

Planning for health in higher density living: learning from the experience of Green Square, New South Wales

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Key words: health, density, high-density, high-rise, Green Square

Abstract:

Urban densification proceeds apace. However, and notwithstanding a renewed awareness of the intrinsic link between urban form and human health, we are only beginning to query the impact of higher density living on health-supportive behaviours. Using Green Square, Sydney as a case-study, this paper reports recent research that addresses this gap. Findings include a consistency – though largely unrecognised – with the healthy built environments research literature; a lack of a consistent ‘healthy environments’ language, including any definition of ‘healthy density’; a lack of attention to high-rise high density; and a need for an active engagement with complexity, as well as substantial and ongoing institutional support.

... in our practice now I am in the thick of trying to work out the best height of the towers. I'm getting conflicting views. Some say very tall buildings leads to isolation - the upper level leads to poor physical movement and poor mental health outcomes. But when I look around I find evidence both ways. It may be if you design the ground level to encourage people out of the buildings properly, you can even improve health outcomes. ... The height thing is the hot topic. How tall is wrong? Is it the design or height of the towers that matters or is it the ground area? That's the burning issue we are trying to move through.

Workshop comment (paraphrased), 5 July 2018.

1. Introduction

This paper reports new research that investigates the intersection of two contemporary features in Australian urban development, and planning:

- (i) a level of densification not hitherto experienced (at least since the inner-area 'slums' that characterised many cities in the late 1800s and early 1900s), and
- (ii) a 're-discovery' of the inherent close connection between urban form and human health.

The densification process is largely a result of government consolidation policies aimed to deal with a rapidly increasing urban population. A key prompt for the renewed recognition of the urban form-human health nexus has been an alarming increase in chronic diseases, coupled with evidence that a significant causal factor is the patterns of behaviour encouraged by the car-based low-density suburbs promoted since the 1950s (Leeder and Ward 2006). Here there is an irony. This urban form was adopted, in part, as a 'cure' for an earlier health concern, – being the high rate of communicable diseases arising from the earlier denser and poorly serviced 'slum' environments (Freestone 2000); and indeed, since then, density has predominantly been referred to in terms of the generally implicit 'benefits' accruing from lower densities (the suburban ideal). However, these lower-density replacement suburbs have been found to result in reduced physical activity, social interaction and, in some localities due to poor access, consumption of fresh foods, all of which can lead to poor health (Kent, Thompson, and Jalaludin 2011).

These outcomes were wholly unforeseen at the time and prompt a valid contemporary question: might we now be at risk of similar unintended and detrimental health outcomes from the current move to higher density urban forms, with their correspondingly different and often unfamiliar living environments and associated behaviours?

In New South Wales, the government land development agency, Landcom, has been at the forefront of such matters. Initially established to deliver affordable housing on the city fringe, it is now also charged with the significantly different objective of 'urban consolidation'. As part of its expansive brief to deliver 'triple bottom line' (ecological, social and economic) outcomes, Landcom also has an organisational commitment to the development of environments that are supportive of residents' health. Responses have included a specific 'Healthy Development' policy and liaisons with the New South Wales Heart Foundation (Landcom 2010); a comprehensive health analysis of four newly-developed estates (Paine et al. 2016); and references to healthy living in various marketing material.

In 2018 Landcom engaged a consortium comprising the University of Technology Sydney, Sydney University and the University of New South Wales to look specifically at health and high density. Two precincts within the developing high-density inner Sydney locality of Green Square, in which Landcom has substantial involvement, were used as case studies. They are Victoria Park (predominantly residential, initiated in the late 1990s), and the Green Square Town Centre (mixed residential and commercial, initiated in the early 2000s).

The study (*Translating Evidence to Support Planning Strategies for Healthy Higher Density Living*) ('the study') took place over 2018-2019. A second stage longitudinal study of residents and their health was also envisaged. There were two aims:

- (i) to understand how health evidence can be used to plan higher density precincts to support both day-to-day and intergenerational population health, and
- (ii) to create an on-going learning partnership between Landcom and the universities involved.

The study adds to other research in Australia focussed on this, generally embryonic, concern (for example, Easthope et al. 2020; Foster et al. 2020; Kleeman et al. 2020; Foster et al. 2019; Hall and Andrews 2019; Thompson 2018; Heenan 2017; O'Neill and Fokkema 2017; Udell et al. 2014; Haigh et al. 2011).

Three initial reviews of documents were undertaken. The first two investigated the local and international academic literature on:

- the connections, positive and negative, between health and higher density built environments ([Connon et al. 2018](#)), and
- the extent to which, the researched evidence in this regard has been translated into current planning strategies for healthy higher density localities ([Connon et al. 2019](#)).

