High-density living in the Asian context

Prof Jason Pomeroy, RIBA
Founder of Pomeroy Studio

Introduction
Global population increase has had a significant impact on the built environment. The consensus among demographers is that, by 2050, the global population will be 9.2 billion people — an almost fourfold growth on 1950 figures. For the first time in history, approximately half the world population have lived in cities since 2007, reinforcing the continued trend towards inner city transmigration in correlation to rapid economic progress.\(^1\) Such factors have seen both population and building densities magnify, and have further heralded the tall building as not only a symbol of the city or a representation of economic progress, power and prestige,\(^2\) but also as a means of optimising land use in the wake of increasingly higher land prices. The tall building, however, is by no means the panacea to designing high-density environments; rather, it is a building typology that will be present within the city skyline until alternative, more environmentally responsive designs can be embraced.\(^3\) The view that the tall building has been the root cause of many socio-physiological and environmental ills within the urban habitat has been shared by both the general public and some academics.\(^4\) Recurrent issues of perceived high density, lack of social space, illegibility and compromised health, well-being, noise, security and maintenance have contributed to the sense of community disconnection that has beset the tall-building typology.

This paper seeks to consider high-density living within the Asian context, particularly apt, given that some of the region’s cities have some of the highest urban densities in the world. It will demonstrate in particular how the embracing of the tall-building typology has become an accepted means of densifying Asian cities, despite its often negative connotations. It will explore how the transition from the city of spaces to the city of objects has resulted in particular socio-physiological ills that have become associated with high-density living. It goes further to consider how the incorporation of open space within the built object and the new hybrid forms seek to readdress such ills by providing better habitable environments.

The high-density environment
The term ‘density’ may appear familiar at first glance, but is actually more complex upon closer examination. As highlighted by the academic Vicky Cheng, there are varying measures. These include ‘physical density’, which is the concentration of individuals within a geographical unit.\(^5\) ‘People density’ has different permutations which include the regional (the ratio of a population to the land area of a region), the residential (the ratio of population to a residential area), and the occupational (the ratio of the number of occupants to the floor area of an individual habitable unit).\(^5\) Measures of building density further demonstrate multiple interpretations. ‘Plot ratio’ considers total gross floor area of a development to site area, while ‘site coverage’ represents the ratio of the building footprint area to its site area.\(^5\) Furthermore, ‘perceived density’ is about the interaction between the individual and the space, and between individuals in the space, which requires the concepts of ‘spatial density’ (the perception of density with respect to the relationship among spatial elements) and ‘social density’ (the interaction between people) to distinguish between the two.\(^5\)

Cheng’s observations demonstrate the multiple definitions that straddle different disciplines within different contexts and, more pertinent to this paper, how building density is intrinsically associated with the shaping and densification of urban morphology: both physical and perceptual. In the context of the Asian city, this has materialised particularly in the form of the tall-building typology, which has often been perceived as the panacea to spatial shortage and city densification. Many an Asian city, such as Hong Kong, sought to replicate Le Corbusier’s modern city model in its rapid post-colonial urban development programmes, which attempted to satisfy a developing economy’s aspiration of
urbanisation and sanitisation. Less than 25 per cent of Hong Kong’s total area of only 1,104 square kilometres is developed land; a further 40 per cent is forests, natural reserves or marshland. Such physical constraints impose high urban densities of 29,400 persons per square kilometre, making it one of the densest cities in the World.\(^6\)

