



HEART IN THE RIGHT STREET

Beauty, happiness and
health in designing
the modern city

A study into the links between
specific components
of the built environment and
measurable wellbeing

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Summary

If you could design the perfect urban development what might it be? This report is an attempt to summarise the sociological data for maximising wellbeing for the greatest number in the modern city or town.

Of course everywhere is different and needs to be so. So this is a theoretical exercise though it is based on empirical research. However, the research *does* permit us to pull out the themes which need to find a distinct and individual form and flavour place by place. The 'perfect' urban development most likely to maximise wellbeing and which also reflects the data on popularity and value is normally likely to consist of some combination of;

1. **Greenery.** Frequent green spaces inter-woven into the city either as private gardens, communal gardens or well-overlooked public spaces between blocks and where people really need them and frequent them. Large parks are necessary but need not be ubiquitous. Lots of street trees;
2. **Homes.** Some of the very real and valued advantages of suburban living (houses, private gardens, privacy) but at rather greater densities (think terraces of houses with some flats) and without the long commutes and consequent risk of isolation. Children preferably in houses not flats. As many houses as possible;
3. **Height.** Most buildings at human scale height. Sparing use of residential towers and only in city centres, for the rich, for the small number of people who seek them or where the local micro-climate is unimportant (their high energy usage and their malign local environmental impact is more defensible in hot countries). No children in high rise;
4. **Connectivity and streets.** Streets that 'plug into' the surrounding city. A well-connected, highly walkable, traditional street pattern of differing types and sizes with multiple junctions and route choices. Some streets should be pedestrian or bicycle only but most would be mixed use with generous pavements wherever possible;

5. **Land use.** Mixed use of residential, commercial and retail wherever possible and where traffic implications can be managed. Retail nearly always interspaced with commercial and dotted around primarily residential as far as density permits;
6. **Blocks.** Blocks that are neither too big nor too long. Buildings that appear to be buildings not entire blocks. Often narrow fronts with many doors and a strong 'sense of the vertical' to break up the scale of a terraced block. Clear fronts and backs with very clear internal private or communal gardens *inside* blocks. No deck access;
7. **Space.** Minimal internal semi-private space. No residential corridors. As few doors as possible off the same 'core.' External open space normally less than about 50m in breadth;
8. **Beauty and design.** Beauty really matters – any development that most people don't aesthetically like is missing a key trick. Must have a strong sense of place and 'could not be anywhere'. This will normally (though not always) include either a style or use of materials that at least references a place's history. A variety of street types, design, green spaces. Streets that bend and flex with contours of the landscape. Some surprises. Not designed by committee;
9. **Facades.** No long blank walls but either frequent front doors (ideally with modest front gardens) or shop fronts. 'Walking architecture' is more popular, more complex and more valuable than 'driving architecture.' Some front doors should have steps for social and public health reasons;
10. **Density.** Somewhere in the 'middle.' Dense enough to be walkable and to provide walkable shops and offices. But not so dense as to be overwhelming, to undermine wellbeing or to create problems of long-term maintenance costs. Fifty to 220 homes per hectare is probably right.

Reflecting on the twin extremes of the tower block and the suburban development, the brilliant 'urban experimentalist', Charles Montgomery, has written that the 'sweet spot is somewhere in between.' He would appear to be right.

8. But towers in space don't seem to be very good for most residents either

The opposite reaction to the human preference for some green space in the city is to build towers or large residential blocks in open green space. This was the driving momentum behind most of the post-war rebuilding in the UK where both local planning departments and central government subsidy favoured high-rise housing surrounded by open space. The Conservative 1956 Housing Subsidy Act was biased in favour of high-rise housing for example.¹ In the twenty years from 1955 around 1.5 million homes in streets, squares and alleys were demolished - about 10 per cent of all homes in the country.² The new tower blocks and linked slabs were essentially built at suburban densities (even in the city centre) and surrounded with large open communal spaces. This was meant to bring light, greenery and, yes, happiness. Today, this provision of green space is, again, the justification being used for the construction of high rise towers in London and of towers in Asia.³

8.1 An overview of the evidence

What is the evidence of the experience of living in high rise or large blocks on wellbeing and correlated factors such as crime, physical activity and levels of social interconnectivity? Although there was a definite trend for such research in the 60s, 70s and 80s, there has been far less in the last 25 years. The most comprehensive literature review (by Professor Gifford of the University of

¹ Flats of four, five and six storeys obtained much larger government subsidies. And above six storeys the subsidy rose by a fixed amount for each additional floor. A flat on a four storey block received £20, a flat in a six storey block received £38, 2.3 times the subsidy paid on a house. Increasing by £1.15 each floor this multiple over a normal house rose to 3 for a flat at fifteen storeys and 3.4 for one at twenty storeys. Dunleavy, P. (1981), *The Politics of mass housing in Britain*, p. 37.

² Holmes, C. (2003), *Housing, equality and choice*, p. 9.

³ For example see, *Evening Standard*, 19 November 2014. Yuen, B., (2009), 'Reinventing Highrise in Singapore', *Cityscape. A Journal of Policy Development and Research*, vol. 11, number 1 p.7.

Victoria) we have been able to find into the key question of 'are high-rise buildings a net benefit or cost to their residents?' concluded that;

*'the literature suggests that high-rises are less satisfactory than other housing forms for most people, that they are not optimal for children, that social relations are more impersonal and helping behaviour is less than in other housing forms, that crime and fear of crime are greater, and that they may independently account for some suicides.'*⁴

We believe that the studies that Professor Gifford was able to find together with some additional and more recent studies that we have found permit a little more certainty than that. Clearly people can be happy in towers and miserable in houses and *vice versa* but of a total of at least 85 peer-reviewed academic studies which contrasted socio-economically comparable groups living in high and low-rise accommodation, 67 (or 79%) found that high rise residence was negatively associated with some aspect of wellbeing. Nine (11%) found no association either way. And nine (11%) found a positive association between high-rise residency and wellbeing. The spread of research and the correlations found are set out in Table i.

⁴ Gifford, R. (2007), 'The Consequence of living in High-Rise Buildings', *Architectural Science Review*, vol. 50. p. 1.

Association	Total number of studies	% showing high rise 'bad'	% showing no link	% showing high rise 'good'
Satisfaction with home	12	92%	0%	8%
Levels of mental strain, crowding, stress, optimism	19	66%	21%	11%
Depression and more serious mental health	5	100%	0%	0%
Suicide	4	50%	50%	0%
Behavioural problems for children	5	80%	20%	0%
Levels of crime	6	50%	50%	0%
Fear of crime	2	50%	0%	50%
Pro or anti-social behaviour	5	100%	0%	0%
Levels of social engagement and social capital	16	75%	13%	13%
Children's' progress in high- rise	11	91%	9%	0%
Total	85	78%	12%	11%

Table i - High rise vs. low-rise residency and wellbeing⁵

Whatever limitations there may be in individual studies, all of the studies cited in Table ii compare high-rise residents to reasonably similar low-rise residents and have been published in an academic journal. Some are naturally controlled groups who are randomly allocated (for example students or military families). Others are sociologically or economically similar. Some studies are very precise on accounting for this. Others are less robust. Studies where no account was taken of material differences between groups or where no

⁵ For a full list of studies see Appendix one.

