Designs On Our Future

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How to Implement ESD in the Planning Process

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ABSTRACT
Local Governments have long been trying to enhance the environmental performance of the built environment through the inclusion of Ecological Sustainable Design (ESD) provisions in planning schemes. A lack of resources and consistent processes has often hindered the effective implementation, thus creating frustration among town planners, architects, developers and other stakeholders.

Drawing on the Victorian context, this paper reviews the current obstacles Local Governments face and discusses where within the planning-building continuum, planning can make tangible impact on enhancing sustainable development.

Through analysing successful mechanism that assess ESD during later design stages, the framework for a new body, the Green Planning Council, is sketched out that could assist planners, developers and other building professional to implement sustainable concepts early on.

Keywords: environment, sustainability, ESD, planning, regulation, assessment

Introduction
This paper discusses how the planning framework could be used to enhance the sustainability of the built environment. While drawing on specific issues identified within the Victorian planning framework, it is anticipated that main points and conclusion are valid throughout Australia.

In 2007, SBE in association with Hansen Partnership, and funded by the Department of Sustainability and Environment, the Sustainability fund, the Victorian Local Sustainability Accord Committee, Moreland City Council, City of Port Phillip, City of Darebin, published a study, Sustainability in the Planning Process which investigated the current status of Ecological Sustainable Design (ESD) in planning, identified obstacles for greater integration of sustainability and outlined how the planning process can be used to enhance the quality of the built environment.

One of the recommendations was to create a new body, external to local government, which administers the implementation of ESD measures at the early planning stages. This paper further analyses this idea.

Local Government have long been trying to use the planning framework to push for a more sustainable built environment. Even though these councils are often struggling for funding and resources, the better outcomes of these efforts were successful initiatives such as Moreland’s Sustainable Tools for Environmental Performance Strategy (STEPS) for
residential developments and the **Sustainability Design Scorecard (SDS)**, a tool for non-residential development. Furthermore, Local Government founded successful associations like the **Council Alliance for a Sustainable Built Environment (CASBE)** and started joint initiatives between councils and Universities like the **Accelerating Sustainable Buildings in Local Government** program. The less successful measures eventually involved the **Victorian Civil and Administrative Tribunal (VCAT)** decisions. VCAT is the Victorian authority, where planning applicants can raise objection to planning permit conditions when they believe these are not justified.

Many of the cases that went in front of VCAT revolved around the issue whether planning permit requirements are interfering with building requirements, i.e. mandating things that are covered by building regulations. One reason for this issue of how to draw a border between building and planning is that the current planning schemes are fairly unclear about the appropriate level of ESD initiatives that should be incorporated during the early stages of design; even though they often include clauses which demand some form of sustainable development. In essence, there is no clear political decision about ESD during the planning process.

**The Planning-Building Continuum**

In Australia, we have detailed requirements for implementing energy efficiency initiatives during the building process: what are the minimum levels of insulation required, how much glazing is allowed and what type of windows are necessary; what efficiency for building services is required? All this is mandated through the Building Code of Australia (BCA) which, as per its introductory chapter, aims to ensure a minimum standard for buildings.

Looking at it in a slightly different context, what the BCA regulations address (to a minimum standard) is to ensure that the industry is providing occupant comfort in buildings in a way that does not excessively waste energy and that does not lead to prohibitive building costs. It addresses these questions at the latest possible design phase, where most of the decisions are already made. While it is essential that there is a last, bright stop sign that ensures that the built environment achieves minimum quality standards it is questionable whether this is sufficient.

Many of the decisions that are made during the early stages of the design will eventually impact on the passive comfort of a building and consequently on the health and well-being of its occupants as well as on the energy required for lighting, heating and cooling. The building’s orientation as well as internal zoning of functional spaces is one of the things that tend to develop early on during the design phase; both of which are important factors for the performance of the building later on. A good design with inefficient equipment might use as much energy as a bad design with efficient equipment. Also the form and height will not only impact on the internal comfort of the building itself but also limit or maximise the potential for surrounding buildings, existing or conceptualised.

This has been acknowledged by various councils with some of them having developed their own guidelines and tools; STEPS and SDS being the most prominent in Victoria. However these tools can be costly to develop as well as to maintain. Councils are required to update these tools regularly to reflect recent developments within the industry meaning that substantial ongoing research and subsequent in-house training is required. Without support it becomes more and more difficult for Councils to keep their developments up to date.

While planning decisions will always impact on comfort and energy, it potentially also impacts on other aspects of ESD: the availability of public transport, materials, stormwater
initiatives, irrigation requirements and landscaping, etc. Incorporating sustainability at the planning stage then means addressing all these items, including:

1. Provision of operational management plans for water, stormwater and waste,
2. Access to natural light and to external views as well as general Passive Solar Design,
3. Provision for natural ventilation,
4. Solar orientation and how the location and size of windows reflect the site opportunities,
5. Noise and visual impact of external services,
6. Design and the orientation for the implementation of renewable energy systems and how the new development impacts on existing renewable energy systems installed in the surroundings,
7. Landscaping for retention of native vegetation, Water Sensitive Urban Design features and future irrigation requirements,
8. Access for Universal Design and,
9. Integration of public transport as well as other alternative means of transport such as bicycles and small / hybrid cars.

Items that should be left to building stages include:

1. Building management controls and building user guides,
2. Building systems and services design, including details of natural ventilation strategies,
3. Detailed internal and external material and fitting specifications,
4. Insulation values, glazing types, light fittings and equipment selection,
5. Compliance with DDA, and
6. Detailed hydraulic and management plans.

Whether planning addresses sustainability directly or not, whether there is a clear framework for this process or not, the decisions made at planning stage and by planners will affect many key performance targets of sustainable developments. At the moment, there is no working mechanism that acts as a comprehensive guideline to steer this process leading to frustration among developers as well as councils.

Planning for ESD

The goal of planning for ESD should be to ensure that items that are answered during early design stages incorporate sustainable principles and at least highlight these principles for decisions that are made during later stages. This means that planning should consider aspects of the design that cannot be changed at a later stage, such as orientation, access to light, availability of electricity and gas and how the building will communicate with the space it sits in. Planning should then lay the groundwork for good design later on, as discussed above, by introducing preliminary requests for e.g. management topics, such as the way construction, water and waste are handled.
However, it needs to be acknowledged that a building, at such an early stage, is a work in progress. Many of the challenges a design team faces during this time cannot be easily answered, which could be taken as an argument against a prescriptive approach, e.g. “needs to include a water tank or two”. Also it is important to note that a sustainable building is not something that can be delivered through a recipe: noise, thermal comfort, visual comfort, energy efficiency and other salient aspects need to be balanced against each other, with the internal layout and with the purpose of the building. The demands of these design goals can sometimes be detrimental thus requiring flexibility. On top of this, a prescriptive approach will also require extensive and ongoing research as well as updates in order to stay relevant.

On the other hand avoiding such an approach cannot mean that there should not be measurable performance outcomes. Targets are required to enable developers and designers to work towards specific requirements rather than vague and philosophical clauses that can, and often are, interpreted in various ways, unforeseeable for the project team. One of the tools that offer a combination of a non-prescriptive approach but clear targets is Green Star.

**Why Green Star works…**

The *Green Building Council of Australia* (GBCA) was established in 2002 and developed the Green Star suite of tools that assess buildings during the later design stages and after construction.

Over the recent years, Green Star has established itself as the leading tool for ESD in building design and construction. The tools rate buildings according to a scale ranging from *Australian Best Practice* (the minimum requirement for an official rating) to *World’s Leadership*. Where on the scale a certain building will end up, depends on how many points it scores in total under all of the following categories: management, indoor environment quality, energy, transport, water, materials, land use and ecology, emissions and waste and innovation.

Each of these categories includes a number of more detailed credits. The tools are non-prescriptive in the sense that they allow project teams to decide which credits they want to target. There are only two mandatory credits (regarding energy and ecology), thus the tools remain relatively flexible.

All of the tools are voluntary and free to download. Providing the tool for free makes sure that it can be used as an unofficial guideline on any project. This can assist in the distribution of the tools and thus makes it fairly easy for professionals to familiarise themselves with Green Star.

In official ratings, which are targeting the top end of the market, all buildings still need to comply with BCA provisions, but in many aspects (e.g. energy) the Green Star requirements are simply more stringent, requiring significant amount of work and effort. Looking at it in this way, the story of Green Star could be seen as an example where the industry led and the regulations followed, i.e. implementing ESD in the built environment before stringent official legislations are made, thus short-cutting a potentially long political process.

Another very important aspect of Green Star is that the tool is peer reviewed by the entire industry. Project teams can request a review, addendum or clarification when they identify flaws within tools or alternative ways to comply with the intention of a credit. Due to this mechanism, the tools undergo continuous improvement.
In summary, the key Green Star items that could prove relevant for planning are:

1. Green Star makes a successful case for the implementation of ESD via a flexible, voluntary tool that targets the top end of the market
2. By introducing high end solutions to the market Building Code adoption may potentially be fast-tracked.
3. By making the tool freely available, the rest of the market can use it as a guideline for less ambitious projects that do not seek formal accreditation
4. The tool has a mechanism that allow for continues improvement through stakeholder feedback

... and doesn't work for planning

On the flip side, the tools benchmarks and credits in Green Star do not lend themselves well to planning, as they assess well developed design aspects that are related to the building phases.

For example, Green Star requires detailed modelling of the anticipated energy performance based on advanced design drawings and specifications in order to benchmark the design against Green Star energy requirements. None of this detailed information is typically available, at the early stages of the design. However, as discussed above, planning decisions do have an impact on the eventual energy consumption. So rather than make a detailed assessment, it is possible to assess whether at planning, the design contributes to lower energy use and to what degree. This would involve assessing the location of this particular building within the precinct, the orientation and the building massing itself as well as the internal zoning.

The detailed compliance requirements at planning stage need to be fundamental different compared to later phases of the design, the framework for sustainability however does remain the same.

The Green Planning Council

To solve the scenario sketched out above, SBE proposes the establishment of an independent body, the Green Planning Council, which develops a best practice tool for planning that assists planners, developers and designers in identifying the most salient benchmarks for sustainable developments. In a similar manner to the Green Building Council which provided successful mechanisms for assessing designs during the later, building related, stages, a Green Planning Council would devote itself to the development of instruments that boost the uptake of ESD during the earlier planning stages.

Such a body, supported by Local Government and Industry, will be in a position that ensures that enough resources are available for an ongoing update and for the maintenance of the tool.

The new tool could draw on the previously mentioned Green Star categories to develop its own framework for incorporating and classifying the ESD aspects that should be dealt with at the planning stage. The framework can then act as a fairly fixed skeleton, ensuring a holistic approach with regards to ESD is incorporated, while the more detailed specifications under the framework can be subject to ongoing refinement.
In order to guarantee a flexible approach, a point system should be established that permits project teams to concentrate on the initiatives most relevant for their specific project type and site. In order to qualify for formal recognition through the Green Planning Council, each project would have to achieve a minimum number of points. Similar to Green Star, the tool could also introduce further advanced steps, which recognise excellence.

By introducing quantifiable rigour in its assessments, this tool should aim at national recognition in order to achieve leadership and provide a reliable platform and resource for the integration of ESD during the early stages of design. This recognition will also be crucial for the cross over between the Green Planning Council and statutory planning at Local Government: a certified assessment of the Green Planning Council should mean that all relevant, ESD related planning scheme requirements are ticked off, i.e. this future tool needs to “replace” the ESD component in planning schemes. A certified rating could then be linked to the more comprehensive “Green Door” approaches, or the fast tracking of planning applications for projects that make a comprehensive commitment to sustainability.

This not only will mean that developers, and project teams in general, can develop a clear understanding of what is required but will also allow Local Government to draw on a combined and exhaustive ESD resource instead of acquiring the resources to first develop and then maintain the required expertise.

Furthermore, such a tool will complete the suite of existing rating tools, allowing recognition for projects with ambitious sustainability goals through the planning, design, construction and occupation phases.

**Conclusion: From Here to There**

Over the last decade, Local Government and industry have undertaken numerous projects and research that aimed to answer how we can create a built environment that is inherently more sustainable than the current one. The case for ESD has been frequently made, and successful mechanisms exist that provide a framework for good design.

These mechanisms currently lack a connection to planning and the early design phases, where, as discussed above much of the later performance of a building is decided. With policies in place that demand the integration of sustainability at the planning stage on the one hand, and a lack of information, guidance and tangible benchmarks on the other, a situation has emerged that where significant time, money and effort is wasted due to avoidable disputes between planners, developers and other building professionals.

Effective outcomes in terms of sustainability are only guaranteed when ESD is considered early on in projects rather than only be implemented as a quick fix at the end. In Australia, we have the combined knowledge and resources that are required to successfully ensure all phases of building design contribute to achieve sustainable results.

By establishing a tool and or independent body, as proposed by SBE, we can achieve better outcomes in a non-painful way. The earlier we begin this process, the quicker we will arrive at a situation that re-establishes a well defined planning process and creates a built environment that achieves the required benchmarks for sustainable development.
Future-proofing our environments for an ageing population

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ABSTRACT

There is growing recognition that the ageing of Australia’s population will necessitate many urban policy and planning shifts. Creating age friendly environments is about future proofing our infrastructure. It is essential that it be done now to support the demographic changes presented by population ageing. A more sensitised and holistic planning approach will contribute to the mobility, participation, social inclusion and well being of people of all ages and abilities. Meeting the health needs of Australia’s ageing population requires an acknowledgement of the relationship between the physical environment and healthy ageing strategies. Age-friendly built environments provide us with great opportunities to address several health issues relevant to many older people. Accessible and welcoming environments encourage mobility, social interaction and inclusion.

Keywords: Ageing; Accessibility; Inclusion; Transport systems; Liveability; Urban Vision.

Introduction

Population ageing poses a number of challenges for urban planners. The number, location, health, disability (physical, sensory, cognitive) and age skew of the older population will impact on everything from seating design, the width of our footpaths, to the way we plan transport, roads, amenities, public spaces and housing. More and more people are ageing in place which means our local communities, cities, regions and towns need to accommodate the mobility of older people. Urban planners have an enormous opportunity to ‘future proof’ the built environment and contribute to prevention and early intervention so as to ensure the enablement and social inclusion of people of a range of abilities across the life course.

Future proofing describes a process that anticipates future developments, so that action can be taken proactively to minimize possible negative consequences, and to seize opportunities. It is also sometimes used to mean design of infrastructure that does not become outdated or outmoded in the near future. For instance, urban planning initiatives that fail to address population demographics, socio-cultural expectations or are based on developer lead innovation which may fail to provide access to common areas or public amenities in an equitable and thoughtful manner are those most likely to be outmoded in the future. This is important because, at some point in any human life the ability to move freely, see clearly and to be independent will change over time.

Physical aspects of the built environment encompass land use patterns, transport systems, public facilities; housing and design features of the built environment. Traditionally these have been addressed via urban planning. Two promising movements that on the surface
embrace improved walkability include ‘new urbanism’ that promotes walkable neighbourhoods that contain a range of housing and job types and ‘New Pedestrianism’ which advocates walkable neighbourhoods (i.e. 400m radius/five minute walk). Both these planning movements are a response intended to contain if not completely reverse the perceived problems of modern cities. These problems include unsustainable infrastructure costs resulting from urban sprawl land release; a desire to return to car-less traditional forms; and the need to achieve low-carbon sustainable development targets. These have in turn fed into strategies such as urban consolidation, and have resulted in higher density more vertical developments.

While these newer urban planning movements have many pluses for older people, sometimes they do not align well and conflicts result such as those posed by provision of a shared-use path, multi-use path, or recreational pathways. For instance, pedestrians aged 60 plus years already represent 42% of all pedestrian fatalities within NSW\(^1\). Lack of senior friendly design features, vehicle speed, physical frailty and slower responses time are all indicated as important in fatal accident investigations. For instance, electric or e-bike use is increasing and e-bikes can reach a speed of 32 kilometres per hour. Critically, other senior friendly environmental interventions are either inadequately considered or are dismissed because they are perceived as unnecessary or too expensive. For instance, while many older adults do not perceive thermal comfort differently pathologies like cardio-vascular disease and dementia alter thermoregulation and thus health; agitation and comfort outcomes are different\(^2\).

The promotion of the Healthy Spaces and Places planning principles, which advocate well located, well maintained local community infrastructure – bike paths, safe roads and climate-proof buildings in which to house public services is one example of this. It is intended to be a means of achieving many important social and health policy goals and it is clear that many older adults would benefit from these initiatives. However, few new developments consistently and adequately address population ageing adequately. Failure is both in numbers and placements of required amenities. For instance, very few if any new developments or significant retrofits adequately address way finding for cognitive impairment or provide accessible seating every 50-100 m for those with cardio-vascular or arthritic issues. Yet these are critical in enabling continued independence and autonomy in walking.

Local government authorities’ have the delegated responsibility of ensuring the suitability of the built environment. This typically translates to physical access minima enshrined in legislation. Over the past several decades most developed nations, including Australia, have enacted a number of pieces of legislation to control and direct planning and infrastructure outcomes. The new legislation covers energy production and consumption, water conservation, disability discrimination and, finally, waste disposal and contamination. Anti-discrimination legislation is an attempt to rectify the inequalities that are being experienced by a number of people. In reality though this concept has not been achieved and despite the existence of liability for environmental harm there are shortcomings. For instance, the Disability Discrimination Act came in 1992 but there has been insufficient attention paid to the needs of the ‘the user of buildings and the wider built environment outcomes have been

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reduced to compliance with a minimum standard as called up by the Building Code of Australia. Unfortunately, older people and people with disabilities are often viewed as a homogenous group of wheelchair users, which disenfranchises many other functionally impaired groups whom have hidden disabilities like emphysema and arthritis.

Human functional and size variability is generally poorly understood and thus is understandably poorly covered in architectural theories and practices. The failure of our current physical infrastructure to accommodate older people appropriately can be attributed to them having been constructed to deal with a narrower range of variation than is in fact present in our older population. For instance, Australia has no design database to draw on of older Australians abilities and dimensions. Further, amenity inconsistent with economic objectives are omitted; relegated to the periphery; or only reluctantly provided and when provided are often inadequate to the actual needs. This is because, it is relatively easy to cost bricks and mortar but social benefits and cost substitutions such as health and care is still poorly understood.

The urban environment is also one which has been most impacted by the Global Financial crisis, both in terms of developer and construction industry cutbacks. Local government reducing rate base compounds this situation and municipal budgets are under pressure and financial contractions are projected to only get worse into the future, which is likely to have impacts on ability to maintain existing amenity let alone upgrade, or retrofit for improved amenity. However, where people live and the level of amenity that their built environment affords has an extremely important effect on the type and quality of the lives that they lead and on their life choices.

**Demography of Ageing**

It is still a truism that the only thing that humans can be sure of is death and taxes but one of the greatest achievements of the 20th century was an almost doubling of life expectancy. The substantial achievements in lower mortality rates combined with lower fertility rates has caused an evolution in the age structure of the human population. The number of persons aged 60 years or older in the world is estimated to be 605 million in 2000, and it is projected to grow to nearly 2 billion by 2050. Already many European countries, as well as Japan, and Korea have almost a quarter of their populations in this age category.

By 2050, the older ages will make up over a third of the total population in the more developed regions. The size and speed of these shifts is unprecedented and therefore there can be little doubt that these changes in age distribution will have clearly foreseeable social and economic implications at both the societal and individual levels. For instance, the departure of older workers from the labour force is a source of serious pressure on national economies through its impact on pension schemes and has been estimated to cost the Australian economy more than 12 billion dollars in lost productivity. Thus a critical issue is the question of how greater urban planning sensitivity could respond in a timely fashion to these very significant demographic changes.

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What urban design strategies are critical future-proof for ageing?

It is important to understand the diversity of the ageing population who may be working, travelling, volunteering, caring for a partner or relative, raising grandchildren and more often than not ageing in place. This and the fact that 77 per cent of 65 and over and 50 per cent of 80 and over are independent of the care system⁴, has huge implications for housing, transport, and public amenity. The physical and social security of familiar environments enables many older people them to carry on with everyday activities in this public realm, this is especially so for people with memory limitations such as in Dementia. Outside space can be therapeutic when it facilitates everyday social participation and frightening when it demands skills and abilities to navigate and utilize beyond the capacity of the older person⁵. For instance, shared pedestrian cycle ways are not just frightening but hazardous for the hard of hearing or the mobility impaired. The politics of speed and slowness and the emergent experiences of mobility and immobility that these relations impact require careful consideration within urban planning discourse.