The third review (the 'review', and the subject of this paper) ([Paine et al. 2019](#)) canvassed a more eclectic array of reports, planning strategies, and academic and non-academic commentary specific to the case-study sites and the planning bodies involved, primarily Landcom and the local City of Sydney Council. This review addressed the translational component of the study, and the following questions:

- (i) how are higher density living environments defined and understood?
- (ii) to what extent was health considered in the development of the two case-study precincts?
- (iii) were such considerations explicit, or implicit (i.e. unstated, but still present)?
- (iv) what were the organisational and other factors that contributed to health being considered (or not)?
- (v) to what extent is the Green Square experience replicable (able to be translated) into strategies for higher density development elsewhere?

The following section describes the methodology of the review. Section 3 then outlines key findings of immediate relevance, and use, for practitioners currently planning for higher density living.

2. Method

The review comprised an in-depth analysis of three different sets of documents. The first two (summarised in Table 1) comprised:

- documents available in the public domain (the internet, libraries) detailing the actual planning strategies for Green Square and the two case-study sites (generally the initial master plans) (Set 1 - nine documents).
- Landcom documents, where available, detailing decisions relating to the development process for Victoria Park (20 documents) and the Town Centre (15 documents) (Set 2). These comprised public documents as well as internal reports, minutes and discussion notes, and primarily address design, construction, marketing and activation matters.

What constituted a ‘planning strategy’ was determined by the first earlier literature review (Connon et al. 2018) and was defined broadly (drawing on Barton 2015) to comprise:

- ‘bureaucratic’ strategies (eg. legislation, policies, plans and guidelines), and
- ‘design and action-implementation based’ strategies (eg. land use policies, building controls, infrastructure proposals, community development and participatory processes).

The analysis focussed on content relating to (i) density and high density, (ii) health, and (iii) health and density (as linked). An early finding was that *explicit* references were limited, requiring considerable interpretation to then also locate *implicit* references. This interpretation drew on:

- a new composite schema (the ‘Three Healths Framework’ – Table 2) based on the now extensive literature on health-supportive environments. This was a key outcome of the first study review (Connon et al. 2018). It demonstrates how different conceptualisations of health have developed over time, and how they actually interrelate rather than supersede each other. Three key conceptualisations were identified: (i) public/population health, (ii) health as sociologically and ecologically determined, and (iii) human health and planetary health as inherently linked;
- three earlier but less extensive schemas (the *Checklist for Healthy and Sustainable Communities* (Capon and Blakely 2007), *CHESS* (Thompson and McCue 2008), and the *Three Domains of Healthy Built Environments* (Kent and Thompson 2014)), plus a set of word variants around health developed to assist a similar review of metropolitan planning strategies (Wheeler 2011 – Table 3); and
- the researchers’ own experiences as practising town planners and, latterly, in health and built environment research.

Different approaches to the analysis were established for density and for health.

The process for ‘density’

This drew on a conceptual framework around density developed in the first literature review, and an initial assessment of ten documents from Sets 1 and 2 to get a ‘feel’ for the ways in which density was included or referenced. Four categories of density ‘definitions’ were developed to facilitate consistent comparisons between the various and differing references, including where documents did not include any definition of higher density, or even density, let alone ‘healthy higher density’:

- (i) density is defined according to a specific spatially defined and quantified set of criteria,
- (ii) the term density is used but not defined,
- (iii) quantitative or qualitative or both quantitative and qualitative *descriptors* are used to conceptualise density, and
- (iv) no reference is made to density.

These categories (developed into six ‘scores’ – Table 4) were then used to classify each density reference in each document. The references (including applicable words and phrases) were recorded in an EXCEL spreadsheet for ease of compilation. The words and phrases were then transferred to a WORD document for scoring, via colour coding (only whole cells can be coloured in EXCEL). The results were grouped by density definition category to develop findings and recommendations.

The process for ‘health’

The references to health in each document were recorded together with (i) explanation about the research decision as to what constituted an implicit reference, and (ii) an assessment of the likely motivation of the authors of the report to include the health reference. Each reference, whether explicit or implicit, was then ‘tagged’ against the 53 attributes in the ‘Three Healths Framework’ (Table 2). Quantitative tallies of the number of times there was a consistency with each of the 53 attributes in each document gave advice on:

- the relative emphasis given to each of the three conceptualisations in the ‘Three Healths Framework’, and
- those attributes *not* referenced within each document.