comparison from high-rise to low-rise was attempted were excluded. So, for example, data that shows people can be satisfied (or unsatisfied) in houses is not considered if no sociologically valid comparison is included (and *vice versa*).⁶ Also excluded are studies where the compared populations are dissimilar and this is not adjusted for. Several studies which found that high-rise was 'bad' were thus excluded and one that found they were 'good'. Sadly recent surveys are not necessarily any more robust than those conducted 40 years ago.⁷ For example, the most recent research of which we are aware found that Vancouver high rise residents were less likely than those living in detached homes to know their neighbours' names (56% to 81%), to have done them a favour (23% to 48%), to trust them (40% to 60%) or to believe that their wallet would be returned if lost locally (55% to 68%). But resident populations are probably not comparable and the difference is not adjusted for so the survey is not included in the table above.⁸

We find it very hard not to draw from this survey of research a clear view that living in high rise building is less popular for most, associated with higher levels of stress and mental depression (particularly for women in families), is normally inimical to effective child-rearing and seems to be normally associated with lower levels of social capital. (High rise blocks in estate-type urban forms have been associated with higher crime but this seems to be not true for high rise today with associated high running costs). This is not to say that there is not a market for them or that high rises residences do not have their place for (usually, not always) the prosperous, the childless and the second-home owners. Well maintained (and they are much more expensive to maintain than normal buildings) and plugged into a proper streetscape they can work. But they are, clearly, statistically, not for everyone.

⁶ There are multiple reports with varying degrees of rigour which show that certain populations at certain times are or are not satisfied.

⁷ Gifford, R. (2007), "The Consequence of living in High-Rise Buildings', *Architectural Science Review*, vol. 50. p. 13.

⁸ Vancouver Foundation, (2012), *The effect of apartment living on neighbourliness*.

8.2 Satisfaction and stress

To pull out a few themes. Although individual studies show that residents *can* be satisfied in high rise, in eleven out of twelve controlled comparisons we have been able to find *between people living in different housing forms*, people living in tower blocks are less happy with their homes than people living in low rise. To be clear, these are comparisons which take account of social and economic status and are not comparing 'apples with pears'. In one survey, British flat dwellers complained more about privacy, isolation, loneliness and noise. In the second survey, an American comparison of otherwise equal college students randomly assigned to high or low-rise buildings, those in low-rise buildings were more satisfied. A nationwide Canadian survey found satisfaction highest among those in houses and lowest among those in high-rises. In a New York comparison of randomly assigned social tenants those in high-rise buildings were less satisfied with their building than those in low-rise buildings. The same was true of a survey of moderate-income households where high-rises were found to be less satisfactory than terraced houses or low-rise flats. In a sixth study, the taller the building, the lower the residents' satisfaction even when several possible influences (education, income, age) were taken into account.⁹ A 2009 Indian study of 512 randomly selected families found a starkly 'unfavourable perception of the housing environment by the residents of high-rise buildings.'¹⁰ Another recent, though less wide-ranging, British study compared three West London estates. 60% of those who lived in the post-First World War development of houses and two storey flats would recommend it as a place to live in comparison to only 43 and 8% of residents of more monolithic estates.¹¹ In an early 1980s survey of residents' views of London multi-storey housing, there were 258 specific and

⁹ Cited in Gifford, R. (2007), "The Consequence of living in High-Rise Buildings" in *Architectural Science Review*, vol. 50. pp. 4-5.

¹⁰ Chatterjee, M. (2009), 'Perception of Housing Environment among High-Rise Dwellers' in *Journal of the Indian Academy of Applied Psychology*, 35, pp.85-92.,

¹¹ Lane, L. and Power, A. (2009) *Low income housing estates*. In fact four estates were studied but no detailed interviews were conducted at the fourth so this has been excluded from our synopsis. P. 7, pp. 44-52.

spontaneous negative comments about multi-storey housing and 67 spontaneous positive ones – a ratio of nearly four to one against.¹²

Many have argued that high-rise can work for the elderly (as long as they are kept secure and the lifts work). Controlled comparative studies we are aware of are not very reassuring. It is true that one modest study of elderly persons who were randomly assigned to high- and low-rises reported a small difference in satisfaction that favoured high rises over low rises. However, a nationwide U.S. study of the elderly found that residents of low buildings liked their housing more than residents of taller buildings, although the size of this effect was quite modest. A third study found that low-rise residents needed less daily help and were less prone to confusion. They offered 'more positive reasons for liking their residence than high-rise residents did, and the high-rise residents offered more negative comments than the low-rise residents did' although they did find the high rise social environment socially supportive.¹³

The majority of controlled studies (13 out of 19) also show that the residents of high-rise blocks suffer from more strain and mental health difficulties than those in low-rise buildings, even when socio-economic status is comparable. To cite one example, a study of British military families randomly assigned to houses and 3-4 storey low-rise flats found those in flats suffered from about three times the rate of neurosis as those in detached houses whilst also being 57 per cent more likely to need to go the doctor and 63 per cent more likely to be referred to a specialist. Increased sickness or mental strain were most pronounced for children under 10 and for women aged 20 to 29 and those over 40.¹⁴ At the other end of the social spectrum a study in Hong Kong found that there was more emotional strain among people living in multiple-family units on higher floors. Indian studies have agreed. One 1992 study found that elderly

¹² Coleman, A. (1985), *Utopia on trial*, p. 33.

¹³ Cited in Gifford, R. (2007), "The Consequence of living in High-Rise Buildings" in *Architectural Science Review*, vol. 50. pp. 5. Also Devlin, A. (1980), 'Housing for the Elderly', *Environment and Behavior* December 1980 vol. 12 no. 4 451-466

¹⁴ Fanning, D. (1967), 'Families in flats' in *British Medical Journal*, 18, pp. 382-386.

male residents in Kolkata and Dhaka struggled with the stress associated with living in high-rise buildings.¹⁵

A 1978 study of working-class and lower middle class residents of the Bronx in New York found 'vast differences' between those living in high-rise and low-rise buildings. Those in high-rise had less social support, a lower sense of control over their lives and felt more crowded than their sociologically identical neighbours in low-rise buildings.¹⁶ UK researchers have found that mothers in flats are more depressed and lonely, that rates of mental illness rose with floor levels, that psychological symptoms increased in high-rise buildings and that those moving out of high-rise became happier and less depressed. A study that controlled carefully for age, education and occupational level found that husbands (though not wives) in flats rather than small houses had a greater incidence of psychiatric illness, that fathers had worse relationships with their children (hitting them more often) and that marital discord was higher.¹⁷

In contrast, four studies show no association between high rise residence and mental health or strain and two actually show a positive association between living in high rise and mental health.

8.3 Children in high rise

The evidence seems to be particularly strong for children. Nearly all studies of which we are aware have found associations between high-rise living, childhood behavioural problems and slower development – again even when socio-economic status is comparable. Only one study that we are aware of has found high-rise living beneficial to children (and this was arguably a non-

¹⁵ Dasgupta, S.K., Bhattacharyya, S. & Asaduzzaman, M. (1992), 'The impact of tall buildings on elderly residents' *Bangladesh Journal of Psychology* 13, pp/ 7-15.

¹⁶ McCarthy, D. & Saegert, S. (1978), 'Residential density, social overload, and social withdrawal' in *Human Ecology*, 6. pp. 253-272.

