How Should Housing Densities be determined? A comparative analysis of Brisbane and Copenhagen

Greg Bamford
University of Queensland
Email: g.bamford@uq.edu.au

ABSTRACT

Modern urban housing densities, actual or proposed, show enormous variation. 'Broadacre City', Frank Lloyd Wright's proposal from the early 1930s, for example, was several *thousand* times less dense than the Liverpool docks had been in the middle of the previous century. What housing densities should we aim for? The determinants of housing densities can be thought of as either internal or external to habitation. The former concern the space households acquire or are allocated to satisfy the functions or desires of habitation; the latter are those forces, external to habitation, which influence density, such as the provision of public transport, the profit seeking behavior of developers or government policy to slow urban spread. I begin with some brief reminders of how in the recent past when urban compaction theory or practice has been in the ascendancy (internal) considerations of habitation have not been given due weight. Is this the case again? I compare a sample of higher density housing types and schemes in Brisbane with Copenhagen, a denser city admired by compact city advocates. This comparison produces some surprising results about relative densities and should give us cause to think again about levels of amenity and the usefulness of external space in our higher density housing, whatever our beliefs about the need for such densities.

INTRODUCTION: FROM THE LIVERPOOL DOCKS TO 'BROADACRE CITY'[i]

Lionel Frost describes a crowded area in 1790 near the Liverpool Docks in which additional houses in the form of three storey back-to-back terraces (with cellars) were shoe-horned into the back yards of the existing terraces such that one half-acre lot carried as many as 130 houses. The population density of this area was then in excess of 4, 000 people per hectare (pph).[ii] With sub-letting and taking in lodgers through the first half of the 19th century, the density rose to an extraordinary 7, 067pph by 1851 (Frost 1991: 13-14). What would such a density be like? A Brisbane 'Six-pack' is a three storey building - six flats on the upper two floors and garages under at ground - on an 800m² lot. To match the density of 19th century Liverpool, almost 700 people would somehow need to be accommodated on this lot. Squeeze a second Six-pack onto this site and we would need to cram only 50 people into every flat with a couple of families camping out in each of the garages. Just 80 years later, the American architect Frank Lloyd Wright proposed 'Broadacre City', a city so dispersed - every citizen would have at least an acre of ground to tend - it would be "everywhere and nowhere" (Fishman 1982: 92, Frampton 1992: 190). Wright imagined that something like Broadacre City was inevitable, and to the extent that our cities have frayed so extensively at their edges they are surrounded by vast "peri-urban" or "ex-urban" zones (Hugo et al 1997), heavily reliant on the motor-vehicle, Wright was right.

How shall we live then, in sunny Brisbane?[iii] Not for us, thankfully, the grim conditions of the 19th century Liverpool docks, living at a density which would see the edge of Brisbane only a few kilometres from the centre of the city, roughly where Toowong, Breakfast Creek and Stones Corner are

located. Nor Wright's dystopia, in which the population of the city would be sprinkled over much of South-East Queensland in one vast extended 'rural living' zone (the expansion of which the new *Regional Plan* has abruptly curtailed, Mackenroth 2005: 48). Our possible futures occupy the space between these poles, but how much choice do we have? The title of this paper is deliberately rhetorical; it is intended to focus attention on the scope of the choices we can exercise in relation to density, notwithstanding the forces at work on our cities.

TWO GENERAL KINDS OF DETERMINANT OF HOUSING DENSITY

In his elegantly written *Urban Utopias in the Twentieth Century* (1982) and *Bourgeois Utopias: The Rise and Fall of Suburbia* (1987), the American historian Robert Fishman outlines the principal ideas that have shaped western cities across the 19th and 20th centuries. Where has all this utopian interest lain? The sub-title of *Bourgeois Utopias* gives it away - principally in ideas of housing and neighbourhood. The *malleability* of housing is surely a large part of the explanation for this interest. Housing arrangements can be very different, physically or socially, from how they are, however they are. Housing has been attractive clay for remolding cities and housing *density* a continuing *leitmotiv* of the utopian thought Fishman describes.

The determinants of housing densities can be distinguished as either internal or external. Internal determinants concern habitation, for example, how much private outdoor space do families require? How much outdoor space for immediate household use can be semi-public or shared with other families, rather than being private? Can such space be above ground level? And so on. External determinants of housing densities follow from such considerations as what numbers of local residents or commuters are needed within such-and-such a distance of a centre to support local services or public transport. The desire of housing investors to maximize profit or governments or public housing providers to cut their land costs and shorten waiting lists or, more generally, to reduce urban spread are instances of the external forces on housing density. With compact city theory and policy in the ascendancy, continued scrutiny of whether the *internal* criteria for determining housing densities have been given due consideration is needed, as the following brief historical reminder of earlier waves of densification indicates.

Bold ideas for housing in the 20th century, for example, Le Corbusier's 'Radiant City' linked with the Smithson's proposition for 'streets in the air (or sky)', emerged against a background of continuous suburbanization and the corresponding, long-running decline in the densities of western cities (Frampton 1992: 180-82, 272-73, Young and Willmott 1975). The Radiant City was an idea for a high density but sunlit city of high-rise towers and slab-blocks liberating the ground for spacious parklands and a seemingly efficient (private) transport network. 'Streets in the sky', as the concept was usually known, was an attempt to reproduce, on windy elevated access balconies, the conditions under which sociability thrived in the ordinary working class streets below. Versions of these unusual ideas, often debased, almost invariably bleak, were foisted on hapless public housing tenants in the decades after the War when these same tenants would have overwhelmingly preferred a conventional house and garden, perhaps a flat, or the slums they grew up in, to the creative but unworkable concrete slums of the new housing schemes (Coleman 1985, Wates and Knevitt 1987, 'Reinventing the Victorian Terrace' 1993, Towers 2000). These schemes generally failed to achieve "the generous things that were expected of them" but also "none of the meaner things", proving to be neither cheaper to build nor maintain (Stretton 1987: 148). In 1970, Robin Boyd published 'Waking from the Suburbia Dream …', in which he was the one who was dreaming - of another generation of widely celebrated but soon-to-fail housing estates, such as Thamesmead New Town in London (Fig. 2), as well as grander (mercifully unrealizable) schemes for whole cities.