**Housing** - The majority of older people want to age in place and most do not want to relocate to age-specific or care facilities. We know that diversity of accommodation options from dual occupancy through to manufactured homes need to be rethought. A step towards future proofing housing resulted when Commonwealth guidelines under the National Residential Affordability Scheme that committed more than $1 billion to stimulate the supply of up to 50,000 new affordable rental dwellings, included a requirement that most constructed dwellings adhere to universal design principles that facilitate better access for people with disability and older people. Universal housing design outcomes are important because the Victorian Council of Social Services (VCOSS) calculated that greater provision of increasing universal housing stock in Victoria could save the Victorian Government over $70 million each year solely on the basis of savings in home care, residential aged care and hospital costs based on the ageing population⁶.

The National release of the ‘Liveable Housing Design Guidelines’ in June of this year is another step towards future-proofing housing construction. The Liveable Housing Design Guidelines describe six key easy living elements that aim to make any home safer and more responsive to the changing needs of the home occupants over time. This new initiative is a industry agreed one that is currently unregulated, it aligns with social and affordable housing initiatives, where higher levels of performance can be made conditional on the receipt of government funding. With an ageing population, universal housing design features will enable ageing in place and visitability. However, more thought about how this will apply to non-standard housing types and how it will roll-out for existing housing will be critical. Only 2 per cent of housing infrastructure is new build so the lead times set out in the National Dialogue for Universal Housing Design’s Strategic Plan for the intended implementation plan mean that outcomes will be slow and may well not be in large enough numbers nor in the places where older people are seeking to remain. Further, home modification strategies and subdivisions to create more accommodation where it is needed most will remain a challenge for planners into the near future.

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**Transport** – This includes pedestrian measures and transit systems. Pedestrian systems are of major concern for older people and providing a continuous, stable and level footpath with adequate seating and lighting is strongly correlated to better health and wellbeing outcomes. In order to access our transit system and navigate roads sufficient and appropriate pedestrian crossings are missing. There is also a lack of traffic islands and traffic lights that provide sufficient time for an older person to cross the road. The design of bus shelters and transport interchanges often materialise an organisation of space-time that favour the “quick” and the “spry”, and fail to adequately consider those who are not.

Adequate provision of and spatial accessibility within community and public transport modes like taxis, bus, train, ferry and the like are the primary determinant of transit use and only in the presence of such accessibility do other factors such as cost, comfort, security become important for older users. Transport that is universally designed allows all people to remain linked in with social networks, services and employment. Integrating reliable, safe and accessible public, private and community transport is essential to developing liveable and sustainable communities. The challenges in transport planning in metropolitan, regional, rural and remote areas including consideration of off peak shuttle buses, space for mobility scooters, pedestrian drop off points, and meeting accessible transport and safety standards.

Transport is the linchpin of holistic planning, an essential ingredient of social inclusion and an enabler connecting communities to housing, health, social activities and employment. This is acknowledged in the review of the inclusion of Disability Standards for Access to Public Transport in the Australian Government’s Disability Discrimination Act, which provides time frames for progressive improvement in accessibility of public transport conveyances, infrastructure and premises. Achieving pedestrian connectivity and pedestrian safety are critical for older people. Future walkability assessment must better consider how walking fits within an integrated transportation system and how accessible this system is for older people.

**Public Spaces** - Well-lit and maintained public spaces promote safety and opportunities for active lifestyles. However, on a daily basis, older people are faced with barriers, which effectively exclude them from participating as equal citizens. Many of these barriers relate to the accessibility of their built environment. Many public spaces are inaccessible without going up or down steps, there is insufficient seating, lighting, pedestrian and public amenity. This can make it difficult to get out an about - go shopping, visit friends or family, remain active and connected. The WHO Global Network of Age Friendly Cities has been advocating partnership in its age friendly environments work where initiatives are being implemented from big cities to shanty towns. Australia has been actively engaged in improving standards and introducing guidelines to encourage self-regulation around liveable, universal design, healthy spaces and active ageing.

The Disability (Access to Premises – Buildings) Standards by the Commonwealth Government announced in March 2010 recognize the importance of accessibility to a range of public buildings. The Premises Standards will commence operation on 1 May 2011, in line with the adoption of the Building Code of Australia in each State and Territory. This will allow

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States and Territories time to adopt the Premises Standards within their building law frameworks. These standards will impact on public premises and the common spaces in multi-unit accommodation.

**How can we make future proofing happen more effectively?**

There is a shortage of small scale initiatives which impact on the day-to-day lives of older people and people with a disability. To rectify this gap a small pilot project lead by Local Government Association of NSW, The Physical Disability Council of NSW and COTA-NSW in partnership with the University of NSW is collecting visual examples of best practice within NSW at the local level. In particular, photographs may be used by councils to communicate with developers, engineers and planners and by the Associations to demonstrate liveability constructs. Planners and others involved in design need to understand the importance of future proofing for our ageing population and increase their focus on the creation of more liveable and enabling environments.

There are a number of key strategies that will facilitate future-proofing these include: building an evidence-base for best practice; building design databases of older people’s variability and share good design. Effectiveness also means building from several known successful initiatives. First, the World Health Organisation suite of age friendly tools; which includes the Global Age Friendly Cities Guide and the Checklist of Essential Features of Age-friendly Cities. Second, the Missed Business guide developed by the Australian Human Rights Commission and Marrickville Council aims to provide small businesses with information on how they can make their businesses more accessible to all their customers. Third, the Premier’s Council for Active Living (PCAL) aims to build and strengthen the physical and social environments in which communities engage in active living. The PCAL website offers a range of useful resources including evidence papers, planning and design guidelines. Fourth, the Australian Government’s Healthy Spaces and Places planning principles, in partnership with Australian Local Government Association (ALGA) has great potential to deliver social, economic and health returns through better planning of our built environments. Last, the new Liveable Housing Design guidelines raise awareness within the residential design and construction industry and governments about the benefits of incorporating universal design principles into new housing. The housing industry has embraced these guidelines and has developed a plan, which includes an aspirational target of having all new homes meet the guidelines by 2020.

**What next?**

More inclusive public spaces, housing, and transport are evolving but it is critical that we: move towards universal design for everyone; consult older people and include their views in the development of policy and planning initiatives; raise public awareness of cost substitutions being made; and that we develop a design database that adequately represents older Australians abilities and sizes to better inform planning decision-making. COTA NSW’s Age Friendly Environments Working Group is a cross sector partnership focussed on information sharing and developing strategies to promote age friendly resources and initiatives. Everyone benefits from future proofing – individuals, communities, and Governments. Age friendly presents benefits to people of all ages and range of mobility across the life course.
THE VALUE TO THE BUILT ENVIRONMENT OF AN URBAN DESIGN APPROACH TO ROAD INFRASTRUCTURE

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ABSTRACT

Roads are significant pieces of our built environment. At their best they are the armatures of built form; major walking and cycling linkages; and a public space within which we spend considerable amounts of time.

Many roads authorities have come to understand this in recent years. The RTA is no exception and under intense public scrutiny over its projects, it has, in the last 10 years, developed an urban design approach to its projects.

This ‘journey’ has lead to many insights. Such as the best processes of managing urban design and what is good design and what is a costly liability. These lessons are included in the recently published policy ‘Beyond the Pavement: urban design policy procedures and principles’.

INTRODUCTION

The purpose of this paper is twofold: Firstly, to explain the contribution roads can make to the quality of the built environment. Secondly, to demonstrate by example, how urban design is being integrated into the work of the Roads and Traffic Authority – the peak road authority for the state of New South Wales in Australia.

THE CONTRIBUTION OF ROADS TO THE BUILT ENVIRONMENT

Allan Jacobs begins his book ‘Great Streets’ with an inspiring introduction on the value of the street. “Streets are more than public utilities, more than the equivalent of water lines and sewers and electric cables …. more than linear physical spaces that permit people and goods to get from here to there”. “Urban settings, both at the scale of streets and of blocks and of buildings and spaces are also the setting of peoples lives … they contribute to the making or non-making of community”. (Great Streets, Allan B Jacobs, 1993)

This philosophy doesn’t just apply to streets but also to lanes, avenues, boulevards, parkways, highways and freeways. These are all roads in the same way that huts, houses,
halls, churches and offices are all buildings. Just as each building serves a different function so does each road type. In the case of roads, the function or purpose of each type reflects a differing balance between transport needs and community needs. The larger faster roads provide more of a transport need while the smaller slower roads provide more of a community need. But importantly all roads have some level of community function whatever their scale, even if it is only a visual experience on the faster roads.

But roads (and their bridges) are more than this, as intimated by Allan Jacobs. They actually form the structure of the towns, cities and regions within which we live. Responding principally to topography, they provide a layout within which buildings and open space sits: In urban areas, a layout which remains for centuries while buildings and open space comes and goes. In rural areas, a layout structuring land uses and providing boundaries which influence forever the landscape character of the area in which they sit.

Top left: The street layout of Paddington draped over the undulating Sydney topography, contributes significantly to the character of the area. Top right: The flowing alignment of the Pacific Highway, between the cane fields and wooded ridge in the Northern Rivers, is a memorable aspect of the journey and will remain so for many years. Bottom left: The Sea Cliff Bridge perched over the Pacific Ocean has a 100 year design life but will always be a vital connection and iconic lookout for the coastal communities between Sydney and Wollongong. Bottom right: Lennox Bridge built in 1839 (3rd bridge from left) in Parramatta is one of oldest bridges in Australia and together with the other less venerable crossings locks in the grid form of the city and provides it with much of its character.
Therefore the implication is if you design the road well, you can significantly contribute not only to road based transportation, but also to the structure of towns, cities and regions as well as the social, recreational and business activity that goes on along the road. You help create an identity or particular character to a place, and you impart a sense of pride in the civic infrastructure.

If further evidence is needed as to the power of roads to influence the built environment consider the opposite - the outcry and detrimental effect that poor road planning and design has had on roads authorities around the world.

WHAT IS A WELL DESIGNED ROAD?

Firstly and most importantly a road must be considered as a piece of public space with three dimensional qualities. It is a linear space and so interacts with many other contexts and places - a fact which also must be considered. A road designed as merely a means of getting from A to B misses the opportunity of contributing to its context and does not respect people’s time spent on the journey.

This idea of a road being a public space has many implications: It should allow for views of the landscape and towns; provide an experience in movement; be well designed and attractive in appearance but also not a maintenance liability; combine landscape with built elements; in its pedestrian areas provide sufficient space to walk, stop and rest; provide information and interpretation of its setting and heritage; fit with the grain and character of the landform ecology and built environment; and importantly be safe, secure and open to passive surveillance.

The second point is it should promote good and well designed connections not just for the vehicles that will use it but for all modes of transport that move along and across it. If it acts as a blockage then it will not contribute to the built environment or community and will be resented. Dead ends or cul-de-sacs for local roads, footpaths – in fact any desire line - are the antithesis of urban design. In this connective capacity, roads offer the medium by which all modes are connected – car, bus, taxi, train, tram, plane, ferry, bicycle or foot.

INTEGRATING AN URBAN DESIGN APPROACH INTO THE ROADS AND TRAFFIC AUTHORITY OF NSW (RTA)

Like other authorities around the world, the RTA has experienced keen community and stakeholder pressure for the well designed road in the past 10 years or so. A growing awareness of good design coupled with a greater say in the development of projects has placed the spotlight on the organisation and it has had to adapt.

Two projects, both built in the late 1990s, represent the awakening of this design consciousness. They are the M2 Motorway and Eastern Distributor Motorway in Sydney. Two similar scale projects as part of the Sydney Orbital, but offering widely differing versions of road design.
The Eastern Distributor showed what could be done with an urban design approach to roads - the freeway sunk in cut and tunnel; following the grain of the streets; the local roads reinvigorated and returned to the local community; connections and public space kept and enhanced; the whole designed as an important piece of public architecture and landscape.

The M2 showed what could happen if urban design as process and product was ignored - the freeway severing landscapes and linkages; views blocked by grim noise walls; the cuttings sprayed with untreated sprayed concrete (shotcrete).

Completed in 1999, it could be said the Eastern Distributor was a reaction to the 1997 M2. It certainly helped ensure an urban design approach in the RTA and the setting up of an urban design team and policy. With both of these projects you could not have argued for a better ‘carrot and stick’ for integrating urban design into an organisation.

Produced at the same time as the Eastern Distributor and influenced by it Beyond the Pavement Urban and Regional Design Practice Notes was published in 1999. It was a flagship document and set the direction and tone for urban design in the RTA. It contained many sketches, concepts and practice notes but was short on accomplishments. The following ten years saw the realisation of the concepts; a maturing of ideas in the lessons
learnt; design gaps filled with new guideline documents, for example on bridges and noise walls; and the creation and adoption of a range of urban design processes.

This ten years of learning – a unique apprenticeship in applying urban design to a major transport infrastructure organisation - has been captured and recorded in the updated Beyond the Pavement: Urban Design Policy Procedures and design principles. It is a document that has been recognised by awards from the Australian Institute of Landscape Architects (AILA) and the Planning Institute of Australia’s 2010 Australia Award for Urban Design. For the latter award the Judge’s citation stated:

“Beyond the Pavement is a leading edge design policy and provides a valuable precedent and tool for all Australian states and territories. It is an innovative guide to maximising quality urban design and confirms the significant role of traffic and civil engineers in the creation of good places.”

BEYOND THE PAVEMENT URBAN DESIGN POLICY

The main elements of the Beyond the Pavement policy are:

— Senior management support. So that the policy must be applied, by project managers, to all work carried out on NSW State roads - some $2 billion per annum plus private financing.

— Applicability of the policy to all scales of project. From the large state and federally funded motorway and highway programs. To the very important myriad of small projects such as bus and cycle works, intersections, road widening, safety projects, noise walls, pedestrian bridges. Very often the community can be more affected by the many smaller projects.)

— The Integration of the policy with the RTA’s project management procedure called ProjectPack. This ensures that urban design is integrated into the four phases of road projects – initiation – development – implementation – operation.

— The inclusion of urban design clauses and pre-tender urban design assessment techniques into all forms of contract including design and construct and alliance types.

— The integration of the policy with environment assessment procedures. Ensuring that assessment is a tool to both understand ‘place’ and improve design, so the values of an area are understood and adverse impacts on those values are eliminated not just mitigated.

— The maintenance of a shortlist or register of urban design consultants that must be used for all projects and that are fully conversant with RTA policy and appropriately experienced in transportation projects.
— The recognition of urban design through both internal awards recognizing staff excellence in urban design, and external AILA awards for excellence in road infrastructure design.

— The provision of training through annual urban design courses for RTA staff and annual AILA transport infrastructure workshops for external teams.

— The definition of urban design outcomes through nine design principles:

BEYOND THE PAVEMENT URBAN DESIGN PRINCIPLES

The document sets down nine key principles of urban design for the authority. The policy requires that they must be applied in such a way as to be safe (safe for road users, safe to maintain and safe for the public), Cost effective (represent good value for money and not be an unnecessary maintenance liability) and Sustainable (be robust, durable, ecologically sound and create liveable communities).

The principles are a mechanism for explaining urban design to RTA project teams. However good design should not focus on one particular principle, it is the bringing together of all design principles in a way that is sensitive to context. It is only achieved by using good designers that are integrated into good multidisciplinary teams, who all share the same objective of producing excellent built outcomes.

The principles are as follows:
1. **Contributing to urban structure and revitalisation by:**

- considering the role of networks in the structuring of towns, cities and regions; considering both transport and community needs in planning and designing road networks and hierarchies; creating streets and boulevards that provide a sense of place; and considering the potential opportunities of a reduction in traffic volume.

![Image of Hume Highway upgrade at Albury](image1.jpg)

The Hume Highway upgrade at Albury on the NSW/ Victorian border contributes to the grid structure of the town by following the rail line which runs perpendicular to the Dean Street (right).

2. **Fitting roads and related transport infrastructure into the built fabric by:**

- keeping the road/infrastructure footprint to the minimum possible to achieve a good design outcome; integrating noise control into road corridor and project design; avoiding adverse visual impacts in the planning and design of roads and related infrastructure; and considering the potential use of adjoining land.

![Image of Eastern Distributor in Sydney](image2.jpg)

Left: The architecture of the Eastern Distributor in Sydney fits with the Victorian architecture of the adjacent housing. Right: The adjacent one way local streets have been freed from the excessive traffic and returned to a two way traffic system.
3. **Connecting modes and communities by:**

- considering connectivity into and through surrounding environments; considering connectivity between modes; and considering where people want to cross and the quality of crossing points along a busy road.

Left: Connections for local roads, the Pacific Highway and Brunswick riverside walkers have been catered for and designed as a unified piece of infrastructure at Brunswick Heads in northern NSW. Right: The Station design at Bonnyrigg on the Liverpool to Parramatta Transitway in western Sydney has been structured around the pedestrian and local road desire lines between housing, shopping and business areas.

4. **Fitting with the landform by:**

-forming a road or related piece of infrastructure in response to topography and landform; and considering slope stabilisation design as part of the project.

Left: The alignment of the North West Transitway in north western Sydney follows the historic Windsor Road corridor and the natural topography. Right: The F3 freeway alignment reveals the Hawkesbury landscape and sandstone between Newcastle and Sydney. The cut faces designed on curved alignments and the central rock medians, termed ‘Mohawks’, help avoid a notch on the skyline and provide a highly memorable journey.
5. **Responding to natural pattern by:**

- integrating natural patterns and systems into road design; ensuring physical continuity of natural systems; and using natural characteristics in the road’s landscape design.

The pacific Highway travels through the State Forest near Bonville south of Coffs Harbour, retaining a 50m wide median. The experience of the journey through the forest is enhanced and glider crossing of the road enabled.

6. **Incorporating heritage and cultural contexts by:**

- integrating historic buildings and precincts into road design thinking; adapting and re-using heritage infrastructure in projects; protecting and incorporating Aboriginal heritage in road design; recognising European cultural plantings; protecting bridges of heritage significance within their setting; and preserving roads that provide a sense of history.

The ridgeline at Leura is the setting for the historic Leura Mall (right). It is protected through a cut and cover approach to the upgrade of the Great Western Highway in the Blue Mountains near Sydney.
7. *Designing roads as an experience in movement by:*

- enhancing the view from the road; providing visual stimuli within the road corridor; and creating a progressive sequence of visual events.

   ![Image of the Lizard Tree Bridge](image1)

   The road to Wagga Wagga from the Hume Highway is marked by the distinctive design of the ‘Lizard Tree Bridge’.

8. *Creating self-explaining road environments by:*

- distinguishing between the different functions and speeds of roads by differentiating their appearance; and improving the legibility of roads.

   ![Image of Bangor Bypass and Menai Road](image2)

   Bangor Bypass (left) was built to bypass Menai Road (right) in the south of Sydney. Bangor Bypass clearly looks like a road designed for high speed travel. Menai Road which was narrowed and planted, looks like a road designed for slow speed travel. All roads should be designed so driving above the speed limit is uncomfortable and obvious to the road user.
9. Achieving integrated and minimal maintenance design by:

- Using robust, durable materials fit for purpose and place; providing a self reliant and minimal maintenance natural landscape; avoiding opportunities for vandalism; creating a simple, coordinated and neat composition of road elements along a corridor; and considering the design quality of major road components and individual road elements.

![The M7 motorway, part of the Sydney Orbital, is an integrated, unified and distinctive 40km section of road. The road engineering has been shaped to provide a good urban design outcome. Expensive and high maintenance additional elements are not needed.]

CONCLUSION

The Beyond the Pavement experience has demonstrated that it is vitally important for an organisation such as the RTA to adopt an urban design approach to road infrastructure. It has also demonstrated that such an approach need not be a costly additional aspect to road design, but a way of bringing together all design objectives - whether engineering or environmental - to shape road projects and also explain them clearly to the public and stakeholders.

All organisations should adopt an urban design approach to the work they do. The built environment is the product of a multitude of groups and individuals making their contribution over time. Whatever its purpose, this contribution should have a common overarching goal - to ensure our settlements and landscapes are liveable and all this implies.

To do this, design direction is needed and as Jonathan Barnett stated “Urban design is the generally accepted name for the process of giving design direction to urban growth conservation and change.” (An Introduction to Urban Design, Jonathan Barnett, 1982)
DENSITY X DISPERSAL:
TYPOLOGICAL TRANSFORMATIONS FOR A FUTURE AHUPUA‘A

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ABSTRACT
Can society mitigate environmental degradation and achieve sustainability on an island? What can be learned from the indigenous lifestyles and land classification system of pre-1778 Hawai‘i—the ahupua‘a—which enabled aboriginal Hawaiians to assist rather than destroy their ecosystems life-cycles of renewal? Current conditions of environmental degradation in Hawai‘i can be attributed in part to problematic western planning, which fragments ecosystems into mono-functional land-use districts, segregating mountain, stream, and ocean habitats. This paper concludes with a theoretical framework for Pacific Island urban redevelopment that blends successful place-based Hawaiian knowledge with modern urban design, so that urbanized ecosystems can thrive. The goal is to introduce a holistic way of thinking aimed to direct the current built-environment toward an inspirational, prosperous future.