¹⁷ Cited in Gifford, R. (2007), "The Consequence of living in High-Rise Buildings" in *Architectural Science Review*, vol. 50. pp. 6-7.

typical case where children living in a 32 storey high rise very near a major road learnt to read better higher up and away from the very heavy traffic).¹⁸

The broader picture seems hard to argue with. One study matched 99 pre-school children on gender and economic well-being and found that children in high-rises suffered from more behavioural problems¹⁹. In another boys (but not girls) who lived in fourteen versus three storey buildings were rated by teachers as having more problems such as hyperactivity and hostility²⁰. Other studies have found children in high-rises suffering from more bedwetting and temper tantrums and that the best predictor of juvenile delinquency was not population density but living in blocks of flats as opposed to houses. One Japanese study found that the development of many skills such as dressing, helping and learning to use the lavatory was slower.²¹ Even an Israeli study of middle class high rise residents that was otherwise more positive to high rise living was most negative for those with children under six.²²

Why is this? Most have come to the conclusion that it is just much harder to bring up children in large blocks of flats – particularly high-rise ones. Several studies show that children go outside less when they live in high-rises and that they spend more time playing alone or in restricted play. This is not without consequences. One controlled study, compared mothers of under 5s in the Newcastle estate of Cruddas Park. Sixty-two per cent of mothers living on the sixth floor or above reported difficulties with the 'play, health [or] personality' of their children. Fifty-three per cent of mothers in high rise below the sixth floor reported issues. However only 3 per cent of mothers in houses reported

¹⁸ Cohen, S. & Singer, J. (1973), 'Apartment Noise, Auditory Discrimination and Reading Ability in Children', *Journal of Experimental Social Psychology* 9, pp.407-422.

¹⁹ Richman, N. (1977), 'Behaviour problems in pre-school children' in *British Journal of Psychiatry*. 131, pp.53-58.

²⁰ Saegert, S. (1982) 'Environments and children's' mental health: residential density and low income children' in Baum, A. & Singer, J. *Handbook of psychology and health*, pp. 247-271.

²¹ Cited in Gifford, R. (2007), "The Consequence of living in High-Rise Buildings" in *Architectural Science Review*, vol. 50. p 8., p. 10.

²² Churchman, A, Ginsberg, Y, (1984), 'The image and experience of high rise housing in Israel', *Journal of Environmental Psychology*, 4, pp.27-41.

issues.²³ When children do go out they are also out of sight and much harder to control. As early as 1961 British qualitative research was showing that mothers were concerned about the safety of their children on balconies, staircases and lifts and that the lack of outdoor play opportunities was creating stress and illness for mothers. Over 50 per cent of young children in high flats were only ever playing in their flats.²⁴ Explaining the link between flats and litter Professor Coleman summed up the dilemma in the 1980s:

'There can be little doubt that littering characterises flats more than houses and it is easy to see why. In houses with gardens, children can spend their formative pre-school years under close parental supervision. The garden is a safe place where toddlers can gain the self-confidence that comes of venturing out alone while knowing that help is immediately at hand if needed. They learn to care for the home territory, partly through the natural impulse, at this age, to imitate parents, and partly by being taught, until litter abstention and litter clearance become engaged habits.

In blocks of flats these child-rearing advantages are not available. A mother has a different range of options – all of them unpalatable. She can keep her children safely indoors, which deprives them of energetic exercise to let off steam. She can let them play on the balcony, with the risk of a serious fall. She can let them loose in the corridor, where their noise may drive their neighbours mad. Or she can allow them out into the grounds, where she cannot always be supervising them, and where they pick up bad habits from unsupervised children. Some parents succeed, against all the odds, in teaching their children not to litter. Others do not, and litter may be ever-present. Children then see it as the norm, not as an environmental insult – an attitude which is probably permanent...

As successive age-groups of litter louts are bred, their collective activities become too much for the remaining litter clearer. An old lady living in a slab-block in Tower Hamlets described how at first she had regularly scrubbed the

²³ Gittus, E. (1976), *Flats, families and the under-fives*, p. 81.

²⁴ Gittus, E. (1976), *Flats, families and the under-fives*, p.11.

*corridor and staircase, only to find them promptly re-littered and fouled by dogs. Her sense of responsibility was strong, and she continued the abortive cleaning for a whole year before finally giving it up as useless.*²⁵

A seminal study by Pearl Jephcott of multi-storey housing in late 1960s Glasgow had reached similar conclusions:

*'... the new form of housing segregates the generations and cuts off the child from his home. In traditional housing dozens of reasons lead him to make brief appearances there. He turns in to shelter from a squall, to fetch a toy, to go to the toilet, to wheedle 2p when he hears the chimes of the ice cream van – all of which mean he is fairly often in touch with his grown-ups. In a high flat this is less likely because of the bother of the lift. The adult is equally reluctant to have to use it. And as regards anybody having a glance now and then to see if he is all right, the child can slip under the block, round the corner and vanish from sight more easily than in a street. . . The child's casual contacts with people other than his own home have also lessened. No one leans on a sill or pops out to look at a pram, no couples have a half hour blather at the gate, no father mends a fence, no gran sits on the step minding a toddler but also available for talk with the 8 year old.'*²⁶

Do these themes still hold true today? Research carried out by Ipsos-MORI for RIBA found that parents had the strongest preference for private gardens. One interviewee commented: 'I would like my living space to lead onto my garden. At the moment I'm upstairs and the garden's down. My son is a terror, he needs space to run but I don't always want to be out in the garden.'²⁷ These problems with children would seem to be crucial to the difficulties that many tower blocks have faced over the years as petty failures reinforce each other and spiralled down into criminality. 70 per cent of graffiti in one study was committed by children²⁸. In another study children were responsible for much of the urine and faeces. Excrement was most common in blocks next to play

²⁵ Coleman, A. (1985) *Utopia on trial*, p. 83.

²⁶ Jephcott, P. (1971) *Homes in high flats: Some of the human problems involved in multi-storey housing*, p. 87.

²⁷ RIBA (2012), *The way we live now*, p. 53.

²⁸ Redknapp, C. (1983), *The effect of entrance design in blocks of flats*, unpublished report to the Nuffield Foundation. Cited in Coleman, A. (1985), *Utopia on trial*, p. 26.

areas, especially where the design made it difficult to reach home in a hurry.²⁹ A UK Home Office Survey also found that vandalism in tower blocks was significantly correlated with the number of children aged 6-16, increasing in direct proportion to the average number of children per dwelling.³⁰

8.4 Human interactions, scale and crime in high rise

When the internal scale of a large building matches their external scale, large buildings can 'atomise' and dehumanise by taking away from residents any 'control' over who they will meet as they travel between their flat and the public realm. This can increase withdrawal and anonymity and decrease friendships. Residents may *meet* more people but they will *know* fewer of them. Research suggests that 'the richest social environments are those in which we feel free to edge closer together or move apart as we wish.'³¹ However living in large buildings can undermine these bonds of social interdependence. And society needs these bonds. Professor Robert Gifford, has cited a very wide range of controlled studies that make this point emphatically. A Canadian study found that high-rise residents tended to choose friends from outside the building. A Hong Kong study found that high-rise residents with a strong sense of neighbourhood tended to interact with colleagues or schoolmates rather than physical neighbours. A study of American students found that those in small living units believed they benefited from more social interactions than those in high-rise buildings. A study of German and Italian high-rise residents found that both wanted more friends among their neighbours and believed this would be possible if they lived in smaller buildings. Other studies back up this belief. At least four separate studies show that high-rise residents have fewer genuine friendships with their neighbours than low-rise residents. In one Israeli study, women who lived on high floors knew more neighbours but those on lower floors had closer relations with those that they knew. Those with garden flats had three times as many friends in the building as those on high floors. In another study

²⁹ Coleman, A. (1985) *Utopia on trial*, p. 26

³⁰ Wilson, S. (1978), 'Vandalism and "defensible space" on London housing estates' in *Home Office Research Study No. 47*.