The undoing of these housing schemes was the lack of private outdoor space and the novel arrangements of their semi-public spaces, that is, the spaces between the front doors of everyone's flat and the edges of the scheme where the legible and familiar spaces of ordinary suburban housing, streets, parks and squares resumed. The dominant spatial device of a Corbusien-inspired scheme like the post-War Alton Estate at Roehampton in south-west London was a picturesque analogy with the English country house in its landscaped park (Fig. 3). But however much it must have appealed to Roehampton's public sector architects that their urban working class tenants would seemingly now enjoy some of the spatial privileges formerly associated only with the landed gentry, a public space is a poor substitute for the life of neighbourhood streets and the private gardens their tenants would have longed for or been familiar with (Roberts 1991, Stretton 1974, 1999). Indoor/outdoor domestic life, household economies and neighbourhood networks are not so easily reinvented in novel spaces not designed for those purposes, spaces which belong to everyone and therefore no-one (Figs. 4 & 5). Most estates were not as pleasant or well appointed as Roehampton. At the Doddington and Rollo Estate in Battersea in south London, for example, there was no lawn, only hard surfaces and abandoned and dangerous parking garages between the slab blocks, with the concrete roof decks of these garages made inhospitable and in large areas untrafficable by partially embedding bricks into the concrete, presumably to keep children from playing too close to the windows of the adjoining flats (Fig. 6). Doddington and Rollo have since demolished some garages and reclaimed others to provide a Centre for the Residents' Association and various community activities and facilities as well as extensive workshop spaces at the below ground level. The once free Corbusien space at the base of the blocks has been subdivided into play grounds (for children of different age groups, for example) decorated with various out-buildings, its access roads festooned with bollards; ornamental flower beds planted and screens or fences used to mark out the private courtyards adjacent to ground floor flats (Fig. 7). Other remedial measures common on such estates include community gardens and messy cubbies, or programs for writers or artists to work with the residents so a young boy, for example, can have a mural of a dog he cannot own (Lahey 1987).

Low rise, medium density housing estates often retained the device of the landscaped park-like setting, making dense schemes appear less dense and visually more attractive. Space was too valuable aesthetically, it seems, to have been designed for the mundane domestic uses that would typically have left it littered with sheds or carved up by fences. Common sense often did prevail, however, in the case of row houses, to the extent that private fenced back yards were provided or allowed (Ministry of Housing and Local Government 1952, Cooper 1975). Nonetheless, groups of houses could still find themselves marooned in semi-public space and any private outdoor space that was provided or fenced stripped of barriers to vision to retain the semblance of the park-like setting. Similarly, open air group car parking or carports were preferred to lockable garages (this was a matter of cost, of course, if not always a recognition of resident's priorities). Household privacy, weather protection, the control of ongoing outside projects, and security or shelter for outdoor household possessions are all frustrated without a moat of private space at least along the permeable edges of dwellings. Without this condition, sociability between neighbours is less likely with increased density and unwanted visibility; mistrust or resentment is more likely to fester as control of outdoor spaces weakens. High child densities and high child-to-adult ratios on public housing estates only exacerbated these problems (Cooper 1975; Cooper-Marcus and Sarkissian 1986, Sarkissian & Doherty 1987).

Easter Hill Village was an award winning public housing scheme of 300 units (mostly row houses, but some flats) built in the early 1950s in Richmond, California. The Federal Housing Authority opposed all private outdoor space but the architects argued successfully for front porches (deemed unnecessary

because it didn't rain much in California), small unfenced front yards (fencing would encourage tenants to become proprietorial) and small wire mesh fenced back yards, all of which were valued or well used (Cooper 1975: 3-4, 81, 99). Propaganda by the development industry played on the scenographic possibilities of pooling outdoor space in commons such as at Easter Hill ('Can Row Housing Solve the Builder's No. 1 Housing Problem?' 1955). Detached houses - where all outdoor space is private and sub-divided into small parcels - were said to constitute "crowding at five houses per acre" whilst row houses offered "spacious luxury at eight houses per acre", when much of the outdoor space was pooled, thus providing a park-like commons (Fig. 8). These densities are net of roads so the spacious row house case is actually equivalent to detached housing on 500m² lots. Even so, the argument is pure sophistry because detached houses can simply pool as much of their outdoor space as is necessary to match the "spacious luxury" of the row housing commons *and* still retain more private outdoor space per dwelling. The argument next took a shameless ideological turn when it is announced that at "twenty houses per acre [approx. 34dph NRD]" Easter Hill Village "boasts … more *useful* outdoor space than many an expensive suburb" (Row Housing 1955, pp. 102-3, 108-9). This conveniently overlooks the child-to-adult ratio at Easter Hill of about 1.7: 1. More importantly, the child density was about *ninety children to the hectare*. So with only small back yards, poorly located and otherwise inadequate public space and facilities for children's play, and no effective means for residents to negotiate or control the ribbons of semi-public space entangling their dwellings, social relations atrophied.[iv] At Minto in Campbelltown, Sarkissian & Doherty (1987) conducted a post-occupancy evaluation of (more) award winning public housing with similarities to Easter Hill, including comparable child densities, its problems made worse by the use of neo-Radburn layouts in which houses were sited back-to-front (Figs. 9-11). Reconfiguring houses internally or building new access roads to the backs of houses to turn backs into fronts has become the order of the day, either that or demolition, on several such housing estates in western Sydney (Woodward 1997).[v]