KEYWORDS

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INDIGENOUS KNOWLEDGE & PLACE: THE AHUPUA‘A

Deep within an ocean of islands are the delightfully varied habitats of the Pae ‘Āina Hawai‘i (Hawaiian Islands). In comparison to larger continents, the infinitesimal ecosystems of an island are extremely fragile—environmental degradation thus occurs at an accelerated pace. During the first stages of Polynesian settlement in Hawai‘i, humans destroyed major portions of the lowland forests with primitive agricultural practices, threatening the wellbeing of their society and environments. However, over time aboriginal Hawaiians eventually learned to assist rather than destroy an ecosystem’s cycles of renewal through more effective practices in agriculture and resource management. These practices were informed by lifestyles of intergenerational knowledge, place-based leadership, cooperation, and familial-based relationships between people and their environment.

Among the greatest practices developed by Hawaiians was the typological stratification of island ecosystems into manageable communities, the sizes of which were determined according to the capacity of resources within each watershed (FIGURE 1). Among the most important was the unified socio-political unit of the ahupua‘a—a continuous area of land designed to protect the life-giving continuity between mountain, stream, ocean, and sky. The limits of each ahupua‘a typically aligned with the geographical boundaries of a watershed, where nearly every aspect of the environment—winds, rains, scents, landforms—was recognized and named, allowing each community to become intimately connected with their environment. Such connections nurtured attitudes of grace, patience, and responsibility necessary to mitigate environmental degradation. In doing so, each ahupua‘a cradled the natural resources of each ecosystem, securing access to food, fresh water, and other provisions for clothing, shelter, and medicine.

A major component of the ahupua‘a included the integration of agriculture with the natural hydrological cycle of the watershed; Hawaiians adapted their infrastructure to complement existing networks of fresh water streams, springs, and wetlands. At the mountaintop, evaporated seawater fell as rain, flooding streams and irrigation ditches (‘auwai) that sustained taro fields (lo‘i), eventually carrying nutrient enriched water down into fishponds (loko i‘a) along the shore. The union between agriculture and the hydrology of an ecosystem encouraged a balanced pattern of population density (est. 400,000 to 1,000,000 people) that dispersed in proportion to surrounding food and natural resources. The ahupua‘a exemplified the power of place-based innovation and the ability for humans to co-exist with natural systems in a way that was comprehensible only by reference to the ecosystem as a functional whole.

DISAGGREGATION & ENVIRONMENTAL DEGRADATION

Today, the unapologetic beauty and marketed image of the Hawaiian Islands as an “exotic paradise” conceals a major problem—environmental degradation. For decades, Hawai‘i has had the highest concentration of endangered species on the planet and among the most toxic polluted streams in the United States, in addition to being nearly completely dependent on imported foods and fossil-fuel energy resources. Since western contact (1778), the predominant systems of land-use, leadership, and infrastructure in Hawai‘i have come to no longer align with the physical limits of island ecosystems. Through a process of disaggregation, human activity has become perceived as something separate from the environment—a false projection that fosters a built-environment in continual contradiction and deflection of its surroundings, destroying the resilience of natural ecosystem and compromising the well-being of associated communities.

Western perspectives toward land-use in Hawai‘i represent a fundamental difference from the traditional ahupua‘a system, where most human activity occurred symbiotically with the environment. While the ahupua‘a was place-specific, today’s built-environment is function-specific; ecosystems are altered to fit human activity. As a result, western planning and design strategies have facilitated the filling of wetlands, dredging of reefs, channelization of streams, introduction of invasive species, and separation of people from food resources. The shift in perspective from “place” to “function” and displacement of the indigenous
Hawaiian population has resulted in the loss of the ahupua'a and the relationships that once mitigated environmental degradation.

A major component of disaggregation includes the fragmentation of island areas into functionally homogenous land-use districts (FIGURE 2), which separate mountain, riparian, and ocean habitats. Current land-use classifies mountains as “conservation” and lowlands as either “urban” or “agriculture.” Such forms of land-use facilitates a psychological separation between where people live, grow food, and conserve the environment, allowing for only additive, rather than multiplicative relationships between functions. As a result, urban areas become void of important agricultural and conservation functions, especially where development crowds streams and shorelines—destroying the essential life-links between mountain and ocean habitats. This is problematic since the health of coastal and marine habitats depends on the quality of stream water from mountain habitats.

AGGREGATION: RETHINKING DENSITY AND DISPERSAL

Overcoming environmental degradation requires the rethinking of how humans have concentrated and dispersed on the island. In alignment with such efforts and to protect the health and productivity of communities and ecosystems, the continuity between mountain and ocean habitats must be restored. While such a task is immense, it presents an opportunity to re-establish components of the traditional ahupua'a system and reconnect people with their communities, food resources, and ecosystems. This calls for a revolutionary transformation in land-use typologies and how those are managed through socio-political, cultural, and economic activities.

Such transformation can be achieved through a process of aggregation—the typological recombination of conservation and agricultural land-uses within urban areas to form a whole greater than the sum of its parts (FIGURE 3). The concept of aggregation emphasizes the relationship between fragmented mountain, stream, and marine habitats to re-establish ecosystem continuity. To do this, aggregation would “transform” developed areas into a more evenly distributed community of people, intermixed with localized food, renewable energy, waste-recycling, and clean air and water resources.

The process of aggregation would require a more nuanced perspective on how urban populations concentrate and disperse across island ecosystems. From the context of urban design, the term density commonly refers to the concentration of populations within defined areas, while dispersal denotes the sprawl of populations over large, undefined areas (often positioned as separate, oppositional forces, such as urbanization vs. suburbanization). However, what if definitions were expanded so that density and dispersal referred to more than just the functional distribution population demographics? Density could also refer to an inclusive compactness of multiple functions while dispersal could refer to the scaled diffusion of multiple functions within the defined area of an ecosystem. Translated into a system of place-based land-use, density and dispersal would represent the intensification and integration of agriculture and conservation functions within urban areas, in a manner proportional with the capacities of each respective ecosystem.

Similar to the traditional ahupua'a, the integration and intensification of urban, agriculture, and conservation functions would occur at multiple scales—such as home/block, neighbourhood, and ecosystem—rather than at single, large-scale districts as currently practiced. This could encourage beneficial adjacencies between seemingly disparate functions that currently do not exist. Once adjacencies are established, they could increase exponentially over time, creating a community enriched by a diverse array of urban, agriculture, and conservation activities specific to the places of each ecosystem.

This concept parallels the adjacency between home, food, and ecosystem characteristic of the traditional ahupua'a, where the overall transfer of resources between scales emerged as a pattern that was self-reliant at the smallest scale, centralized at the intermediate scale, and decentralized at the large scale. This developed in direct response to island ecosystems and would therefore be more appropriate to the island geography. Strategies to achieve aggregation in developed areas could include the vertical combination of various functions to occur simultaneously within a finite area—for example vegetative
rooftops that produce food ad provide habitat. Such recombination could emphasize the connectivity between different functions to yield the multiplicative benefits that occur when land use functions are integrated, rather than separated...ultimately rebuilding the severed relationships between people, food, and ecosystem.

**TYPOLOGICAL TRANSFORMATIONS, A ROADMAP**

Aggregation calls upon the power of typology to reveal leaping points from which the existing mechanisms of degradation can be re-evaluated and recombined in a manner resilient to each specific ecosystem (FIGURE 4). The following roadmap of transformations could occur over the course of several decades:

+ Synchronize geopolitical boundaries with each respective ecosystem—an *Ahupua’a Management District*—and define all land as conservation, to manage, repair, and unify the ecosystem.
+ Replace single-function zoning with place-based *Ecological Information and Resource Potential Zones*, containing site-specific data on solar radiation, soil-type, rainfall, and wind velocity.
+ Delineate no-build zones—an *Ecological Corridor and Community Refuge*—around mountains, streams, and shorelines to allow the ecosystem to “breathe.”
+ Delineate buildable zones—a *Ahupua’a Community Network*—based on pedestrian walking adjacencies to natural resources, maximum percentages of buildable area, and pedestrian access to schools and markets, to minimize sprawl and automobile dependence.
+ Establish a special *Community Economic Development Zone* to support local business specializing in sustainability services and technologies, localized food production, renewable energy generation, rainwater capture, cooperative market distribution, and long-term urban redevelopment.
+ Establish farmers markets and community gardens at each elementary/high school and university; implement curriculum that educates students about sustainability and develops green workforces.
+ Re-evaluate housing typologies to accept hydroponic units in a way that redefines a higher standard of living through appropriate solar envelopes, community agricultural spaces, and direct relationships between home, food, and community resources.
+ Integrate agriculture resources with dwelling/school/market rooftops; intensify the population capacity of city blocks.
+ Innovate food production technologies, such as hydroponics, to intensify food production within aggregated areas.
+ Revolutionize infrastructure—renamed ecostructure—to facilitate on-site renewable, reused, and recycled energy, water, waste, and food resources, paired with schools and cooperative markets.
+ Devise an integrated modular building system to facilitate the prefabrication residential and hydroponic building components to decrease the cost of transformation.
+ Reclaim excess developed areas around streams and shorelines and restore for ecosystem functions.

**THE WORLD, AND AHUPUA’A**

As the destruction of Hawai’i ecosystems continues to accelerate, society must seriously seek ways to transform the built-environment in a manner that perpetuates the relationships and attitudes necessary to avert degradation. The ahupua’a, as the manifestation of a place-based knowledge system spanning hundreds of years, we already have a template for balancing human activity with ocean-island ecosystems. Because Hawai’i contains nearly every climate seen throughout the world, the potential for the ahupua’a as a world-wide example for sustainability is possible. If people consider the Hawaiian Islands as a microcosm of the planet—and the world as an ahupua’a—the strategies developed in Hawai’i could provide a fundamental leaping point toward environmental equilibrium for all of humanity.
Figure 1: Land Classification of O'ahu

1) 'Aina (island)
2) Moku (district)
3) Ahupuaa (ecosystem)

Figure 2: Disaggregation

Figure 3: Aggregation

All images by Sean Connelly
Figure 4: Typological Transformations

(1) Current Disaggregation. (2) Proposed Aggregation.

Ahupua'a Management District

Community Economic Development Zone

Ecological Corridor & Community Refuge

Community Resources

All images by Sean Connelly
Putting a value on landscape

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Abstract

‘Landscape’, is the totality of conditions in which our settlement takes place and is increasingly expressed in tradable terms - but is this to the detriment of ‘good design’?

Our historical refusal to value ecological, cultural and designed aspects of our ‘landscapes’ is addressed and contrasted with the focus on ‘landscape’ costs and benefits in economies founded on competition. Melbourne, Australia, provides examples of frameworks for analysing, quantifying and prioritising the allocation of resources to ‘landscape’. Green Infrastructure thinking and new design currencies are discussed.

It is concluded that ‘good’ urban design is possible and indeed facilitated by this direct participation on the economic playing field but a clear framework for urban design values assessment and application is still lacking.

Keywords
Grey to green, urban landscapes, green infrastructure.

Australian urban areas remain disconnected from the environment and urban design has a key role in reminding us what we need to value in our landscapes and the terms on which these values can be realised. Green Infrastructure thinking offers urban design a framework with which to achieve this.

Our politico-economic system is such that ‘value’ has become a very frequently used word. In urban design, ‘value’ usually refers to the worthiness and relative status of a proposition or element. This usage has had to defer increasingly to ‘value’ translated into the absolute monetary or exchange units that seem to strengthen the credibility of urban design decisions. The following discussion looks at this latter form of value in the context of impacts on local practice in Victoria, Australia and reveals that the other meaning of ‘value’ as moral principal and accepted behaviour also remains most relevant.

In the context of this paper, ‘urban design’ means the broad collaborative process of urban planning and shaping rather than the discrete discipline: ‘landscape’ refers to the totality of conditions, natural and constructed, physical and abstract, which not only pervade our urban areas but which also form the setting in which our settlement takes place.

Truly urban areas existed many thousands of years ago, the first domestication of plants and animals having encouraged the more permanent settlement that occurred in a slow but steady ‘urban revolution’. However, early cities remained vulnerable to the same broad environmental and political change as the landscapes to which they were linked and they
succeeded or failed accordingly, succumbing to sea, sand, climate and hostility. This vulnerability disappeared when the relatively recent cities of the ‘industrial revolution’ suddenly acquired an ability to sustain themselves in apparent isolation from the environments of their supporting non-urban hinterlands. These cities were cradles for the arrogant rejection of natural and human values that we still struggle to reverse.

Australian cities date from this time and thinking and having quickly freed themselves from reliance on sea communications they spread inland rapidly with a persistent disregard for environment.

Some time in the second half of the nineteenth century it became apparent that the values of cities as centres of creativity and innovation were being realised at an unacceptable cost to many of their inhabitants. Early responses focused entirely on human health and welfare values, symbolised by the 1847 opening of the world’s first publicly funded urban park in Birkenhead, England. With less fanfare yet with massive beneficial consequences the nineteenth century rise of the publicly funded municipal engineer, health officer and teacher brought about urban landscape improvement through improved sanitation, water supply, drainage, transport and education.

Relatively recently, in the second half of the twentieth century, this commendable concern for the environment of human wellbeing matured into complementary concerns for the massive impact that our urban / industrial systems are having on broader environmental values. The 1962 publication date of Rachel Carson’s ‘Silent Spring’ (1) is an often cited milestone.

In 1967, two years before we stepped out of our environment and on to that of the moon, the Smithsonian Institution addressed urban issues in a symposium entitled ‘The Fitness of Man’s Environment’. The stated Premise of the symposium cautioned: ‘that something is somehow wrong with man’s relations with his environment’ and ‘our increased command over nature has not reinforced our humaneness’ (2). Architect Phillip Johnson’s paper (3) bemoaned expenditure on ‘going to the moon’ and suggested that $US100 billion should be spent on United States city improvements over two years. This was the nearest the Symposium came to putting monetary values on landscape but landscape architect Ian McHarg came closest to setting a new value system, one based on the ‘natural systems’ of his then uncompleted ‘Design with Nature’ (4): ‘We must abandon the value system of our inheritance which has so grossly misled us. We must see nature as process within which man exists...’(5).

Urban design over the last 50 years has consciously or otherwise participated in the translation of the Smithsonian ‘something is somehow wrong’ into efforts to value features and processes that remedy the rift between ‘city’ and ‘environment’.

During this time the notion of ‘ecosystem services’ has provided a broadening context and language for giving a value to landscape. The term refers to the goods and services that are provided by the natural environment and was brought into prominence in the oil-shocked 1970’s to stimulate public support for biodiversity conservation. ‘Services’ are extensive and can be summarised as; ‘Supporting’ (nutrient recycling, oxygenation, soil formation); ‘Provisioning’ (food, fuel, fibre, water); ‘Regulating’ (climate, water quality, flood mitigation) and ‘Cultural’ (education, recreation, aesthetic services). These services are in poor shape -
in 2005 the United Nations cautioned that ‘60% of the ecosystem services evaluated are being degraded or used unsustainably’ (6).

The need to change our approach to the urban areas in which most people live is obvious. Unfortunately, ecosystem services do not readily translate into values directly usable in urban design or indeed into any sort of absolute or exchangeable values (7).

Stemming from ecosystems services thinking, the relatively recent notion of ‘green infrastructure’ has, however provided both a spatial and a multi-layered values framework suited to urban design applications. Described as ‘the next big thing in the green world’ to follow green building and green energy (8) it highlights the importance of the natural and the managed green areas in both urban and rural settings in decisions about land use planning strategy, design, development and maintenance.

As promoted by the AILA (9) the power of the green infrastructure approach is that it assists the classification and maximisation of the environmental functions actually or potentially fulfilled by spaces and built elements. Multifunctionality is stressed – that is, the integration and interaction of different environmental functions or activities on the same piece of land. Unlike traditional, ‘grey’ infrastructure features such as roads and power lines, green infrastructure is often hard to visualise. The ‘green’ values of farm land are similarly often under-appreciated. A ‘grey-green continuum’ of thinking assists in the planning process: the functions of an area of intact woodland might result in it being a ‘very green’ component of an urban area and a local park a ‘green’ component with a cycle path ‘grey / green’.

The relevance of green infrastructure to urban design is highlighted by the fact that the term is in use in government and the broader market, appearing in budget headings and ascribed economic values particularly where it plays critical roles in ameliorating flood risk or poor air quality. It applies as equally to water, soils, microclimate, flora and fauna systems as well as anthropocentric functions such as health, recreation and green buildings.

The Global Financial Crisis has highlighted the fragilities of economic values systems and diverted thought and expenditure away from environmental concerns. However, at the time of writing activity at global, national, state and local level points to a continued, sincere drive to value the landscape of our urban areas.

At world level the UN has engaged former Deutsche Bank economist Pavan Sukhdev to head up the groundbreaking TEEB (The Economics of Ecosystems and Biodiversity) report, dubbed the ‘Stern for Nature’. Values at stake are immense with estimates that $45 billion per annum expenditure on environmental conservation will yield $4 to $5 trillion benefit per annum.

Sukhdev’s thinking on valuing environment is clear: ‘What you buy and sell is stuff that is able to be identified, privately owned and marketed. A market does not sell a public good. Pigs will fly before markets trade public goods. The only way you can get a public good into the marketplace is to first create a private liability or private asset’ (10). This is a statement that has lessons for urban design.

At national level in March 2010 The Australian Federal Government in its ‘The State of Australian Cities’ stressed the health, wellbeing and biodiversity values realised by the design and better management of the urban environment (11).
At state level in Victoria in April 2010 the State Government Parks Victoria was a major supporter of the Healthy Parks Healthy People Congress (12) which was focused on the values of open space in terms of physical and mental health and the robustness of our communities.

At a local level in July 2010 Melbourne City Mayor Robert Doyle in reviewing the past ten years of the development of the massive Docklands area (13) expressed the urban design view that too much attention had been given to the area’s buildings and not enough to the spaces between them and to community infrastructure. Two additional hectares of this newly ‘designed’ inner urban suburb have subsequently been pledged for future recreation and open space, thereby promoting the value of such urban features.

World wide attention has focused on the value of carbon either as a liability or an asset. At the time of writing, the local Australian debate on this value and how to reflect it through taxation or trading is without conclusion. As a result direct urban design responses to carbon are without structure despite the supporting implementation framework offered by green infrastructure.

There are, however, other fundamental values under debate.

One of the first formal environmental values to affect urban design in Victoria emanated from Victoria’s ‘Native Vegetation Management – A Framework for Action’ which introduced the ‘Net Gain’ concept (14) and sought to be ‘a strategic, whole of landscape approach’. One of the most immediate environmental effects of urbanisation is clearance of habitat. The ‘Net Gain’ legislation is intended to place values on ecology that encourage retention and incorporation into the urban green infrastructure to yield ecosystem services benefits. To do so, values have been exchanged into a new ‘currency’, the Habitat Hectare. The State has been mapped to define the Ecological Vegetation Classes (EVC) or communities that would theoretically occur at any given place and vegetation is valued in terms of its degree of intactness compared to the relevant EVC.

For example, a hectare of woodland that through damage or other reasons is only half the ecological quality of what it theoretically could be achieves a value of 0.5 Habitat Hectares. The ‘invoice’ for removal becomes the cost of establishing 0.5 Habitat Hectares elsewhere. However, this tantalisingly simple equation has also been criticised for neutralising other legislation and devaluing the Habitat Hectare currency to a point where ‘trading’ should cease, to use the language of the market place. It is often too readily overlooked that ‘Net Gain’ mandates a graduated approach. Firstly all steps must be taken to ‘avoid’ loss of value by keeping assets intact, in-situ and relevant to the urban area. Secondly, if impacts are unavoidable, they must be ‘minimised’ by foregoing or undertaking ‘less efficient’ development (in other words ‘payment in kind’) before the last resort of ‘offsetting’ which is funding the replacement of vegetation elsewhere.

Although urban design processes have for some time been conducted with a heightened awareness of ecological issues, these processes, even at initial strategic planning stages, have proven all too able to lead to the conclusion that desired urban layouts can be purchased, thus forfeiting green infrastructure values. In practice the difficulty of revegetation and the maintenance of an ecological community to mature values are not properly emphasised.
This concern about the complexities of environmental balance sheets was highlighted by the Greens party in objecting to the recent formal expansion of Melbourne to a new Urban Growth Boundary (15). As part of the expansion the Victorian State government intends to acquire 15,000ha of grasslands on the edge of Melbourne to offset the loss of 6,900ha within the growth area, interpreted by the Greens as ‘In return for the guaranteed, irreversible destruction of high quality grasslands we are going to get a statement of intent to purchase other land and manage it’ (16).