³¹ Montgomery, C, (2013), *Happy City*, p. 139.

residents of low-rise buildings had fifty per cent more local friends than residents of high-rise buildings. Two other studies found that social relations were poorer for high-rise residents.³²

Some planners and architects celebrate this lack of domesticity. Describing Balfour Tower and Trelick Tower (the latter being the 'hard-to-let' tower discussed earlier and termed locally the 'tower of terror') Ernö Goldfinger's biographer, Nigel Warburton, praised them in terms that are surprising given they were meant to be homes. 'Viewed from outside, they are incredibly muscular, masculine, abstract structures with no concessions to an architecture of domesticity.' James Dunnett's praise is even more bizarre: 'The sheer concrete walls ... impart a delicate sense of terror. At the summit of the tower the boiler house ... evokes the bridge of a warship. At night the estate is illuminated by the merciless beam of powerful arclights mounted on the summit of the slab.'³³ The idea that architects should try to terrorise their residents clearly borders on the perverse. It is unsurprising that those who built them rarely lived in their terrible creations.

Even when architects were not trying to deny domesticity or be delicately terrifying, one consequence of such grotesque scale is clear. People just aren't as nice to each other in large blocks of flats. In two 1970s studies stamped addressed envelopes were placed on hallway floors in college halls of residence that were 22-25, 4-7 and 2-4 storeys high. Letters were mailed in inverse proportion to building height in both studies. Donations were also sought of milk cartons for an art project. The fewest donations *per capita* were received in high-rise blocks. Interviews of student residents in these and one other Israeli study also reported that social support and involvement declined with height within buildings. A comparison between those in high-rise flats and garden flats found that those in garden flats had a significantly greater sense

³²Cited in Gifford, R. (2007), "The Consequence of living in High-Rise Buildings" in *Architectural Science Review*, vol. 50. p.10.

³³ Warburton, N. (2003) *Ernö Goldfinger: The Life of an Architect*, p. 157.

of 'community' and a greater sense of 'membership'³⁴ This evidence corroborates the recollections of many residents of neighbourhoods bulldozed to build estates that the local sense of 'community' never recovered. As one Deptford resident recalled, 'once they started pulling everything down, it all died.'³⁵

With such damaged social bonds, with fewer friendships, it should be no surprise that violent crime can be higher in multi-storey blocks particularly in complex non-conventional estates. (Though burglary inside high rise blocks with more prosperous residents and proper security can be much lower).³⁶ Criminals are confident that they are less likely to be identified or challenged. They feel freer to prowl for opportunities to attack or rob. This phenomenon was studied in the important 1972 work, *Defensible Space* by Oscar Newman. He termed it *anonymity* and his findings revealed that as anonymity increased so did crime. Oscar Newman's most famous study was based on all the public housing projects in New York (169 estates covering 4,000 blocks of flats and many houses with a population of half a million people). He identified five primary drivers of anonymity: low density (mostly meaning that there were larger areas of public space which were far from earshot or visual oversight), the sheer size of an estate, the number of people using the same entrance, the number of storeys per block and the degree to which the common parts of the building are shared and defended by different households. Consistent with the data set out above he found that crime increased in line with building height and that it was concentrated in semi-public spaces which were shared by large number of dwellings, spaces where there was no sense of responsibility or ownership.³⁷ Other studies replicated these patterns, finding that, 'although causality cannot be inferred from the findings, a positive association was

³⁴Cited in Gifford, R. (2007), "The Consequence of living in High-Rise Buildings" in *Architectural Science Review*, vol. 50. p. 9, p. 10. A comparison of elderly Afro-Americans in high-rise and low-rise buildings found a similar phenomenon though other social differences between the two groups meant that the survey was only suggestive.

³⁵ *Our Streets, Deptford High Street*, screened on BBC2, 6 June 2012.

³⁶ Budd, T. (1999) *British Crime Survey*, The 2001 British Crime Survey Home Office Statistical Bulletin.

³⁷ Newman, O. (1996), *Creating Defensible Space*, pp. 9-30.

observed between high-rise areas and property crime rates. Furthermore, both of these variables were negatively associated with the respondents' sense of community.³⁸

It is not hard to see how these studies found the combination of large building and an overly-porous urban form dangerous. It can be simply easier to commit crime in a complicated concrete and glass jungles of post-war multi-storey housing. They can offer a plethora of semi-private, semi-public unpoliceable spaces such as corridors and stairwells which are hard to survey and which offer multiple escape routes. Streets with windows and doors looking out onto them are open to easy public view. If they have bay windows, if houses are near the street (as in old fashioned terraced housing) or if doors are raised above ground level they are also particularly easily policed by residents simply looking out of their front windows or standing by their front doors. Dealing drugs or committing a robbery outside a house on a street is possible. But it does mean exposing yourself and there are likely to be witnesses. An external corridor on the (say) sixth floor of a medium-rise slab-block is a rather easier proposition. There is still a risk of being witnessed. Most flats have small kitchen windows looking out onto the corridor and you might be spotted from afar. But overall the chances of quickly snatching a bag or wielding a knife unobserved are greater.

Easier still however would be an internal corridor or stairwell in a tower block. There are very unlikely to be any witnesses. It is not for nothing that the stairwells, corridors and landings of tower blocks have long been associated with vandalism, robbery, burglary, drug-dealing and murder or that Oscar Newman's study (cited above) found that crime was only 14 per cent greater within flats themselves but 604 per cent greater in interior public spaces of high-rises. The communal facilities of Trellick Tower were vandalised before any tenants had even moved in and the fire hydrants were vandalised six times in the first eight months – leading to a power failure during the building's first

³⁸ Bynum T, Purri, D, (1984), 'Crime and Architectural Style', *Criminal Justice and Behaviour* 11:2, pp. 179-96.

Christmas in 1972.³⁹ The lifts in Robin Hood Gardens were also being vandalised within a year of completion – well before anyone could blame all failures on poor maintenance.⁴⁰ This theory also helps explain why more crime is associated with houses or buildings whose door faces *away* from the street. There is less surveillance. A final specific problem with multi-storey housing is the multiplicity of escape routes. Lifts, multiple staircases and exits have been found in several studies, (most famously by Oscar Newman), to be positively correlated with crime.

8.5 Fixing the problems is possible but can be expensive

As we have alluded to, the good news is that more recent city-wide data finds that crime, particularly burglary can now be lower in high rise buildings compared to other housing types. Several recent studies have found this.⁴¹ With the right combination of more prosperous residents, more expensive controlled access and management and positioning on a street high rise buildings themselves can prove safe from crime. In some estates it has even proved possible to 'design out' issues more broadly, particularly those of anonymous but easily accessible spaces. Following on from the studies of the 1970s and 1980s cited above, remedial work was done on many multi-storey estates. Entrances were given keypads and buzzers. Connecting walkways between blocks were dynamited. Extra doors were built to restrict the number of dwellings per entrance. Where budgets permitted, CCTV and even a concierge were introduced. These changes were intended to reduce anonymity, increase the level of surveillance and reduce alternative escape routes. Although there has been less systematic research over the last twenty years, many of these changes have had a positive impact – particularly where

³⁹ Warburton, N. (2003) *Ernö Goldfinger: The Life of an Architect*, pp. 164-8.