The spatial experimentation sketched above was possible only because public housing tenants were powerless. But there is another, deeper reason: what households do with the domestic space and resources at their disposal - the goods and services they produce, the ways in which they can fruitfully occupy their time and the way usable and well used housing can help stitch a neighbourhood together - does not appear, by and large, in the national accounts (Stretton 1974, 1987, 1999). So it is easy to overlook all this domestic production and the resources required for it to occur. And housing is malleable, as I have suggested. Industry, agriculture or commerce would never have been subjected to such indignities or long running inefficiencies in the allocation or design of the space and resources they need to be productive. Seen in this light, these spatial experiments had a distinct *ideological* function or effect. Reducing and pooling external domestic space was one way to increase housing densities and the novel spatial ideas architecture provided masked the program for doing so. People would still have modest flats or houses, and a new way of living, so where was the problem?

THE COPENHAGEN PROJECT: BRISBANE'S HIGHER DENSITY HOUSING COMPARED

In the first *State of Australian Cities Conference* (Bamford 2003), I briefly compared Brisbane's traditional higher density housing types with a small sample of recent higher density housing schemes in Copenhagen. The purpose of this comparison was to raise doubts about our assumptions concerning the relative densities of housing in a seemingly high density European city versus low density Australia cities. To develop this point further, in the context of the above discussion of the importance of *habitation*, I offer a more extensive analysis below, adding a sample of recent Brisbane schemes and a larger sample of Copenhagen schemes, drawn from the period in which urban consolidation has come to the fore in this country. Copenhagen is among the least dense of large European cities but is widely

admired by compact city theorists, if not always for the right reasons (Newman and Kenworthy 1992, 1999; Beatley 2000; Hodgson 2001). In covering the UK Urban Task Force White Paper, for example, Bill Hodgson (2001) reports the distinguished architect, Lord Rogers, who was the Task Force Chair, nominating Copenhagen and Barcelona as "role model" cities and endorsing "high density developments" as "vital" for UK cities. Tim Beatley (2000: 77) commends Copenhagen for developing "the very successful model of high density satellite communities oriented around metro and suburban rail lines".

I begin with Brisbane. 'Small lot development' in Brisbane once commonly consisted of detached timber worker's cottages on 16 perch (roughly 400m²) lots. A reasonably sized suburban block of 400m² lots, with 20 metre wide road reserves, would produce a net residential density (NRD) of about 18 dwellings per hectare (dph).[vi] The NRD for a single 400m² lot in such a block would be 20dph (Table 1, Fig. 12). (This increase is not magic, of course, but a product of the fact that corner lots have longer frontages and so reduce block densities; both lot and block densities are needed if we are to compare housing schemes on small and large sites.) With urban consolidation, narrower streets, smaller lots, zero lot lining and the use of attached housing, small lot housing densities in Brisbane have increased density, often significantly. Two 'Green Streets' projects from the early 1990s illustrate this point. Gresham Gardens in suburban Tarragindi, seven kilometres from the city, is a private scheme on an awkward site consisting of two and three bedroom (2br and 3br) attached houses and achieves 21dph NRD (Figs. 13-14). A public housing project in inner suburban Kangaroo Point, 41 Baines Street (1994), combines 2x2br detached houses and 3x2br attached houses on a 32 perch (809m²) lot (Table 1, Figs. 15-16), thus achieving 2.5 times the density of the traditional timber cottages. This housing type is now common in the private sector as well and is not limited to the inner suburbs.

Table 1: Traditional Brisbane Small Lot Housing and Two Higher Density 'Green Street' Schemes

Housing Type or Scheme	**NRD (block)**	**NRD (lot)**
Traditional detached timber worker's cottage on (roughly) 400m² lot	**18dph**	**20dph**
Gresham Gardens, Tarragindi, 1992 **(54 dwellings, 2br & 3br attached houses, 1 - 2 storeys, 125% car parking)**	**21dph**	
41 Baines Street, Kangaroo Point, 1992 **(2x2br detached houses, 3x2br attached houses, 2 storey, 100% car parking, 809m² lot)**	**(45dph)**	**50dph**

Turning to flats, a common traditional medium density type in Brisbane - certainly the most discussed before urban consolidation - was a type known as a 'Six-pack' (Fig. 17). I briefly mentioned the Six-pack earlier and other States have a similar type of the same name (Lewis 1999: 90-92). A Brisbane Six-pack was characteristically a three storey block of 6x2 bed flats; the flats occupied the upper two levels (like a six-pack of beer on its side) with garages or car parking under, at ground level. The minimum and typical site area for a Six-pack was 800m². The car parking requirement was high, typically 150% or nine spaces per Six-pack (Brisbane City Council 1989: 2). The suburban block above, if covered in Six-packs, would yield 54dph. It would be straightforward to replace the 6x2br flats with 8x1br flats, which would then yield 72dph. The NRD per lot would be 60dph for 2br units and 80dph for 1br units. Replace the garaging with 1br flats and block and lot densities would rise to 108dph and 120dph, respectively. The Six-pack produces a plot ratio of approximately 0.9 (Table 2, Fig. 18).[vii] Table 2 also includes a sample of recent higher density schemes in Brisbane, from a low rise

scheme for the Spring Hill Housing Co-op which mixes flats and attached housing at 90dph (Fig. 19), a recent public boarding house, 'Welsby Street' at 235dph (Fig. 20), to *Vision*, an 80 storey mixed use tower in Brisbane's CBD at approx. 800+dph.[viii]

Table 2: Brisbane 'Six-pack' Flats and some Recent Higher Density Schemes[ix]