Another set of formal environmental values influencing urban design in Victoria in which the ‘currency’ analogy works better are those applied in the case of urban storm water management and indeed, Melbourne Water uses the word ‘currency’ in its literature (17).

A statutory requirement under the Sustainable Neighbourhoods Clause 56 - Victoria Planning Provisions is that urban stormwater management systems for all new residential subdivisions and redevelopments are designed and managed to meet the current Best Practice Environmental Management objectives. These objectives include the on-site retention of the following percentages of the typical urban storm water annual load: suspended solids 80%; phosphorus 45%; total nitrogen 45%; litter 70%. Similar provisions apply to industrial and commercial projects. Nitrogen has been selected as the common currency of value assessment for the contribution as it is typically the limiting pollutant.

The expectations placed on the storm water drainage infrastructure of both new and rejuvenated urban areas have changed radically in a short time. Developers have a choice of either meeting requirements on site or making a financial contribution for treatment elsewhere. The commercial and social appeal of the associated green infrastructure has led urban designers to expect support for the accommodation of elements of the ‘water sensitive urban design’ treatment train whether working on a regional or a street scale.

It is tempting to believe that the visual appeal of the open water and indigenous plants used in water quality control, the likely continuity with existing drainage corridors and the potential for networking with other open space systems are all seen as worthy and positive values that lead to the creation of wetlands and adjacent open space. In reality, drainage functions are valued because they are strongly prescribed by laws that protect life and property and command more adherence than those defining ecological values.

However, whether dealing with redeveloped urban street rain gardens or new regional scale wetlands, the task of the urban designer in maximising integration and multi-functional benefits can be undertaken in a positive atmosphere of acceptance. This contrasts to practice not long ago when the engineers in an urban design team were only tasked to size and hide required drainage pipes or provide the dimensions of the grassed bowls necessary to accommodate and retard flows in times of heavy rain.

Whilst the values of ‘EVC’ and Nitrogen’ remain somewhat intangible they have been more readily locked into the urban design process than seemingly more abstract yet scientifically supported ‘health’ values. The recent Healthy Parks, Healthy People Congress in Melbourne focused on the physical and mental well-being costs / benefits of the provision of access to open space. The Congress was supported by significant speakers and sponsors (18) and it revisited in more empirical and more prolific form the arguments behind the creation of the world’s first urban park referred to above.
In concert with this Congress, the State Premier, John Brumby, announced free entry to the State’s parks from 1 July 2010. Although the Premier did not put it this way, he was responding to the need to readjust aspects of the green infrastructure values system to reflect not merely the economic value of access to open space but to also express his government’s ‘values’ in the sense of accepting the moral principal that people have a right to open space.

Recent debate on ‘values’ in Melbourne’s new urban growth areas has focused on the Growth Areas Infrastructure Contribution (GAIC)(19), a levy on land value increases that is expected to fund up to 15% of the cost of state funded transport and social infrastructure (including parks) in growth areas.

Government estimates in 2009 put the value of a hectare of unzoned farm land at $15,000 to $35,000 and when rezoned at $225,000 to $450,000 ($365,000 on average)(19). In this context the cost of providing land for and building a new one hectare local open space (currently over $1.2M) is reasonable. Although reference to ‘a million dollar park’ may draw attention, the property development industry routinely undertakes this sort of planned green infrastructure provision as an acknowledged essential part of building new urban areas. The actual average expenditure by developers on growth area public domain provision, excluding land costs, works out at an economical $5,000 per residential building lot.

There is, therefore, broad acceptance of the value of expenditure on ‘landscape’ – but there is just cause to question if an adequate ‘landscape’ values framework is yet in place to guide expenditure. In addition, the affect of the GAIC on the urban design of new areas and their multi-functional environmental values is yet to be seen.

The greyer the infrastructure the more easily it seems its green qualities are valued. A recent, unpublished Melbourne urban design study of a road / rail grade separation proposal showed that although the infrastructure costs were in the order of $50M, there would be a benefit / cost ratio of 1 to 1.9. A wide range of benefits were costed and included reduced congestion and therefore reduced vehicle emissions, reduced accidents and associated social costs, urban consolidation and business efficiency benefits and the amenity values of a more appropriately provisioned and vibrant public environment.

This accounting uses recognised government valuation techniques, discounted cash flow analysis and includes parameters connected to urban design quality with which urban designers are familiar. Infrastructure projects proceed or hold on the basis of such information. As reviewed above, local and global thinking is at a point where this form of consolidated accounting needs to be more formally extended to ‘landscape’ using a spatial values framework such as that offered by a green infrastructure approach, supported by an appropriate project ‘scorecard’ review system.

The starting point of this paper was the disconnection between urban areas and the environment. We are still looking for a values framework to facilitate this connection. Whereas the local urban design community has clear goals for the preservation and creation of water quality and public realm values, the immobility and connectivity of ecological values and the time and resources required to create them means that it remains difficult to incorporate or recreate these values within urban areas. There is clearly more work to do to establish and agree what ‘landscape’ values our urban areas require and a need to move
from a two-dimensional plan view of these values as interruptions to the urban form and on
to a four dimensional view of what further benefits they may yield for future communities.

Careless talk of markets and currencies suggests we are nearer a solution to the
Smithsonian ‘something is somehow wrong’ than we really are. Ian Thompson, a
philosopher and landscape architect (20), in looking for ‘sources of values in landscape
architecture’ began by commenting that ‘Money only works because there are other sorts of
value which are worth having in their own right. Another way of putting this is to say that
money is a proxy for some sorts of values’. We urban design practitioners continue to
design urban areas but do not yet have a clear vision of what values we want to see in our
cities and why.

Notes

(1) Carson, Rachel (1962), Silent Spring, Houghton Mifflin – a book that revealed not only
the misuse of pesticides and the environmental damage created but also, in its aftermath,
the unwillingness of industry to accept criticism.

(2) Smithsonian Institution (1968), The Fitness of Man’s Environment – papers delivered at
the annual symposium, February 16-18 1967, Smithsonian Institution Press.

(3) Ibid. paper by architect Phillip Johnson, ‘Why We Want Our Cities Ugly’.


(5) Smithsonian Institution op. cit. paper by Ian McHarg, ‘Values, Process and Form’.

(6) The United Nations Millennium Ecosystem Assessment 2001 to 2005 synthesised
existing data to appraise the state of the environment, determine trends and guide actions.

to Australian Government, Land & Water Australia – contains detailed mathematics and
some candid comments, for example ‘In general, we can’t value ecosystem services without
first measuring the values that people have for the environment. We have a dilemma….A
much simpler and theoretically more satisfying approach consults a citizen jury to estimate a
schedule for the social price of natural capital under realistic policies’.

(8) New Civil Engineer, February 2009 – ‘Engineers are pretty clued up on green buildings
now. We understand the concept of green energy. But are we up to speed on the subject of
green infrastructure? Green infrastructure is the next big thing in the green world. It turns
the focus of attention to improving the management of the “bits between the buildings” as
modern economies struggle to upgrade their performance on all things environmental’.

(9) Australian Institute of Landscape Architects ‘Adapting to Climate Change - Green
Infrastructure’ Policy Statement 2009

(10) Pavan Sukhdev interviewed by Tom Levitt, news editor of The Ecologist, 22nd January,
2010.

(12) The inaugural International Healthy Healthy People Congress, Melbourne April 2010


(15) Victorian State Government Growth Areas Authority Information Sheet, July 2010, announcing that the GAIC Provisions are in force from 1 July 2010.

(16) Greens Greg Barber, MLC, Member for Northern Metropolitan Region, Upper House of the Victoria State Parliament, 25 May 2010, speaking against the GAIC.


(18) Healthy Parks, Healthy People op cit – sponsors included the Victoria State parks and open space organisation, Parks Victoria and Beyond Blue, an organisation dealing with mental welfare and in particular the illnesses referred to collectively as ‘Depression’.

(19) Victorian State Government Growth Areas Authority Information Sheet, June 2009, Supplementary Information on GAIC related to land costs.

(20) Thompson, Ian (2000), Ecology, Community and Delight – Sources of Values in Landscape Architecture, E & F N Spon.
"Where are you?"
Technology and Public Space: Why design the public domain for mobile media technology

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"WHERE ARE YOU?"
Access to technology anywhere, anytime need not just be an individual pursuit, but an enabler to bring people together. No longer physically tied to the classroom, boardroom, or office space, people can gather outside the traditional learning and working environments to learn and work! The opportunity exists for mobile media technologies to provide the foundation for new activities within the public realm and how those places are designed.

Technology magazines dedicate editorial to virtual space, psychologists research how digital technologies have altered accepted public behaviours, public artists have explored digital media interactions ... the question that is posed here is how can current technology breath new life and activation into the urban environment and how can it change the design of the public domain?

Keywords:
The Future of Public Spaces
Infrastructure and Sustainability in the “New” Australia

"WHERE ARE YOU?" More or Less Public
In November 2003, New York Architecture Critic Paul Goldberger wrote a paper for Metropolis Magazine called “Disconnected Urbanism.” In the piece he argued that the mobile phone had caused the demise of public space. He wrote:

"...the mobile phone renders a public space less public. It turns the boulevardier into a sequested individual, the flaneur into a figure of privacy, and suddenly the meaning of the street as a public space has been hugely diminished."

This conjures up images of individuals, unaware of their surrounds, mindlessly occupying the city determined in the pursuit of their own goals. It is reminiscent of the Industrial Revolution’s fear that the machine would replace people, their interactions, relationships, and their purpose. It reinforces Baudelaire’s double notion of the flaneur as both a participant in but a detached observer of the modern city. It is true, we live in extraordinary times. But do we really live with diminished public space?

Digital media is increasingly becoming the topic of research related to contemporary living. Writers, philosophers and theorists are now beginning to examine the roles and impacts of digital media and computing technologies on everyday living in a positive way. By example, William J. Mitchell’s Trilogy City of Bits (1995), e-topia (1999) and Me++ (2003), seeks to describe how our lives and our surroundings are positively transforming under the influence of technology.
As a follow-on piece, Dr Ning Gu and Professor Mary Lou Maher, in their work “Designing curious places: Digital and computing technologies in the workplace” took Mitchell’s vision and applied it to changing patterns of activity in indoor commercial office space. This is a highly logical extension given that contemporary business is entirely underpinned by efficient and effective mobile, digital technologies.

What is less obvious, perhaps, is how mobile technologies can significantly alter our occupation and use of the public realm, and how they can positively contribute to and build on traditional notions of public space.

Goldberger argued that it is increasingly common for mobile phone conversations to begin with the question, “Where are you?” suggesting a loss of association between people and their environment because of technology. The truth is that mobile technologies, the least of which is the mobile phone, are here to stay and set to become more and more common. As designers of the public realm we should seek to work with them, understand their patronage and their function, and design our cities, districts, public spaces ... and our streets ... to accommodate this new form of public life without diminishing, and hopefully enhancing, the meaning of our streets.

Adding to the Placemaking Kit-of-Parts

Since 1975 the non-profit planning, design and educational organisation, People for Places and Spaces (PPS), New York, has been pioneering placemaking. Founded to expand the work of William (Holly) Whyte, the author of The Social Life of Small Urban Spaces, PPS seeks to achieve public spaces that build stronger communities. PPS’s communities are created by citizens transforming their public spaces into vital places that highlight local assets, spur rejuvenation, and serve common needs. These are absolute essentials to designing public space right in our cities.

Placemaking “thinking,” however, has historically come before the advent of technology as we know it today and as such, placemaking rarely, if ever, thinks overtly about using mobile technologies as a means to create physical communities – virtual communities yes, but not those real environments grounded in context and place. The history of public space leads us to the relatively recent arrival of placemaking as an informal discipline, and the later arrival of place management as a profession. As this coincides with the advancement of mobile technologies, the opportunity exists for technology to become another component in the placemaking kit-of-parts.

One of PPS’s great visions is to “create a place, not a design.” They argue that if your goal is to create a place (which should be the ambition), a design will not be enough. Physical elements and infrastructure must be introduced that will make people welcome and comfortable, such as seating and landscaping, legibility of movement, and a relationship to surrounding activities like retail and community uses. What about including technology infrastructure as one of those elements? If the goal is to create a place that has both a strong sense of community and a comfortable image, as well as a setting where activities and uses collectively add up to more than the sum of its often simple parts, then surely 21st Century placemaking must consider technology as a placemaking device.

It is wrong to suggest that technology doesn’t exist in the public realm today. It is being used increasingly as an overlay to the use of space to create a WiFi enabled environments. In
other cases it is the inclusion of a “live screen,” a large format digital display that enables the collective to share a TV experience like the Olympics or World Cup. Both are highly successful applications of new technologies in the public realm. What this means is that we are terrific at using technology as the focus of 1000 people, in the “live screen” example, or giving the individual another personalised activity via WiFi. What we are not focused on is enabling a cluster of 8 to 10 like-minded folk to gather and share a technologically based experience.

**“Tweetup” Infrastructure**

Witness the “Tweetup.” Someone I know owns a cafe and recently mentioned he had been approached to host a Tweetup. I had no idea what that was. Research tells me that a Tweetup occurs when a group of people who are sharing and exchanging ideas, philosophising, conversing, debating via the social network Twitter decide to get together physically to continue the discussion in person in a real, physical place. Geographical limitations notwithstanding, the Tweeters actively seek appropriate locations to host Tweet-events. Though an avid Tweeter, my friend declined the invitation to be a host because the thing about the Tweetup is that you don’t really know how many people will turn up – 4 is intimate, 8 is comfortable, 24 is a party. What this suggests is that what is required is a flexible environment, a Paley Park-type environment, a Bryant Part-type environment, where tables and chairs can be easily moved, brought together, pulled apart, reorganised as a seminar space, and then taken away for standing room only. Moreover, Tweeters need to keep their technology with them – laptops, iPhones, Blackberries need to be laid out, plugged in, and charged.

There has been a paradigm shift. We are no longer designing places for the post industrial city. While the function of public space to provide a forum (in the Greek sense of the word) will always exist, we are placemaking in what can best be described as the Wireless City. The reality of our daily lives, the literal extension of our self, is the mobile phone, GPS, iPhone, iPad, E-book, and so many other technological devices and gadgets. In the first instance, we had these things as knowledge workers, to enable us to work anywhere, anytime. Like Tweeters, knowledge workers seek flexible, integrated, sustainable work environments, and these environments may not need to be within the interior of an office building. Richard Marshall writes in the paper “Working in the Wireless City:”

“The knowledge worker will want to be able to sit at any park or cafe and be able to instant message each other, check their e-mail, work remotely from their laptop. To do this they will demand wireless broadband internet encompassing the city – not just a few “hotspot” Starbucks.”

Similar to the Tweetup, it is also possible to imagine that these individual knowledge workers might also like to work together, collaboratively. To sit together outside the formal boardroom and view a presentation, develop a proposal on media, collectively “speak” to another like minded group. Examples of this practice spring to mind. An obvious one is the way in which the plaza space at Australia Square in Sydney is utilised, particularly when the complex of tower and podium was occupied by the 1000 strong Lend Lease. Naturally, rather than by design, the plaza operates as an outdoor meeting room, encouraging gatherings both large and small, it is a work place and a social space. Long before Australia Square was WiFi enabled, the bones of outdoor working were well established.
Technology is no longer the sole domain of the knowledge worker. We also have these devices as parents to stay in contact with our family, as students to foster education outside the classroom, as children to encourage simple play and learning. Witness the app for iPhone called The Hidden Park. Its intention is to teach kids to explore and learn about the public realm. The app sets up a number of clues that guides you through environments. Using the various functions on the phone, including the camera, GPS and compass, you encounter trolls, fairies and dragons along the way. You can play this game in any one of 12 parks in cities such as New York, Tokyo, London, Melbourne and Sydney. Of course, you cannot have this type of interaction without the infrastructure.

**Smart Cities, Phantom Cities**

Some cities have responded to the demand for access to technology in order to maintain competitive advantage. They know that attracting knowledge workers to a city also attracts the businesses cities seek, and vice versa. Therefore, to invest in the infrastructure is to invest in a city’s sustainable future. A number of cities have incorporated wireless technology in order to maintain competitive advantage. In 2007 these included Toronto, Seattle, New Orleans, Philadelphia and the whole 2400 square kilometre zone of Silicon Valley from San Francisco to Santa Cruz, all in order to compete for companies and lure talented workers. Working is one way to use this technology, but another is to genuinely use it as an enabler to engage citizens with their environment.

There is another fantastical iPhone app by Irene Cheng and Brett Snyder which has been released in New York City. Sponsored by the Van Alen Institute, Museum of the Phantom City, is a “public art project that allows individuals to browse visionary (but unrealised) designs for New York City on their iPhones … proposals by Buckminster Fuller are suddenly as real as the Empire State Building – after all, they’re both pictured there on your iPhone.”

What a curious world we live in where technology can provide us with the real view, virtual view, or even a future view of what our cities do or could look like. Cities have long cottoned on to the competitive advantage placemaking affords their efforts to secure business and residents, commerce and culture. Citizens are discerning customers. Could technology be harnessed to contribute to the visual and physical understanding of a place and therefore contribute to a city’s competitive advantage?

**EduRoam-ing**

After cities, educational facilities and campuses appear to be the first to recognise the need for technology overlay. Programs like Eduroam enable the global connection of like-minded researchers, educators and students. Eduroam (EDUCation ROAMing) is a global initiative forming an agreement between educational and research institutions enabling them to share wireless accessible inter-institutional roaming, both physically and virtually. Using the University of Sydney as an example, visitors to the University from participating institutions can access the Eduroam network using the login credentials from their home institution. Conversely, when visiting participating institutions, University of Sydney students and staff can connect to the Eduroam network. For the most part, this occurs inside classrooms, lecture halls, libraries and tutorial spaces. However, the notion of the outdoor classroom is starting to achieve traction, particularly in cities, like Sydney, where the weather is amenable to outdoor living. In places like the University of Sydney we find students outside, perched
uncomfortably on walls that surround the Quad or cross-legged on stone footpaths (never on
the grass where the sign still says “keep off”). Imagine, then, if the University of Sydney
Quad was redesigned to encourage the educational version of a Tweetup, with outdoor
power, moveable seating to enable clustering, and tables at desk height to replace the lap.
The need for competitive advantage for a University cannot be underestimated. Designing
the “cloistered” areas of the institution, its public realm, to accommodate and support the use
of mobile technologies, can only be advantageous.

**Techno-skirting**

Next in line come public and cultural facilities. Many public buildings and precincts around
the world have worked out that a WiFi overlay secures their visitation and invites patrons to
linger in their spaces ... both inside and out. The Pompidou Centre, Paris, Tate Modern,
London and MOMA, New York, all have three things in common; a purpose built cultural
facility, an associated public space – plaza, riverfront, and courtyard respectively – and have
a newly applied WiFi capability.

Exploring the Pompidou Centre a little further, this cultural institution was designed in the
“high tech” architectural style decades before the ubiquity of mobile technologies. It therefore
does not meaningfully accommodate their presence in the design of the building, inside or
out. Furthermore, there is the question of distance. How far from the WiFi epicentre will the
technology work? There is arguably a techno-skirt surrounding the building that could be
considered the mobile technology design zone. This zone neatly overlays on the public plaza
at the Pompidou Centre providing the perfect platform to investigate technology focused
public realm design. It also raises the question of how to retro-fit our established public
spaces with technology based infrastructure.

The view of people trailing from public facilities as they close with their laptop still on is
becoming an increasingly common phenomenon. The default techno-skirt enables people to
continue researching, thinking, communicating outside the neighbourhood, state or national
library, for example, for some undisclosed if not random distance. Sometimes it is just pure
luck that when the library closes you can finish writing your paper, often uncomfortably,
under a tree in the park outside. Where are the dedicated and considered park benches with
integrated power and laptop shelves? Someone must be designing them.

Closer to home, the techno-skirt at Federation Square, in Melbourne, is clearly defined.
Completed in 2002, Fed Square is a cultural precinct in central Melbourne which
accommodates a public broadcaster, art galleries, a museum, cinemas, exhibition spaces,
auditoria, restaurants, bars and shops around two major public spaces, one covered (The
Atrium), and the other open to the sky. A key part of the plaza design is its large, fixed public
screen, which is used to broadcast major sporting events, such as the AFL Grand Final, the
World Cup, and Olympics. It successfully gathers the public for collective experiences and
provides a true civic destination for the residents of Melbourne. It also proudly advertises
itself as:

“... the biggest free WiFi site in Australia, where visitors with a laptop and a wireless
connection can enjoy fast, easy internet access.”

The image advertising the WiFi on Fed Square’s website shows two separated individuals, in
heavy winter coats, at night under lights, sitting “side saddle” to their computers on the
sandstone wall that surrounds the outdoor plaza. With the greatest of respect to the designers of the place, and also the marketeers for the project, perhaps the ergonomics of how technology is physically used could have been better integrated into the design of the space to make it more user friendly.

