, and subsequently into knowledge and policy (NRC, 2003).

Central to the whole discussion of evidence-based-policy-debate are conceptual perspectives: Instrumental model is based on the assumption that the relationships between evidence and policy are unproblematic, linear and direct. Cognitive perspective, is based on the understanding that ‘research is related to policy but not in a linear fashion, rather it creeps or is absorbed into … policy … via direct, cumulative and diffused process… and in combination with lay knowledge’ (Radaelli, 1995). The central focus of the cognitive perspective is the understanding that problems are unstructured (Int’d Veld and de With, 2000) and that questions cut across many facets and disciplines (Weinberg, 1972). Enlightenment model emphasises a deeper understanding of interest, based on informing as well as provoking wider public debate about topical issues. In this case it is evidence-informed policy rather than evidence-based policy (Solesbury, 2002). This research draws on the enlightenment model.

From the forgoing it is important to consider policy that is informed by evidence. This is necessary to evaluate similarities, differences, gaps and overlaps in processes between respective land agencies in making appropriate decisions. This is consistent with the perspective of Major City Unit (2010:1) of the Department of Infrastructure and Transport, Australia that:

‘a strong information base is required to better understand growth and change in Australia’s cities, to identify issues and priorities for action, and to inform the best paths for public and private investment’.

Regarding this, Enemark 2005; McDougall 2007; Williamson et al, 2010, have shown that effective collection, storage, analysis, use and dissemination of information, are heavily dependent on the interactions between the land agencies within a national jurisdiction. Improved interactions could provide opportunities to critically engage with land and building information. This will facilitate making appropriate policies and consequently supports agencies’ functions and processes of operation. It is not just the information base relating to land and building that is important; this information should be location based or spatially enabled and spatially integrated.
2.2 Spatially enabling land and building information

Land information is an important component of national development. Land information holds the potential to holistically manage property rights, restrictions, and responsibilities over land (Wallace et al, 2010). While land information is usually linked with land registration, building information is thought to include data on: building use, value, height, land value and improved value (building value).

Specifically in the area of housing production, a nation’s capacity to understand housing needs and demands requires improved demographic information to be linked with geographic land and building information. To accurately estimate housing demand, robust combinations of arrays of data across land administration functions and between different levels of government are required. This is evident, in Australia, as the Australian Bureau of Statistics - the main source of census of population and housing data - openly acknowledges undercount and discrepancies in figures published (ABS, 2006). The Post Enumeration survey revealed this.

Presently, data sets are disparately stored across a range of state agencies making integration of data for decision making significantly challenging (Wallace et al, 2010). This is in addition to some internal ineffectiveness and inconsistencies of development assessment processes. The realisation of these inefficiencies has initiated calls for embracing the principles of spatial enablement.

2.3 The principles of spatial enablement

There are different principles involved in spatial enablement. As suggested by INSPIRE, an SDI initiative of the European community, the realisation of the vision of spatially enabled society is dependent on the development of appropriate mechanisms to facilitate the delivery of data and services. The INSPIRE initiative suggests that these mechanisms should encompass mitigation of duplication, sharing between levels of governments, minimal restrictions, and easy discovery (CEC, 2004).

The INSPIRE initiative is currently being implemented by the European Commission. However, the major limitation of this initiative is that the intent and contents are more focused on the data sharing consideration, rather than on policies and processes, or even actual users of the data. The limitation of adopting this approach is that more pluralistic issues across functions and between different levels of government will be ineffectively covered and analysed. Pluralistic issues involved in compact city policy need jurisdictional governance and inter-agency collaborative arrangements. This highlights the importance of
bringing together both information and users to facilitate the realisation of spatially enabled society (Rajabifard, et al, 2010).

2.5 Compact city growth policy

Compact growth policy is an offshoot of the global agenda: sustainability, Millennium Development Goals (MDGs) and climate change. The global agenda is driving national land management policies. Consequently, planning activities within a national jurisdiction are generally based on broad objectives of land uses and land development. This is mediated by the desire to achieve the global agenda (at least from the perspective of each level of government). Within this scope, it involves city development that is set to achieving optimal utilisation of space.

Most often, conflict of interest and lack of appropriate data impede progress on these agenda. Where infrastructures are available the focus has been on data collection rather than applications (Enemark, 2005; Rajabifard, 2006): there is a significant disconnect between data infrastructure, agencies’ functions and policy formulation.

An expanded scope includes the consideration of land use and land development that aligns with, and considered as, an integral part of land administration functions. Within this expanded view, land tenure and registration should be seen to essentially impact, and be impacted, by land use planning activities.

Several studies have been conducted to review the outcomes of the effectiveness of government policies towards the development of cities. At a global level, Angel et al (2005, 2010, and 2011) embarked on an extensive analysis, the contentious issues of urban containment, especially to facilitate a balance between the options of urban sprawl and infill development within the context of sustainable development.

The analyses centred on the assessment of urban density, fragmentation and sprawl. The research outputs present a snapshot of the global situation and seek pragmatic approaches of developing major cities around the globe. The findings reveal a need for a paradigm shift from urban containment to ‘the making room paradigm’ especially in the fast growing cities.

At the national level, the questions then are: to what degree should the making room paradigm and vice versa be pursued? On what bases should this be implemented? What should inform the decisions on which these policies should be based? What role for spatial data infrastructure in achieving policies?
To effectively answer some of these questions will require fine grain temporal analyses of land use changes with respect to three metrics - urban density, fragmentation and sprawl - as developed by Angel et al (2011).

However, the discussions as presented here do not engage directly with the prescribed analysis involving the determination of the different possible scenarios of urban: density, fragmentation and sprawl. The focus is to expose the challenges of making appropriate decisions concerning the development of cities which might invariably result to any of the three metrics. The case study areas offer useful context to gain improved understandings of the situation.

3.0 Case Study

3.1 The study area and data used for the analysis
The study focuses broadly on Australia. However, it adopts a case study approach (C.f. Bromley, 1986; Shavelson and Townes, 2002). Metropolitan Melbourne was selected as a case city to showcase the importance of integration of data infrastructure with agencies’ functions and policy making (see Figure 1). The urban growth containment policy of M2030 now Melbourne @ 5 Million strategic plans provides context for the analysis and discussions. Melbourne offers an appropriate location for this study due to the city’s growth – being one of the fastest growing capital cities in Australia – and its land market that reflects national trends.

Figure 1: Australia, Victoria, Melbourne

3.2 Research Methods

The method includes an overarching synthesis of existing studies to evaluate past and present initiatives that offer good insights into the requirements, prospects and challenges of spatially enabling urban planning in Australia. In parallel, it also involves the use of interviews and a secondary dataset in an exploratory way to evaluate existing views and opinion on the management and growth of Australian cities within the context of available data.

One of the objectives of the interviews is to identify data gaps that support or preclude sufficient evidence for decision making. The selection of respondents for structured interviews was based on the objective to cover as much as possible the diverse areas of Melbourne that correspond to the inner ring – Brownfield redevelopment; middle ring Greyfield – regeneration; and the outer ring – Greenfield development. The rationale for this is the assumption that the land release strategies for these different areas respond to different circumstances and will possibly require specific treatment of spatial datasets. With this in mind, three local councils were considered in each area for inclusion in the structured interviews. In addition, some government referral agencies and departments were also considered for inclusion in the interviews to provide a broader insight.

The analysis and conclusions are drawn from the combination of different viewpoints derivable from existing knowledge through documents, interviews and secondary datasets. In particular, Planning Permit Activity Reporting System (PPARS) dataset offers opportunity to explore the benefit of spatially enabled data to assess the efficiency and effectiveness of the development assessment framework. This is set within the land delivery context. The PPARS dataset contains extracts of 50,268 records of standardized monthly automated reporting of Melbourne metropolitan in Victoria. It covers a period between 2005 and December 2010. The datasets provide insights into the nature and planning activities in the study area.

The dataset was spatially enabled to realize its full potential, meaning that the address field was used to geo-code each location, that is, give it map coordinates. This subsequently allowed for the combined assessment or graphical overlay of the statutory and strategic approaches of land use planning in Melbourne, Victoria. The dataset offers an opportunity to appreciate the utility of location based data for a better analysis and visualisation of development assessment procedures.
4.0 Findings and analysis
The discussions are guided by the broader issues of integrating polices with data infrastructure across land agencies. This provides scope for identification of data gaps necessary for spatially enabling planning for housing and urban development in Australia. The discussions start with the exploration of past and present initiatives to spatially enable planning in Australia. It is then followed with an exploratory analysis to establish the data requirements needed for appropriate decisions and policies.

4.1 Evaluating land and building information towards spatially enabling land use planning: past and present initiatives

4.1.1 Australian National Data Infrastructure
The development of National Spatial Data Infrastructure (NSDI) has been an ongoing event in the last two decades through the coordination of ANZLIC. As a part of the initiatives, PSMA Australia Limited succeeded in combining selected land related disparate datasets from states and territories. This involved combining spatial data from Australia’s governments (local, states/territories, and national) to contribute to the creation of national spatial information datasets. These datasets include features such as roads, street addresses, and cadastral and administrative boundaries. The datasets are then used by networks of partners to develop useful products and services. PSMA’s datasets are the building blocks to spatially enable urban planning for city growth and housing production in Australia. There is also an ongoing initiative by the Office of Spatial Policy to develop 12 fundamental datasets. However, while these are essential they are not sufficient for the type of analysis required for housing development.

4.1.2 e-Government and connected governance
Another initiative is e-Government run by the national and state governments. This aims to provide services that are government-to-citizens or government-to-business and inter-agency communications that are friendly, convenient, transparent and inexpensive. The key is not the technology but having data available in the right form.

Part of the e-government initiatives is the e-planning projects and services through the development of planning portals. In Victoria, these include: tools to support online

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1 ANZLIC - The Spatial Information Council is the peak intergovernmental organisation providing leadership in the collection, management and use of spatial information in Australia and New Zealand.

2 A company with shareholders consisting of each state and territory government, - in Australia
lodgement, referral, approval and tracking of planning permits (SPEAR); Planning Maps Online - an interactive map service that provides access to all Victorian planning scheme map information; an online system for the regular collection and reporting of planning permit activity in Victoria - Planning Permit Activity Reporting System (PPARS); Planning Property Report - a standard two-page report that provides information on the planning controls that apply to any property in Victoria; and Planning Schemes Online for all Victoria Planning Schemes (DSE website).

Currently, attention is shifting from e-government to connected governance by taking advantage of the advances in technology. This offers new thinking about increasing integration in service delivery based on commonality of infrastructures, data and business processes. Within this framework, intergovernmental processes could be integrated vertically between various government agencies and/or horizontally between agencies at the same level and/or with the inclusion of private sector and other stakeholders.

However, a major challenge remains the difficulty of achieving inter-agency integration across and between different levels of government especially across land administration functions (land tenure, value, use and development). As discussed, this integration is important for making appropriate decisions.

4.1.3 Whole of Government (WoG) Approach in monitoring development
Following from the progress made through connected governance and the realisation of the limitations of this initiative, a whole-of-government initiative was introduced (Australian Public Service Commission).

As described by the Commonwealth of Australia (2004:2), the whole-of-government concept refers to ‘public service agencies working across portfolio boundaries to achieve a shared goal and an integrated government response to particular issues.’ WoG is important to developing mechanisms, structure and cultures which will facilitate all parties working together (Keast et al 2004; Mulgan 2002; Pollitt 2003; Productivity Commission, 2010). It is construed and described in several ways: Whole of Government Approach, joined-up approach, collaboration, working together (Keast et al, 2004; O'Flynn 2009). Given the range of issues involved in housing production, it is important to adopt approaches that will bring at least the majority, if not all, participants to the same table in seeking solutions to and dealing with associated challenges.
The major limitation of the whole-of-government approach within the context of this research is that it is anchored upon ICT-enabled public sector governance rather than spatially enabled government. In other words, the approach is data centric rather than process centric. What is required is a close cooperation among agencies to develop land management policies and thereby improve land administration processes using location data infrastructure as a tool.

4.1.4 Developing body of knowledge through academic research

Given the role of academic research in developing knowledge base, research is considered an important component of making informed decisions and policy. An example is the Australian Urban Research Infrastructure Network (AURIN) initiative. AURIN is an on-going research initiative by scholars to provide research infrastructure through a single portal that facilitates direct access where possible, to a number of federated data services at point of origin. The idea is to build access through this portal, in an integrated way, to access data held at various sites around the country. The urban housing lens constitutes one of the lenses focusing on a number of themes. These themes include: housing affordability and sustainability in housing. Others include housing density, supply and demand, housing finance and housing and land use development growth patterns.

4.1.5 Other research collaborative initiatives

In addition to the AURIN initiatives, other collaborative investigations examining better integration of national datasets include: National Infrastructure for Managing Land information (NIMLI) - an Australian Research Council linkage project (Wallace et al, 2010); and research about information to assist 3D property management.

Other initiatives include: the Property Exchange Australia (PEXA) that specifically focuses on electronic conveyancing; and the Australian Spatial Market Place, an initiative of ANZLIC to make all spatial data available in a tradable manner. In summary, each of these initiatives strikes the major challenge of building integrated datasets required for effective decisions.

Following from the evaluation of the past and present initiatives the next section discusses important considerations, by drawing from the views of respondents and the exploration of secondary datasets. Each of these considerations is followed by specific data requirements necessary for spatially enabling land use planning and associated spatial analyses.
4.2 Assessing data gaps for housing decision making in the context of spatially enabling strategies

Some of the parameters to assess data requirements and adequacy for spatially enabling land use planning for housing production in the study area are discussed here. These offer justification for the adoption of a spatially enabling platform. One of the parameters is the improvement of analysis on land requirements for housing.

4.2.1 Improving urban density analysis and land space requirement for housing

The desirability of adequate and reliable data for optimal land use planning decisions is apparent in estimating land space requirement for housing production. To estimate this necessitates the calculation of land and space requirements. To effectively do this requires the adoption of appropriate urban density estimation techniques within the overall spatial configuration of urban development. This is expected to be responsive to the demographic and household characteristics.

Attempts to do this without adequate recourse to spatial analysis and enablement have been met with much criticism and lack of confidence in the outcomes of government policies. For example, the Australian National Housing Supply Council (NHSC) has released three reports since its establishment in 2007. The housing needs assessments in these reports have contradictory trajectories.

The estimate of housing supply and demand as presented by NHSC is far from accurate. This is reflected in the criticism following the release of each of the 2008, 2010, and 2011 reports. This suggests that it is important to look beyond the broad aggregated data base for forecast and analysis and engage more with the disaggregated datasets. It will be sufficiently appropriate to set this within the building information platform.

Apart from the difficulties of establishing the actual housing gaps, there have been significant efforts at improving the development assessment procedures to reduce cost and delays in land delivery for housing production. One of the challenges has been the management of assessment records to allow effective assessment of the processes.

4.2.2 Facilitating housing production: the role of development assessment

Development assessment involves the processes, by the responsible authority, to determine development potential of a particular site for appropriate use and development. Contrary to some popularly held beliefs and perceptions about the efficiency of the present development
assessment and the implications for land delivery for housing, it could be inferred from the analysis of PPARS (VIC) that some of the popularly held views are not supported by hard evidence. For example, the Grattan report (2011) argues that delays in the processing of development assessment approval should be blamed on third party objections and went further to assert that:

... the greatest area of concern for developers is Melbourne’s wide ranging third party appeals .... In Victoria, 1 in 10 applications are appealed, compared to 1 in 83 in NSW and 1 in 1000 in Queensland.

While the Grattan report (2011) provides, broadly, an accurate exposition of the nature and complexity of planning as a tool to facilitate housing production; the assertion regarding the implication of third party appeals does not fully reflect the facts. It is thus not consistent with empirical analysis through the exploration of PPARS using a simple bivariate analysis of the contribution of Objections in explaining gross days to planning decisions (Duration) (Table 1).

<table>
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<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Noncent. Parameter</th>
<th>Observed Power(a)</th>
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<td>101</td>
<td>1168409.98</td>
<td>86.67</td>
<td>0.0</td>
<td>.166</td>
<td>8754.421</td>
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<tr>
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<td>21824392.8</td>
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<td>1168409.98</td>
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a Computed using alpha = .05
b R Squared = .166 (Adjusted R Squared = .164)

In explaining the importance of the effect of Objection, the R² gives the proportion of variability of the independent variable Objection on the dependent variable (Duration). As shown in Table 1, the R² value of 0.166 suggest that the gross days to planning decision (Duration) can only explain 16.6% of variability in Duration. This means that a substantial percentage of the factors responsible for Duration can only be explained by other variables. It is important to note that this type of analysis was made possible because of the integration of different data records obtained from the different local councils in Victoria, therefore
underscoring the importance of integration of data infrastructure among various levels of government.

In summary, it would be more appropriate to argue that the delays, as a consequence of the third party objections in securing development approval, could not be convincingly linked to third party objections. Other variables contained in the PPARS dataset, such as the number of dwelling, pre-meetings, and referrals are equally important in contributing to delays.

Further exploration of the data set also reveals that the contributory factors for development assessment delay have spatial or geographic dimensions (Figure 2). This indicates that the challenges have locational specificity.

![Figure 2: Spatial pattern of more than 10 objections per development proposal in Melbourne (red dots)](image_url)

Essentially, the full potential of this dataset is better appreciated if data are spatially enabled as illustrated in Figures 2 and 4. In this regard, the data allows better analyses and spatial
graphical representation of the observed pattern. This offers better means of communicating findings as well as making decisions and policies.

5.0 Discussion

5.1 The necessities to promote spatially enabling land use planning

Government policies that favour compact city development as an alternative to sprawl are not well articulated and have been variously opposed by the society. This is because the society does not bond well with the intention of government and the implication such policies will have on their life is not known.

As commented by one of the interviewees on the intent of activity centres as advocated for in the Melbourne @ 5 million:

…the complete disregard for all nearby residents is appalling. No consultation, no consideration and no asking those who live in the community what will work in the community.

The question is how will the affected nearby residents know if they are not told, and how will they be told unless data and information are made available for analysis and visualisation? The prevailing process has revealed that not everyone has access to the necessary authoritative and accurate spatially based information. The multi-layered privacy regimes, especially in Victoria, further compound access to the data. Other identified blockers are the issues of law, data sharing policy, pricing, and licensing.

The community should be able to access the spatial information it requires to evaluate the decisions made by government. This will promote a WoG approach and assist making informed decisions regarding land use management, housing, and urban development.

5.2 Enhancing the development of ‘building information’

Building information is becoming more important. It sets parameters for assessing the efficient use of buildings while consideration is also given to a more efficient utilisation of space. Information regarding building use, value, height, land value and improved value (building value) is important. In addition, location and energy usage are significant in assessing the economic performance of cities. Different agencies are responsible for the different aspects. They need to collaborate for effective performance. The following section discusses the challenges and data gaps as identified in the study area.
i). Residential Development Potential Index (RDPI)

This refers to the measurement of redevelopment sites and spaces that have the potential to accommodate additional housing especially in the Greyfield areas through redevelopment and recapitalisation (Newton, 2011). The requirement to calculate and determine the Residential Potential Index (RDPI) is closely correlated with the success of linking planning datasets with valuation datasets. These datasets essentially belong to separate agencies (custodians). There is sufficient evidence to assert that there is a disconnection between valuation data and planning in Australia to allow for this type of analysis.

As indicated in Figure 3, RDPI ranges between 0 and 1. A higher value represents higher potential. The highlighted area shows an established suburb that has RDPI of more than 0.7, indicating that it has potential to be re-developed. This is an undercapitalised area where the cost of building is far less than the cost of land based on the derived index. This is suggesting that land in this area could be optimally utilised if it is re-developed.

This type of analysis provides a platform to demonstrate the value of an aggregated datasets from different agencies dealing with land tenure, land value, land use and land development
ii). Urban intensification and change of use analysis

This is required to provide sufficient evidence in resolving differing views, supporting or opposing, regarding compact cities development. It is important to provide sufficient and robust assessment of urban density, urban fragmentation and urban sprawl. The types of data required for this analysis include a spatial land use dataset to include information on previous, present and proposed land uses with this information to be linked with demographic datasets.

iii). Analysis of Development Assessment Approval

This is important to analyse the development approval processes with a view to determining efficiency, effectiveness, time, and cost. It is also important to evaluate the implications of current practices for strategic planning and legislation. The data requirements are records of building and planning permits.

The Department of Planning and Community Development (DPCD), in Victoria, initiated a project to compile planning report centrally at state level, now refers to as Planning Permit Activity Reporting Systems (PPARS). The dataset derivable from this has the potential to be spatially enabled and exported to the 3D environment for graphic representation/visualisation and better decision making. Figure 4 provides a demonstration, at parcel level of analysis using the PPARS dataset.
It should be noted that the overall data requirements as discussed above are intended to underscore the importance of data infrastructure among land agencies and to demonstrate how this could help in making informed decisions regarding land release (strategic planning) and development assessment (statutory planning) to facilitate housing supply.

### 6.0 Summary and Conclusion

The study investigated the utility of spatially enabling urban planning for city growth and housing development. From the overview, through the existing literature in parallel with the perspective offered through the exploration of data; it was evident that the quality of decisions could be directly linked to the quality of data infrastructure on which such decision were originally based. It was also clear that there were conspicuous absences of essential datasets necessary to make appropriate decisions.

What is required in addition to the fundamental datasets is building information that will include information relating to land value, building or improved value, land use, building height, age of building, condition, and building footprint. It could be argued that some of these already exist. Some of the challenges include bringing this information together in a way that it will be useful for meaningful analysis. In addition, it is equally important that the datasets are *accurate, authoritative and assured*. In this regard, it is essential that in making appropriate decisions, government should rely on good data.
Within this scope, the emphasis on ‘area-based’ data capture as the basis for analysis should be reconsidered and replaced with a more rigorous analysis of land use change that is ‘parcel-based’. This will provide sufficient grounds for the adoption of appropriate policy for urban development.

It is recommended that managing land for housing production should follow the principles of good land governance that is spatially enabled. Within this structure, policy is informed by data and evidence (evidence informed policy), land administration processes are based on policy (policy-based evidence) while data infrastructure is driven by land administration processes (process-driven data).

Therefore in bringing evidence of any kind to bear on policy, the key questions to be asked are threefold: how relevant is the evidence to what we are seeking to understand or decide? What processes are in place to implement the policies? How reliable and how well-founded theoretically and empirically are the processes to drive the required data? These are difficult but necessary tests to support evidence-informed policy, policy-based evidence and process-driven data. Further studies are suggested to provide answers to some of these questions.

Acknowledgements

The authors would like to acknowledge the support provided by the Australian Research Council through a linkage project on National Infrastructure for Managing Land Information (NIMLI) and the collaboration of the industry partners: Land Victoria, Land and Property Management Authority, New South Wales, Landgate - Western Australia and PSMA. Also acknowledged are the constructive comments from members of CSDILA. However, the views presented are those of the authors and not of the project partners.
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