⁴⁰ Cited in Stewart, G. (2012), *Robin Hood Gardens – the search for a sense of place* (Wild Research), p. 15.

⁴¹ For instance see Hillier, B. & Sahbaz, O. (2008), An evidence based approach to crime and urban design, available at www.spacesyntax.com/wp-content/uploads/2011/11/Hillier-Sahbaz_An-evidence-based-approach_010408.pdf (accessed December 2015) and Budd, T. (1999) *British Crime Survey*, The 2001 British Crime Survey Home Office Statistical Bulletin.

it has proved possible to provide full time surveillance or in some tower blocks where it is easier to control access. (One building that has been successfully improved by increased security is Trellick Tower, no longer known as the 'tower of terror'). However, improvements are expensive and limited. Where this has worked, such as Trellick Tower, there has usually also been a socio-economic shift to more affluent professionals, often without children. Such groups can bear the higher costs that multi-storey living needs in order to work. Further, building multi-storey blocks only to lobotomise the scale and space which is their defining feature seems a little perverse – and certainly expensive. One study by the Centre for Housing and Planning Research at Cambridge University described them as 'resource intensive, both in capital expenditure and in ongoing revenue expenditure.'⁴² Houses and streets provide the same features without the need for the paraphernalia of buzzers, a salaried concierge and monitored CCTV. As the American writer Jane Jacobs put it pithily: 'this is something everyone already knows: A well-used street is apt to be a safe street.'⁴³ Solving one of the issues helps but it alone will not change that much.

The Packington Estate in Islington demonstrates both the potential for improvements but also the limits to what is possible without a fundamental shift back to streetscapes. The Packington Estate was enthusiastically pushed through by planners and central government in the 1960s in the face of local resistance. It was composed of 27 large slab-blocks, six storeys high, linked together by pedestrian decks at ground level and at the third floor. It deliberately cut across surrounding streets and severed its residents from their neighbours. Its descent was rapid and it quickly became notorious for its 'gang culture.' Starting in 1988 a series of improvements were made. The overhead bridges were demolished. Upper and lower levels were given separate access. Courtyards were made private to specific groups of flats. A new estate management office was built and manned. Camera surveillance was introduced. And on each deck metal screens restricted access to a relatively

⁴² Jones, M. (2012) High density housing – the impact on tenants, p. 4.

⁴³ Jacobs, J. (1993), *The Death and Life of Great American Cities*, p. 44.

small number of dwellings. These eliminated some of the worst elements of the design.⁴⁴



Fig i – The Packington Estate intentionally cut across the surrounding streets

It was only a question of stemming the inevitable however. There were ongoing problems with the inherent safety of the buildings. (In 2003 they were revealed to not be compliant with gas regulations imposed in the 1970s after the collapse of Ronan Point tower block). Nor did issues with crime disappear. The Packington Estate remained linked to Britain’s most notorious drugs gang – the Adams family.⁴⁵ The high security necessary to overcome the disadvantages of multi-storey design was intrusive to normal life and led one local councillor to write, ‘it cuts the estate up into fortresses where each staircase and landing is bisected by fences; one former resident calls it

⁴⁴ Towers, G. (2000), *Shelter is not enough*, pp. 161-2.

⁴⁵ *The Independent*, 17 September 1998.

Colditz.⁴⁶ In 2007 tenants agreed to the estate's demolition and the bulldozers went in during spring 2011. The estate was only 41 years old. Meanwhile the early Victorian terraced houses identical to those destroyed to build the estate in the first place are 150 years old and sought after local homes. The 'new' development has met many of the residents' views though not all of them. The traditional street pattern has been reinstated.⁴⁷ Union Square has been nearly perfectly recreated (figure ii). However, residents' desire for no high-rise housing, with 91 per cent opposing development more than 3-5 storeys high, has been partly overruled.⁴⁸



Fig ii – Union Square has been recreated in the new Packington

In summary, improved use of entry phone technology and a reduction in the number of dwellings per entrance can 'fix' these problems but keeping these

⁴⁶ 19 March 2008 blog of Bridget Fox, [//bidgetfox.wordpress.com](http://bidgetfox.wordpress.com) accessed in December 2011.

⁴⁷ The first phase of the re-build has been prize winning due to the revival of streets. The developer, Hyde Housing, won the *What House?* development award in November 2012 and was specifically praised for a 'welcomed return to traditional streets and squares... with a contemporary interpretation of period style.'

[www.hyde-](http://www.hyde-housing.co.uk)

[housing.co.uk/News_1.aspx?id=12:35040&id=12:35039&news=12:38068&b_mainnews_o=12:38068](http://www.hyde-housing.co.uk/News_1.aspx?id=12:35040&id=12:35039&news=12:38068&b_mainnews_o=12:38068). Accessed January 2013.

⁴⁸ *Packington Estate Planning brief, Appendix 4* (2005), available at www.isllington.gov.uk accessed in December 2011.

improvements 'live' is expensive and requires constant vigilance. You are always trying to push water up hill.

8.7 Exceptions or not? Asia, men and the wealthy

There clearly *is* a market for top end residential occupation of flats high in towers. In modern, high-end, well-managed developments in London with a reliable lift each floor is typically worth an additional 1.5% - with this market very driven by Asian purchasers.⁴⁹ Evidence also shows that middle income or wealthy residents can be very satisfied with their homes as long as the blocks are well managed.⁵⁰ There does not appear to be a body of academic literature studying wellbeing and wealthy high rise residents. (Perhaps this is not surprising. Private bankers study the rich. Sociologists tend to study the poor.) It is hard therefore to make completely categorical assertions but some points seem to be self-evident. Despite the lack of robust evidence, there seem to be at least three good reasons to believe that high rise will work better for more prosperous residents:

- The first is that the more prosperous can afford to buy flats in central city districts towers where high density, additional footfall from workers and general high levels of prosperity can support busy streets and ground floor retail (though for the inescapable micro-climatic effects of high rise on light and wind see section 9.7)
- The second is that the more wealthy commit far less physical crime and with salaried doormen to keep them safe from outside intruders, there seems to be no evidence that the same correlations between large buildings and crime are witnessed in luxury high rise as in social housing
- The third is that the more prosperous can afford to meet the clearly high running costs of larger buildings. The long term evidence is fairly consistent that larger buildings such as tower blocks cost more to run per

⁴⁹ Knight Franks, (2012), Tall Towers, p.7.

⁵⁰ For example, Mackintosh, E. (1982). *High in the city*. EDRA: Environmental Design Research Association, No. 13, pp. 424-34. Broyer, G. (2002). *The appropriateness of buildings over 20 storeys high for middle-class residents*. Research thesis, Technion, the Israeli Institute of Technology.

square foot due to their inherent complexity and to the need to manage in the private realm some of the actions that are performed gratis in the public realm (notably natural surveillance). A 2012 study by the Cambridge Centre for Housing and Planning Research found that service charges for flats rose as densities increased.⁵¹ Andy von Bradsky, the former chairman of PRP Architects, has concluded that 'it is inevitable that tall buildings have much higher management costs.'⁵² This seems to be particularly the case as high rise buildings age. Service charges in the Barbican Centre's Shakespeare Tower are now £8,000 a year.⁵³ Clearly it is easier for more prosperous residents to pay these charges.