**Smarter Design**

Ironically, it seems, the places where we gather - the plazas of our cities, the forecourts to our commercial buildings, the platforms of our railway stations - are the least enabled to physically accommodate the virtual technologies we now treat as a given in our lives. This raises the question of whether we should be encouraging the activity of “work,” among other activities, within our public spaces. Indeed, is it right to be able to access information anywhere, anytime. But in a world where we seek to encourage the use of space – for security, for legibility, for social life in urban spaces – surely we should be designing to accommodate another positive activation of our contemporary cities. If mobile technologies arguably drove us inside to work, the possibility exists for the same technology, be it broader in application, to be a catalyst for purposefully and meaningfully activating the public realm. In this way, mobile technologies have the potential to make public space more, not less, public. Perhaps Goldberger’s quote could be rewritten as:

“...mobile technologies can render a public space *more* public. It turns the boulevardier into an *engaged community member*, the *Tweeter into a figure with like-minded company*, and suddenly the meaning of the street as a public space has been hugely *reinforced.*”
Designing Human Habitat

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ABSTRACT

This paper will suggest an approach to urban design that seeks to ensure that people’s surroundings do not disadvantage them. It will offer a way of looking at our surroundings that reflects a commitment to respect the inherent dignity of all people and meeting the other social and economic imperatives that inform the practice of urban design.

The way towns and cities are designed can have profound and often unintended consequences on the ability of people to thrive and fulfil their potential. Our surroundings influence the opportunities available to us to forge the bonds of community, to meet our needs and express ourselves. Our surroundings make something’s easy, some things difficult and some things impossible. This paper will seek to shed some light on how this can have a profound effect on the quality of people’s lives by effectively making people prisoners of their surroundings, limited in the opportunities available to them. This paper concludes by suggesting some ideas about how we can better provide people with the “props” to meet their needs.

Keywords: Urban Design, Social Inclusion

No one sets out to design socially irresponsible environments yet that is often the outcome.

When people are not able to meet their needs their ability to thrive, fulfil their potential and contribute to society is diminished. The way we form our urban areas, the spaces they enclose and the values they embody can either hinder or enable people to meet those needs and can have a profound effect on the quality of people’s lives. “We shape our cities, and afterwards our cities shape us” to paraphrase Winston Churchill (1941).

A place that offers people many choices to access relevant qualities, services, activities and events, with minimal emotional or financial cost, will increase the chances of people being able to meet their needs, feel nurtured by their surroundings, forge the bonds of community with their neighbours, and develop a sense of meaningful connection and ownership over their surroundings.
The problem
Places that fail to provide these opportunities stifle the people who live and work there and makes their wellbeing something that happens despite, and not because of, their surroundings. The social symptoms of surroundings that fail to offer their inhabitants the opportunities they need have been documented by Jackson (2002), Louv (2005) and Kavanagh A et al (2007). The list of problems borne by individuals that have been attributed to a poor quality physical environment include poorer nutrition, poorer health, both physical and psychological, lower educational attainment, lower rates of social engagement, increased rates of alcohol consumption and lower life expectancy. Furthermore, the workings of the market and the way planning and urban design occurs often inadvertently compounds other forms of disadvantage where the poorest and most excluded communities are also those with the lowest levels of environmental quality (Kavanagh A, et al 2007). The perpetuation of poor design can lower quality of life and limit employment opportunities. The U.K's Commission for Architecture and the Built Environment (2006) states this “is likely to have significant adverse environmental, social and even economic effects”.

Toxic and Healthy environments
We believe that these outcomes are symptomatic of a dysfunctional relationship between people and place where the place does not support its occupants to meet their needs and those occupants cannot or will not maintain that place. This might be seen as a toxic relationship. This occurs when:
• A community is not able to access the relevant opportunities to meet their own needs; and
• The ability of those surroundings to meet its occupant’s needs is being eroded by issues such as vandalism, poor maintenance or irrelevant provision.

To put that another way, a toxic relationship is one where the people have a negative impact on their surroundings and those surroundings have a negative impact on them. Many commentators argue that low-density peripheral urban development with rigidly segregated and impermeable land uses, with poor connections to transport and commercial activity lock people into this disadvantage. We suggest this is an expression of a toxic relationship. However a healthy environment is one in which;
• A community enjoys surroundings that offer them a wide range of relevant opportunities to meet their own needs; and,
• The qualities and characteristics of those surroundings can be sustained in the long run by the people who benefit from it without detriment to other communities or future generations.

In other words, a healthy relationship is one where the people have a beneficial impact on their surroundings and those surroundings have a beneficial impact on them.

Emerging challenges
The undesirable outcomes of poor urban design are likely to be exacerbated in the future when peak oil and climate change make it increasingly difficult to service our cities in their present form. The increasing cost of fuel and transport threatens mobility and the increased cost of electricity threatens comfort of homes in extreme weather events. The increasing competition for scarce resources will result in those people living in peripheral low income, low density and car dependent suburbs finding it increasingly difficult to get to the places they need to get to, to enjoy a good quality of life. For example, with reduced ability to use a car it would be harder to access opportunities for social interaction, exercise or to get to meaningful employment, education, or access healthy, tasty food (ITPOES 2008).

Our responsibility
This paper contends that as planners and urban designers we help frame the choices that are open to the people that experience the results of our work. We have a responsibility to help create places that give the people that experience them the best possible chance to
make well informed decisions, stay healthy, forge meaningful connections, meet the challenges they set themselves and enjoy a good quality of life. In other words we should ensure “No-one should be seriously disadvantaged by where they live” (Social Exclusion Unit UK 2001).

The paper further contends that addressing this problem can be achieved by consciously designing environments that equip the people who will experience that environment to meet a wider range of their needs within that space, minimising time, effort and emotional cost of needs fulfilment. This can be achieved by designing places to reflect incidentality. This means designing places that equip people to meet needs incidental to their main reason for being in that place. For example they may be moving through a place to meet a key need (get to work, as part of their work, to get to school, shops etc), but that space also provides them with an opportunity to experience nature, meet friends etc, benefits they can enjoy with no or little opportunity cost as they are in that place anyway. The paper concludes that this quality will help ensure our surroundings, our habitat if you will, will become more efficient at meeting our needs. However it is recognised that whilst this is a part of equipping people to meet their needs it is not enough in itself and should form part of a broader range of initiatives if we are to create places that do not disadvantage people.
The Future of Wind Energy in The City

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**ABSTRACT**

A common depiction of the cities of the future is of modernistic buildings clad in solar collectors, adorned with foliage and topped with roof mounted wind turbines. Wind energy is certainly one of the fastest growing renewable sources currently being deployed, but what is the feasibility and the likely future of incorporating wind energy systems directly into our cities with building integrated wind turbines and can these help meet the energy demands of our future cities? This paper presents the author’s recent endeavours to integrate wind turbines into both existing and new commercial buildings. Details are presented of the process and viability of incorporating wind energy in buildings and the engineering and commercial challenges faced in this renewables sector.

**Keywords:** wind turbines, windtunnel, renewable energy, building mounted.

**Introduction**

If we are to meet our collective commitment to lower the carbon dioxide emissions in Australia, the energy sources supplying our cities must increasingly come from renewable sources. While large scale wind, solar, tidal and geothermal power plants will no doubt play a role, a strong case exists for distributed generation and the use of localised supply sources to reduce transmission loses and increase the diversity of the grid supply. In the case of city buildings which account for a large fraction of our overall carbon footprint, many operators could gain a competitive advantage in the low carbon economy by harvesting their own power from renewable sources thereby improving their energy ratings and mitigating the effect of rising grid power prices.

One possibility for city buildings is to harvest energy from the wind, exploiting the high elevation of skyscrapers and the various aerodynamic amplifications found amongst city buildings.

The integration of wind turbines on buildings can involve detailed architecturally sculpted building forms designed to enhance wind flow onto a set of turbines or more simply by the installation of roof mounted turbines on a new or existing building. This is a relatively new proposition for modern buildings despite the first use of wind mills for electricity generation as far back as 1887.

Most recently we have seen an increasing number of vertical axis wind turbines populating the market; these are designed to perform in turbulent urban environments as an alternative to the traditional horizontal axis turbines installed in most modern wind farms. This paper explores the feasibility of using building integrated wind turbines to generate power within a commercial building. The future of this resource could change the landscape of the city.

**The reasons to consider wind**

Many property managers and building owners in cities around Australia are actively looking for ways to reduce the carbon footprint of their buildings. The reasons stem from the need to future proof the facility from rising electricity prices and to increase the competitiveness of
the building under the pressure of mandatory disclosure. Moreover many businesses are
demonstrating a commitment to make cuts in their net operational emissions if not from a
cost management perspective then from marketability alone. The cost of not adapting their
facilities for the broad and varied impacts of climate change could be devastating to their
business.

With the National Australian Built Environment Rating Scheme (NABERS) building owners
and operators are presented with a market incentive to maintain high energy efficiency in the
operation of their buildings as star ratings are demonstrated to translate into increased rent.
Under mandatory disclosure building ratings will not just be advantageous to the four and
five star rated facilities but will have a similar impact across all classes of commercial
buildings. There is therefore an onus on individual building owners to take low carbon
strategies into their own hands rather than wait for technology such as clean coal, nuclear or
large scale renewable power plants to reduce the carbon associated with grid electricity.
Various government grants are also available to assist building owners to improve their
energy efficiency. So while the Australian Government have clearly stated that renewables
will form a key part of Australia’s low carbon future, it seems likely that the uptake of
renewables will occur across the largest and smallest consumers from businesses to homes.
Given the impetus to utilise wind as a resource in the city, how do designers determine the
extent of the resource and the opportunities to best exploit it?

Where is the wind resource in a city?
Wind is driven across the planet due to differential heating of the earth’s surface which
creates differences in air density and pressure near the surface, the air then flows to
equalise those pressure differences. As wind flows over the surface of the Earth and over
various natural and built forms it is disturbed by those obstacles and made more turbulent.
At greater elevations above the surface the wind is less disturbed by obstructions, this gives
rise to a velocity profile of increasing wind speed with height. Where there is little
disturbance such as over water, the wind can reach strong and steady velocities at relatively
low height and provide a high energy yield for off-shore wind turbines for example. Likewise
the temperature differences between land and sea can drive the wind onto turbines at
coastal locations. Local wind flow accelerations where air streams are compressed such as
over a ridge or through a valley or canyon where wind is funnelled can provide an effective
wind resource. While all these natural locations have among the highest wind speeds the
power undergoes transmission loses when it is exported back to the grid.

For individual buildings to utilise their own wind resource in a city environment the
aerodynamics of the city and buildings must be accounted for. Inner city wind flows can vary
considerably between quiet sheltered spaces to exposed roof tops as well as strong gusty
winds around the corners of buildings. In some city streets such as St Georges Terrace in
Perth the wind is funnelled along the street by the tall buildings on either side. In Melbourne
the Docklands area is a renowned windy location due to it’s open exposure to the bay. Wind
speeds at the top of the Rialto in Melbourne have been recorded at 253km/h. In many cities
tall buildings can deflect fast moving wind from upper elevations down to ground level
creating problematic gust impacts on pedestrians. Buildings which are most exposed to wind
effects usually include those that protrude a few stories higher than their immediate
neighbours and those positioned on the perimeter of the city upwind of the prevailing wind
direction. The wind exposure of these buildings provides an opportunity to harvest wind
energy using building mounted turbines. The author has undertaken measurements and
analysis of city buildings in Melbourne which show that at 10m above some high roof tops
the wind speeds can reach an annual average of 6.5m/s. Some partially shielded locations
show records of over 5m/s which still exceeds the turbine manufacturer’s typical
recommendation of 4.5m/s average wind speeds.
Aerodynamics of buildings

The author's experience in building aerodynamics stems from a multitude of wind tunnel tests on model buildings. These include smoke flow visualisation studies, pressure testing to determine cladding loads and velocity measurements around buildings to determine pedestrian wind impacts. When wind encounters a tall building the flow is disrupted and distorted. A consequence of the increased magnitude of wind speed with height is that some of the wind at higher elevations tends to be deflected downwards by the building. Typically a stagnation point forms at about two-thirds the height of the building above which the wind tends to flow upwards and over the roof and below this point the wind can tend to be deflected downwards causing gust impacts on pedestrians. Wind also flows around the building from the high pressure upwind side to the low pressure lee side. Often the wind is compressed and accelerates around the upwind corners of the building as well as over the roof. When flowing around square edges of a building the momentum of the wind tends to make it separate from the building surface giving rise to vortices and a separation zone of relatively low wind speed or reversed wind flow. Streamlined shapes such as curved roof profiles exhibit more steady and consistently faster wind flows and the streamlining of building forms can be used to enhance wind flow onto carefully positioned wind turbines. The wind flow around buildings in a city environment is often more unsteady and gusty, this condition has necessitated the evolution of vertical axis wind turbines which can more easily cope with gusty conditions. The challenge for building integrated wind turbines is to position the turbines around a building where they will experience the fastest and most consistent winds and the highest energy yield.

Evaluation of the wind resource

A couple of tools exist to help define the extent of the wind resource in a city environment. For an existing building it is possible to undertake wind monitoring with an anemometer. The important aspect of on site monitoring is to position the anemometer correctly so that it provides a representative measurement of the wind resource on the roof top. Anemometers provide a single measurement location in space so it is important to move the anemometer around to different locations where time permits. The anemometer data should be compared and normalised against the local bureau of meteorology data. Measurements of on-site wind speeds can form a valuable addition to verify computational modelling or wind tunnel test data. In the author’s experience often the site anemometer shows only a small component of the overall wind flow condition on the roof a building and if inadvertently located in a flow separation zone it can potentially miss areas of higher wind speed around other regions of the roof. By mapping out the wind speed distribution for all prevailing wind directions and utilising meteorological records to determine the wind speeds approaching the city it is possible to identify the prime locations on a roof for the installation of wind turbines. The most important aspect of maximising power from wind turbines is to realise that the power output is proportional to the cube of the wind speed. Therefore small improvements in wind speed can produce big gains in power output but missing the best winds on a roof top can be devastating to the energy yield.

Designing urban wind turbine Installations

On a medium to large commercial building the use of wind turbines as a renewable energy generator can be a viable proposal so long as it can be shown to meet certain design criteria. These usually relate not only to the power production and payback but also to the aesthetics and the overall environmental impact.

Wind turbines receive a mixed response within the community; there are those who find them an elegant symbol of clean energy and those who despise them as an unsightly addition to the local landscape. It seems that for wind energy systems to coexist with the population within a city they must do so inconspicuously and/or as gracefully as possible. The challenge remains in the small wind industry to adopt designs which will result in the least amount of objection. Councils seem generally supportive of wind energy systems in
most capitals as proposals and installations continue to gain support in Sydney, Hobart, Melbourne, Adelaide and Perth. In New York Mayor Bloomberg has envisioned wind turbines on New York buildings as a useful mechanism to reduce carbon.

It is important for any new building venture let alone one faced with a degree of scepticism to approach the issue with a scientifically grounded approach in design and selection of the technology. The following performance criteria are recommended.

Engineering performance criteria include assessment of the power output, start-up speed and braking performance. These may be demonstrated by a power curve obtained through testing to a standard such as IEC 61400 or by windtunnel tests of the product. Structural wind loads should be obtained by measurement and should include both static and dynamic (resonant) components. To date there is little of this information available on most urban turbines and some building owners may choose to undertake their own tests prior to considering the integration of wind on their buildings. The small wind industry needs significant work in this area.

Servicing and maintenance criteria should be demonstrated by the provision of local support for the product and by specifying maintenance activities based on recent installation experience. The proximity of local suppliers and installers to the site is an advantage when installing new or unfamiliar technology.

Environmental Impacts of the turbines should be shown to have no adverse impacts in terms of fauna, noise or electromagnetic interference. Aesthetics may also be factored into the assessment of the various turbines.

Available Technology
Within the performance criteria discussed above a search of the available technology for this application can be undertaken. Generally the manufacturers of vertical axis turbines claim their products are more suited to a turbulent environment and produce noise levels more conducive to a suburban or city location. Some manufacturers of horizontal axis turbines state that their products are not suitable for roof top applications. The small wind turbine industry is growing and developing worldwide and while one or two manufacturers have several years experience of supply and service, there are many who are relatively new to the industry with limited data to verify their products. The market supply of vertical axis turbines suitable for urban environments is the least developed within the wind turbine industry. Many of these products lack adequate test data and there is an ever present danger of encountering those seeking to exploit the renewables market for their own short term gain by offering less well engineered products or products with a superfluous point of difference. More than one supplier contacted by the author expressed confusion when asked to see a power curve for their product and simply focused on the fact that the turbine could be painted in various colours. The standardisation of product testing in this category is particularly lacking but is improving. In the future more customers will demand higher levels of certification as product familiarity increases.

Two recent turbine installations of note include the Bahrain World Trade Centre (in Bahrain) and the Strata building in London, both of which chose to use established and tested technology for their building integrated turbines. Both are of the horizontal axis variety and include building forms designed to enhance the wind flow onto the turbines. These are noted to be directionally limited and may produce unfavourable noise levels, it will be interesting to observe their performance in coming years. At Logan airport in Boston a set of parapet mounted turbines have been installed and are designed to pick up the wind acceleration effects over the roof of the building. Such products work suitably well for a strongly unidirectional wind climate. Some products are designed to attach to the corners of buildings to pick up the acceleration of wind around the building edges, designers must consider that
these turbines will produce little energy when they're on the downstream side of the building although they can still be a worthwhile installation.

**Future Engineering Challenges**

In order for the wind resource in cities to be exploited there needs to be further engineering of the available wind turbine products. Most of the urban turbines that exist on the market are designed for low rise residential applications with power outputs of up to 6kW. Larger vertical axis machines exist up to 200kW but only a few are available with capacities suited to a large commercial building in the range 30-50kW. For these products to be able to tap into the wind resource atop tall city buildings they need to be engineered and tested for such use. Structural safety is of paramount concern when installing these devices above a population centre. Turbines must be demonstrated to be capable of withstanding the fastest wind speeds recorded in cities as well as being resilient to fatigue and designed to resist dynamic loads across the whole wind velocity spectrum. Start up speeds must be reduced further so that the turbines can provide power in lighter winds. Simple methods for maintenance must be engineered into any wind turbine solution especially at the top of a 40 storey building.

**Business Case**

The business case for building mounted wind turbines is a function of the upfront capital cost and the on-going maintenance cost offset against the future avoided cost of electricity and other derived income such as renewable energy certificates (RECs). In the coming years electricity prices and RECs prices will be indirectly influenced by the price of carbon but a direct cost of carbon in the future should also be allowed for. The decoupling of domestic solar hot water RECs from commercial renewables in January 2010 will likely enable RECs to trade closer to their capped limit in coming years, this could provide a valuable income stream for wind energy generators.

The marketing benefits of a wind turbine installation are difficult to quantify as part of the business case however this could form part of the incentive for conscientious corporate organizations. Where wind turbines improve the overall building NABERS energy rating, the building may achieve greater rental when disclosing it’s GHG emissions under mandatory disclosure.

The business case predominantly comes down to the extent to which this clean renewable energy will offset the cost of grid electricity into the future. Electricity prices will be influenced by a variety of both demand pull and cost push inflationary pressures over the next two to three decades as well as direct regulatory control. The retail price of electricity is a summation of wholesale electricity prices, distribution costs, network costs, retailer’s supply costs and pressures associated with government policy such as emissions trading and renewable energy targets.

Modelling undertaken for the Garnaut review as part of the assessment on Australia’s Low carbon future shows that a government scheme (modelled start date 2011) such as the Carbon Pollution Reduction scheme will likely lead to strong price rises in the first three years after the introduction of the scheme. In late 2009 the NSW Independent Pricing and Regulatory Tribunal (IPART) corroborated the findings of earlier studies and announced a 62-68% increase in electricity prices could be expected in the first three years after the introduction of the CPRS. Even without emissions trading they have stated that a 40% price increase is necessary to cover the cost of network upgrades. Other forecasters are suggesting a 100% price rise in the next 5 years. In Victoria SP Ausnet have proposed a 400% increase in the peak summer tariff charges as a means to discourage non-essential peak use and to manage the grid demand. In Australia the demand for electricity will also increase with our increasing population. The impact of all these influences is an upward
push on electricity prices which must be accounted for when considering the business case for building integrated wind.