In addition, each document was assessed as to its consistency with *all* the 53 attributes, considered together. The aim was to understand the overall intent within each document in relation to their (varied) inclusion of health matters

An additional broader contextual assessment

The third component of the review differed from the above two and involved an investigation of a further set of 96 documents (Set 3) related to the social and planning history of Green Square, and the then associated planning and broader community ‘zeitgeist(s)’. These documents comprised a mixed array, dating back to the early 1900s, of earlier planning strategies, commentary and histories in refereed and non-refereed books and journals, research theses, commentary by local community groups, marketing material and a documentary film. This information proved invaluable when interpreting the content in the other two sets. This review is included in detail in the actual study report ([Paine et al. 2019](#)), and is now also the subject of a separate paper (Paine et al. 2020).

3. The findings – seven key themes to guide practice

This section describes the key findings. Seven themes to guide practice are identified. As would be expected, most interrelate and overlap, and no priority should be assumed. For readability and conciseness the reviewed documents are not individually named or extracts referenced. All are listed and analysed in detail in the actual study report, which can be accessed here:

<https://cityfutures.be.unsw.edu.au/research/projects/translating-health-evidence-support-healthy-planning-strategies-higher-density-living/>

3.1 *An active engagement with complexity*

Green Square represents, in the Australian context at least, an unprecedented scale of high-density brown-field development, located in an already congested inner city. This generates a complex mosaic of overlapping issues. Sometimes this complexity presents as a highly constraining, even overwhelming, ‘knot’ of matters. However, positively, the documents also suggest a distinct

engagement with this complexity by Landcom and the City of Sydney Council, as well as an equally distinct commitment to the *quality* of outcomes. These responses require substantial resources, as well as an attitude of long-term commitment. The review findings also suggested a further feature – that, arguably, such development is conceptually fundamentally different to the more ‘simplistic’ spatially-separated planning required to deliver the city-fringe low-density car-based suburbs that preceded current consolidation strategies; requiring, in turn, a particular, and perhaps new, complexity-responsive skill-base.

One outcome has been a composite and fluid quality to the strategies themselves. Fortuitously, this feature also appears to be conceptually consistent with the need for places to have similar qualities if they are to be socially and economically successful and, by correlation, successful in supporting health. The Town Centre Master Plan, for example, aims to achieve ‘a *complex* urban environment for encouraging social interaction’ (emphasis added). Further, the strategies often contain frequent use of composite terms such as ‘ecological sustainable development’, ‘community’, ‘urban design’, and ‘public domain’. ‘Place-making’ is defined in one document as: ‘... integrated, cross-disciplinary and long-term planning for holistic places that consider the social, economic, environmental and cultural aspects of place. It encompasses a broad range of ideas and philosophies ...’ (City of Sydney n.d.,3). Examples of this fluidity in conceptualisation and practice, include:

- an openness to the idea that the master plans may require on-going revisions to deal with market variations, including an increase in density for the Town Centre (see also 3.4, below);
- a valuing of innovation. An internal Landcom review of Victoria Park refers, for example, to a ‘superior urban design outcome’, an aim to ‘better the targets set for energy usage’, and ‘innovative measures’;
- the ready re-allocation of Council-owned land to provide a new walkable primary school when that need became apparent (in part via a later Health Impact Statement, refer Harris-Roxas et al. 2016);
- engagement with State agencies to establish an active transport modal split only otherwise found in the central business district; and
- attention to ‘early activation’ strategies, which draws to some extent on lessons learnt from poor early provision of local retailing in Victoria Park.

In addition, within Landcom itself there is evidence of a ‘continuous learning’ approach. A review of Victoria Park for example notes: ‘Landcom is already applying many of the lessons learned ... Staff and management have ... refined them in Landcom’s business processes for future use to enhance the built form and urban outcome elsewhere.’ (Landcom n.d.,14).

3.2 *Strategies are largely consistent with the academic literature on health promotion*

Positively, the review found that health concerns have a continual presence within the various documents. This includes elements of the three conceptualisations of health in the ‘Three Healths Framework’ generated from the earlier assessment of the national and international literature. However, this presence was quite varied, including that health is only rarely given *explicit* mention, and then predominantly only within the earlier strategies reviewed (variously, inquiries in the early 1900s, the first metropolitan plan in 1952, and the local South Sydney Strategic Plan of 1995). Mostly, the presence of health is implicit, and comes about through fortuitous co-benefits from actions undertaken to address other imperatives or stand-out matters of interest in the current

professional and community ‘zeitgeist’: sustainable development, the generation of urban vibrancy, reducing private car dependency, place-making, development of community, and overall ‘wellbeing’.