Oscar Newman summed up this situation well in 1972:

*'The high-rise prototype with its myriad of resident janitorial and security staff, worked well for upper-middle income families with few children but cannot be simplistically transplanted, minus the accompanying staff and accoutrements, for the use of large, low-income families.'*⁵⁴

If the prosperous are one exception, some Asian cities are often cited as a second and one that proves that the corpus of (admittedly largely European or North American) evidence is merely 'cultural' or a demonstration of poor management. There certainly is evidence that high rise residents in Asia are satisfied with their high-rise homes. As long ago as 1975, over 75% of Singapore high-rise public housing residents were satisfied, according to one study.⁵⁵ And a more recent study concluded that;

'The people who live in high-rise structures are not reluctant tenants; instead, an increasing number of Singapore residents are opting for high-rise living.'

⁵¹ Jones, M. (2012) *High density housing – the impact on tenants*, pp. 2-3.

⁵² Speaking at launch of *Superdensity the Sequel* on 22 May 2015.

⁵³ HTA, Levitt Bernstein, Pollard Thomas Edwards, PRP, (2015), *Superdensity the sequel*, p. 38.

⁵⁴ Newman, O. (1972), *Defensible Space*, p. 7.

⁵⁵ Yeh, S., & Tan, S. (1975). 'Satisfaction with living conditions', Yeh, S., *Public housing in Singapore: A multi-disciplinary study*. pp. 214-39.

Most (82.5%) households in public housing have expressed contentment about the idea of always living in public housing apartment buildings.⁵⁶

We have not been able to find equivalent data for Chinese cities such as Hong Kong though probably it exists. Clearly high-rise is by most yardsticks 'working' in some Asian cities. And this does highlight an important point. Although it may be more difficult, with the right expenditure high rise can be made to work for mass housing. Nevertheless we think that two points of caution are necessary.

The first is that quite often most residents actually have no choice in the matter. For reasons of confined geography (Hong Kong) and Government policy (Singapore) the vast majority of residents have no option but high-rise. We simply do not know and have no control data of where they might, given the choice, prefer to live or be happier. Hong Kong anecdotal pricing data on houses on the peak of Victoria Island or further out into the New Territories suggests that many of those who can afford to exercise it are actually very keen to move to less high-rise homes, just as is the case in the West.

The second is that what evidence is available tends to indicate (though could not be said categorically to prove) some of the same behavioural and management themes and concerns as in the West. Maybe we aren't so different after all. For example, the same Singaporean study cited above also investigated how Singaporean high rise residents spend their time. Some of the same less socialising, less well-connecting behaviour patterns emerge as you would expect from the wider data.

'When we compared our data with American findings, the emerging picture seems to indicate that the Singapore respondent spends more time on passive leisure, in particular on watching television, than the television-addicted American does. The Singapore respondent also appears to engage in fewer collective social activities in other people's homes, such as visiting, and in

⁵⁶ 'Reinventing Highrise in Singapore', *Cityscape. A Journal of Policy Development and Research*, vol. 11, number 1 p.13.

*activities outside their own homes, such as visiting museums, than does the typical American.*⁵⁷

A Hong Kong study found comparable results with a very low sense of residential community in high rise blocks. In fact where respondents had a very strong sense of neighbourhood, their interactions were often work- or school-based, with colleagues or schoolmates living in the same area.⁵⁸ Finally, a study that argued that Singaporean families *could* in principle be housed in flats and that impact on family time management was minimal nevertheless conceded that the management challenges made it unlikely and, by implication, inadvisable.⁵⁹

It would be wrong to be too emphatic but also certainly wrong to conclude that less well studied Asian cities 'prove' that the European and North American data is purely cultural or the consequence of the western 'status' of living in a house. As an aside, it is interesting to note that some of the recent high-rise Singaporean developments are not actually that high density. Recent residential developments are at 172 units per hectare rather similar to the density of street-based central London neighbourhoods such as Pimlico.⁶⁰

Finally, there is some evidence that indicates (but again could not be said to prove) that high-rise living works better for men than for women. One of the studies cited above found, in 1977, that floor level was a 'strong, direct and durable predictor of psychological strain' among women but was 'a weaker, though as persistent, negative predictor of strain among men.' Put in normal English, in this study living up high made women notably *less* happy: it made men very slightly *more* happy. The author hypothesised that the reason for this was that more women aspired to the 'traditional' role of the 'wife-mother' in a

⁵⁷ 'Reinventing Highrise in Singapore', *Cityscape. A Journal of Policy Development and Research*, vol. 11, number 1 p.12.

⁵⁸ Forrest, R., La Grange, A. Ngai-Ming, Y. (2002), 'Neighbourhood in a high rise, high density city: Some observations on contemporary Hong Kong'. *Sociological Review*, 50, pp.215-40.

⁵⁹ Appold, S. & Yuen, B. (2007), 'Families in Flats, Revisited', *Urban Studies*, 44:3, pp. 569-589.

⁶⁰ 'Reinventing Highrise in Singapore', *Cityscape. A Journal of Policy Development and Research*, vol. 11, number 1 p.8.

house while men were more attracted to the 'symbolic ...upward social mobility' of penthouse living.⁶¹ We won't speculate as to whether this is still true or not but in 2014 only 37% of female Londoners aged 16-64 said they would be 'happy' living in a 'tall building'. 63% of male Londoners said they would be.⁶²

8.8 Conclusion

Towers and high rise clearly have their place in cities. A subset of people actively want to live in them. A rather larger group, particularly younger richer men, would be happy to. When actively chosen, they can act as status symbols particularly as a penthouse. They permit ultra-high density development of commercial or residential use. Some wealthy residents (particularly men, those without children or seeking second homes) will pay handsomely for them. And they *can* be designed to work, in central well-connected neighbourhoods, with active management, for the right uses and with active facades onto busy streets not stranded in path-free open space. (see section 9.3 below). The example of modern prosperous downtown Manhattan is the obvious example. (Though it is important to recall the state of New York in the 1970s and the fact that only 19% of New York residents live in Manhattan, fewer even than that in downtown high rise.)

However, all the evidence on wellbeing and built form would seem to suggest that towers are an inefficient and unsatisfactory form of housing for most people most of the time. They would appear to have certain core constraints as a place to live for most people. It is just harder to regulate unwanted social interactions and it is harder to bring up children successfully. Without high costs or residents restricted to the more prosperous or the elderly there would appear to be a greater risk of some types of crime as well and certainly a greater fear of crime. These greater costs, the greater management

⁶¹ Gillis, A. R. (1977). High-rise housing and psychological strain. *Journal of Health and Social Behavior*, vol. 18, pp. 418-431.

⁶² Ipsos MORI survey for New London Architecture carried out in February 2014. Available at: www.ipsos-mori.com/researchpublications/researcharchive/3361/High-rise-in-the-capital-Londoners-split-on-merits-of-more-tall-buildings.aspx

complexity just mean that they high rise developments can more easily 'go wrong' particularly when there are many children or less prosperous groups living in them. Maybe this is something we will get right this time. Maybe not.