In January 2010 Australia’s mandatory renewable energy target has been expanded from a target of 9500GWh to 45,000GWh. The RET specifically addresses the use of renewable energy in the pursuit of stabilising Australia’s atmospheric CO₂ concentrations. Most commentators concede that renewable energy is a more expensive form of carbon reduction than other abatement measures (eg transport or agriculture reforms) but it is a desirable technology based initiative for our long term future. The expanded RET places greater pressure on costs within the economy and particularly the price of grid electricity because of the increased need of electricity retailers to purchase renewable energy certificates. Low, medium and high probability pricing models may be adopted when considering the business case for wind energy.

**Future Systems**

The short term future for wind energy systems will likely include numerous building mounted installations as the wind resource and business case can be demonstrated in a city environment. Designers will be able to appropriately locate the turbines to maximise the yield within the built environment considering the aerodynamics of the surrounding built forms. Importantly there will be fewer surprises in the performance and safety of the turbines as a result of increased testing to recognized standards.

The ever present issue of wind intermittency may be circumvented by intelligent energy management, where only essential services are operated by grid power and the wind energy is used to provide power supply that is not time critical such as making chilled water or hot water for later use. The power from wind energy can also be moderated by making hydrogen and combining the system with a fuel cell.

Intelligent control systems in turbines will enable products to tune themselves to the local built environment so they can more easily initiate their own start-up and can take advantage of certain site specific wind effects. Inverter and battery technology is also set to improve.

Wind turbines can also be used to control adverse wind gusts in complex built environments and could become an essential part of wind control in cities. By installing wind turbines around the edges of tall buildings they can dissipate wind energy and dampen the effects of tall buildings and mitigate the impact of gusts on pedestrians at street level. Vertical axis turbines positioned on certain street corners or across windy streets can have the same effect as a tree in subduing unpleasant wind effects.

Future wind energy systems in buildings may not necessarily be confined to a set of spinning blades. Future wind harvesting could come in the form of piezoelectric devices designed to capture energy from the motion of a building as it sways in the wind. These pressure sensitive devices can be installed in the foundations of the building or in the fabric to create a virtually invisible form of wind energy system.

**Conclusions**

Direct integration of wind energy systems into commercial buildings is already starting to gain increased interest and in the future we may expect more commercial buildings to be fitted with wind turbines. Some careful analysis and design is necessary before installing these wind energy systems in sufficient quantities to make a moderate difference to a building’s operational carbon footprint. Turbines must be appropriately cited to take advantage of the fastest flowing winds around a building especially in the context of a built up city environment. Turbine manufacturers must be encouraged to demonstrate the operation of their products by testing to recognized standards. Finally a business case can be established including modelling of future electricity pricing and consideration of the value of a reduced carbon building.
1 Propositions

As Richard Johnson, AIA 2008 Gold Medallist, recently observed, “I see architecture as a public art – an art that has the capacity to enrich our lives, to inspire us, to give tangible evidence of the values of our time and to respond to the important challenges facing us. I see ... we are all part of an old and noble profession. We have a responsibility not only to those who commission us, but, importantly, to the society in which we practice. This is, after all, one of the defining characteristics of a profession.”

Johnson rightly emphasises the public responsibility, which I believe should unite all involved in the creation of the built environment, whether specialising as an architect, planner, landscape architect, urban designer or in the engineering fields, as an academic or as a practitioner. Our responsibility to society stems equally from our role as professionals, and from our actual work in the city or in the field.

This lecture focuses particularly on our responsibilities to the public space of the city, also often referred to as the public realm or domain. For all our disciplines, making the project is our special field of action. The best city-making projects are positive agents of change; based on well-founded ideas, thoroughly researched and analysed, precisely drawn and articulated, expertly implemented and vigourously defended. The city gives rise to a concurrence of interests, many obviously competing for limited space and resources. The urban project, then, must be in the long-term interests of the citizens; equitable, sustainable, integrative, far sighted, culturally enriching, in the public interest in every sense possible. Such projects operate on and for the public domain, which is after all the collective space of democratic society.

At times, as I and others have found, advocating for the public interest can put you at odds with potential clients, disappointingly even public clients. Aalto may have famously quipped that the three rules of architecture were; “get the job, get the job, get
the job”; however I would contend that many jobs are questionable if not sufficiently defined in terms of the public benefits, if overly favourable to narrow private, sectional or transitory interests. We have an obligation, both as professionals and as citizens, to exercise our expertise in the broadest public interest.

Advocacy for the public realm, and hence the public project, is essential to the wellbeing of the city. All cities, across time and cultures, can be well understood by the qualities and availabilities of their public assets; the streets and monuments, the parks and natural assets, transport and other infrastructures, environmental systems, public places and buildings. Public space is also the theatre of celebrations and events, participation and dissent, socialisation and exchange, where we can experience the press of the crowd or quiet retreat. The quantum, distribution, operation and management of these societal assets are all of vital importance, as is the preparedness to deal with threats and creeping change.

Our expert disciplinary knowledge must be based on experience of the physical space of the city, on emersion in its culture and form. We should favour robust operating theories founded on urban history. We must be keen observers of activities and the occupation of urban space. We must understand place, its dimension and scale, its materiality and character. We must respond to specific questions of city making; how topography becomes the ground plane, how geography dictates microclimate, how public life occupies space, how spaces are defined, how streets frame the city, how blocks divide into lots, how architecture contributes to both the street and the skyplane. We need to articulate our expertise to engage with politics. From the most modest re-paving of a street to major new public transport infrastructure, the public project can have a positive transformative impact. While size and investment certainly matter, nonetheless even the smallest project can crystalise potent ideas and affirm commitment. Accordingly we must articulate our expertise to engage with politics.

Capturing time; the city’s history is never past; its future potential is always present. In the city we continue to live with the choices made, as successes and mistakes reverberate down through centuries. As we reflect on the first 5 000 years of urban life - a brief period coincident with recorded civilisation - we consider the local struggles of nature and the city. Today, on a global scale, we also confront the twin challenges of climate change and half of humanity living in cities. Therefore the imperative for the urban project is undeniably urgent. Now as always, we need to see, think and act.
As the 2006 Pritzker Prize winning architect and teacher Mendes da Rocha reminded us;

“Yes, because architecture is an activity that deals with soil mechanics, engineering, philosophy, anthropology, it addresses the needs of the population – selecting the forms and the spatial relations of all future construction in ways that can be public, democratic, free, enlightening and positive.”

2 Propositions as a counter to current Practices

All agree that the future of the Barangaroo site is vital to Sydney. This vast piece of public land, on the harbour foreshore, is in the heart of the city. It should be our great public place for the 21st century.

To be in the long-term interests of the city, any proposal for this site must be based on a great public domain; our new streets, squares, parklands and waterfront promenades must be as free and accessible as possible. Great public places make the city open and democratic - our space to use and enjoy. Think of the Opera House, our foreshore walks, beaches and parks; these are generous legacies that far-sighted citizens have passed on to future generations.

The opposite is now happening at Barangaroo. The current scheme's vocal proponents are obscuring fundamental issues of public interest and clouding the inadequacies of the design, procurement and planning processes. Instead of substance and transparency, we get a spin of simplistic notions about the shape of the foreshore, whiz-bang images and commercial buzz.

The Barangaroo Concept Plan was based on the 2006 competition-winning project (Philip Thalis, Paul Berkemeier and Jane Irwin led the winning team) and was initially approved by the Government as the original Concept Plan in 2007. This planning document was meant to guide the delivery of the site. The entire waterfront was reserved as inalienable public land, without commercial intrusions. A fine-grain network of public streets organised the site into blocks, connecting into the structure of central Sydney while allowing ample development potential.
The original design proposed many small-scale and delightful places where people could engage with the harbour’s edge. Instead two excavated inlets that cut this generous site into three separate chunks are now being offered. These unrelated fragments risk becoming enclaves, disconnected from each other and cut off from the heart of the city. Demolition and reconstruction of seawalls is hugely expensive and has unknown environmental impacts. Why, at great cost, lose so much useable public space? Why, to pay for such folly, should we underwrite developers’ profits?

The Stage One development proposal, announced by the NSW Government just before Christmas 2009, is founded on the private interests of a single developer. Its scheme voids the proposed network of public streets that are, in Sydney as in any good city, the major arteries of public life.

A developer’s responsibilities to shareholders typically outweigh any responsibilities to the city. Is it not inevitable that the publicness of the streets and foreshore will be eroded for commercial advantage? That all available land will have to turn a profit? Are the proposed public spaces along the waterfront really public at all? The "verandah" is a front for private concessions; the "public pier" is the doormat to a massive private hotel development that intrudes into our harbour. Real public space should accommodate all without undue commercialisation – spaces where we are free to sit, play and enjoy without the pressure to spend. This scheme merges the most sterilising concepts of the post-war city – the shopping mall and the business park - overlaid by the glitzy imagery of Dubai.

Recent presentations of the current scheme draw parallels between Barangaroo and the intensity of New York. The proposed development enclave is the opposite of the democratic reality that is Manhattan. Mature global cities would never let private interests play with their waterfront.

Remember that Barangaroo is publicly owned land, not a private development site. Therefore the processes of change must be even more open to public scrutiny. Why won't the NSW Government reveal details of the contract it is proposing to sign with the developer? A grant of 7.3 hectares is the largest ever parcel of land given over to a single developer in the history of the City of Sydney – entitling the developer to build half a million square metres of floor space and counting. Despite the unprecedented generosity of this development deal, the developer is asking for the additional, exceptional right to build over a further 0.75 hectares of harbour.
The Premier and NSW Government are now in the untenable position of advocating for the interests of private development over our interests as citizens and the actual owners of the land. The Premier and Planning Minister have already signed a secret undertaking with the developer Lend Lease, yet the same Minister will be sitting in judgement upon the proposed changes to the approved Concept Plan. How can that be right?

The facts are conspicuously absent from the cynical, sketchy publicity material so far displayed. Surely the citizens have the right to full disclosure from the NSW Government?

The current proposals for Barangaroo show with searing clarity the risks of bad urban projects. Like failed forerunners such as The Rocks redevelopment scheme in the 1960’s, the Woolloomooloo Redevelopment Scheme in the 1970’s (both fortunately prevented from proceeding), or Darling Harbour in the 1980’s, or indeed Melbourne’s Docklands today, these projects thwart the open city. They show the dangers of giving development interests precedence, uncovering the lack of conviction of the institutions that are meant to be the custodians the genuine public interest. Such processes and projects are a threat to the city – a threat that must be exposed and challenged.

"Leaving aside representation, ornamentation and decoration art can become praxis and poesis on a social scale: the art of living in the city as a work of art…. In other words, the future of art is not artistic, but urban, because the future of ‘man’ is not discovered in the cosmos, or in the people, or in production, but in urban society. (Like art, philosophy can and must rehabilitate itself in this perspective.)"3

Philip Thalis, with Paul Berkemeier and Jane Irwin, led the team that won the 2006 International Design Competition for Barangaroo.
1 Richard Johnson AIA 2008 Gold Medallist – AS Hook Address
Published in Architecture Australia January / February 2009

2 2006 Interview, Paulo Mendes da Rocha – Fifty Years - Rizzoli, New York 2007

Benefits of CFD in Sustainable Buildings

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Abstract
Currently within the Australian Market CFD is rarely used when designing a building. Computational Fluid Dynamics uses algorithms to solve and analyze fluid flows and displays these results in a 3D representation of the space. In a building some of the main components that CFD software can examine are the air temperature, air velocity, air change effectiveness and thermal comfort.

By using Computational Fluid Dynamics feasibility Studies of Natural Ventilation can be performed and the grille locations, supply air rates, supply air temperatures and the building facade can be optimised to help increase thermal comfort and energy efficiency with the space.

Introduction
The authors have been in the industry for many years working on improving energy consumption and efficiency for buildings.

In recent years there is a strong push in the market place for Sustainable Buildings. The engineering interpretation of Sustainable Buildings is generally buildings that consume less resource to operate, provide healthy and comfortable environment and reduces waste generated. This extends to the reduction in energy consumption in constructing the building, and to a lesser extent, reduction in energy wastes to remove the building at the end of its economic life.

With the increase in computing power at less expense, a large number of computer applications have been developed for building design and CFD (computational fluid dynamics) applications are some of them. The use of CFD in building design is becoming more common as the computing power required to perform CFD calculations are now available much cheaper. A large number of CFD codes could be run on PC platforms.

This paper discusses the application of CFD simulations in Sustainable Building designs and illustrates with recent examples.

Benefits of a Sustainable Building
Sustainability is rapidly emerging as a priority for high profile tenants occupying commercial office buildings. This trend is driven by several factors: legislation; corporate social/environmental responsibility reporting requirements (CSR); staff retention/productivity needs; marketing benefits and direct cost savings associated with resource efficiency. Consequently the demand for ‘green’ commercial office space is significant, and sustainability is increasingly referred to in new and renewable lease agreements.
Sustainable Buildings are generally highlighted in local and national media— including newspapers; consumer and industry magazines; newsletters and electronic news services; corporate reporting; conferences; workshops and educational seminars.

By increasing a building's energy efficiency there is a direct cost savings that can dramatically cut running costs for the building owner and the tenants. Currently in the market place energy efficiency is becoming a priority among tenants and building owners. The ease of filling vacancies and tenant retention is increased if a building is known for being energy efficient.

There are also considerable potential productivity gains associated with improving the Indoor Environment Quality. Increased fresh air rates, penetration of natural light into the floor plate, thermal comfort, adequate lighting levels, reduced glare and low levels of pollution all help to increase productivity. Occupants may also enjoy the appeal of working in an attractive and sustainable office building. Studies have been done in schools and commercial buildings which prove areas with a high indoor environment are more productive. This is a huge benefit for a tenant and a great selling point for a building owner.

Computational Fluid Dynamics

CFD is the acronym for Computational Fluid Dynamics. It refers to the computer codes written to solve simultaneous equations in thermal and fluid dynamics. There are a large number of CFD codes in the market, some of them are free. However, most people nowadays refer to CFD programs is not only the computer codes, but also the pre and post processing software that handles the data input for the computation and produce understandable outputs after the computation. Some CFD packages also include visualisation software to visually display the results.

CFD is a predictive design tool that enables the designer to visualise the results of his/her design on a computer screen. There are many software packages that can perform CFD modelling. Two of these software are IES Virtual Environment (Simplistic models) and Phoenics (Large or complex models). Using these software packages CFD models can be created for a broad range of applications that relate to the interior or exterior of a building.

The indoor built environment involves the analysis and understanding of the flow of air and its thermal (heating and cooling) behaviour. The use of CFD packages would therefore enable a better understanding of the indoor environment without the expenses of carrying out physical experiments or mock-ups.

There are some limitations when using CFD software. The more complex the model the longer it will take to run. This means for complex models the results can take from days and up to weeks to get results. If there is an error in the model the simulation has to be run again. Most CFD softwares allow the model to be paused during simulation to view the intermediate results so that errors can be picked up at an earlier stage but this can still take time before the errors can be detected.

To reduce run time and overall cost of the exercise the model needs to be simpler however this can cause the results to be less accurate. An assessment needs to be performed to identify the level of complexity and accuracy that is required.

CFD Application in Sustainable Buildings

By using CFD to model the indoor air environment, the air grille locations, supply air rates, supply air temperatures and even the building facade can be optimised to help increase thermal comfort and energy efficiency within the space.
**Air Change Effectiveness**

ASHRAE defines ventilation effectiveness is a description of an air distribution system’s ability to remove internally generated pollutants from a building, zone or space. Air Change Effectiveness (ACE) is a description of an air distribution systems ability to deliver ventilation air to a building, zone or space.”

Typically a design engineer does not have the knowledge or control of the pollutants that are going into or generated within the air conditioned space. Therefore ACE is more relevant when designing the air conditioning system to ensure that the building is designed to reduce pollutant levels.

Using CFD allows the ACE to be calculated which provides localised ACE results over the floor plate. This allows for optimisation of the diffuser placement and supply air rates to maintain air quality while not over designing the diffuser placement. If the simulation shows that the ACE is performing better than required then the supply air rates and temperature can be reduced to save on energy.

Having a high ACE is beneficial to the occupants as any indoor pollutants will be removed at a faster rate.

**Natural Ventilation**

By using Natural Ventilation within a building multiple benefits can be achieved,

- The operating costs of the building can be decreased by eliminating or reducing the need for mechanical ventilation plant
- The construction costs can be decrease be eliminating or reducing the need to air-condition the space.
- Decrease green house gas emissions by reducing energy consumption.
- Increase the controllability of the indoor environment by occupants, e.g. openable windows

There are two types of natural ventilation that can be used in buildings. The two types are “Cross Flow Ventilation” and “Stack Effect”.

Cross flow ventilation is driven from wind. By having openings into the space on two different facing facades when the wind is blowing on one side then a positive pressure is created on that opening. The other opening will experience a smaller or negative pressure that will create an air flow through the space. The openings do not have to be on the opposite sides but the best results will occur when they are opposite. To optimise the positioning of the opening CFD can be used.

Due this cross flow ventilation being highly dependent on the wind conditions an assessment of the area needs to take place. Using the wind data multiple simulations of the building would be performed. If there are a number of buildings around the site that will affect the wind distribution then they would also be modelled. From these assessments the placement of the openings as well as the building form and orientation can be optimised and calculations can be performed to identify the times throughout the year that the cross flow ventilation can be used.

Stack Effect uses the concept that hot air rises due to it having a lower density than cold air. By having a central atrium with floors open to the atrium and to the outside as the air heats up within the space and the atrium the air rises to the top of the building where is it ventilated. This causes air to be pulled through the openings around the perimeter of each floor keeping the areas cool.
Using CFD the temperature differential from the ground to the roof and on the floors can be calculated allowing for the openings placement of the openings as well as the building form and orientation to be optimised.

Thermal Comfort
Thermal Comfort can play a very important part in workers performance and productivity. Using a factor called Predicted Mean Vote (PMV) the number of staff satisfied within a space can be calculated. This can be calculated for by hand but it will only provide an average PMV for the whole area which does not give a very good indication about how the space is going to perform over the year and if the grille locations and supply air rate is adequate or excessive.

Using CFD any cold or hot spots can be identified and the grille supply rates and temperature can be modified to achieve the desired thermal comfort while reducing the energy consumption.

Use of CFD in the Market
Currently within the marketplace CFD is rarely used to improve the Sustainability of a building and when it used it usually isn’t to its full potential. This is due to the majority of the time the person performing the CFD calculation isn’t the Mechanical Services designer, who is not normally sufficiently skilled to optimise the system.

The number of CFD software packages in the market and their relatively expensive costs make it difficult to widely apply the tool. The complex nature of computer modelling also presents some challenges to the engineering designer to completely understand the constraints of the software packages. This is some of the reason why a lot of CFD work is carried out by computer modellers, not the design engineer.

Examples

Cochlear Global Headquarters

The new Cochlear Global Headquarters was built in 2010 and achieved a 4 star Green Star design rating. The building was a 6 story office tower with 2 levels of underground car park with a net lettable area (NLA) of 23,309m². Points of interest were Façade optimisation, Thermal Modelling and CFD analysis.

In terms of CFD analysis, one of the credits that was achieved under the Green Star program was “IEQ-2 Air Change Effectiveness”. During the design stage ACE calculations were performed using CFD software. From this initial assessment it was determined that the ACE was performing better than the Green Star assessment requirement.
Another assessment was then performed at the lower supply air rate and temperature. This assessment not only investigated the ACE but also the air temperature and comfort throughout the space to determine if the lower supply temperature would affect the occupants.

This enabled the airflow to be reduced to 3l/s/m² from a typical .5-6 l/s/m². Due to supplying less air it reduces the fan energy required. Overall this reduced the energy consumption for the building while maintaining an adequate ACE.

This reduced the yearly energy consumption of the AHUs and return air fan from 193.3MWh a year to 149.1MWh. This relates to a direct savings of approximately $5,700 pa. Savings are also achieved through the reduction of contractor cost through building tuning. By performing the studies the correct airflows can be assigned to each grille which will reduce the need of modifying the grille locations and air flows after construction to get the desired air conditions.

The CFD simulation would take between 0.5 a day to 1 day for a typical floor.

The benefits from the CFD studies included,

- Increased Occupant Comfort through ACE.
- Increase Occupant Comfort through air supply temperature and rates.
- Decreased Energy Consumption.
- Decreased Upfront Cost.

Integer Resort Hotels, China

The Integer Resort Hotels Development was a sustainable group of resort hotels built in China. This development used multiple modelling tools to optimise the building.

CFD was used to optimise the building orientation and openings placement. Due to surrounding buildings and landscape around the development a macro-flow simulation was required that incorporated the surrounding buildings to identify the effect on the air flow.
From this simulation the airflow pattern around the building was identified which allowed for the interior natural ventilation model to be performed. This allows for optimisation of the building orientation and opening placement.

However Natural Ventilation is only one part of the whole Sustainable Development. The level of Daylight within the building had to be assessed. Once the natural ventilation had been studied, daylight modelling was carried out. From this, the CFD model and the Daylight Model were modified to still retain the natural ventilation performance while increasing the daylight to the apartments.