Often too, references to these matters appeared concurrently as part of marketing objectives. Overall the documents suggest an active interest – and engagement – with ensuring a high standard of liveability. This engagement, whether explicit or implicit, is multi-dimensional, addressing:

- ‘private’ (individual apartment and building) *and* ‘communal’ (public domain) needs, and
- the ‘quantum’ of public infrastructure to be provided *and* the ‘quality’ of that infrastructure (and resultant user experiences).

In addition, and as suggested in the academic literature (Connon et al. 2018), it is possible to view the intended (higher) density as being in itself health-positive, by:

- generating the population required for a vibrant multi-functional public domain, accessible by active transport, and
- reducing the overall footprint of the metropolitan area, with positive ecological outcomes.

That said, Green Square is in its early days as a lived-environment. It is not yet possible to fully evaluate the success of the positive intentions in the strategies. There are however a number of recent surveys of resident satisfaction undertaken by, variously, Landcom, one of the Town Centre consortium partners, and the City of Sydney. Further appraisals of these existing surveys from the specific perspectives of (i) resident health and (ii) the high density ‘living experience’, may yield useful advice in these regards.

3.3 An absence of a consistent language to describe the healthy environments sought

The strategies for Green Square emanating from the 1990s and late 1980s – and which influenced the later master plans for the case-study sites – give value to the existing close-knit mixed-use urban fabric typical of its inner city location. There is a recognition, both implicit and explicit, that this urban pattern – walkable, busy, commercially active and conducive to incidental social contact, and captured in varied use of the terms ‘urban village’ and ‘activity centre’ (one more evocative, one more prosaic) – is essentially health-supportive.

Later documents however use a wide range of other terms to describe essentially the same objectives, for example ‘vibrancy’, ‘community’ ‘wellbeing’, ‘global village’, ‘town centre’, ‘activation’, ‘identity’, ‘green’, and ‘sustainable’. The number and frequency of use of these different terms, within individual documents and even sentences suggests a problem. Initially, the first, or second, appearance of a term suggested an explicit ‘knowing’, by the authors, of the resultant intended environment. However when reading subsequent appearances, coupled with their numerous variations, one gets a different impression – that there is, instead, a lesser ‘knowing’ and even potential confusion about the ultimate objective, and also how it might be achieved.

So, what are the authors really intending here? Is it what we now understand as the attributes of a health-supportive environment, as detailed for example in the ‘Three Healths Framework’, or something else? More critically, are the authors merely using contemporary jargon without much additional thought?

These questions also prompt another: does it actually matter?; generated also by the finding (3.2, above) that, and notwithstanding this imprecise wording, there is in fact an overall consistency with the researched attributes of a health-supportive environment.

An initial conclusion is that it *does* indeed matter that health is not more explicitly, and consistently, referenced; and that it would be useful to develop a more precise terminology. There are a number of reasonings:

- (i) inconsistent understandings of desired health outcomes risks the possibility they will be lost amongst the many, often competing, needs and interests in urban development.
- (ii) further, and as evidenced from the assessment of older documents, urban planning tends to focus on *different* aspects of health at varying times, in effect on whatever matter is most pressing (eg. poor sanitation, air quality, sedentary lifestyles and, most recently, heat stress). More critically, health appeared not to be considered at all when there were no current obvious issues (most noticeably in metropolitan strategies from the 1960s and 1970s). A lack of explicit articulation of the health–built environment imperative risks a continuation of this pattern.
- (iii) there were, at times, an inconsistency in health-related intentions within different planning documents applying to the same planning area. This may be prevented in the future if there is a more consistent understanding of health ‘goals’.

3.4 *A lack of definition of ‘density’ and ‘high density’, and therefore ‘healthy high density’*

The earlier two study reviews of the now growing local and international academic literature on health and higher density, found only one quantitative definition of a health-supportive development density. This was 35 to 43 dwellings/hectare (net), and determined to be the minimum required to achieve a walkable neighbourhood (Connon et al. 2018, 28, referencing the local research by Giles-Corti et al. 2014). In addition, one of the strategies evaluated in this third review referenced a density of 15 dwellings/hectare, as the minimum required to achieve viable local public transport. Neither figure is particularly helpful. They are both quite low in terms of the current urban consolidation imperative and far lower, for example, than what is being constructed in Green Square. As well, it leaves the question of whether there is an *actual* and context specific density that either supports or does not support health, beyond 35–43 dwellings/hectare, wide open.

Further, and as Giles-Corti et al. (2014) factored into their figures, such quantitative measures alone are insufficient in describing a healthy locality. People will only tend to walk for instance if there are useful and interesting places to walk to (thus a need also for mixed use zonings), and can do so conveniently and safely (thus also a need for high public amenity) (see The Committee for Sydney 2016; Heart Foundation 2014). There is also a potential interpretative difficulty in that different readers will tend to be familiar with only some of the many density *descriptors* that are used, such as visual building form (eg. ‘townhouses’, ‘slim towers’) or actual building heights (in storeys or metres).

The review therefore looked for both quantitative and qualitative references and potential measures of healthy high density, but without success. None of the strategies provided a definition of healthy high density, and where resident population or dwelling targets were stated there were no suggestions that the resulting level of density was optimal for health. Indeed, there was no evidence that proposed densities were based on any such ‘healthy density’ (or even ‘health’) target or intention. Rather, densities appeared to be determined more by what building form might sell in the market, with the delivery of ‘greenspace’ alongside residential buildings often used as a proxy for providing actual ‘health’ initiatives.

The general lack of spatially defined and quantified density criteria also made it difficult to compare the case studies with other development generally. Only one document (relating to the Victoria Park Master Plan) included a calculation of dwellings per hectare (to assist assessment of two development scenarios). And while there was frequent reference to ‘low’, ‘medium’ or ‘high’ density, there was no clarification as to what each might constitute. In addition, sometimes development was described as ‘lower density’, meaning not that it was necessarily ‘low density’ but simply less dense compared to other proposed buildings.

The review also identified a further, somewhat unexpected, matter – a *pliability* of density levels as sought by the development proponent (ie. Landcom). In Victoria Park the master plan was quite up-front about the possibility that the final density levels may need to change depending on market conditions. Indeed, and with Council agreement, they were increased in subsequent revisions; though, equally unexpected, were lower on completion given a reduced commercial component (and accepted by Landcom due to higher than anticipated financial returns given the overall quality of the development). In the Town Centre a substantial increase in floor area density of 38% was sought, and approved, even though it added to the complexity of local traffic management, based on an argued need to cover the substantial establishment costs on this difficult brown-field and flood-prone site.

3.5 A lack of engagement with high-rise high density

High density development can take various configurations in terms of building scale and design. In Green Square this includes quite tall buildings, up to 30 storeys. However, the documents revealed a noticeable lack of engagement with any *specific* needs resulting from higher density development that comprises high-rise (tall) buildings. Most particularly, there has been little or no attention to how the higher levels of such developments should be designed and whether there are different needs compared to the lower levels (here the practitioner’s quote at the beginning of this paper is relevant).

In Victoria Park, although the mix of different building types was marketed as a positive, the intended taller buildings (constructed only in the latter stages of development) were given less attention. Perhaps acknowledging a lingering public ‘stigma’ regarding high-rise housing (Butler-Bowden and Pickett 2007), the precinct overall was characterised in the planning strategies and subsequent marketing material as a medium-scaled ‘green’ and ‘natural’ ‘suburb’ able to accommodate a diversity of household types and sizes.

Overall, in both case study areas, design and management attention is predominantly given over to the ‘ground level’ aspects of the proposed higher density living. On the precinct scale this includes:

- adequacy green open spaces and other public domain areas,
- adequacy public facilities for recreation and cultural stimulation, and
- management attention to social ‘activation’ of the public domain.

On the individual building scale (mainly in Victoria Park), it includes:

- requirements for communal open space and recreation facilities (eg. gyms, swimming pools) within each development,
- attractive ground-level foyers,
- as many apartments as possible to have their own entrances direct to a public street, and
- (in the Town Centre) attention to awning and balcony design on lower levels to reduce amenity impacts from the ‘active’ public domain.

The academic literature canvassed in the first study review (Connon et al. 2018) did not distinguish to any useful extent between high, medium and low-rise development. References to taller buildings is predominantly in relation to public housing, where additional socio-economic influences come into play (Connon et al. 2018, 63, 65, 68), and which can distract from more generic design lessons. Some commentary does note that ‘high-rise’ living can ‘work well’ in areas with ‘good neighbourhood amenities, built-in security, shared facilities, recreational spaces and opportunity for selective interactions’ (and that this can equally apply to any ‘lower income groups’ in such areas) (Connon et al. 2018, 65). However there is still no canvassing of any need for particular design features to assist ‘healthy’ living at higher levels. This is something the further appraisals of existing resident satisfaction surveys (as suggested in section 3.2 above) could also consider; though advice from one of these surveys (see Paine et al. 2016) is worth noting here: that although the inclusion of higher density multi-storey buildings generates more pedestrians and thus interesting and safer local streets, residents are frustrated at not knowing their neighbours and regard foyers and lifts as too impersonal to be meeting places.