The Asian experience, and some evidence in the West, demonstrates definitely that large buildings and high rise *can* be made to work. It is less clear that the apparent popularity of high rise in some Asian cities indicates a profound cultural difference or merely restricted choice. We have not found sufficient robust research of wellbeing and built form in Asian cities and what little there is rather tends to stress similarities with Western findings as much as (or more than) differences. To quote Professor Gifford's 'tentative' conclusions again;

*'Many, but by no means all, residents are more satisfied by low-rise than by high-rise housing. High rises are more satisfactory for residents when they are more expensive, located in better neighbourhoods, and residents chose to live in them. Children are better off in low-rise housing; high rises either restrict their outdoor activity or leave them relatively unsupervised outdoors, which may be why children who live in high rises have, on average, more behaviour problems. Residents of high-rises probably have fewer friendships in the buildings, and certainly help each other less. Crime and fear of crime probably are greater in high-rise buildings. A small proportion of suicides may be attributable to living in high rises.'*⁶³

9.7 Towers and the urban form – there goes the neighbourhood?

The evidence appears to be supporting a well-connected network of streets with clear blocks and active ground floor facades. What about towers on those streets? We have already seen how towers are an imperfect form of housing for most people though they undoubtedly can work for some and in some places. Some of the research on poor post-war developments has conflated the social impact of their scale and their urban arrangement. Some urbanists

⁶³ Gifford, R. (2007), 'The Consequence of living in High-Rise Buildings', *Architectural Science Review*, vol. 50. p. 13.

have therefore argued that towers work as long as they are in streets and with well-animated ground floors.



Figure viii – A tower in Barking town centre

The 'poster boy' city of such new developments are towers built over the last 30 years is city centre Vancouver. The towers are set back from the street, surrounded by low to medium rise podiums on the street. They are designed to permit waterfront views between the towers. Even the Danish architect and planner Jan Gehl, not usually a fan of urban towers, has written;

'The lower level is two to four storeys high, a plateau that follows building lines along the city streets. Above this plateau rise densely built skyscrapers recessed from the lines of the street, so that they do not impact on the pedestrian landscape...Vancouver's plateau development provide an

*interesting new orientation in attempts to combine large and small scales in the same development.*⁶⁴



Figure ix – Vancouver with tower set back from an active street façade

Research would imply several points of caution however, certainly in temperate climates. The first is that indicative research implies that precisely the same issues of social ‘atomisation’ and disconnect are happening in these new ‘perfect’ towers as in the ones of 50 years ago.⁶⁵ The second is that given the limitations of the human eye, ear and voice there is no way in which the upper levels of a tower can integrate with the surrounding streets and city life in the way in which buildings up to five or six storeys can. Humans have evolved with a horizontal sensory toolkit. As we walk and look around us we do not see much above us and even less when we look down 10° as we typically do when we walk. Our normal field of vision is limited to 50-55° above the horizon. With

⁶⁴ Gehl J, (2010), *Cities for People*, p. 203.

⁶⁵ Vancouver Foundation, (2012), *The effect of apartment living on neighbourliness*. This research is not fully controlled for so is only indicative.

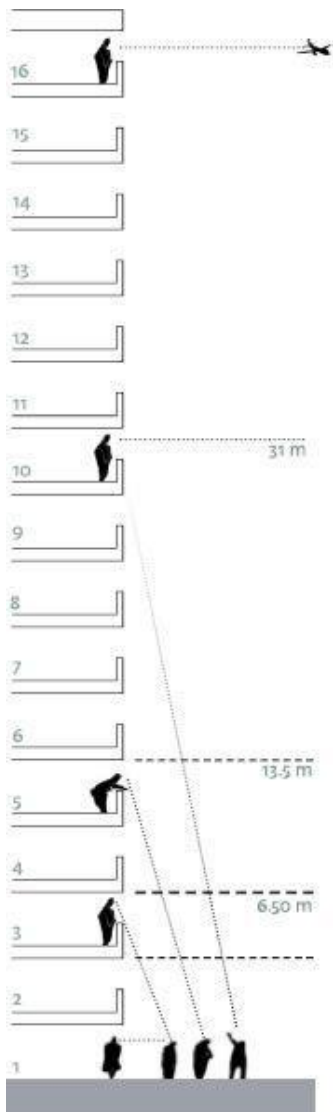
increasing distance interaction between those in higher flats and on the street therefore becomes impossible.

*'From the street we can only experience with difficulty events that take place higher up in buildings. The higher up, the more difficult it is to see. We have to move further and further back to look up, distances become greater and greater, and what we see and experience diminishes...the connection between street plane and tall building is effectively lost after the fifth floor. Communication from tall buildings to their surroundings is correspondingly excellent from the two lower storeys and feasible from the third, fourth and fifth floors. From there we can watch and follow the life of the city; talking, shouting and arm movements can be perceived...Above five storeys the situation changes drastically. Details cannot be seen, people on the ground floor can neither be recognised nor contacted. Above the fifth floor, offices should no longer be the province of the air-traffic authorities. At any rate they no longer belong to the city.'*⁶⁶

The facts back up the theory. In one study of activity in a Copenhagen residential area, those living on the ground floor comprised only 25% of all residents. However, activities in and around semi-private outdoor space in front of ground floor homes made up 55% of all outdoor activities in the neighbourhood. The ground floor residents were part of the city.⁶⁷ Their elevated neighbours were not. This matters because sociability in the public

⁶⁶ Gehl J, (2010), *Cities for People*, pp. 41-2.

⁶⁷ Gehl J, (2010), *Cities for People*, p.84.



sphere that people want and can contain (as opposed to unsought interactions which they cannot escape) is a determinant of wellbeing. What compounds this problem of course is that the most sensible housing to allocate to towers is high end homes for the rich (they can afford the service charges required by higher running costs). Towers do not seem to be a very good way to develop a neighbourly and socially integrated city.⁶⁸

The second urbanistic concern with towers is their micro-climatic impact on their immediate surroundings. This is most acute in temperate or colder climates where sunlight and the lack of strong winds can often play a crucial part in making the streets, square and plazas usable outside midsummer.

Figure x – Losing contact with the surrounding streets beyond the fifth storey. Gehl J, Cities for People

This in turn can be critical in supporting local businesses or property valuations to say

⁶⁸ As the example being cited is Vancouver it is worth adding that recent indicative research implies that even the text book new towers in Vancouver continue to impose some of the same social isolation on residents as their forbearers. Vancouver high rise residents were less likely than those living in detached homes to know their neighbours' names (56% to 81%), to have done them a favour (23% to 48%), to trust them (40% to 60%) or to believe that their wallet would be returned if lost locally (55% to 68%). This research did not take

nothing of supporting the sheer joy of sitting outside in a public square with friends, colleagues or family. In temperate zones, however, towers can crucially undermine this dense use of public space by blocking out light or creating biting fast and cold winds.

This issue tends to be most acute in the transition zone between high rise commercial city centres and their neighbouring residential districts. For example, in the currently (2016) proposed development for the Bishopsgate Goodsyard complex on the edge of the city of London, eight large and tall towers up to 177m high will (all agree) cast long shadows far over nearby residential streets.

The developers' light study showed that there would be 'major adverse impact on sunlight at public amenity spaces' with 34% of rooms in the impacted areas dimmer and 44% of windows having less sunlight during the year.⁶⁹

Of course this impact is not evenly distributed. Some parts of streets or homes lose a large proportion of their daylight; others rather less.

account of different demographics so can only be taken as indicative. Vancouver Foundation, (2012), *The effect of apartment living on neighbourliness*.

⁶⁹ Downloaded December 2015. Available at:

www.static1.squarespace.com/static/5530f2e6e4b07c041496d779/t/55524f36e4b0cd88346669ed/1431457590786/Goodsyard-Light-Study-Cumulative-Impact-on-Property.pdf.