**Conclusions**

CFD software is beneficial for Sustainable Building designs in multiple aspects,

- Energy savings can be made through design optimisation along with being able to prove the feasibility of using alternative designs such as natural ventilation.
- Upfront costs can be reduced by being able to provide more detailed information during the design stage to minimise building tuning later down the track.
- Occupant comfort can be improved by performing thermal comfort and ACE analysis. This assists in increasing staff productivity and therefore increased profit.
- Able to provide confidence in alternative solutions such as natural ventilation.

Currently in the Australian market CFD is not yet widely used in new buildings. However it is used regularly in other places around the world.

The benefits of using CFD have been demonstrated through multiple projects where without CFD, it would not have achieved the desired outcomes cost effectively.

For new developments, CFD should be used as a design tool to assist in predicting the design performance and assist in improving the sustainability of the building, where design changes are much cheaper to implement than changes during the later stages of the project.
Rethinking the Dwelling

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Abstract

While we seek housing affordability and sustainability, larger houses accommodate smaller households, and “affordable” is relegated to suburban fringes. Higher density is perceived as over-scaled, ugly, or impersonal, with few positive models. We need a new paradigm, limiting floor area and offering genuine choice. Existing urban fabric has the resilience and capacity to accommodate innovation. Learning from early, fine-grained examples, infill in a pre-war low-density suburb is explored. Affordability, sustainability and community are addressed through existing codes, advantageous site attributes and innovative design. We achieve site densities equivalent to 64 dwellings per hectare, high amenity and a light footprint, wide choice from 3-bed to studio, and innovative household and community dynamics, demonstrating the value of looking outside the square.

Keywords: Housing diversity and affordability, Sustainable higher density development, Renewable development, Energy efficient building design, Settlement patterns.

Background and Context

Housing affordability, sustainability and community cohesion are increasingly high on the urban design agenda. But our predominant forms of development are not responsive to those objectives. Despite lofty strategies stipulating more compact development and more “connected” communities, the urban form being delivered by the predominant speculative development process is too often further exacerbating unsustainable trends.

The degree to which housing has been decreasing in “affordability” over recent decades is paralleled by the increasing floor area per person and by increasingly unrealistic expectations of what features housing should include. Our typical suburban house is now 30% larger than 20 years ago, yet average household size is significantly smaller. Even first-time homeowners insist on more bedrooms than people, and the up-front inclusion of extensive extras, from ensuites, carpets and paved driveways to air conditioning and fortress-like fences. The concept of “affordable” is now relegated to far-flung fringes where low-set cookie-cutter mini-McMansions are replicated on broad- hectare land, lower-cost because of remoteness from employment, services, amenities and opportunities for exchange.

This trend cannot go on forever. The added cost of services, of transport, and the social cost of isolation and exclusion mean that living in these far-flung fringes is both unaffordable and unsustainable. As we become more affected by oil depletion over time, the prospect of access
to centralised jobs and urban services from car-dependent localities will become even less
tenable. We are therefore guided by current planning strategies to consolidate through infill
development closer to transport, to jobs, to goods and services and to a wider range of
opportunities for human contact and exchange, rather than continuing to sprawl inexorably at
the fringes.

However, there has been strong negative reaction to the concept of infill development from the
communities where it is proposed. It is commonly argued that infill will destroy neighbourhood
character, be beyond human scale, result in unmanageable traffic increases, increase crime
rates, and devalue surrounding property values. Higher density development is perceived as
being typified by over-scaled McMansions on split blocks, ugly “six-pack” walk-ups, or
impersonal and over-shadowing highrise. We have few models in Australian experience
demonstrating a more amenable and complementary way forward.

A New Paradigm

We need a new paradigm. Instead of maximising floor area and features, we need more
effective and amenable utilisation of the more limited floor area and features that we can more
reasonably afford. Instead of sizing all houses for large families, we must offer genuine choice
and provide product suitable to a changing demographic context. We need to respect the fine-
grained scale and character of the neighbourhoods we are integrating into. We need to take
advantage of the attributes of individual sites and situations, to deliver outcomes that add to,
rather than detract from, the receiving community.

There is an alternative way forward. There is more opportunity in existing patterns of
subdivision and flexibility in existing planning codes than is generally appreciated. Existing
urban fabric and character does have the resilience and capacity to accommodate innovation.

Learning from History

Prior to 1946 and the explosion of the car-culture as the predominant driver of urban form, my
town of Brisbane was a classical star-shaped city. It featured fine-grained, tightly grouped
residences, mostly of small physical footprint, arranged in clearly-defined corridors within
walking distance of the rail lines and the tramways. Intensive, if low scale, mixed use centres
punctuated the stops and termini of the transit systems, as the foci of local exchange. Between
these corridors were green “wedges” of open space and agricultural production.

Interestingly, those same early urban corridors and their suburbs, including their tiny workers’
cottages, are still among the most exclusive and sought-after in the city. The fine grain, the
character and human scale, the proximity to services and amenities, and the access to
transport, remain highly-valued attributes. Perhaps we can learn something from them.

A Personal Case Study

My personal case study is based on a modest infill development I am undertaking in a pre-war
suburb some nine kilometres from Brisbane’s CBD near the Ferny Grove railway line. It is an
exploration of an alternative infill typology – of “rethinking” the dwelling, of seeking a more
sustainable option for addressing the housing challenge. The intent is to "tick all the boxes" of more sustainable housing, viz:

- Affordability;
- Wide housing choice to accommodate those in different stages of their life cycle;
- Increased population (close to transport) without grossing the footprint;
- Design for low energy, water cycle management and comfortable lifestyle;
- Optimising site attributes (existing subdivision, orientation, views, breezes, etc);
- Retention of existing (pre-1946) built fabric;
- Retention of existing street scale and character;
- Increased opportunity for social exchange without undue impact on privacy;
- Reduced vulnerability to impacts of peak oil;
- Conformance with existing codes and planning provisions;
- An inflation-adjusting income stream yielded from modest rental rates.

The 607 sqm site comprises two allotments, one 10 metres by 40 metres, the other 5 metres by 40 metres, originally on a single title. The site is currently occupied by a tiny (40 sqm) one-bedroom cottage which may have been a drover’s cottage in the days before the area was first developed as an orange orchard and later subdivided. The cottage sits primarily on the wider of the existing allotments, but eaves and a patio roof encroach onto the narrower lot. The site has a northerly aspect and rises four metres from the street. The site is zoned low density residential and, although in an area developed before 1946, is not in a demolition control precinct. Surrounding development is typically high-set single-family dwellings of various ages and condition.

The street is wide, with a pavement of over 11 metres, and is relatively featureless, save for a community tree-planting program a few years ago which has softened the ambience to some degree. There is a bus stop next door and another across the road. This bus route is currently very infrequent and operates only at inconvenient times. It is just over 800 metres walk to the rail station and to express bus stops. The current tenant of the cottage does not own a car, and gets by with public transport (augmented by occasional lifts from family and friends).

So far, I have severed the titles and obtained separate certificates of title. Queensland Urban Utilities (a business arm of Brisbane City Council) has duplicated the water supply and sewerage services. I have confirmation from the City Council that, under the Planning Scheme, the development proposed does not require town planning application, so long as it conforms to the low density development code, the house code and the small lot housing code. I engaged Bligh Graham Architects who have developed concepts and prepared design documents. The plans have now been assessed by a private certifier as conforming to the relevant codes.

A Different Typology – “Rethinking” the Dwelling

In this example, affordability is addressed through greater utilisation of the site, and by space efficiency achieved through small floor-plates. The cottage will be retained, renovated and repositioned as a "secondary dwelling" (less than 70 sqm) on the 10 m wide block with a
setback of 1.5 m on each side and of 6 m to the front. The undercroft will be excavated for car-spaces (which are required under the code).

Using the small-lot housing code, compact two-story “principle” dwellings built to the common boundary, will be established at the rear of each allotment, with 6 m rear setbacks and 1.5 metre side-yard setbacks opposite the common boundary. The one on the wider allotment will be a 3-bed with rumpus room, en-suite and office. The one on the narrow lot will be a very compact 2-bed, akin to the traditional row houses of Sydney’s Surrey Hills. A detached bed-sit "studio" will be positioned as a "secondary" dwelling above a car-space behind the front setback of the "narrow" attached dwelling.

The heights of the bed-sit studio floor and verandah roof will correspond to those of the cottage, helping the new structure to read as a companion, rather than conflicting, identity. The modest floor areas of each dwelling allow a substantial shared central open space courtyard between the front and rear dwellings of each lot. Significant trees in the courtyard will be visible from the street, softening the apparent bulk of the rear buildings and adding to the amenity and ambience of the courtyard. There is also the potential to open the side-yard between the courtyards to create a greater shared zone between pairs, or to screen it into semi-private spaces for each pair.

The slope of the land allows the dwellings at the rear to enjoy the views, breezes and amenity of the northern orientation overtop of the lower scaled dwellings at the front. The north-sloping roof surfaces lend themselves to solar hot water and solar electricity. The buildings are being "sub-tropically" designed to make the best of opportunities for solar orientation, cross-ventilation and vertical air movement, achieving comfort conditions without air conditioning. Provision will be made for rainwater storage and grey-water reuse.

Driveways will be grass over a stabilising grid to both soften the appearance and minimise the runoff from hard surfaces. There will be no front fence, but delineation of the front yard will be created with vegetation, landform and seating to visually "engage" with the footpath.

Entry to all dwellings will be via the central shared courtyards. As the primary and secondary dwellings on each allotment are prescribed to be occupied by the same "household" (allowing that a "household" can comprise a number of unrelated persons so doesn't preclude a single household including "Fonzie" tenancies), the shared courtyard provides the opportunity to explore the social implications of the balance of privacy and sharing. The Spanish-influenced courtyard housing I experienced in New Orleans some decades ago gives me hope that this experiment will also work to foster positive engagement. I anticipate that tenants will tend to self-select on the basis of their willingness to enter into this kind of semi-shared arrangement. My hope is that it will foster a re-invention of the positive creative dynamic we used to enjoy in share-houses, and in dwellings and flats, before our natural propensity to act as social beings was overwhelmed by the more recent imposition of 1.8 metre fences and opaque privacy screens.

The rear yards, side yards and courtyards provide opportunities for "edible" landscape for
residents to grow their own food. The small building footprints accommodating the central courtyards, in addition to the front and rear yards, actually offer more open space than is typical of the single dwelling "urban McMansions" most often seen as the result of redevelopment of narrow lots.

Conclusion

Utilising existing development codes, advantageous site attributes and sub-tropical design principles, issues of affordability, sustainability and community are addressed. The result achieves site densities equivalent to 32 households (or 64 dwellings) per hectare with high amenity and a very light footprint. The dwelling choice ranges from a 3-bed dwelling to a bed/sit studio and explores innovative concepts of household and community dynamics. This approach to an alternative typology does not claim to be a “silver bullet”, but does demonstrate the value of looking outside the square.
Future population shocks and the need for urban growth management

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ABSTRACT

Australia is in the middle of a population boom it needs to accommodate 35 million people by 2050. Currently, about 443,000 people are added to our population every year. The figure used to be just 220,000. This is being generated by immigration rates and a generation X driven baby boom. Even with our present population of 22 million the deterioration in the quality of life in our cities is obvious – schools, hospitals, transport systems and water supply are already inadequate.

Australia cities are experiencing constant change but are they heading in the right direction? Federal Government needs to develop a robust and co-ordinated engagement to facilitate urban growth management throughout Australia to respond to demographic change.

Keywords: (growth, demographic change, settlement patterns, transport)

Introduction

Since “Big Australia” was announced by former PM Rudd in October 2009 the new PM Gillard’s call for sustainable population policy announced in July 2010 is timely. The key to sustainable population is not population policy it is creating livable cities. Livable cities, like healthy bodies need good circulation. The key to livable cities is mass transit connectivity to and from home, work and play. Citizens should be rethinking core attitudes and behaviors about “progress” when market forces and individual freedoms are generating major environmental impacts, increased congestion and housing stress in our cities?

Coalition of Australian Government (COAG)

The 9 COAG criteria that measure overall Capital Cities performance are:

1. **integration**: the level of integration of the strategic planning system.

2. **presence of plans**: existence of hierarchy of plans

3. **infrastructure**: inclusion of nationally significant economic infrastructure

4. **addressing Policy issues**: specifically nationally significant ones

5. **emphasis on networks**: considering and strengthening networks between capital cities and other important regions.
6. **land release policies**: land release and balance of infill and greenfield development.

7. **encouraging investment**: identified priorities for investment and policy effort by government and the private sector.

8. **urban design**: world class urban design and architecture

9. **implementation**: effective implementation of arrangements and supporting mechanisms

These criteria have been applied to the eight major capital cities that highlight where cities are responding and where they are failing to respond. This will become increasingly important as Infrastructure Australia funds will be allocated to those cities that are clearly seen to be managing their urban areas effectively, otherwise they will not be funded.

**Future growth studies by different Australian States**

Gaining an insight into future growth by the different States has been undertaken in a number of ways including:

- **Queensland** undertook a Growth Summit in March 2010 that involved various experts and stakeholders in response to rapid population increases.
- **NSW** launched consultation review papers for the transport and metropolitan strategies
- **Victoria** undertook an independent assessment of Melbourne 2030 by a panel of experts.
- The 30 year Plan for Greater Adelaide was subject to wide spread consultation
- The **critical issue** for all these plans is whether stakeholders are supportive or whether they are being opposed and contested for each development application for increased housing supply.

Brisbane, Perth and Hobart are expected to have higher population levels than the annual planning level and this means that they may face challenges in the way they respond to housing supply and service provision.

Significant population growth is the greatest challenge facing Australian capital cities.

There are significant differences between the planned population forecasts and the actual increases in 2008-09. There needs to be more regular reviews to ensure government agencies are responding to the demand to ensure service delivery of:

- **housing supply**,  
- **education**  
- **health and community services**.

Long term population projections for the major cities indicate major population growth. Implementation arrangements will be crucial in delivering this growth in infill areas and priority growth areas.
Forecast additional population growth for Australian capital cities

South East Queensland 1.6 million additional population by 2031
Sydney Metropolitan area 1.7 million additional population by 2036
Canberra Capital area 98,000 additional population by 2031
Melbourne Metropolitan area 1.8 million additional population by 2031
Adelaide Metropolitan area 560,000 additional population by 2038
Perth Metropolitan area 556,000 additional population by 2031

National re-think required on the location of future urban growth.

Australians have never idealised city life instead the bush and the beach are celebrated

- Long term population forecasts are often unreliable “nonsense on stilts”
- They are more likely to be wrong than right
- Australia was forecast to have 8 million population by 2000 it got more than double.

There needs to be a co-ordinated national rethink and review about where future population growth is located? Currently as is well documented sea changers are moving to coast and tree changers are depopulatng the hinterland. With predictions of sea level rises is population moving in the right direction?

Australian capital cities are dispersed with low density urban forms and structures that are failing to respond to increasing pressure from growth on ageing infrastructure, transport systems, un-met housing supply, lack of integration of land uses and transport connections by multiple un co-ordinated government agencies. Metropolitan Planning strategies are not given the status of co-ordinating differerent State Agencies programs with different time frames and objectives, departments answerinng to differnt State Government Ministers.

Decentralization of growth should no longer be regarded as a sacred cow in a rural pasture.

Queensland ‘s Urban Land Development Authority will master plan (3) new satellite cities at Ripley Valley, Greater Flagstone and Yarrabilla to house 250,000 population

Victoria have undertaken a Regional cities feasibility study as to whether they should be targets for growth. Eight cities have been identified including Albury- Wodonga, Ballart, Bendigo, Shepparton, Mildura, Warrambool and Geelong.

The Resources boom would benefit from government support in remote mining areas through the creation of well planned settlements for workers and families and transport links to the ports.
Urban form can be broadly influenced through current state planning policies, local residential codes and design guidelines. The supermarket giant TESCO in the UK is maximizing the use of its properties by adding house construction above its supermarkets. The new approach is being coined as the birth of the Supermarket suburb.

Tesco the UK Supermarket giant is preparing to build a high rise with 367 apartments, shops and health centre in West London. The project nicknamed “Tesco Town” would include a supermarket, creche and a square, named Tesco plaza. Many have objected to this truly depressing invention “living in a Tesco Tower would feel like being a packet of frozen peas stacked on their shelves”. Will Westfield, Coles and Woolworths in Australia follow this trend?

Spatial planning provides the backbone and skeleton to metropolitan planning to rationalize the functioning of the city. Australian capital cities are suffering from imbalances owing to centralization of employment and haphazard dispersal of centres and lack of public transport links.

These problems are causing increasing distress including dislocation of housing and job markets, increasing transport congestion and social stress. The VAMPIRE index highlights these problems and the lack of balanced development.

The Eastern suburbs of Sydney are densely populated yet few residents complain about overcrowding because residents have access to reliable and frequent public transport. In fact these suburbs are keenly sought after because they provide a high quality of urban living.

Density is not the problem in the western suburbs it is lack of public transport.

Lack of transport connectivity in cities discriminates against commuters, the old the poor and the young. There needs to be a rethink of transport priorities away from single car occupancy to walking cycling and mass public transport provision.

Priority targets need to be changed to:

• Promote walking and cycling facilities
• Increased use of public transport
• Improved pick up and drop off facilities
• Improved parking management
• Promote travel change – green travel plans

Re-engineer working days from 9-5 into early and late shifts to create 14 hour city that would result in 30 - 40% increased utilization of roads and office buildings through flexible working.
Density comparisons between Sydney and other western cities

By way of comparison if Sydney had the same density as London we would share it with nearly 58 million population. Montreal has the same population as Sydney but covers only 35% of the area.

Reshaping are cities with renewable energy

The first “Smart Grid city” in the USA is Boulder, Colorado that provides cutting edge energy savings that services plug in electric cars with zero carbon emissions. The grid could be extended to support public transport vehicles to reshape the city fueled by renewable energy.

Australia can accommodate future growth

National policy co-ordination is required to solve structural regional problems and to build strong well connected cities.

As Australian cities expand it will be important to have balanced development instead of competing cities. e.g. need to adopt models like the Ranstaad in the Netherlands.

The Melbourne 2030 plan endorses an integrated metropolitan structure by designating six sites for new CBD scale developments within the middle and outer suburbs.

The lack of strong decentralised centres is symptomatic of a lack of strong government authorities and lack of strategic planning and transport links that puts development at the mercy of nimbyism and depressed development activity

Emerging Institutional arrangements

Urban governance of Australian cities ranges from 43 different Local Government Areas for Sydney to only one city that has a single Development Authority in Canberra. The institutional arrangements for delivering growth will depend on the powers they are given. Proposed agencies include:

- VicUrban
- East Perth Redevelopment Authority
- Sydney Metropolitan Development Authority
- Growth Management Queensland
- Queensland Urban Land Development Authority

The current arrangements have not been successful in delivering major growth precincts in Sydney with problems of multiple land ownership; levies that are discouraging development and lack of public transport access. Metropolitan City agencies will need to have extended government powers to champion future growth of the capital cities.
Capital Cities Governance

Capital cities governance has become more complex with multiple layers of government agencies. There is a need to re-assess urban governance models for Australian capital cities. They are not meeting the COAG performance criteria. The main challenges and priorities are:-

• Innovative funding strategies to release investment to address the infrastructure challenges

• Growth and competitiveness are the primary drivers in decision-making.

• Environmental concerns are important but are often sacrificed for growth.

• Resources are needed to build mass public transit systems to alleviate congestion in cities

• Better performance begins with better governance

• City management must become more transparent and accountable

• Silos and short-term thinking are holding Australian cities back.

• Australian cities need integrated government leadership.
Mining Town to Regional Australian City: Karratha, City of the North
Karratha City of the North Plan

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ABSTRACT
This paper discusses the proposal for the creation of a new City of the North, through the transformation of the town of Karratha, as outlined in the Karratha City of the North Plan. The Plan offers a ‘blueprint’ for the transformation of Karratha from a resource town into a regional city of the north. It proposes the economic, social and spatial strategies required to make Karratha a place of choice to work, visit, grow up, raise families and age gracefully.

This ambitious plan highlights the need for collaboration, identifies an urban vision for Karratha and provides an estimate of the investment that will be required to deliver this new Australian city.

Keywords:
• Demographic change
• Housing diversity and affordability
• Settlement patterns
• Sustainable higher density development
• Transport system requirements
• Effective governance and leadership

Further Information on Karratha City of the North Plan

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KARRATHA CITY OF THE NORTH PLAN

(Paper extracted from the Karratha City of the North project work and the Karratha City of the North Plan: Summary; June 2010 document, which were delivered with input from the authors of this paper and an extensive team of government and non-government experts under political leadership from State and Local Government and with recognition of the Federal Government agenda).