In the case of Singapore, the city state gained freedom from Colonial rule in 1965, but was forced to leave the federation of Malaya and gain independence unwittingly.\(^7\) The small island, predominantly Chinese in a Malay region, lacking in natural resources, facing declining trade and a fast-growing, largely unskilled population, embarked on a programme of ‘nation building’ that would see Singapore exert itself as an economic hub through rational policies that would lift it beyond its regional status and allow it to compete at an international level.\(^8\) Such a step similarly found its expression in the built environment through mass slum clearance and relocation, in order to industrialise and modernise, despite recommendations by UN appointed experts to rehabilitate rather than demolish and rebuild.\(^9\) The prevalence of the two to three-storey shop house gave way to the tower and podium model, in anticipation of efficiency and modernity. State-run urban renewal projects during the 1960s became inseparable from housing and relocating the majority of the local population from the centre, and resettling them in high-density, Corbusian blocks to the periphery. The city centre became the reserve of international banks, hotels and shopping centres, appropriated by expatriates, tourists and wealthy entrepreneurs. Public space for social and commercial benefit became relegated to the void decks of the social housing schemes or to the Padang (a ceremonial public green space) for National Day celebrations. Today, 84 per cent of the population live in high-density public housing developments and 11 per cent in high-density and often high-rise condominium developments. Only 5 per cent live in landed housing, effectively creating a city of tall buildings that is an accepted habitable norm and a marked contrast to both the skyline of many a UK city and its equivalent public perception.

The shift from an age of industry to an age of technology, coupled with population increase and inner-city transmigration has seen the tall building within the ‘city of objects’ become an alluring object of speculation — driven by the consequence of high land prices, economically optimised land use and the desire for a company, city or country to demonstrate power physically over one’s peers.\(^2\) The research of Sir Leslie Martin et al., however, has demonstrated that there are alternative (and more economic) means of achieving higher densities, not least the exploration of low- to medium-rise high-density typologies such as the courtyard or the terrace.\(^10\) What has been considered to a lesser extent is how more hybrid forms that balance space and object, and rooftops that exploit air rights, have become an increasingly investigated means of densifying the city. Before investigating these alternatives, this paper first considers how the city has evolved from a city of spaces to a city of objects as a backdrop to these alternative scenarios and shows its consequent effects.

**From a city of spaces to a city of objects**

Socio-economic change due to the effects of technology, industrial capitalism and secularism saw a correlating impact on urban morphology and an increase in building density. By the middle of the 18th century, ‘public space was implicitly traded for the private object; a deal that formally represented the beginning of the end of the res publica’.\(^11\) Until the 18th century, the city of spaces was determined from the outside-in. Rationalised voids acted as outdoor rooms which dictated the city and provided a means of planned social interaction or chance meeting; trade and commerce, political activity, religious or cultural event. Meanwhile, the buildings’ solid form accommodated the urban idiosyncrasies by acting as infill elements. Such a celebration of public life reaffirmed the predominance of space over object. By the middle of the 18th century, however, shifting patterns in society saw the public realm go into decline and the development of the free-standing private object. The need for more housing, improved public utilities and transport infrastructure determined the space from the inside-out. Rationalised solids of core structure and service elements dictated the building within the city, and the void spaces became the habitable space left over. By the 20th century, the
transformation was complete. The freestanding private object building sat within open, undifferentiated space, and became the means of absorbing the urban idiosyncrasies. The modern city of objects represented the antithesis of the traditional city and heralded the predominance of object over space and the erosion of a public realm that would have otherwise nurtured civility among society. Such a physical transformation is lucidly summarised by Urbanist Colin Rowe’s description of the diametrically opposite figure ground diagrams of the traditional and modern city — ‘one is almost all white, the other almost all black ... in both cases, the fundamental ground promotes an entirely different category of figure — in the one object, in the other space’.12

Such a paradigm shift from the city of spaces to the city of objects is apparent in Le Corbusier’s approach to clearing the slums and disease that lay behind the Hausmann façades of Paris, as he sought paradoxically to decongest the city centre by increasing the density through high-rise structures. These buildings would contain ‘perfect human cells which correspond[ed] most perfectly to our physiological and sentimental needs’, while allowing the automobile to take precedence over the pedestrian.13 The likes of Le Corbusier greatly influenced a post-war generation of qualifying architects around the world, spawning a legacy of high-density residential development which borrowed heavily from his concepts in order to address slum clearance, increasing land prices, and an increasing birth rate that would lead to overcrowding. ‘The big cities, many of which were not averse to keeping their own people rather than exporting them to new and expanded towns, read all this as a signal to build dense and build high’.13