Housing Type or Scheme	No. of Storeys	NRD (block)	NRD (lot)
Traditional Brisbane 'Six-pack' on 800m² lot (6x2br flats, 800m² lot , 150% car parking)	**3**	**54dph**	**60dph**
Six-pack 'rebuilt' as 1br units (8x1br flats, 112.5% car park.)	**3**	**72dph**	**80dph**
Six-pack 'rebuilt' as 12x1br units, *replacing garages with units* (12x1br flats, 33% car park.)	**3**	**108dph**	**120dph**
Spring Hill Housing Co-op, c.1990 (4x2br, 7x1br flats, 2x3br attached houses, 100% lower ground car park.)	**2 - 3.5**		**90dph**
Brisbane Housing Company (BHC) Flats, New Farm, 2004 (2x2br, 6x1br, 2 studios, minimal car park.)	**2**		**110dph**
'Avalon', New Farm, 1929 (26 Studios, 40m², 2 shops, min. car park.)	**2**		**160dph**
'Madison Peaks', Spring Hill, 1993 (40 units, 35m² - 70m², 100% basement + min. ground level car park.)	**2 - 4**		**195dph**
'Breeze', Indooroopilly, 2005 (39 flats, 103m² – 177m², 2 penthouses, basement and visitor car park.)	**8**		**c. 205dph**
Welsby Street Boarding House, New Farm, 2002 (20 Studios, 42m² - 49m², 9 Boarding House units, min. car park.)	**4**		**235dph**
'Warry Residences', BHC, Fortitude Valley, under construction (61 Studios, 42 Boarding House units, 1x1br unit, min. car park.)	**3 - 4**		**365dph**
'Vision', Brisbane CBD, under construction (370 Flats over 55 floors, 34, 000m² other uses, 700 car parks)	**80**		**c. 800dph**

So, how are things in Copenhagen? Tables 3, 4 and 5 contain all higher density housing schemes built in Copenhagen over the past 25 years or so which have been published in the Danish architecture journal, *Arkitektur DK*, or *Copenhagen Architecture Guide* (Lind and Lund 2001) and for which adequate data is available - which is all but a few such schemes.[x] The sample comprises close to 6,000 dwellings – or about 15 months of additions to the dwelling stock of the whole Copenhagen region (Greater Copenhagen Authority 2004: 67). I have grouped the schemes into density bands in each Table as this is sufficient for my purposes and emphasizes that these calculations can only be approximate.[xi] One further point: whilst a sample consisting only of schemes published in the

architectural literature can be claimed to be schemes the profession considers exemplary it cannot be claimed to be representative of all new housing in Copenhagen. However, this sample does contain dwellings across a wide range of sizes and costs, and social housing schemes are well represented in each Table. I also indicate the general planning controls on development in inner Copenhagen.

Table 3: Attached Housing Schemes (including Flats*) in Copenhagen

Scheme	Location	Date	No. of Dwellings	No. of Storeys	Approximate NRD
Dobbelthus	***Gentofte***	**1988**	**2**	**1**	**5 – 15dph**
Bel Colle	***Rungsted***	**1999**	**18**	**2**	
Boligbebyggelsen Sjølund	***Hellebæk***	**1978**	**74**	**2**	
Havrevangen*	***Hillerød***	**1994**	**50**	**2**	**16 – 20dph**
Nørgårds Plantage & Hesselbo*	***Værløse***	**1984**	**145**	**1 - 3**	
Skovhaven (Stage 1)	***Værløse***	**1998**	**85**	**1 - 2**	
Jonstruphusene	***Jonstrup***	**1994**	**50**	**2**	
Torpgården	***Herfølge***	**1979**	**176**	**1 - 2**	**21 – 25dph**
Fuglsang Park*	***Farum***	**1983**	**189**	**1 - 3**	
Søhuse*	***Birkerød***	**1995**	**15**	**2 - 3**	
Trudeslund	***Birkerød***	**1981**	**33**	**1 - 2**	
Samsøvænget	***Køge***	**1983**	**41**	**2**	
Hastrupvænget*	***Køge***	**1981**	**132**	**1 - 2**	
Tinggården I*	***Herfølge***	**1978**	**78**	**1 - 3**	
Søkrogen	***Værløse***	**2001**	**52**	**1 - 3**	**26 – 30dph**
Hedelyngen	***Herlev***	**1981**	**142**	**1 - 2**	
Vedbæk Station	***Vedbæk***	**2002**	**25**	**2**	
Dambakken*	***Birkerød***	**1996**	**57**	**2 - 3**	
Tubberup Vænge*	***Herlev***	**1990**	**119**	**2**	**31 – 35dph**
Lynggården*	***Ølby***	**1984**	**143**	**2 - 3**	
Holmebækhuse*	***Køge***	**1982**	**258**	**2 - 3**	
Præstebanken*	***Køge***	**198?**	**78**	**2**	
Taarbæk Ældreboliger	***Klampenborg***	**1980**	**24**	**1 - 2**	
Tinggården II*	***Herfølge***	**1984**	**91**	**2 - 3**	
Grønhøj	***Ballerup***	**2001**	**46**	**2**	**40 - 45dph**