3.6 Green Square may be atypical – in relation to financing and to extended organisational objectives

The Green Square case studies have proved useful. They are contemporary and on-going, they are dense in the Australian context, and various existing resident surveys can provide useful ‘lived experience’ data. Green Square itself is a place where, as Karskens (2004, 9) suggests, ‘... we can actually witness the spectacular, strange and often poignant process of [urban] social, physical and economic transformation.’

Further, Landcom has adopted an aspiration to be both a design and industry leader. In Victoria Park this included multiple roles as ‘master planner’, ‘master developer’ and ‘delivery partner’. These approaches suggest a potential fruitful engagement with Landcom to ascertain the various organisational and personal skill-sets involved.

However, here there is also a caveat. There are two components. Both have had positive outcomes for Green Square but may not be replicable elsewhere.

One is the extensive financial resources available to establish considerable and high quality health-supportive infrastructure. This includes ‘hard’ (eg. open spaces, transport facilities), ‘soft’ (eg. community facilities and programs, effective maintenance), and ‘hybrid’ (eg. affordable housing) components. This is financed partly from development contributions effectively paid by the new residents (as increased purchase prices) and from the substantial resources of the local government authority (the City of Sydney). A substantial factor in this ability to pay is Green Square’s location within the ‘global arc’ of Sydney’s international economy, resulting in a particular financial advantage when compared to most other areas.

The other component is the atypical nature of Landcom itself. As a public authority it has a *legislated* corporate brief that includes a triple bottom line accounting regime. Landcom is expected to (i) provide financial returns commensurate with the market, (ii) develop not just housing estates but also ‘communities’, and (iii) achieve outcomes which are ecologically sustainable. The documents suggest an active commitment to these multiple tasks. The minutes of Board meetings in respect to Victoria Park for example show concurrent attention to each of these criteria; the master plans include requirements for ‘innovative’ environmental performance; various awards have been won for these

and other development features; and a presentation (to university students) made the quite up-front statement that ‘[we, ie. Landcom] walk the talk – [a] focus on delivery’.

3.7 A new and extended dimension in supporting health – affective environments

A final matter is somewhat nascent – the ability of a built environment to not just provide features that support healthy behaviours but to also comprise an overall environment of *influence*, prompting a mindfulness within residents and others of the need to undertake such behaviours (Facer and Buchczyk 2019); indeed, seeing built environments as an actual ‘medium of communication’ in themselves (Dickinson and Aiello 2016). This includes how such environments are managed and promoted, in addition to how they are designed and constructed.

While several of the reviewed documents suggest an awareness of this potential, this tends to be in respect to ecological issues rather than health. In Victoria Park this includes, for example, water features designed to make visible the ‘water sensitive urban design’ initiatives and local sub-surface water quality issues. The Town Centre master plan explicitly refers to the potential for the urban domain to generate an *overall* environmental awareness (prompted also by the fortuitous inclusion of ‘green’ in the name of the locality itself).

It is worth exploring how such actions could include similar prompts to promote healthy behaviours, and also an awareness of the fundamental link between human and ecological health. There is some evidence of this already, though again, without apparent explicit recognition of the health implications. Examples include the visible quality of the parks, footpaths and cycle-ways; various marketing material (eg. Figure 1); and the ‘early activation’ strategies in the Town Centre (including welcome dinners, sustainability talks, and pop-up community gardens) which aim to establish a ‘vibrancy’ and sense of community.

4. Conclusions

The development of new high-density areas in our cities proceeds apace. Green Square, as a significant example of this process, provides a rich opportunity to identify lessons for high-density development elsewhere. Initial findings have been positive. There is a high degree of consistency between the strategy work in Green Square and the attributes of a health-supportive environment identified in the academic literature, both nationally and internationally.

Nevertheless, there are important cautions.

Perhaps the most critical relates to the high degree of organisational and financial backing apparent in Green Square and which has been provided by the State Government through Landcom, and the local City Council. This strongly suggests the need for similar levels of structural, policy and financial support if the generally positive outcomes apparent within Green Square are to be achieved elsewhere.

Second, ‘health’ still gets little or no explicit mention, and then only when a particular health issue becomes apparent, such as the current concern about chronic disease. It means the potential to address health issues *proactively* is potentially lost, with urban planning (and other actions) continually needing to ‘catch up’. A current broad population interest in the notion of ‘wellbeing’ may ameliorate this concern, however this is likely to depend on the extent to which there is alignment between how health, and also broader wellbeing, is understood at both community and professional levels.

Finally, ‘density’, ‘high density’ and, more critically, ‘healthy higher density’ lack coherent and agreed definitions. There is a growing recognition that density ‘done well’ can result in positive health outcomes. However, a long-term acceptance of – and subsequent emphasis on – a lower density suburban ‘ideal’ over many generations has also meant a hitherto lost opportunity to ‘design-in’ these positive aspects and ‘design-out’ potential problems within a new and innovative *range* of higher density models. The Green Square experience suggests design responses in this regard are still somewhat experimental, at least in the Australian context. Further, caution should perhaps be applied here too by not over-enthusiastically adopting more international high-density models that may not fit well with local, Australian aspirations.

The partnership between Landcom and the universities involved in this research provides an avenue to further the resolution of these matters and promote practical understandings of what comprises a healthy higher density environment and how it might be achieved. As such, the study presented here will be well worth referencing by practitioners of higher density residential development.

Acknowledgement and funding details

The authors gratefully acknowledge the financial and in-kind support provided by NSW Landcom to undertake this research project.

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Table 1. Documents reviewed from (i) the public domain, and (ii) and (iii) from Landcom, detailing planning strategies and development processes and decisions.

(i) Strategic planning documents relating to overall Green Square redevelopment area (various responsible authorities)	
1	Environmental Impact Statement for proposed new railway, with broad structural redevelopment options (1994)
2	Local Council Discussion Paper canvassing planning issues and seeking public comment about priorities, etc. (1991)
3	Resultant very comprehensive local Council strategic plan, and planning instruments + Social Plan (1995)
4	Overall Structural Master Plan for Green Square redevelopment area, with densities, layouts, etc. (1997)
5	Associated Green Square redevelopment area Infrastructure Strategy and Plan (various dates, given updates)
8	Brief, entries and winner of international design competition for the Green Square Town Centre (2002)
9	Local Health District Strategic Plan details proposed infrastructure and policies for Green Square area (2018)

(ii) internal Landcom documents reviewed relating to Victoria Park	
1	Original site Master Plan (1998)
2	PowerPoint presentation detailing vision for the development, the master plan, the role of Landcom (2005)
3	Untitled briefing note to an external consultant detailing the development and the role of Landcom (n.d)
4	Summary of Landcom Board Papers (agendas and decisions) regarding Victoria Park various dates over 10 years).
5, 6	Post Project Review (1997-2010), WORD document and associated PowerPoint presentation (late 2010)
7	Briefing note about a review of the Contaminated Site Summary Audit Report (1999)
8	Deed of agreement with local Council re developer contributions and Landcom's own public work costs (2007)
9	Draft marketing images and wording (n.d.)
10	Draft Home Page for proposed marketing website for Victoria Park (n.d.)
11	Description of 'Landcom vision' for 'water sensitive urban design' inclusions (n.d.)
12	Community newsletter entry encouraging residents to start a local group, and offering advertising space (n.d.)
13	Post card advertising a Christmas BBQ by Landcom and the local community group established by Landcom (2006)
14, 15	Edition of newsletter to residents giving various local advices (2006)
16	Notes for a presentation to the local State government Development Corporation on development standards (n.d.)
17	Independent Architect Review on design of a development proposal submitted to Landcom (2009)
18	PowerPoint presentation to university students on sustainability provisions + Landcom

	operations (2011)
19	'Welcome to Victoria Park' - 'fact sheet' about development process and outcomes, in marketing terms (2008)
20	Similar content to document, but with more detail (n.d.)

(iii) internal Landcom documents reviewed relating to the Green Square Town Centre	
1	Original site Master Plan (2003).
2	Planning Proposal submission to local Council on 'Core Sites' development (2010).
3	Statement of Community Benefits and Contributions arising from 'Core Sites' development (n.d.)
4	Transport Management and Accessibility Plan for overall precinct, including density reviews (2012)
5	'Pamphlet advising local transport options, and encouraging active 'green' transport and car share (2018)
6	Job description for a new Place Manager position (2016)
7	Draft document detailing background, priorities and proposed 'place-making' actions and 'framework' (n.d.)
8	Details on how a Landcom development partner will meet 'place making' and 'activation' responsibilities (n.d.)
9	Graphic summarising ideas, priorities and 'next steps' from a placemaking workshop (2017)
10	Presentation document on proposed 'Early Activation Strategy' (events and other actions) (2016)
11	Document seeking private proposals to 'activate' a Landcom-established community drop-in space (2017)
12	PowerPoint presentation on various 'activation' events (n.d.)
13	Proposed publicity, events and budget for a Summer Festival (2017)
14	Presentation document on Green Square Placemaking Plan (2018)
15	Design Report on first major Town Centre high-rise development (2014)

Table 2_ The three conceptual frameworks of a health-supportive built environment (after Cannon et al. 2018).

Tier 1	Tier 2	Tier 3
1. Global public & population health	Global-challenge responsive	Focused on solving public health challenges resulting from increased urbanisation
		Improvements to infrastructure and transport provision
		Solve problems resulting from changing urban demographic population profile
	Promotes positive physical health	Good air quality
		Adequate outdoor space
		Pedestrian friendly outdoor spaces
		Safety
		Adequate indoor space
		Low neighbourhood traffic levels
		Access to quality food
	Promotes positive mental health	Good air quality
		Adequate outdoor space
		Pedestrian friendly outdoor spaces
		Safety and human interaction
		Adequate indoor space
		Low neighbourhood traffic levels
	Focused on long-term health outcomes	Action-orientated
Future-orientated		
2. Socio-ecological determinants of health	Liveability	Promotion of liveability and quality of life rather than disease prevention
		Uses stimulating design and infrastructure to enhance resident wellbeing
		Promotes human happiness
		Emphasises a two-directional relationship between the built environment and human wellbeing
		Promotion of active transport
		Enhances social Interaction, including at different stages of the life course
	Positive physical health	Provides access to public and active transport
		Building design and access to space promotes positive behaviour change
		Enables access to fresh food
		Limits exposure to air pollution
		Promotes thermal comfort and reduces heat-related stress
	Positive mental health	Decreases social isolation
		Limits noise pollution and other environmental stressors
		Reduces crime and fear of crime
		Reduces fear of the health risks associated with environmental hazards through appropriate building design
		Decreases suicide rates through effective building design
	Health equity	Age and health
		Gender and health
		Socio-cultural factors and health behaviours
		Socio-economic inequalities and health

3. Planetary health (relational ecology)	Co-benefits approach to human and environmental health	Enhancing biodiversity of the natural environment
		Promoting long-term food security
		Enhancing air quality and reducing atmospheric pollution
		Improving water quality
		Promoting human and environmental flourishing for long-term quality of life
		Reducing the human and environmental impacts of increased planetary heat.
	Holistic approach to human wellbeing	Provides opportunities for accessing and attending to nature
		Promotes urban greening
		Promotes local food production
	Addresses global health challenge especially climate change	Promotes adaptation to climate change
		Promotes mitigation of climate change through reduction in green-house gases
	Promotes planetary sustainability in built environment design	Uses renewable energy
		Innovative environmentally-friendly building design
Building design helps to promote long-term planet cooling effects and sustainable energy efficiency.		

Table 3. Potential variations in the wording of health-supportive matters (from Wheeler 2011:26).

Search Term	Variant(s)
Health	healthy, healthier, healthiest
Wellbeing	well-being, well being
Liveable	liveability
Connect	connects, connected, connecting, connectivity, connector(s), connection (s), interconnect(s), interconnected, interconnecting, interconnectivity, interconnector, interconnections(s), reconnect(s), reconnected, reconnecting, reconnection(s)
Eat/Food	eats, eating, eater(s), eatery, foods
Safe	safety, safer, safely, safest, safeguard, safeguarding, safeguarded, unsafe
Sustainable	sustainable, sustainably, sustainability, unsustainable
Climate Change	climate changes
Walk	walks, walking, walker(s), walkway(s), walkable, walkability
Cycle	cycles, cycling, cyclist(s), cycleway(s), bicycle, bicycling

Table 4. Healthy High Density Definitions Coding Scheme

Category (each with a different coding colour)	Examples
Density is defined according to a specific spatially defined and quantified set of criteria	Total population; number of units per area
The term density is used but not defined	‘high density’; ‘development density’
Quantitative descriptors that provide a measure of an aspect of the site	Floor Space Ratio; Gross Floor Area; number of storeys
Quantitative descriptors that provide a count of an aspect of the site	‘40 parks’; ‘1800 dwellings’
Qualitative descriptors that indicate size or scale	‘neighbourhood’; ‘major centre’; ‘tower’
Qualitative descriptors that indicate changes in size or scale	‘growing’; ‘transforming’; ‘renewal’; ‘developing’

Figure 1. Victoria Park marketing images and text