The ability to re-house the masses into sanitised high-density environments with, in the best case, supporting communal facilities, indoor streets and outdoor raised plazas owed much to the early vision of Fourier and then Le Corbusier, but at the same time signalled the death knoll of how the spaces were to be used by the community.14 Social groupings and complete neighbourhoods, accustomed to low-rise urban environments which permitted casual interaction, were being dismantled and relocated into high-rise urban environments. The very same groups who once gathered to do their laundry or share in common activities were finding that the very spatial mechanisms that permitted communal activity and spontaneous chance meetings with neighbours were being socially and spatially engineered. In the worst case, many high-rise, high-density developers and authorities failed to understand the importance of such spaces being used to improve amenity, well-being, good health, productivity and social interaction, and were often omitted for economic reasons.13

While J.G. Ballard’s fictitious novel, ‘High rise’, highlighted the potential for developments to be poorly conceived enclaves that were divorced from their surrounding context and crudely executed by local authorities, the social and physical disjuncture were all too clear to see in the reality of high-density housing estates such as Pruitt Igoe, Illinois. Here, a multitude of ill15 resulted in its eventual abandonment and its subsequent demolition. Technological advancement paradoxically compounded such socio-physiological, psychological and environmental ills in the tall building. The typology’s increasing dependence on energy-consuming artificial light and air conditioning to counteract deeper and more populated floor plates, and the vertical extrusion of the same uses from the ground plane, further increased its disconnection from the rich milieu of open space and greenery within the urban fabric and people’s ability to forge a sense of community through co-presence. Building-related illnesses, through the lack of natural light and ventilation provision, restlessness and social disorder given sparse or non-existent social and recreational facilities, illegibility and lack of diversity given the same stacked floor plates, and soaring crime figures caused by lack of surveillance and a sense of ownership have all contributed to its tarnished image within the fabric of the city. This has spawned a radical rethinking of the tall building socially and spatially.
From outside in to inside out

Despite the debilitating consequences of high-density tall-building developments of the past, academics and built environment professionals are increasingly seeking to consider more sustainable tall-building solutions that counteract the negative perceptions of high-density living by rejecting the hermetically sealed air-conditioned ‘box’ and instead reconnecting to the external environment. In doing so, such an approach seeks to reduce energy consumption and help foster a greater sense of community. The provision of open space within the confines of the residential tall-building object in a fashion not too dissimilar to the space/object hybrid described by Rowe and Koetter in their book ‘Collage city’\textsuperscript{12} is one such way that is being explored. This comes largely from the understanding of how the positive attributes of natural light, ventilation and their very source within the building, open space, have benefited the health and social well-being of the individual, group or association. Natural light and ventilation is essential for the survival of all living organisms, and its quantitative provision within buildings can be found in the research of Cambridge academics Nick Baker and Koen Steemers in their formulation of the LT method of calculation — a tool that considers active and passive areas of lighting and thermal performance in order to shape more comfortable environments.\textsuperscript{16} Open space for social and recreational purposes was an essential part of Le Corbusier’s high-density communities. His 5th point in ‘Vers une architecture’ was dedicated to the rooftop garden as a supplement to the open recreational spaces on the ground.