Table 3 (Figs. 21 & 32) consists of attached housing schemes, some including flats*. None of these schemes emulates the densities attached housing *can* achieve, for example, Paddington in Sydney has a lot density of 56dph (Urban Design 1998: 31). Brentham Garden Suburb, in Ealing in west London, dating from 1901, is 28dph (Figs. 22-28) and so is above the average density of schemes in this Table (Reid 2000).[xii] Raymond Unwin's preferred range of densities for cottages was 10 to 20 houses per acre (net of roads) or approximately 22dph to 45dph NRD. So these schemes all fall within or below his preferred range (Unwin 1909: 319-20). An increase in density between one-third and one-half of Brisbane's traditional small lot detached housing on wide streets would be all that was needed to reproduce the density of this Danish attached housing. The schemes are generally in suburban, mostly outer-suburban, locations, out to the tips of Copenhagen's 'fingers' (or just beyond, in the same transport corridor). Most schemes attempt to reproduce the spatial and landscape attractions of the garden suburb or the countryside, often pooling space in commons to achieve this end. (The *Danes* do this easily.) Several schemes include ponds or creeks, or share seamless borders with parkland or wood, effectively lowering their densities further. Most of the larger schemes - *Nørgards Plantage*, *Torpgården* and *Fuglsang Park* (Figs. 29-31), all social housing schemes - incorporate an informal soccer pitch. The denser schemes in Table 3, for example, *Tøndehvælv* and *Taarbæk Ældreboliger*, are in urban settings; Tinggarden II was designed to have an "urban feel". However, even the densest

scheme, *Grønshøj*, is no denser than the Kangaroo Point scheme (Table 1, Figs. 15-16). Moreover, *Grønhoj*'s dwellings are small (75m²) and its access roads narrow making its plot ratio and site cover lower than Kangaroo Point. Gresham Gardens in Brisbane at 21dph is less dense than about two-thirds of the Danish schemes, but that is not the whole story. One of the denser Danish schemes, suburban *Præstebanken*, for example, consists of studios and 1br, 2br and 3br attached houses, ranging in size from 30m² to 85m², with no garages, whereas Gresham Gardens 2br and 3br houses range from 88m² to 135m², plus garages. Thus, although *Præstebanken* is at least 50**%** more dense than Gresham Gardens its plot ratio is probably less. In Table 3, only *Grønhoj* would be both more dense *and* more intensively developed than Gresham Gardens.

Table 4: Lower Density Flats (including attached houses*) in Copenhagen

Housing Scheme	Location	Date	No. of Dwellings	No. of Storeys	Approximate NRD
Virumgård*	***Lyngby-Taarbæck***	**1990**	**515**	**1 - 4**	**20 – 25dph**
Rungsted Sundpark	***Rungsted Kyst***	**1996**	**18**	**2 - 3**	
Duemosepark*	***Farum***	**1994**	**54**	**2 - 3**	**30 – 35dph**
Tøndehvælv*	***Ballerup***	**1995**	**28**	**3**	**36 – 40dph**
Dianas Have	***Hørsholm***	**1992**	**41**	**2 - 3**	**41 – 50dph**
Pærehaven	***Ølby, Køge***	**2004**	**80**	**3**	
Skodsborg Sundpark	***Skodsborg***	**1995**	**86**	**2 & 5**	
Ewaldshave	***Rungsted***	**1978**	**28**	**2 - 3**	
Livornparken	**Copenhagen S.**	**1991**	**79**	**1 - 2**	
Strandparken	***Dragør***	**1996**	**34**	**2**	
Allerød Have*	***Allerød***	**1990**	**66**	**2 - 3**	
Banekrogen	***Værløse***	**1996**	**26**	**2**	**51 – 60dph**
Engen	***Rødovre***	**1989**	**51**	**3 - 5**	
Huset	***Christianshavn***	**2000**	**18**	**4**	
Støbervænget	***Dragør***	**1979**	**30**	**2**	
Sibelius Park	***Rødovre***	**1986**	**191**	**2 - 3**	
***Brumleby* (Doctors' Houses)**	***Østerbro***	**1995**	**236**	**2**	**70 – 75dph**

Table 4 (Fig. 33) consists of all schemes that are at or below, often well below, the density of a Brisbane Six-pack (or its notional re-configuration as an 8x1br pack). The location of these schemes varies from inner Copenhagen to the outer suburbs (Figs. 34-44).[xiii] Of the denser schemes, *Sibelius Park* is a typical urban consolidation exercise, on a three hectare site edged by light industrial, commercial and residential building, in *Rødovre*, a middle distance suburb. *Sibelius Park* is a well organized social housing scheme with a wide range of unit types and spatial configurations, mostly 1br and 2br, but with some tiny studios and small 3br units for young people (Figs. 39-44). Units are small by Australian public housing standards. The plot ratio of *Sibelius Park* is less than two-thirds that of a Six-pack. The car parking ratio is about two-thirds with no garaging of vehicles. Cars are corralled at the edge of the site so pedestrian streets, private courtyards, shared courtyard entries to flats, communal gardens and two large recreational spaces productively occupy the ground, unlike the Six-pack. *Brumleby* ('Doctors' Houses') near the centre of Copenhagen is a social housing scheme initiated by a Copenhagen doctor after a cholera epidemic in the summer of 1853 (Figs. 45-48). The scheme consists of 236 small units, disposed as two storey blocks of flats in simple rows on a three hectare, effectively car free, site. The scheme underwent urban renewal in the 1990s but has retained its low density and generous green spaces that have proved to be well suited to children. *Brumleby* has a similar density to a Six-pack (reconfigured as 1br units), with a plot ratio accordingly about one third less.