Karratha City of the North
This paper discusses the proposal to create a City of the North from the existing town of Karratha. The KCN Plan is in response to the State Government’s Pilbara Cities Vision which was launched by the Premier in November 2009. Under this Vision, the State Government aims to deliver sustainable regional centres by ‘normalising’ land and housing supply, improving infrastructure and community facilities, while supporting the health and well-being of the resident population. In turn doing so, it is hoped that an expanded population is attracted to the region that will in turn provide a readily mobilised and skilled workforce. The work will be guided by the KCN Plan, which was developed through a major fast tracked project to respond to significant pressures facing the town and the Pilbara Region. The outcomes of the project and the proposed program for Karratha’s development to a future city are outlined in the KCN Plan.

The KCN Plan was prepared in partnership by the Western Australian State Government (LandCorp as the project managers) and the Shire of Roebourne. It’s preparation was through a consultative and multi-disciplinary approach, in response to the shared Pilbara Cities vision for Karratha. As an adaptive management plan and project management tool, it will help guide the action required to deliver the Karratha City of the North vision.

Karratha in Context
Karratha is the primary service and administrative centre of the Shire of Roebourne (Shire of Roebourne), located 1500km north of the Perth Metropolitan Area in the Pilbara region of North-West Western Australia.

At a sub-regional level, it is the primary centre of West Pilbara, and forms the hub in a network of nearby towns adjacent to Nickol Bay. These include the port town of Dampier, historic town of Cossack, coastal town of Point Samson, and Roebourne, which is a centre for the local Indigenous communities.

Karratha is connected to Perth and other towns along the coast by the North West Coastal Highway. It is also serviced by a major domestic airport, handling almost 500,000 passengers in 2008/09. The town is located near Port Dampier, a major export harbour, from which iron ore and hydrocarbons are shipped around the world. It is also in close proximity to a large number of other existing or planned infrastructure projects, which are helping to drive economic activity in the region.

The case for developing Karratha as a City of North
The emergence of the majority of great cities across the globe has historically involved a long process of organic growth. The process has typically been reactive in nature, responding to economic and population growth pressures as they arise.
The pressure on urban areas is increasing; Australia’s capital cities make up 64% of the country’s the population. There is no major urban centre outside of the Perth metropolitan area in the state’s north-west, despite being the biggest contributor to the economic activity. Establishing Pilbara Cities will enable the growing population to be distributed across the state, and help to alleviate the growth pressure on Perth as the capital city.

Within the Pilbara, Karratha as part of the Shire of Roebourne is central to the current resources surge, with companies operating and developing multi-billion dollar oil, gas and mineral projects within the municipality and often locating a significant workforce in Karratha. The State Government recognises the opportunities for capitalising on this natural abundance, with a view to turning Karratha into a City of the North - a destination of choice for individuals and businesses wanting to take advantage of the area’s strategic importance.

But in recent years there has been emerging evidence that Australia’s infrastructure is not keeping pace with the demands placed on it by a growing population and economy, and that the current approach to infrastructure funding and provision needs improvement. The work of Infrastructure Australia and the revival of Commonwealth interest in Australia’s Regional Centres and Cities provide a significant opportunity to advance the sustainable growth of regional centres such as Karratha. It is recognised that there is a key opportunity to establish strong partnerships between all levels of government to progress infrastructure, transport and other major proposals.

State government has a key role to play in the development and upgrading of one of its key strategic regional centres, Karratha, to ensure efficient and effective use of infrastructure, ensure high quality urban places and spaces where people have a choice of housing and employment supported by a public transport system that allows equitable access and reduces the cost of living, and travelling time.

Karratha current state of development is due to the age and pattern of Karratha’s urban fabric and to progress the bold vision to develop it as a city of the north it should form part of a major urban regeneration project. Urban regeneration projects are often cost prohibitive due to generally limited development scale in existing and high upfront infrastructure costs. However, the benefits of undertaking urban regeneration projects have a wider impact than just the immediate development area, including building capacity for economic development, sustainability and employment generation.

Urban regeneration projects are often planned because they leverage off existing infrastructure or provide an opportunity to leverage off new infrastructure. For the benefits of an urban regeneration project to be fully realised the following need to be in place:

- Land use policies and implementation strategies - there needs to be appropriate policy and implementation strategies in place to deliver (rather than just allow) appropriate development to maximise the wider return from the infrastructure investment.

- Land use catalyst infrastructure - in greenfield development, and more so in urban regeneration, it is vital that funding be in place to ensure timely delivery of catalyst land
use infrastructure so that the redevelopment is actually delivered as planned and the wider benefits of the infrastructure are realised.

There is also a strong correlation between the process of urbanisation and economic growth. Karratha as an urban centre provides a concentration of services and infrastructure, labour, skills, entrepreneurship and markets, which can harness opportunities in the region.

Accordingly, it is a key generator of economic activity. This economy is a critically important engine for supporting the development of the national economy, and achieving national growth goals. A well-functioning Karratha as future city will be a critical component of the national competitive advantage.

Good policy alone is no guarantee of a good outcome and requires direct intervention from Federal and State Government. The purpose of this intervention in a regional centre such as Karratha is to promote improvements in the efficiency, equity and sustainability of the area and to increase its capacity to meet the following objectives:

- economic growth and micro-economic reform
- improved social justice
- institutional reform
- ecologically sustainable development
- improved urban environments and
- a more liveable future city

In this respect, the availability of affordable readily-developable land and housing can be considered enabling infrastructure.

Land is in relative plentiful supply in Karratha; however ready-developable land well serviced by infrastructure is not. This increases property demand relative to supply and adds to the cost of development in new release areas, pushing up house prices beyond what is affordable for many potential home buyers.

Timely and adequate provision of infrastructure is necessary to support new housing development, which can help ease the current housing affordability crisis. This is also true for non-residential property, as timely and adequate provision of infrastructure is necessary to facilitate commercial, retail and industrial development.

There is a need for a whole-of-town approach to upgrade Karratha to address population growth and support the growth in employment nodes to ensure that the delivery of housing demand is met with matching infrastructure and community facility requirements. KCN Plan takes a whole of town approach to ensure that the future requirements for Karratha as a city are mapped out to meet the demand for a sustainable community in an orderly and planned way, and investment can be well targeted and timed.

The Project Methodology
Aspirational Goals were developed with stakeholders to describe the desired characteristics of a sustainable Karratha. These Goals represent a higher-order aim to which the project is intended to contribute – they are statements of longer-term intent. More specific Project Objectives have been devised to guide the development of effective strategies for the
evolution of Karratha, into a future city, ultimately with the characteristics described in the Goals. The objectives aim to be a description of an overall desired achievement involving a process of change from the present to the desired. While mainly reflecting each of the Goal domains of Economy, Community, Environment, Built Environment & Public Realm and Infrastructure, many of the objectives apply to more than one domain. The goals and objectives for this project respond to the shared vision for Karratha and identify the strategies required to achieve different levels of growth.

There has also been an emphasis on facilitating as much public and private sector participation as possible in the timeframe available, to engender ownership and take into account the aspirations and intentions of stakeholders. Collaboration will also form a key part of the partnership approach in the future, as the Karratha City of the North Plan is used as an adaptive management tool in the delivery of Karratha City of the North. The Plan also sets out an implementation program (with staging, costs and timeframes) for the provision of hard and soft infrastructure, matched against the anticipated population growth trajectory which is required for the future urban expansion requirements to progress Karratha from a town to a city.

The Vision for Karratha
The Karratha City of the North vision has been informed by the State Government’s Pilbara Cities Vision and the Shire of Roebourne’s Karratha 2020 Vision and Community Plan. The vision is:

A liveable, compact, Regional City of 50,000+ people, with a diversified economy, a healthy local community which demonstrates demographic balance, affordability, high quality amenity, and infrastructure. It is a place of choice, to work, visit, grow up, raise families and age gracefully.

Principles for achieving the Vision
The stated principles for achieving this vision are:

• An expanded, more diverse economy, which offers a broader selection of job opportunities
• A planned city that responds to the environmental conditions of the Pilbara and exhibits a strong sense of place
• Greater housing diversity that meets the needs of a broader demographic profile
• Infrastructure that meets the needs of the city, and allows for growth
• More industrial, commercial and residential land supply and creation of readily developable land banks that can be quickly released to the market
• Improved housing affordability through normalisation of the housing market, centered around a strong private sector presence
• Demonstration projects targeted at delivery of affordable land and housing for service and residential construction workers
• A modern vibrant and attractive city centre which offers more opportunities to shop and socialise
• Provision of services at a standard that meets the expectations of the community
• Excellent connectivity and transport linkages throughout the city
• A partnership approach that facilitates the coordination and investment required to achieve a city of the north.

Governance and Delivery
To realise Karratha as a City of the North will require a different approach to governance and delivery at a regional and local level to ensure the timely implementation of infrastructure, associated amenity and creation of economic employment opportunities.

The existing delivery format by the State Government agencies is based on a silo approach by the various State Departments and Government Trading Enterprises with little place based integration of its plans, programs or projects. Often, the individual departments and Government Trading Enterprises programs and projects, and associated capital and operational budgets do not align the delivery of hard and soft infrastructure to meet the needs of local government, the community and private sector. This has particularly impacted on liveability and amenity in Karratha. The existing governance and program structures are inadequate for the purposes of advancing Karratha as a City of The North and the Pilbara Cities concept and therefore needs to be addressed to firstly meet the Governments vision and secondly, to ensure effective and efficient service delivery.

A key challenge for any proposed governance structure will be to generate a resident regional workforce to achieve the quantum of employment required for a population of 50,000. This population target requires growth in employment of approximately 287% with around a 206% increase in strategic employment and a 431% increase in population driven employment.

For this to occur, it requires the long-term commitment and investment in the Pilbara by both the private and public sectors. Regardless of the governance model that is implemented, any future governance arrangements require the policy setting, legislative and regulatory authority with subsequent resourcing and investment decision-making capability to advance the development of the Pilbara.

Regional development is a high government priority, and in recognition of this the State Government has proposed establishment of the Pilbara Cities Office to expedite, facilitate and coordinate Government and industry activity for the development of the Pilbara. This governance model for the Pilbara should evolve over time and the establishment of a stand-alone state department that directly reports to a Minister should be considered.

The Karratha City of the North project has taken on many of the fundamental challenges facing Australia and in doing so has redefined how stakeholders from local residents to heads of state and federal government see Karratha and the Pilbara. The future will tell if this City is achievable and if not show the cost of failure.
Finding the void … a vision for a public park in Johannesburg’s inner city

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Abstract
Johannesburg’s CBD is a ‘compressed’ urban environment where available land for open space is extremely elusive and mostly derelict. The Johannesburg Development Agency initiated a design competition “because growing residential densities, along with the lack of adequate green open space, suggest the need for a large scale inner city park”. This paper will examine the issues related to creating a vision for the park through a competition entry. It will also reference landscape urbanism theory to illustrate that in spite of seemingly insurmountable odds, space can be found to facilitate the development of a park system that becomes the landscape, or basic building block, of an approach to urbanism. The emphasis is on the primacy of the void over static architecture as a point of departure for contemporary urbanism.

Keywords: Urban vision, urban parks, landscape urbanism, green infrastructure, Johannesburg

The problems of postmodern organization in the landscape became obvious with the proliferation of sprawling cities, gated enclaves, residential communities and mega-malls. Schumacher and Rogner write that the extension of this dispersed system “fueled the rapid decompression of urban industrial cities and the decentralization of both mass production and mass consumption”1.

Given this “decompression,” the question facing a city like Johannesburg, is what to do about abandoned inner city sites caused by the flight of business and other commercial interests in the 80’s to Randburg, Midrand and Sandton, and the acres of railway land that slice through the centre of the city, cutting it in two. Johannesburg however, is unlike many other ‘new world’ cities where ‘decompression’ has become a major issue. In fact the reverse is true! People are instead flocking to the inner city to find work and a place to live, which now has 217 000 ‘official’ residents (and growing rapidly), many thousands of ‘unofficial’ residents and some 800 000 commuters who enter the city every day. The inner city has changed dramatically because of these two opposing trends. Old office buildings are being converted into residential units to accommodate the demand and new residential units are being constructed, specifically in Newtown, on the western edge of the CBD. Johannesburg’s CBD is instead ‘compressed’ and available land for open space, is extremely elusive, over-utilized and mostly derelict. The only developed park of reasonable size is Joubert Park, a green oasis in the middle dense flatlands, which houses a 100 year old glass Victorian conservatory and the 95 year old Johannesburg Art Gallery. Five other recently upgraded inner city parks exist, but for the most part, they are small and serve only the local neighbourhood. The bottom line is that the Inner City of Johannesburg has a severe lack of open space and parks to cater to the existing and rapidly increasing population. The lack of quality public spaces means that

the parks are over-utilized and as a result, they rapidly degenerate. The City is well aware of these inadequacies and is striving through its Charter on Public Spaces, to significantly increase the amount of space available for quality public places. The Charter also mandates that no person should walk more than 300 meters to find either hard or soft public open space.

In September 2009, Johannesburg Development Agency (JDA) in collaboration with Johannesburg City Parks and Department of Planning and Urban Management, initiated a design competition “to conceptualize and design a large inner city public urban park. The growing residential densities within the inner city of Johannesburg coupled with the lack of adequate green public open space, suggests the need for a large scale inner city public park. … The vision for this park should be of the nature of Central Park in New York”. The competition document also alluded to the “Inner City Regeneration Charter”, a strategic document which outlines how the City will address issues of urban regeneration and economic development in the inner city. The strategy cites as one of its six main principles, “Public spaces, art, culture and heritage”. These references imply that a public park intervention is necessary and could be a catalyst for development, but where in Johannesburg’s dense, ‘compressed’ CBD does one find a ‘void’ of this scale and form to create the park?

“Landscape Urbanism”, and the approach it advocates to understanding the challenges facing the regeneration of decaying urban environments, specifically through the use of brownfield sites, provides a way to understand the problem.

In The Landscape Urbanism Reader, Charles Waldheim states that “Landscape Urbanism describes a disciplinary realignment currently underway, in which landscape replaces architecture as the basic building block of contemporary urbanism. For many, across a range of disciplines, landscape has become both the lens through which the contemporary city is represented and the medium through which it is constructed”. 2 Waldheim sees landscape urbanism, like landscape architecture, as an interstitial design discipline, operating in the spaces between buildings, infrastructural systems, and natural ecologies. He advocates patience and slow growth in cultivating a new urban form in these residual spaces, with the full participation of all assembled on the commons (including the mayor, institutional landholders as well as the dispossessed).3 The idea of landscape urbanism reorders the values and priorities of urban design, emphasizing the primacy of void over built form, and celebrating indeterminacy and change over the static certainty of architecture. Its most powerful contribution, however, may be that it recalls nature’s restorative cycles and tries to put them back to work in the city”.4

Large-scale urban parks are increasingly integral to the sustainable development of cities. They offer the city the opportunity “to stake out new and unique identities, promoting the peculiarities of local geography, ecology, history and cultural quality of life. These large open spaces are seen by

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many city officials as fundamental to assuring the competitive attractiveness of their cities, retaining and attracting new talent, new residents and businesses, and promoting economic development\textsuperscript{5}.

Given this argument, the competition originators must be applauded for advocating the essential, catalytic importance of a major inner city park but reference to ‘Central Park’ as main indicator for the nature and form of the intervention, needs to be challenged! “The planning and design of large urban parks must confront a number of significant challenges, such as multiple competing stakeholders, phased financing, segmentation, inaccessibility and difficult implementation, especially on brownfield or contaminated sites. Consequently, the design of large parks today, must inevitably be strategic and time-based. Design initiatives cannot simply be wilful, subjective or formal approaches, but need instead to be intelligent and flexible, with regard to what is inevitably a complex field of dynamic variables.”\textsuperscript{6}

**THE SEAM**

THE SEAM\textsuperscript{7} employs an approach that makes reference to Landscape Urbanism. It requires identifying a series of voids at CBD wide scale and proposes that once the voids have been created they should incrementally be reclaimed, remediated and creatively stitched back into the dense urban fabric to be utilized by the citizens of the city as places to recreate, socialize and safely move between districts. THE SEAM (Image 1) manifests itself as a linear system of parks that begins as a natural ecosystem (Observatory Ridge) and then penetrates the urban fabric to the west along a series of existing and created voids, to culminate at Newtown – a heritage and cultural precinct. It also connects to the existing disparate parks that are scattered about the inner city.

\begin{center}
\textbf{Image 1: Long term vision for THE SEAM inner city park connecting Observatory Ridge, a natural ridge (bottom of image) to Newtown, a cultural precinct (top of image) NLA + GreenInc}
\end{center}


\textsuperscript{7} Competition entry by NLA + GreenInc + MRA a joint venture between Newtown Landscape Architects cc and GreenInc landscape architects and Mashabane Rose Architects.
At the western end of Observatory Ridge, on a site with spectacular views across the city which has spiritual and cultural significance (many religious groups gather and congregate on the ridge and gold was first sought in these quartzite ridges), a new park, Observatory Hill Park, is proposed (Image 2). The park would also serve as a catalyst for high density mixed-use development proposed along its northern edge. The site would be the starting point for the development of the project and is significant as the ridge line is the watershed between river systems that originate on the ridge and flow either to the north, and ultimately the Indian Ocean or to the south, and the Atlantic Ocean.

THE SEAM then steps down Observatory Ridge in an exciting series of exaggerated steps to meet with Ellis Park Precinct and Stadium Square⁸, which consolidates public space between the two main stadiums and other sports and recreation facilities (Image 3). Using Observatory Ridge as a natural component of the void, a series of new parks are also proposed to stretch east down Bezuidenhout Valley and would be central to new high density housing schemes.

Ellis Park Precinct is linked to a proposed new major park intervention at Doornfontein Station through the westward extension of the precinct. The park space is integral to a proposed high density residential and a mixed use development located south of the railway line (on reclaimed industrial land) and a mixed use development proposed adjacent to the park along its eastern edge. The development would include the recently completed End Street Park⁹ along its western edge, a once dilapidated space which has been transformed into a robust, colourful and somewhat enigmatic play park.

⁸ The precinct was designed by a joint venture comprising Albonico, Sack Mzumara Architects and Urban Designers + MMA Architects + Newtown Landscape Architect.
⁹ The park was designed by Newtown Landscape Architects
Moving further west, the void, making use of the existing railway line, is reclaimed using a landscaped deck structure that would connect Doornfontein Park to the Johannesburg Art Museum and Joubert Park. Joubert Park is then linked to the new Gautrain Station and Park Station precincts along Leyds Street. These are celebrated as the ‘Gateway to Johannesburg’.

Again an infrastructural void, west of Park Station and above the existing railway lines, is reclaimed and designed as a multi-function urban park precinct, which would provide panoramic views to the west and south-west of the CBD. This new precinct is ‘stitched back’ into the old and new urban fabric as a ‘tapestry’\(^\text{10}\) and becomes the catalyst for mixed use developments on adjacent reclaimed brownfield sites (programmed primarily as housing units) and sites along the southern edge of Braamfontien (Images 4 and 5). From this elevated position, THE SEAM steps down in a sequence of smaller, greener parks designed on brownfields sites, to culminate in a series of squares and open spaces that already exist in Newtown Cultural Precinct. The project would offer extraordinary opportunities for city residents to have access to open space and networks of paths, squares and parks that could take hours to navigate in their own time. It also offers distinct opportunities that would otherwise be impossible in the compressed urban fabric of Johannesburg, allowing instead significant space for extensive leisure, social, and recreational amenities.

\(^{10}\) After the first round of the competition four projects were short listed and the consortium asked to submit refined proposals after comment. THE SEAM did not advance past the first stage as (the author believes) the organizers were still looking for a ‘Central Park’ type solution. Newtown Landscape Architects was then asked to join the MMA architects + Fiona Garson Architect + Cohen & Judin team as the lead landscape architect. The ‘Urban Tapestry’ proposal put forward by this new consortium was judged the winning scheme as it was “the strongest and having the most chance of becoming feasible”. 
Conclusion
THE SEAM employs an approach that entails defining and utilizing open space to reclaim, remediate and incrementally stitch back a newly created landscape into the existing and proposed urban fabric. The project illustrates the purposeful discourse between human activities, city landscape and ecological systems - culminating in the deliberate celebration of the urban void. It builds upon existing energy, connecting heritage, cultural and sports nodes with natural features to provide a generous and beautiful large-scale public landscape for a broad constituency of public users. It would become a contemporary open space where people can recreate, socialize and safely move about the city. As such, the park would be fundamental to assuring the competitive attractiveness of Johannesburg’s Inner City and become a leading-edge model for the design and sustainable management of an inner city park system for South African cities.