Considerations of balancing natural light, ventilation and fostering greater communal interaction through open spaces such as verandas, skycourts and terraces has also been considered to offset the perception of higher built densities. The author has postulated that skycourts and skygardens have the potential to be alternative civic spaces which form part of a broader multi-level open space infrastructure that seeks to replenish the loss of social space within the urban habitat and provide an ease of movement.\textsuperscript{17,18} Dr Joo Hwa Bay explored the socio-environmental intricacies of vertical terraced spaces and, in particular, whether their ability to reinterpret the essence of the kampung tradition\textsuperscript{19} can actually recreate a conducive high-density outdoor living environment that can foster similar communal interaction.\textsuperscript{20} The inclusion of planting and landscape as a means of enhancing the physiological and psychological health and well-being within the high-density built environment has also been considered.\textsuperscript{21,22} Yeang’s treatise on sustainable tall-building design takes the cities’ diverse mélange and transposes vertically in order to reconsider the tall building as a mixed use extrusion of the city, punctuated by open spaces which help to establish vertical communities.\textsuperscript{23,24} These assertions by practitioners and academics are perhaps a welcome departure from the non-contiguous, floor-plate stacking exercises of many 20th century tall buildings, and arguably reinforce Oscar Newman’s social theories of reducing crime and improving the sense of community.\textsuperscript{25–27}

Collectively, these attributes offer the potential for not only more habitable, but pleasurable tall and dense living environments which can encourage communal interaction. Particular historical building typologies have demonstrated how open spaces, incorporated into the confines of private development, helped to replenish the loss of space for the community and offer environmental benefits at the same time and are arguably sound precedents. The 18th century hotel, an aristocratic private residence, incorporated a semi-public court within its curtilage that could be used as a place for meeting and greeting. It established a hierarchy of void spaces with its larger, figurative, public space counterpart which contributed to the footfall, amenity and interaction of civil society. The 19th century galleria, a retail object of private speculation, incorporated a semi-public thoroughfare which could be used as a means of transition between larger public spaces and, as with the hotel, provided an environment for social interaction within the broader urban fabric. The inclusion of such privately managed open spaces in the form of the court and arcade accompanied the street and the square as a means of balancing space with object, and formed a collection of alternative spaces that attempted to recapture elements of public life within the private curtilage.\textsuperscript{12,18} Today, the skycourt and skygarden adorn some of the tallest structures in the urban habitat and have become a commonly used architectural or vertical urban device to help reduce perceived tall-building densities and provide a social setting for interaction. To this end, the
skygarden and skycourt could be regarded as alternative social spaces within the residential tall-building typology for the 21st century that vertically reinterprets the functions of their historical forebears.

**Sky courts and the new hybrids**

Sky courts can be spatially defined as interstitial spaces that balance the figurative (semi-public) void within the solid of the (private) tall-building object. Just as one normally finds a proportion of open space to built-up area in ground scraping mixed use developments, skycourts start vertically to balance open space to built-up area ratios within the tall building. In doing so, they can help reduce perceived building densities by breaking the mass and potential monotony of the floorplates, and foster community through the provision of open space for the interaction of social groupings which would otherwise would have needed to travel groundwards. In addition, they provide opportunities for greater penetration of natural daylight and ventilation into deeper floor plates — thus further enhancing the internal environment and making it more habitable. In Singapore, planning policy guidelines allow skycourts and skygardens to be incorporated into high-density residential developments without being calculated as gross floor area — effectively providing an opportunity for developers to increase building density, and sell at a premium for a more sustainable development under the auspices of providing vertical open social space.

Many residential tall-building developments in Asia are increasingly incorporating skycourts for these very reasons. Newton suites, in Singapore, aptly demonstrates the incorporation of skycourts for its socio-environmental benefits. The tall building consists of a series of sky terraces that seek to offer amenity space for residents every five floors and, in doing so, instil the sense of sub-communities within a vertical neighbourhood. Designated green space and vertical greenery act as an environmental buffer to the low-angled east and west oriented sun, thus helping to reduce solar heat gain. Such spaces reinforce the notion of a vertical reinterpretation of tropical verandas, which are essentially social places of meeting with the community and a critical spatial element within Asian urban and suburban fabric.