Table 5: Higher Density Flats in Copenhagen

Housing Scheme	Location	Date	No. of Dwellings	No. of Storeys	NRD Bands
Langelinie	*Østerbro*	1997	96	6	65 - 80dph
Glashuset et al.	*Ballerup*	1996	84	3	
India Kaj Wharf	Copenhagen	1999	49	6	81 - 95dph
Torpedo Boat Hall	*Holmen*	2003	67	5	
Yellow Warehouse	Copenhagen	1978	30	6	
Garvergården	*Østerbro*	1988	71	2 - 6	
Boliger i Nansengade	*Copenhagen*	1998	46	6	96 - 110dph
Mariendalsvej Bofællesskab	*Frederiksberg*	1992	24	3 & 6	
Boliger i Ordrup	*Ordrup*	1992	20	5	
Dalgas Have	*Frederiksberg*	1991	c. 500	5	
Charlottehaven	*Copenhagen*	2001	222	5 - 6	111 - 130dph
The Blue Corner	*Christianshavn*	1989	5	3 - 4	
Kongens Enghave	*Frederiksholm*	1994	90	5	
Blue Warehouse	Copenhagen	197?	36	7	
Solbjerg Have	*Frederiksberg*	1980	407	3 - 6	131 - 150dph
Vera Hus	*Vanløse*	1996	39	4	
Wilders Plads	Copenhagen	1978	166	4 - 5	151 - 170dph
Dannebrogsgade	*Nørrebro*	1992	18	5	
Boliger i Guldbergsgade	*Nørrebro*	2002	40	5	
Ungdoms Boliger	Copenhagen S.	1990	66	2 & 5	c. 250dph
Wennberg Silo	Copenhagen	2004	142	16	c. 400dph

Table 5 (Figs. 49) comprises the schemes that are *more* dense than a Six-pack. These schemes are generally in the inner suburbs or the centre of Copenhagen. Density comparisons are less straightforward here, however, as flats vary widely in size, as does the provision for car parking. Several schemes at the lower density end, for example, *Langelinie* and *India Kaj Wharf*, consist of large private waterfront flats. Nonetheless, these schemes bear little resemblance to the scale of the development of high-rise towers or blocks in inner Brisbane with a view or glimpse of the river. The maximum allowable height for new housing in Copenhagen Municipality (inner Copenhagen), for example, ranges from two to six storeys (plus attics or roof terraces) and plot ratios range from 0.4 to 1.5, with some local exceptions. Allowable site cover varies inversely with the intensity of development, ensuring that as the floor area of new development increases so does the area of the site that must remain open space (Lind and Lund 2001: 129, 232-33, Copenhagen Municipality: 140). In the centres of Australian cities, the intensity of development is much greater. Glen Searle (2004: 46) reports that plot ratios for housing in Sydney reach fifteen, ten times that of Copenhagen, and central Brisbane is similar. At the higher density end of Table 5, moreover, the schemes are typically some form of social housing and flats are small, with little or no car parking. *Vera Hus*, for example, consists of small 1br units for older people with about the same plot ratio as a Six-pack. The studios in the low rise Welsby Street Boarding House are a similar size to the 1br units in *Vera Hus*, and the former is denser, with fewer storeys.

The approach to density of new infill schemes in the centre of Copenhagen, such as *Garvergården* and *Boliger i Nansengade*, is revealing of contemporary Danish housing preferences (Table 5). Both schemes (largely) follow the existing urban block pattern, building to the street edge to create an internal courtyard. Unlike their older neighbours, however, they reduce density, height or site cover to improve amenity. *Garvergården* steps down from six to 2.5 storeys along its south-western edge allowing sunlight into the courtyard behind (Figs. 50-52). The section of the housing block and the

courtyard have also been intelligently manipulated to reduce the block to a maximum of 3.5 storeys at the courtyard edge. *Nansengade* is a social housing project consisting of 12x1br flats for older people, 29x2br flats and 5x3br flats for families, but with a similar plot ratio to a Six-pack (Fig. 53). By building to six storeys, however, and hugging the street edge, *Nansengade* makes one generous interior courtyard space (about 55 metres square) and achieves a very low site cover – about 15**%** or half that of a Six-pack. The function of such a modest insertion into an already relatively dense inner Copenhagen block is clearly to improve the outdoor space and amenity for households, especially given the presence of children. *Charlottenhaven* is similar in execution, creating an interior courtyard of about 2/3 of a hectare. These medium-rise courtyard schemes achieve a higher amenity than, for example, a pair of adjacent Six-packs (Fig. 60) or other recent low-rise Brisbane options. Even though they are up to three storeys higher, these Copenhagen schemes have a better *aspect ratio* (ratio of separation to height of buildings). *Kongens Enghave* is a redevelopment of an early 20th century inner city block which increases the interior space and improves the amenity of the flats and the courtyard. (Fig. 54). Nonetheless, the overall form of *Kongens Enghave* does illustrate the difference in amenity the Danes are aiming for at the end of the 20th century as opposed to the beginning. Indooroopilly in Brisbane is slated as a Principal Centre in the *Regional Plan* (Mackenroth 2005: 74) and currently has an allowable plot ratio in the 'Centre Core Precinct', where 'Breeze' is located (Table 2, Fig. 1), of 2.5 (Brisbane City Council 7/2004: 429-31). This is higher than for the Copenhagen courtyard schemes above, as I have indicated. With lower plot ratios for roughly the same storey height, these contemporary Danish schemes are thus able to achieve better aspect ratios and shallower unit plans.

Finally, of the two densest schemes in Table 5 (Fig. 55), *Ungdoms Boliger* is youth housing, a mix of small studios and a few 1br units. How does this compare? The Brisbane Housing Company boarding house, 'Warry Residences', has a similar overall spatial allocation per resident as *Ungdoms Boliger* but is appreciably denser. The densest scheme in table 5, *Wennberg Silo, is* a high density scheme, the exception to the rule in the Copenhagen sample. *Wenneberg Silo* is a conversion of disused grain silos on the Copenhagen waterfront (into expensive flats) and so is an exception not a counter-example to the general pattern. The desire to finding a new use for an *existing* building, a mercantile landmark, has led to a housing density several times what would otherwise be permitted.

CONCLUSION: VALUING INTERNAL DETERMINANTS OF HOUSING DENSITY?

The surprising outcome of the above analysis is that the density of Copenhagen's exemplary higher density housing schemes of the past 25 years could best be described as modest by comparison with the Brisbane sample. This outcome is the more surprising when one considers the natural advantages the Danes enjoy for achieving higher densities. Firstly, they have a greater familiarity with and acceptance of higher density housing types and higher housing densities. Even when schemes are built to detached housing densities (lowest two density bands of Table 3), the architects have opted for attached housing types and even flats. And they opt for flats when attached houses would achieve the same density within the same or a similar building envelope (schemes in Table 3 with flats and most or all of the schemes in Table 4). Secondly, Danish dwelling sizes are typically smaller than ours. New Danish flats average 89m² and attached houses 92m² (Statistics Denmark 2004: 11). Thirdly, their requirements for the movement, parking and storage of cars on site are much lower. Cars are often grouped in the open, close to site entries rather than being individually garaged beside or under dwellings above ground. This approach improves design options, increases the area of usable open space on site and reduces the size of the building envelope. To put this another way, Danish household sizes are effectively smaller than ours, because cars are fewer and not treated as household members requiring bedrooms or dormitories! Fourthly, shared space is more common, more usable, better used, less trouble and more

highly valued in Danish housing schemes. Common houses are common in both the public and private higher density schemes above. *Huset pa Christianshavn* consists of three floors of housing above a child care centre and even their outdoor space is shared. Residential blocks are more than the sum of their lots - central courtyard spaces in urban renewal projects provide semi-private outdoor spaces for ground floor flats and a variety of common spaces and facilities, enabling a wider range of activities to occur (compare Fig. 56 with Figs. 57-59). When space *can* be shared in this manner, higher densities are more achievable and the park-like settings beloved of Modernism become not merely appropriate but contribute to reducing perceived densities and increasing the uses such spaces can support.

In Section 2 above I sketched the creative but disfunctional shared external spaces of some influential Modernist housing types bent on achieving higher densities. The Brisbane Six-pack and its variations have continued this tradition, minus the creativity. A common criticism of the Six-pack concerned the nature and disposition of its shared external spaces, for example, the Six-pack took its amenity from the neighbours' gardens, reducing or destroying the latter's privacy in doing so. The movement and storage of vehicles dominated the ground and the remaining open space was largely unused or unusable for many ordinary domestic purposes, having no direct connection with any flat (not least because every flat was above ground). The over-riding functions of the moat of space surrounding the Six-pack are the movement and storage of vehicles, and merely providing separation from one's neighbours.

The Brisbane architect, Rex Addison's refreshing challenge to the Six-pack turned the block to face the front, reinstating the street and the back yard as the source of amenity and, importantly, brought two flats down to the ground. Addison's model also offered the possibility of an incremental terrace as he intended it to be built to the boundary (Fig. 61). In lot-by-lot development, as densities rise, the whole will be increasingly less than the sum of the parts unless the development of lots is constrained by appropriate concerns for adjoining lots and the block as a whole. When Six-packs are neighbours (or the equivalent as attached houses), for example, they can often be found staring at one another across an expanse of concrete wide enough to function as a road (Fig. 60).[xiv] Flats and attached houses now often face the front but this streetscape improvement is relatively small beer. The back and front rows of housing confront one another across a narrower expanse of concrete than adjacent Six-packs. The intensity of development leaves little of the site uncovered and the loss of anything resembling a suburban garden with space for at least one large tree, which was at least possible with the Six-pack, is purely a function of the density increase (again, compare Baines Street, Figs. 15-16, with Table 3 schemes). Developers have cranked up the plot ratio in this model, adding an extra bedroom to each of the townhouses, a third storey to the back row and providing garaging under for cars. If attached housing in Brentham garden suburb in London, where cars are confined to the street, is built to about 30dph NRD why are we opting for 50dph? Increasing density is now virtuous and the bar is set so low for higher density housing that a general decline in the amenity and usefulness of external space passes largely without criticism. Peter Richards' intelligent schemes for the Spring Hill and New Farm Coops, both of which mix flats and attached houses, show how the amenity and usefulness of such spaces need not be sacrificed in the achievement of higher densities (Figs. 62-63).

Brisbane's new higher density housing is now as dense or denser than Copenhagen and the intensity of this development - taking intensity of development to include larger dwelling sizes, increased site cover and hard standing, and greater provisions for motor vehicles - exacerbates the decline of amenity and the possibilities for more useful exterior spaces and gardens. Suppose we grant all the external reasons advanced by compact city theorists for such higher housing densities. In twenty years time, the life of the *Regional Plan*, will we regret not having paid more attention to habitation in determining new housing densities?

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Appendix 1: References for Copenhagen Housing Schemes

Housing Schemes	*Arkitektur DK* (unless otherwise indicated)
Allerød Have	**36 (No 1/2 1992): 24-27**
Banekrogen	**42 (No 2 1998): 84-85**
Bel Colle	**44 (No 2 2000): 60-65**
Blue Corner	**38 (No 4/5 1994): 236-39**
Blue Warehouse	**27 (No 5 1983): 214-16**
Boligbebyggelsen Sjølund	**23 (No 6 1979): 240-48**
Boligbebyggelsen, Virumgård	**36 (No 7 1992): 374-85**
Boliger i Guldbergsgade, Nørrebro	**46 (No 7 2002): 458-63**
Boliger i Nansengade	**43 (No 3 1999): 172-77**
Boligeri i Ordrup	**37 (No 7 1993): 322-23**
Brumelby **(Doctors' Houses)**	**Lind and Lund, 2001: 70**
Charlottehaven	**46 (No 3 2002): 160-65**
Dalgas Have	**33 (No 2 1989): 62-77**
Dambakken	**41 (No 7 1997): 396-97**
Dannebrogsgade	**37 (No 5/6 1993): 264-71**
Dianas Have	**38 (No 4/5 1994): 256-65**
Dobbelthus	**35 (No 2 1991): 98-101**
Duemospark	**41 (No 7 1997): 382-83**
Engen	**36 (No 1/2 1992): 30-32**
Ewaldshave	**27 (No 4 1983): 170-73**
Fuglsang Park	**29 (No 5/6 1985): 198-205**
Garvergården	**36 (No 1/2 1992): 16-19**
Glashuset et al.	**42 (no 2 1998): 70-77**
Grønhøj	**45 (No 8 2001): 526-27**
Hastrupvænget	**27 (No 8 1983): 330-34**
Havrevangen*	**38 (No 7 1994): 384-87.**
Hedelyngen	**26 (No 6 1982): 231-39**
Holmebækhuse	**27 (No 8 1983): 335-40**
Huset pa Christianshavn,	**45 (No 1 2001): 33-37**
India Kaj Wharf	**43 (No 3 1999): 162-71**
Jonstruphusene	**37 (No 5/6 1993): 248-49**
Kongens Enghave	**38 (No 7 1994): 444-47**
Langelinie	**41 (No 7 1997): 386-91**
Livornparken	**Lind and Lund, 2001: 285**
Lynggården	**27 (No 8 1983): 342-43**
Mariendalsvej Bofælleskab	**37 (No 8 1993): 354-68**
Nørgårds Plantage & Hesselbo	**29 (No 5/6 1985): 206-15**
Præstebanken	**27 (No 8 1983): 341**
Pærehaven	**48 (No 8 2004): 616-23**
Rungsted Sundpark	**41 (No 7 1997): 374-81**
Samsøvænget	**27 (No 8 1983): 327-29**
Sibelius Park	**31 (No 6 1987): 271-78**
Skodsborg Sundpark	**41 (No 7 1997): 398-403**
Skovhaven	**44 (No 2 2000): 66-73**
Solbjerg Have	**24 (No 7 1980): 261-67**
Strandparken	**42 (No 2 1998): 106-109**
Støbervænget	**24 (No 7 1980): 270-74**
Søhuse	**41 (No 7 1997): 394-95**
Søkrogen	**45 (No 8 2001): 528-29**
Taarbæk Ældreboliger	**27 (No 2 1983): 80-85**
Tinggården I	**23 (No 6 1979): 249-59**
Tinggården II	**29 (No 5/6 1985): 242-49**
Torpedo Boat Hall	**47 (No 4 2003): 235-41**

Torpgården	**24 (No 7 1980): 275-81**
Trudeslund	**26 (No 6 1982): 240-48**
Tubberup Vænge	**36 (No 1/2 1992): 77-79**
Tøndehvælv	**42 (No 2 1998): 78-79**
Ungdoms boliger	**36 (No 7 1992): 386-87**
Vedbæk Station	**48 (No 8 2004): 588-93.**
Vera Hus	**43 (No 7 1999): 448**
Wenneberg Silo	**48 (No 8 2004): 594-603**
Wilders Plads	**23 (No 4 1979): 144-49**
Yellow Warehouse	**27 (No 5 1983): 209-213**

[i] All Figures refer to the Powerpoint Presentation accompanying this paper. Figure 1 is the title slide.
[ii] Extrapolated from Frost's 1851 figure (1991: 13) supplied below, based on his data for average household sizes.
[iii] Adapted from the title of a lecture by William Morris in 1889 (Morris 1971: 217).
[iv] Extrapolated from Claire Cooper's survey of 52 households comprising 85 adults and 143 children.
[v] Ironically, now that these failures are better understood, and better public housing is generally designed and built, we have all but given up on building new public housing, at least in this country.
[vi] A block consisting of two rows of sixteen lots (10m frontage, 40m deep) with 20m wide road reserves on each edge would produce an NRD of 18dph. The calculation of NRD includes half the width of the access road to a lot. The block in this case occupies 1.6ha; the curtilage of access roads 0.4ha. All housing densities supplied in this paper are NRDs except for Brentham.
[vii] The plot ratio falls to 0.6 if the garaging is excluded from the calculation. The values cited for Copenhagen and Brisbane city plans exclude garaging. In comparisons with the Six-Pack I use the value of 0.9 for this type to emphasise the building envelope.
[viii] Densities for particular schemes rounded to nearest 5dph. In the case of 'Vision', I 'cashed out' 25 floors of uses other than housing. A recent check of its web-site indicates 370 apartments now planned (previously 424). The density calculation in the accompanying powerpoint based on previous figure.
[ix] For 'Avalon' see Felipe (2005: 20-21), 'Breeze' (http://www.breeze-apartments.com.au/), and 'Vision ('http://www.austcorp.com.au/residential/vision.asp). Other schemes from architect's drawings and Brisbane Housing Company; street widths from Brisbane City Council Bi-map.
[x] Sources for all Copenhagen housing schemes are supplied in Appendix 1.
[xi] The density measures can only be approximate. *Arkitektur DK* does not supply site areas but scaled site plans. It is not standard practice to scale from a plan and there is a margin of error in doing so. Assumptions had to be made about the location of some lot boundaries, access road widths, and adjacent open space including the division of space in internal courtyards of city blocks. Some conventions were adopted, for example, in mixed-use schemes, I partitioned the site into its different uses or 'cashed out' the non-housing uses (so three floors of housing above a child care centre was counted as four floors of housing). Schemes occupying corner sites will appear less dense (for example, the Blue Corner and *Ungdoms Boliger* but in each such case the scheme makes use of the amenity a corner site offers).
[xii] The NRD of housing in Brentham would be a little higher than 28dph, as some non-residential uses would be removed from the calculation.
[xiii] Figs. 34-35 are *Dianas Have*; Fig 36 is *Engen*; Figs. 37-38 are *Huset pa Christianshavn.*
[xiv] Blocks of flats facing one another can work (very well in the case of *Brumleby*); much depends on the landscaping of the intervening space, and its aspect ratio as I explain above.