Figure xi - Shadows from proposed Goodsyrd development falling on neighbouring residential areas

Towers don't just cut out sunlight. They also create wind effects which rise and are colder the taller the building. Recently, for example, this is causing increased streets winds in the City of London with the impact of 20 Fenchurch Streets (better known as the Walkie Talkie) being particularly noted. One sales assistant told the media: 'I almost got blown over the other day walking up past the building, when I got around the corner it was fine. I was scared to go back.' The manager of a shirt shop opposite the tower added; 'The wind is so strong on this side of the street we usually have to keep the doors closed so stop the clothes getting blown about. It's definitely worse because of the Walkie Talkie. I remember before it was built the wind was fine.'⁷⁰ It can be much more serious however than discomfort and fluttering merchandise. In Leeds in 2011 a man was killed - crushed after strong winds toppled a lorry near

⁷⁰ *CityAM*, 13 January 2015. Available at www.cityam.com/206983/does-walkie-talkie-have-wind-problem (Accessed December 2015).

the city's 32-storey Bridgewater Place. There have been at least three other injuries due to high winds since the tower was built in 2007.⁷¹

- The most frequent and severe urban wind effects come about as a result of the downdraught or '**downwash vortex**' effect at the foot of buildings. When a tall building protrudes above the surrounding cityscape and because the wind's speed increases with height, the pressures that build up on the building's windward face are higher at the building's top than at its base. The difference in pressure creates a strong downward flow. The air forced downwards increases wind at street level. The intensity is further amplified if a low building in front of the tall one creates a stronger suction at the building's base. Once it reaches the low pressure zone at ground level, the downdraft tends to turbulently spin around, further adding to the discomfort it creates.

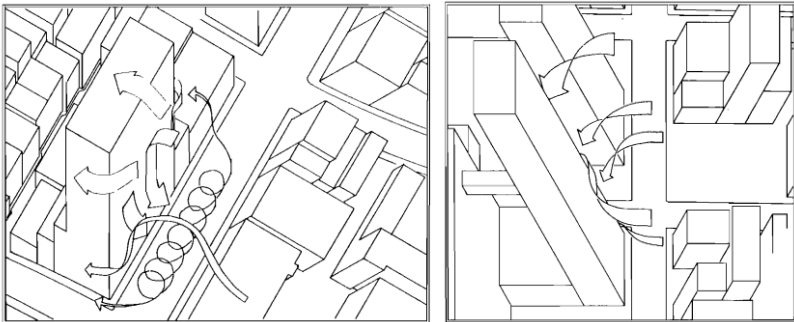


Figure xii - Downwash vortex and corner effects

- Another common effect is for severe winds to be created at building corners, the so-called '**corner effect**.' This is created by the flow of wind from the high pressure zone on a buildings' windward side to the low pressure zone on the leeward side. The taller and wider the building the more intense the effect. If two towers of 30 or more storeys are placed close together, a very severe corner effect will influence the space between them.

⁷¹ 1 March 2013 news on BBC.com www.bbc.co.uk/news/uk-england-leeds-21633206 (Accessed December 2015).

- The '**tower among lower buildings effect**' happens when a tower is built among existing much lower buildings. The lower buildings reduce the wind speed at ground level thus creating a greater differential between high and low level wind speeds. This increase the potential downdraught

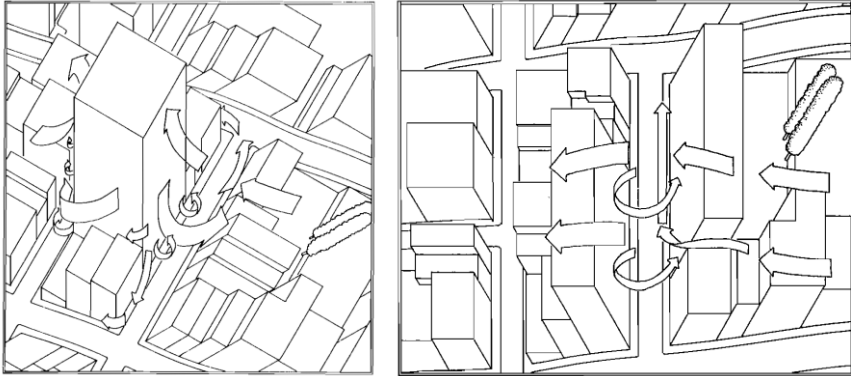


Figure xiii – Tower among lower buildings and pressure connection effects

- The '**pressure connection effect**' is most intense when there is a pattern of continuously-increasing heights. It occurs when wind flows over parallel rows of buildings creating suctions between them that draw in downdrafts and winds and create transverse gusts along the ground. Taller buildings increase the effect. A pattern of continuously-increasing towers creates different pressure zones on the lee-side of each building towards which cross-currents will tend to flow
- The '**channel effect**' occurs most frequently when towers are positioned in streets. A long narrow space tightly set with buildings will tend to channel fast downdraught into neighbouring streets.⁷²

Modern advanced wind modelling and design can to some degree mitigate some of these effects. One reason why so many modern towers are rounded is to reduce the corner and downdraught effects. Other architects are

⁷² Figures xii and xiii description of wind effects adapted from Bosselmann, P. et al. (1984), *Sun, wind and comfort: a study of open spaces and sidewalks in four downtown areas*, pp. 20-22.

experimenting with reflecting light off companion buildings or using mirrored heliostats (computer-controlled mirrors which keep the sun reflected on a target) to reduce shadowing. However, there is a limit to what can be done particularly when towers are surrounded by historic street patterns with consequent 'tower among taller buildings' and 'channel' effects. The current trends for stepping up height in a new development towards the middle also risks heightening the 'pressure connection' effect. There is also certainly a limit to how well wind is currently being modelled and planned for. The wind effects of both 20 Fenchurch Streets and the murderous Bridgewater Place had apparently been accounted for. Indeed Leeds City Council were advised in 2007 that; 'the impact the building would have on wind speed would be minimal.'⁷³ The City of London has recently announced that it will improve its understanding of wind effects.⁷⁴

The classic study of the impact of towers on a temperate zone city was conducted by Professor Peter Bosselmann into the impact of proposed towers on San Francisco in the early 1980s. His team modelled the likely impact on parts of the city from the expected combination of lost light and increased wind speeds due to the proposed towers. Depending on the specific site and the time of year Professor Bosselmann's team then calculated a loss of comfort levels for pedestrians at each of the sites. (Comfort was defined and modelled based on how long it would be comfortable to remain outdoors). The answers were stark with comfort levels normally reduced by between 20% and 60%. Had the additional towers been built as proposed (most were not as a direct consequence of this work) downtown San Francisco with its moist winters, Pacific winds and tendency to fog would have become a much less liveable city.⁷⁵

⁷³ 1 March 2013 news on BBC.com www.bbc.co.uk/news/uk-england-leeds-21633206 (Accessed December 2015).

⁷⁴ 7 July 2015, Building Design, www.bdonline.co.uk/news/walkie-talkie-wind-complaints-prompt-city-clampdown/5076276.article (Accessed December 2015)

⁷⁵ Bosselmann, P. et al. (1984), Sun, wind and comfort: a study of open spaces and sidewalks in four downtown areas, pp. 30-1 (for explanation of comfort calculation) and pp. 50-125 for detailed results of modelling.

None of this is to say that it is impossible, responsibly, to place tall towers in existing cities. However, the loss of light, heat and comfort to surrounding residents or visitors is potentially very material – particularly in temperate climates and particularly in the best and most finely grained streetscapes. Great streets are still possible. But they won't be very light.