Skycourts also serve as transitional conduits within the tall building by connecting the disparate vertical circulation methods — be they via ramp, stair, escalator or lift. When integrated into broader movement strategies via skyways, podium decks or skybridges, it can lead to a greater social integration through pedestrian permeability from the fabric of the city, through the tower and beyond. This begins to ameliorate the risks of visual disconnection and separation from the activity of the street at ground level, as the horizontal and vertical means of circulation within a complex of tall buildings serves to create new eyes on the street in the sky which can serve to aid security through the recognition of who is friend and who is foe. Furthermore, it presents an opportunity to escape from one tall building into another via the skybridge, thus ameliorating the need for phased evacuation which can not only compromise life safety, but may be economically unviable owing to the increase in escape stairs required.

The Pinnacle, in Singapore, demonstrates such an approach in its ability to use 12 skygardens to interconnect its seven, 50-storey high-density social housing blocks consisting of 1,848 family units. The skygardens reinterpret the ground-level void decks of the past social housing blocks as a series of elevated social spaces. The intermediary gardens at the 26th floor serve the residents only, while the 50th-floor rooftop garden is accessible to the public in addition to residents. It is perhaps this sense of pedestrian permeability that is analogous to the arcade and allows one to consider the skycourt as not only a destination place of recreation and planned meeting, but also a transitional space of movement and chance meeting.

Skycourts, in their interstitial positioning in a high-density development, can also be a useful source of convenience, recreation and amenity which negates the need to travel groundwards for groceries, a gymnasium visit or relaxation in open space. As tall buildings increasingly embrace a mixed-use programme, skycourts provide a forum to establish new
The rooftop extension as an alternative means of habitation

With the shortage of space and the often inhibitive costs of constructing tall buildings, the retrofitting and extension of existing tall buildings has become an increasingly explored option to densification. The exploitation of the rooftop and the ‘topping up’ of existing developments has taken place in some of the most populated parts of the world (often illegally), as a means of addressing the issue of densification. During the 1960s, the growth of the famed Walled City in Kowloon accommodated a mass surge of illegal immigrants from the mainland, seeking a better life. Its expansion owed much to the power struggles that took place between British and Chinese Governments claiming jurisdiction, but with neither actively administering it. Such contests over space gave rise to an ambiguity of governance that allowed an almost anarchic appropriation of the city and the increasing ‘topping up’ of ad hoc dwellings with resplendent community facilities ranging from the local doctor to the grocer.23

The legacy of the Walled City lives on in Hong Kong, particularly with land shortage and an increasing population. With high housing prices, illegal rooftop structures that do not comply to the planning or building control process continue to be the home of 3,962 ethnic Chinese (95.5 per cent), Indian, Pakistani, Filipino and Nepalese (4.5 per cent) illegal immigrants who face social difficulties in integrating into the Hong Kong community. Of the rooftop dwellers, 49.9 per cent have salaries below the median household level for the territory of HK$10,000 or US$1,282,34 suggesting that the rooftop is still the home of an underprivileged and marginalised sector of an otherwise affluent Hong Kong society.35 Such issues of densification through rooftops and air rights, however, have also been explored legally. In the Netherlands, 1.9 million of the 3.4 million hectares of land surface (or 55.8 per cent) is designated for income-generating agricultural produce, which impinges on the opportunity for satellite urbanism.36 This has spurred research into the densification of cities via rooftops,37 which in turn has culminated in a series of projects undertaken in the Netherlands exploring the topping up of rooftops in the residential sector, such as the Black Madonna in The Hague.

This may suggest that the topping up expansion of rooftop properties could be explored further as a legally acceptable means of increasing the density of cities. While legitimising the exploitation of rooftop space and air rights, however, there are a number of issues that are both physically and socially challenging. According to architectural critic Eric Vreedenburgh, the preservation of historical buildings has turned old European city centres into urban museums filled with built artefacts that cater for nostalgia tourism and its associated income generation (see Ref. 37 above, p. 48). Preservationist by-laws reduce the ability of historical building fabric to be changed functionally, in addition to their very
physical structures being less likely to include further programmes of accommodation through structural adaptation above the roof level. