REDEVELOPING THE GREYFIELDS WITH ENVISION: USING PARTICIPATORY SUPPORT SYSTEMS TO REDUCE URBAN SPRAWL IN AUSTRALIA.

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Abstract

Given the recent publications from Australian State governments demanding greater community and stakeholder engagement in urban planning, as well as calls from international agencies for a reduction in the footprint, and increase in the sustainable planning, of cities, there is now the potential for the advances made in geo-tools to have considerable effect. Arising out of 'Greening the Greyfields', a federally funded, inter-state project examining the feasibility of redevelopment in the middle suburbs, ENVISION was produced as a GIS-based, Participatory Support System, for engaging with the diverse array of stakeholders involved in urban redevelopment. This system was designed to bring wide-ranging land, demographic and market data together to highlight the redevelopment options, and identify potential redevelopment precincts, across metropolitan centres, with the aim of initiating debate between those involved on how best to manage urban growth. The result of this project has seen ENVISION being used at a state and municipal level, where workshops based on its use have begun to highlight the barriers to redevelopment as well as the ways forward for more sustainable redevelopment in the urban Greyfields (middle suburbs with high levels of un-planned redevelopment, high incidences of culturally and technologically obsolete dwellings, on land that is highly undercapitalised). Based on the communicative and deliberative models of community engagement, ENVISION has shown that geo-tools can have considerable affect in the mutual education of stakeholders, in extracting the pertinent issues and potential barriers to redevelopment, and in encouraging groups of experts to produce novel solutions to 'wicked' problems that they could not, without the collaboration that the tool demands, resolve on their own. Ultimately this project highlights the ability of GIS to not only provide an interface to real-time data manipulation, but its power to be used as a tool for communicative education between the diverse perspectives within a politically, technologically, financially and culturally sensitive area.

Keywords:GIS, participatory Support System, urban redevelopment, education, engagement.

1. INTRODUCTION

The planned adoption of significant levels of stakeholder engagement across state planning strategies in Australia (COAG Reform Council 2012; Department of Planning and Community Development 2012; NSW Government 2012)has highlighted the importance of multi-level interaction to the process of urban planning. Implicit in this engagement is the necessity of collaborative, communicative and deliberative processes where negotiation and interaction between diverse stakeholders drives the envisioning of mutually beneficial futures. This turn towards 'bottom-up', or rather the meeting of bottom-up and top-down planning (Russell 2011), has arisen from a number of areas. The change in governance from centralised structures to localised networks (Gallent and Robinson 2012; Geddes 2006), a growth in community participation methodologies (Creighton 2005; Hartz-Karp 2005; Ramasubramanian 2010; Sanoff 2000; Walters 2007; Wates 2000), critical views on the traditional 'top-down' approaches of planning (Brody et al. 2003; Innes and Booher 2011; Lange 2011; Murayama 2008), and significant success in projects that utilise long-term engagement strategies (Kelly 2010) have largely been the drivers behind this change. These factors, combined with the new multi-disciplinary approaches to solving 'wicked problems' (Roberts 2000), have produced a planning environment where the skills of all stakeholders, as well as the knowledge of multiple perspectives (both expert and local), is required to imaginatively and collectively resolve the complex and divisive issues that arise out of attempting to develop effective urban planning schemes.

In support of this shift, the work of (Newton et al. 2011) has illustrated that in order to effectively capitalise on the redevelopment potential of urban areas, there is a need for consultation across the range of stakeholder groups linked to this process. In particular, they highlighted the need for a platform capable of engaging with building developers, government institutions, community members and the range of experts involved in turning the visions of redevelopment schemes into reality. ENVISION was created to achieve this, where, by obtaining data from a wide variety of sources, the redevelopment potential of urban precincts could be queried and, in redevelopment workshops, the diverse parties could potentially reach agreement on the futures of locales. The tool was also designed as a way to extract the tacit knowledge of experts where, as individuals used the tool, they would reveal the limitations and ways forward for specific redevelopment projects. As such it was designed explicitly for engagement, as both a way to encourage interaction *and* as a mechanism for identifying the various positions and perspectives within the redevelopment arena, with the aim of transferring this knowledge amongst stakeholders and developing institutional mechanisms for more advanced and sustainable urban redevelopment.

In the context of this paper, the importance of this form of engagement comes from calls for more compact cities (OECD 2012), on the basis that current urban expansion is unsustainable and, by using more sophisticated design and technology, there is currently the potential for far more efficient urban design and redevelopment. Newton (2010) identified the potential of the Greyfield (middle suburb areas with dwellings that are culturally and technologically obsolete) to fulfil this role. A report by Newton, Murray et al. (2010) for the Australian Housing and Urban Research Institute (AHURI) revealed that the current nationwide focus on activity centres (areas of high cultural and economic activity) and transport corridors (areas of high transport and economic activity) as the designated strategic areas to drive urban redevelopment were actually having little effect, with the majority of redevelopment occurring sporadically in Greyfields. However, rather than the full capability of Greyfield redevelopment being realised, it was producing low density typologies in an unplanned and non-strategic fashion. The report further argued that with greater integration of stakeholders (business leaders, government, community members and so forth), the factors

7

preventing more advanced design (zoning, land amalgamation, community concerns) could be overcome.

This research led to Greening the Greyfields, a four-year, federally funded project aimed at implementing the four phases of urban redevelopment: proving the economic viability of agglomeration; identifying precincts and extracting tacit knowledge; visualising redevelopment and developing sustainability metrics; and community engagement. The work that led to the creation of ENVISION came from the second module – precinct identification and extraction of tacit knowledge.

What this paper will illustrate is the power of geography and GIS, in the form of a decision and participatory support system (ENVISION), to inform and educate a diverse array of stakeholders. Briefly examining the current state of engagement in planning it will use ENVISION as an example of how community engagement techniques can be built into software interfaces (as well as being included in part of their design) to provide a common platform on which the often divergent voices can manipulate data and ultimately produce models that inform other stakeholders, allowing the many voices to come to consensus around central issues.

2. THE SIGNIFICANCE OF ENGAGEMENT WITHIN DIFFERENT DISCOURSES

The above mentioned strategic planning documents, as well as the growth of policies referring to engagement (Fritze et al. 2009; Herriman 2011; Jarvis et al. 2012; King and Cruickshank 2012; Lawson and Kearns 2010; Le Dantec 2012; Reddel and Woolcock 2004), illustrate the move towards a more decentralised form of decision making, or the move from government to governance. What this process refers to is the gradual movement from centralised authority, or departmental creation of policy, to the localised and issue-specific formation of policies designed to more efficiently resolve the issues of local communities at a local level. Argued variously as an increase in democratic process (Aulich 2009; Gallent and Robinson 2012; Sirianni 2008; Smyth et al. 2005; Sorensen and Torfing 2007) and as encroaching neo-liberalism where responsibilities and costs are placed onto the community (Mowbray 2005), the result of this process is an increase in engagement, support for networks of governance involving multiple stakeholders and arguably more control of local affairs by local agencies. This is essentially the institutionalised aspect of engagement where policies, combined with the changing structure of government, have produced a norm of decentralised collaboration as a way to resolve politically sensitive issues and drive effective subsidiarity (Carson 2011).

Planning has followed this trend towards higher levels of engagement, though from a more critical and pragmatic orientation. Beginning in the mid-1960s, and spearheaded by the social justice movements and discussions regarding authoritative power and its lack of advocacy, notions of participatory planning and deliberation as being a key aspect of effective urban regeneration began to take root. Effectively these positions argued against absolutist, expert driven, knowledge and highlighted, along with other discourses (Ife and Tesoriero 2006; Kenny 2006; Kenny and Clarke 2010; King and Cruickshank 2012), that local knowledge may be just as significant (Levy 2009). These tenets were formalised in Davidoff's (1965) deliberative planning guide and Arnstein's (1969) much referenced ladder of participation which respectively argued for a social and cultural turn in planning and provided a metric for illustrating the various levels of engagement, with the lowest rung of the ladder being the pacification of the population and the highest being complete citizen control of the planning process. These concepts have grown to become industry standards in their own right, producing standardised tables exploring levels of engagement (IAP2 2007)

8

and a significant body of work on the benefits of communicative deliberation, or the power of plural negotiations and mutual education to resolve problematic planning issues (Healey 1992).

This lean towards communication and education has not just come from theoretical positions, with proof of the strength of stakeholder engagement practices also coming from the field. Successes have been noted in Seattle (Sirianni 2008), Salt Lake City (de Souza Briggs 2008), Boston, Chicago (Ramasubramanian 2010) and Portland (Irazabal 2005) amongst others, with the result that the Grattan Institute (a peak body for social and economic research in Australia) noted that successful projects in politically, socially or culturally problematic redevelopments, internationally, can be directly attributed to early and prolonged engagement (Kelly 2010: 4). The benefits of engagement are not only achieving consensus, and therefore alleviating potential conflict from community groups, reducing political infighting and working around 'wicked' problems, but also using interest groups and small-scale democratic process to imaginatively resolve complex and intractable problems.

This is where the problem solving aspects of engagement emerge, from the 'swarm'-like activity as described by Roggema (Roggema and van der Dobbelsteen 2008) and the way in which democracy can be used as a problem solving mechanism – utilising the discursive aspect of interdisciplinary and multi-perspective negotiations to imaginatively resolve disputes and drive progressive and mutually beneficial planning schemes (de Souza Briggs 2008). Hartz-Karp's involvement in the city of Perth's strategic planning exercises provides a good local example of this where she, in consultation with the Western Australian planning minister, began a large-scale consultation process involving over a thousand participants selected from politics, industry and the general community to resolve the city's planning priorities and strategic directions over the next thirty years which produced *Perth: The Network City* (Hartz-Karp 2005; Hartz-Karp and Briand 2009).

One of the primary mechanisms in this process was to bring large amounts of data (both historical and future projections) together in an easy to analyse fashion, allowing users to see the effects of various scenarios and the potential futures available to them. As with other engagements, GIS was utilised to satisfy this function.

3. GIS AND GEO-TOOLS AS ENGAGEMENT AND COMMUNICATIVE TOOL

The success of GIS as a tool for stakeholder engagement can be seen in its inclusion in planning engagement praxis handbooks, land use suitability and developments in software design (Foth et al. 2009; Gordon et al. 2011; Hanzl 2007; McCall and Dunn 2012; Nedovic-Bubic 2000; Ramasubramanian 2010; Sui 2008; Walters 2007; Wates 2000). Malczewski's (2004) review of GIS being used for land suitability, through dated, provides a sound overview of not only the possible technologies and algorithms to be used, but also their ability and power to engage with stakeholders. Covering tools that range from the simple to the advanced, he illustrated that it is not necessarily the sophistication of the tool, but its ability to be easily used by stakeholders that is of most importance. This position was earlier put forward by Klosterman (1999) whose philosophy of simplicity, elegance and intuitive design led to the creation of the "What if?" system. This land use suitability tool incorporated small sets of context relevant (stakeholder and locale) parameters and, through user community engagement, allowed those ultimately affected by changes in land use to observe the various scenarios available to them.

This influential approach began the proliferation of GIS systems being used across the breadth of land development, resulting in these systems being taken up en masse as stakeholder engagement tools and practices throughout America and Europe (Ramasubramanian 2010). However, the take-up of significant levels of stakeholder

9

engagement, and GIS as a way to achieve it, in Australia has been low (Eversole 2012; Kelly 2010; King and Cruickshank 2012; Mowbray 2005; Ramasubramanian 2010), notwithstanding some partial successes (Ghani 2011; Pettit et al. 2004) and a reasonably good supply of map based government services.

As a way forward in this area, AURIN (Australian Urban Research Infrastructure Network), a federally funded project to provide a data and e-tool hub for researchers, has proposed a set of urban research tools. One of the tools they are currently building is a nationwide version of Klosterman's "What if?" tool (Nino-Ruiz et al. 2011) where users will be able to employ community engagement philosophies for land use suitability analysis while simultaneously having access to the best available data. This group are also in the process of designing walkability, health and utility analysis tools, as well as implementing, on a national scale, the ENVISION tool for redevelopment precinct identification.

4. ENVISION

The mandate of ENVISION was to provide a platform to unite, analyse and view a wide range of data relevant to urban redevelopment which would ultimately be used as a stakeholder engagement tool to extract the tacit information held by industry experts, government and community interest groups. Though ultimately failing in its plan to generate a federated and self-updating data backbone (due to non-contiguous government data, limited services for automatically updating land data, lack of consistent protocols for compiling government data, and legal issues concerning data ownership and privacy), the system did manage to incorporate geographical data, valuations data, demographic data, information from hard and soft infrastructure, distance data and other information pertinent to the various stakeholder arenas into a usable an intuitive interface/database.

Two test cases were proposed, the City of Manningham in Melbourne, Victoria and the City of Canning in Perth, Western Australia, both of which provided access to their land data and were instrumental in the development of the system. Further data was provided by the Departments of Planning in both states. Funding came largely from the CRCSI (Cooperative Research Centre for Spatial Information), as well as annual funding inputs from state and local governments.

The package currently consists of four tools, two of which relate to stakeholder engagement and two which relate to housing capacity and density calculations. Only the first two will be included in this paper.

4.1. The Planning/MCE Tool
The first tool is the planning/MCE (multi-criteria evaluation) tool. It was designed to encourage stakeholder interaction and discussion on land use; in particular, to determine what areas to redevelop and what areas to leave out of redevelopment plans. In workshops, users selected which variables they deemed to be significant for redevelopment (such as proximity to services, transport, ages of dwellings, market effects or demographics) and then to weight these variables (1 being mildly significant and 20 being very significant). Weights were proportioned to each variable and scores were then calculated on a cadastral basis. This produced a map of municipal properties achieving high and low scores based on the query; illustrating, based on the variables and weights chosen, the areas of redevelopment focus.

The image below comes from an engagement meeting with the City of Manningham where individuals from statutory planning, strategic planning, valuations, transport and sustainability departments were present. At one point the discussion turned to aged care and where to house the elderly. The interface shows that areas with high aged demographics were selected along with proximity to shops, public transport and parks, all of which, through

10

discussions regarding mobility, aesthetics and probability of successful engagement with the elderly, were weighted. The resultant map indicates the areas that were calculated to best adhere to the entered specifications (with paler areas being a positive outcome and darker being a negative).
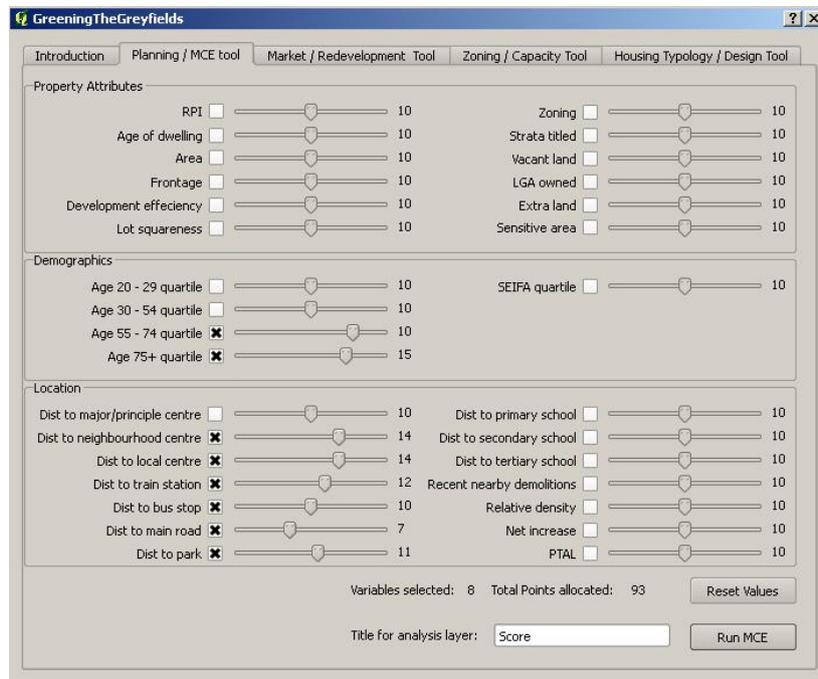

Figure 1. MCE tool with focus on aged demographics and proximity to services
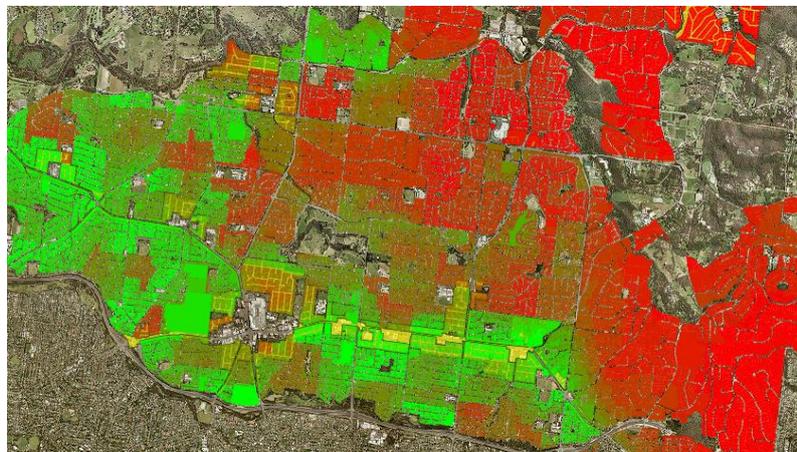

Figure 2. MCE map of redevelopment focus

Other queries involved analysing the best areas for large-scale redevelopment, proximity to schools (for little or no redevelopment) and student housing.

The effect of this tool was to allow individuals from a variety of areas within the local government to begin interdepartmental negotiations and come to consensus, with regard to proposed land use, over a series of workshops with the software. Ultimately this tool will aid in the zoning of areas where, by illustrating the effect of multiple criteria, it can highlight those that adhere to all, or most of the criteria placed upon them. Also, by showing the effect

of multiple criteria, individuals can see, live, the effect of their negotiations which, due to its ability to geographically represent arguments, aids in discussions and compromise.

4.2. The market redevelopment tool

The second tool is less strategic and focuses more on individual cadastral redevelopment potential, rather than an potential rezoning schemes. The aim was to actually identify the dwellings that are likely to be demolished and/or be of interest to building developers. A series of variables were presented to users, each with a specific cut-off. The tool isolated the cadastres that satisfy the criteria supplied by users, with the aim of drilling down into the data and selectiv ely removing more and more properties until redevelopment precincts are identified. In the example below (also from City of Manningham workshops) the factors that were selected were a high RPI (Redevelopment Potential Index – an index of capital improved value to land value, which effectively shows the amount of value that is in the land; a value of 1 indicates that the dwelling has no value and if sold has a high probability of being demolished and redeveloped), age of dwelling over 45 (the municipal mean age of demolition) and area where there has been a significant amount of demolitions and net increase in dwellings (or areas that are currently being redeveloped).
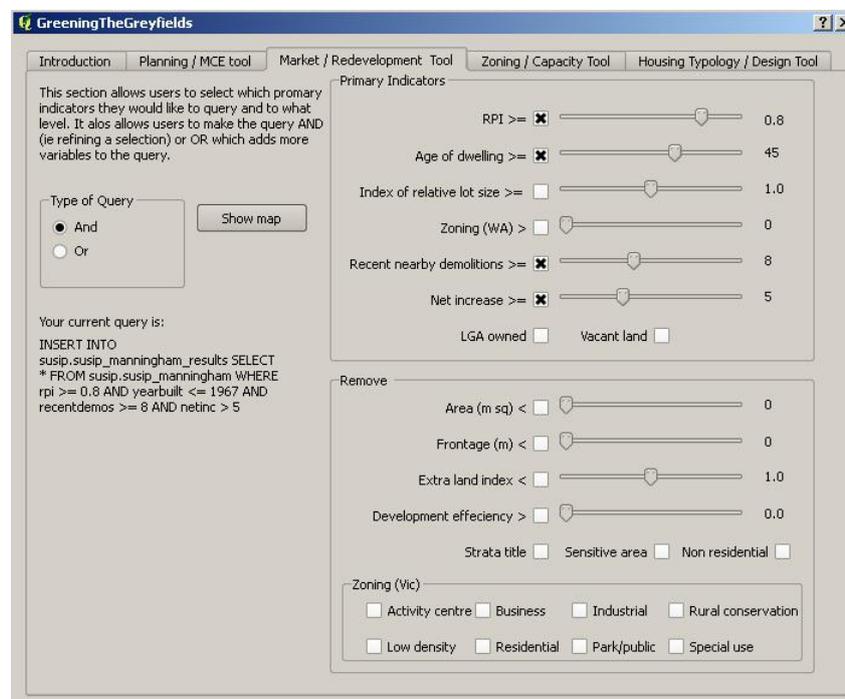

Figure 3. Redevelopment tool with high Redevelopment Potential Index, age over 45 and in areas of moderate redevelopment activity selected

The resultant map from these queries shows pockets of high redevelopment potential (the dark areas) in the north-west, south-west, central and south-eastern corner of the municipality, most of which lie in highly redevelopable areas (as identified from the earlier query).
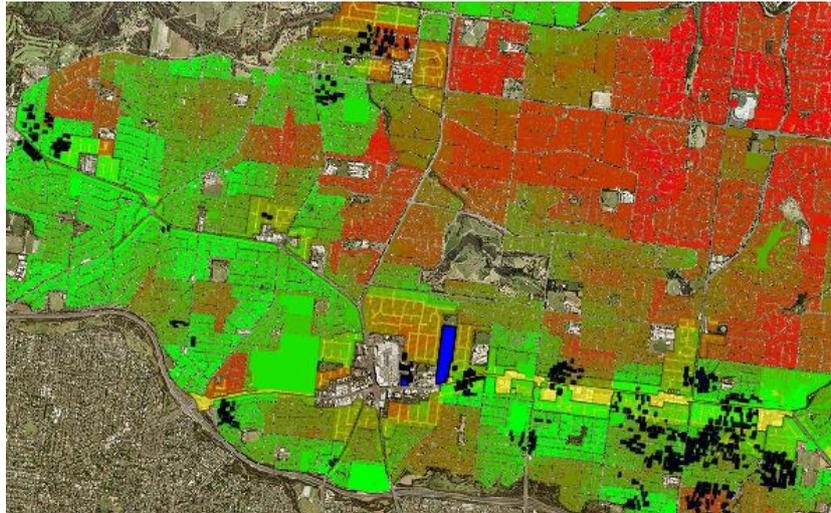
12

Figure 4. Map of highly redevelopable dwellings

When zoomed in, the map clearly identifies a potential redevelopment precinct that coinsides with the strategic redevelopment area, particularly the precinct in the most north-east area of the map. Note also that the map identifies cadastres that could potentially be consolidated, thus leading to the more large-scale development associated with aged care (or other precinct style) constructions.

Figure 5. Close-up of potential redevelopment precincts

The result from this single workshop was the identification of this precinct by the multi-disciplinary panel. This further led to debate over extending the current zoning practices to include these precincts and the potential for including them in future, higher density, redevelopment zones.

5. RESULTS OF PARTICIPANT ENGAGEMENT

5.1. Collaborative Software Design
The initial specifications for the tool were very loose, basically that it be a GIS platform for viewing and drilling down into large amounts of land data for identifying redevelopment precincts. The tool began as a front end to a geo-database. However, due to early stakeholder

engagement, it quickly became a number of specific tools, each with their own function. Interaction with the Western Australian test site (the City of Canning) revealed the need for a multi-criteria evaluation tool, with the variables for the system coming directly from the strategic developers in the municipality. Collaboration between the Western Australian (Curtin) and Victorian (Swinburne) universities involved in the project led to a negotiated set of data common to both states and based on a composite of available data sets. A similar process led to the market based tool, with collaboration, stakeholder engagement and availability of data sets resulting in a tool that could be used in both states. The rezoning tool (not used in this paper) was developed purely for a housing capacity analysis for the City of Canning, while the amalgamation tool (also not used in this paper) grew out of the need to populate precincts and was based on collaboration with the architecture department at Monash University. Further engagement led to stakeholders asking for additions to the package, such as photo imagery, Google maps, slope of land, rental properties and reporting functions, all of which have been, or are scheduled to be, implemented. As such, the development of the set of tools was largely informed by collaboration between both states the project was running in and, more importantly, directly engaging with stakeholders as to their requirements.

Currently the software is about to be adapted and brought into the AURIN portal. As a by-product of presenting this software to AURIN, similar projects at the University of Melbourne have shown interest in combining their models with ENVISION to produce a suite of generic products that can be utilised across the urban development spectrum. As this process is already aiding in the development of mutually beneficial protocols and advances to both sets of modelling tools, it is anticipated that these discussions will lead to further developments in the software.

This form of cyclical development based on fast feedback loops concurs with AGILE development methodologies (Beck et al. 2001), however, when used in tandem with broad spectrum and wide-ranging stakeholder engagement it produces software that is collaboratively designed not just by one stakeholder, but by the range of stakeholders involved in the planning environment.

5.2. Communicative Engagement

Newton, Newman et al. (2012) have identified ten key stakeholder engagement arenas in the urban regeneration area. The three that have thus far been engaged are internal state government, internal local government and the relationships between state and local government (the discussions between property developers and community members are forthcoming).

5.2.1. State government engagement

The discussions and workshops with state government involved directors and planners from strategic planning, statutory planning, policy development, activity centre development, transport planning, urban regeneration and urban growth development. Initial discussion highlighted the need for ENVISION to produce reports and capture data on the effects of redevelopment, however, these discussions also grew into exploring the power of the tool to be used across many municipalities. Later workshops with different sets of government stakeholders produced similar results, with the general consensus being reached that tools such as ENVISION could not only be used for policy change (by illustrating the effect of business-as-usual practices versus more advanced designs) but more broadly as a form of meta-governance to provide the tools needed by local governments to achieve state strategies. In short, the political effect of the workshops was to highlight, amongst various sectors of

state governance, the need for tools and policy-led solutions towards achieving the goals set out in the Greening the Greyfields project.
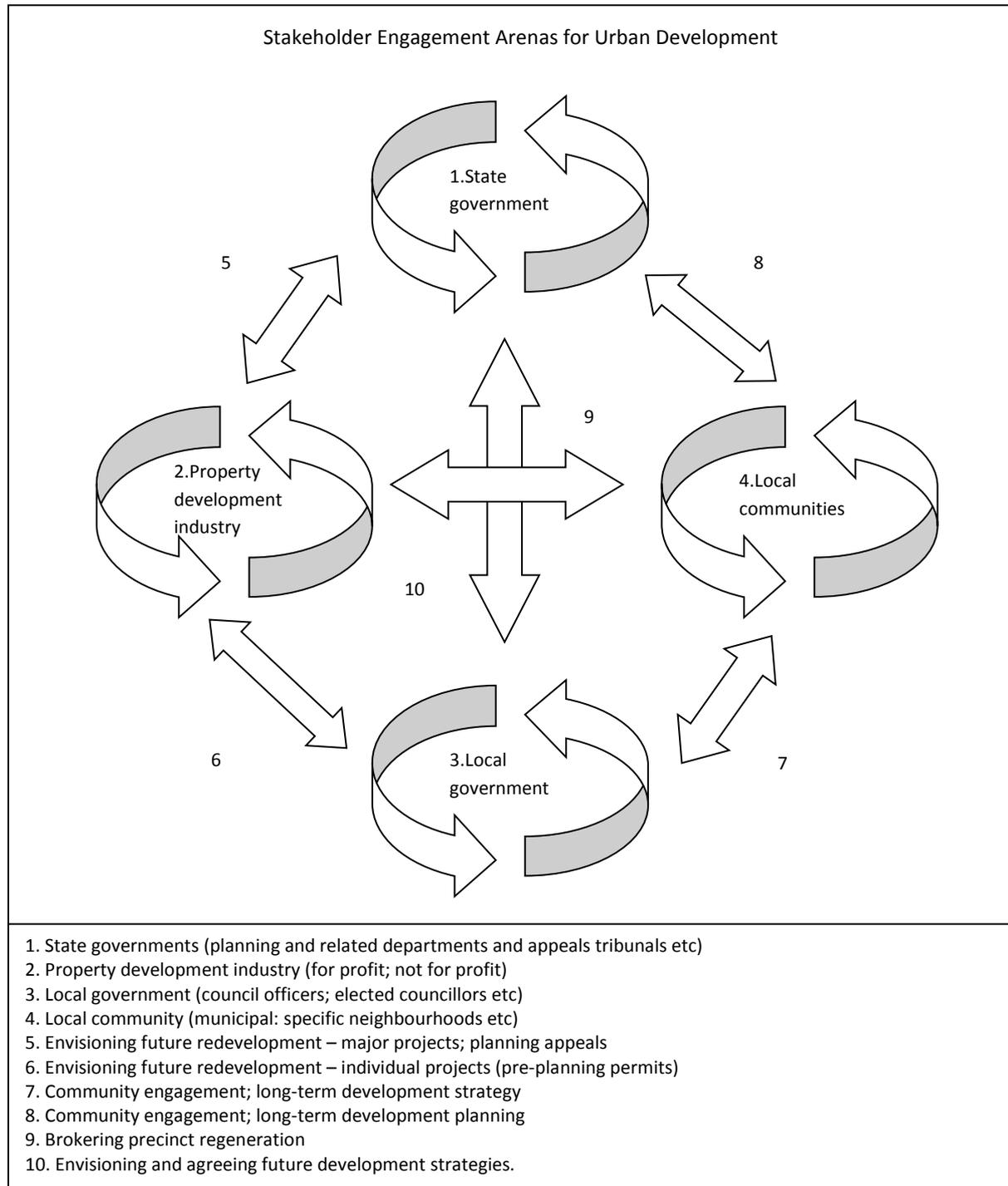
Stakeholder Engagement Arenas for Urban Development

1. State government
2. Property development industry
3. Local government
4. Local communities

1. State governments (planning and related departments and appeals tribunals etc)
2. Property development industry (for profit; not for profit)
3. Local government (council officers; elected councillors etc)
4. Local community (municipal: specific neighbourhoods etc)
5. Envisioning future redevelopment – major projects; planning appeals
6. Envisioning future redevelopment – individual projects (pre-planning permits)
7. Community engagement; long-term development strategy
8. Community engagement; long-term development planning
9. Brokering precinct regeneration
10. Envisioning and agreeing future development strategies.

Figure 6. Stakeholder engagement arenas

Some of the policy changes that were suggested included a move away from concentration on individual lots to looking at how best to consolidate lots. A lot amalgamation bonus or tax was suggested, as were policies based on land use education for key stakeholders. It was also suggested that municipalities be responsible for reporting on their strategic targets, saying how they were going to implement the targets set by state. The

15

effect would be to encourage the use of more strategic tools which would ultimately better educate both the planners and the community members as to the potential of different redevelopment options.

A second response was how the workshop attendees supported the tool and actively looked for ways that it could be used. This debate stimulated ideas amongst, getting them to think of novel ways to resolve key planning issues. Most saw the tool as a way to represent large amounts of data from a wide range of data sets in a simple and usable form, indicating that with tools such as ENVISION, different groups within (and without) government could see, real time, the data pertinent to their own position as well as the pertinent data of other groups, making cross-disciplinary communication easier. It was also noted by many attendees that the tool's ability to look at precinct and municipalities (as opposed to just single cadastres or projects) made strategic planning with the tool a distinct possibility. One pertinent suggestion was that the tool be used to tackle the Norlane project, a social housing redevelopment project which has been on the cards as a state redevelopment project for at least ten years. It was put forward that ENVISION could be used as a way to present the complete range of options to Office of Housing managers (who own 50% of the stock in these suburbs), developers and community members. Another was a way to implement the current state changes in zoning, with the tool being capable of showing where potential redevelopment should be placed.

The final result at the state level, though largely unmeasurable, was the positive effect that the workshops had on the mentalities of those attending them. Though many attendees were initially quite cynical about "yet another urban redevelopment tool", as discussion started to take place, cross-disciplinary ideas came forward and novel ideas started to flow, the inertia of large organisational and silo based thinking began to dissolve. People started to become quite passionate about their ability to make positive change and, being free to image potential futures (outside of current limitations), began to come up with novel ideas and solutions to some of the key issues with planning. In effect, the free-thinking and discursive aspect of the workshops allowed individuals, using the tool as a focus, to become quite creative in how to solve problems that were previously intractable.

In sum, the state workshops illustrated that:

1. There exists within state government the ability to creatively resolve complex planning issues, but this is hampered by institutional inertia, political difficulty and the lack of space for creative freedom coming from cross-disciplinary discussion within and across key departments/offices.
2. Multi-stakeholder collaboration allows for diverse positions to pool their collective resources and imaginatively resolve complex and wicked planning issues.
3. Policy shift is the key mechanism for changing the future, but these policies rest on the ability of the respective departments to envision a positive future and to engage with how best to achieve these ends (not simply focusing on the restrictions and practicalities of current systems)
4. There is currently little discussion between state and local government which needs to occur for effective governance in the area of strategic planning to take effect.
5. Meta-governance and meta-governance tools are required by municipalities. These should come in the form of policy change, but also in the form of strategic tools such as ENVISION, which allow locales the power to decide their future, but with the data consolidation and communicative tools that ENVISION is emblematic of.

5.2.2. *Local government engagement*

Engagement workshops with local government produced the same levels of interdisciplinary discussion, allowing those involved in government functions, including transport,

16

sustainability, strategic and statutory planning, valuations, water, electricity and other services, to come together and discuss possibilities for the future. As with the state workshops these events brought an element of passionate creativity to the group as they could see, real time, the effects of their choices. Once the basic framework was demonstrated, groups started to identify potential redevelopment precincts, as well as attempting to use the tool to focus on where developments should *not* occur, where market pressures were strongest and potential changes to their current zones.

There were a number of positive outcomes and lessons learnt from these workshops. The first was the power of community members to influence strategic decisions, with numerous stories emerging illustrating how zoning changes and large, or even small, development projects had been hampered by concerned locals. This was all said with no mention of actual or historical community engagement, which further illustrated the lack of community consultation, aside from presentation of pre-prepared plans to community members. The reciprocal of this (not being informed, involved in or adequately assisted by state government) was also a pertinent issue which highlighted the necessity of consultation between state and local governments, and which ENVISION workshop leaders and project members are now ideally placed to do.

The issue of policy change, particularly for land accumulation, aged housing, housing affordability and houses for young families, was raised a number of times. Local community members saw these strategies as not necessarily coming from the state, but could be implemented locally through community education and locally trying to lead new projects aimed at medium level redevelopment. It was felt that with a combination of localised policies, education and a significant amount of lead time, the local government could achieve a moderate and acceptable level of redevelopment that would be accepted by community members.

Parking, transport and accessibility were also continually raised, with the traffic engineers and those in the front line of development application processing noting that without adequate provision for transport, congestion and garage space, plans would not go ahead. Planners also argued that storage space (particularly for those moving to medium density developments) was, after parking, the most important issue for locals. This discussion led to the issue of the development typologies that were not only acceptable, but also appropriate for the locale, which also included presentation of the typology work coming from Monash University.

Finally, It became apparent that the current design and development overlays (the areas zoned for medium density development) were already exhausted, having been mostly redeveloped, but to no significant level. This raised the issue of how to move forward, in terms of redeveloping the locale while not raising the ire of locals. While rezoning was being workshopped it was also noted that the tool could also be used to allay the fears of locals who were worried about mass development by illustrating the *lack* of market pressures in contended areas, and therefore the low probability of large-scale redevelopment in their 'back yards'.

The result of local government engagement workshops was that they:

1. Identified the need for engagement with both community members and state government;
2. Highlighted the need for policy change, with community education done locally and meta-governance from the state to provide the mechanisms for doing so;
3. Showed the need for tools to aid in the amassing of data to assist them with the development of future zones;

4. Illustrated the plural approach that is required when attempting to resolve complex issues;
5. Identified possibly redevelopment precincts, or at least now understand that they have the potential to do so in the future.

In sum, ENVISION provided the focal point for numerous individuals from a variety of sectors to engage in a common issue and to observe the result of their comments real time. It showed the potential of redevelopment, both within current constraints and when they are loosened. Though only having engaged in three of the ten stakeholder arenas thus far, the tool has already highlighted the power of GIS systems to not only educate but to act as a tool for negotiation between diverse positions.

6. THE NEXT STEPS

The next step for ENVISION will be its inclusion in the AURIN data hub and set of urban research e-tools where it will be made accessible to the wider urban development community, using the two existing data sets (the municipalities of Canning and Manningham) as test cases. Given the development time for this exercise (one year) and the existence of walkability, health, sustainability and other urban metrics already within the AURIN portal, it is assumed that these will inform the next iteration of the software, where it will begin to incorporate a diverse array of hard and soft infrastructure feedback loops which will further enrich the ability of the tool to connect with different voices in the urban redevelopment arena.

The funding round for the next phase of the Greening the Greyfields project has also begun where we will be taking the tool and adding 3D precinct visualisation, additional feedback mechanisms and redevelopment typologies to it, making it into a complete stakeholder, modelling and analysis tool for urban regeneration and community engagement.

7. CONCLUSION

In the face of continued urban expansion, the increase in individuals living in urban environments and, in the Australian context, the unsustainable way in which this is being strategically managed, there is a growing call for technological and planning reform, based on multi-level stakeholder engagement and data integration, which Greening the Greyfields and ENVISION are primarily concerned with. Though only part way through the project/software development process, there has already been tremendous success in terms of acquiring insider knowledge, obtaining government endorsement and negotiating further investment. This success has come from the project's focus on collaborative and communicative engagement, through obtaining the wide-ranging data and providing the interface for individuals to manipulate it according to their opinions on future planning schemes. Effectively the tool, and the way that it allows experts to educate each other and potentially engage with the local community, has shown the powers of geography and geographical information tools. In providing a focus for discussion, as well as displaying results of discourse specific queries instantaneously, it has proved to be an extremely effective mechanism for broad-spectrum multi-stakeholder engagement.

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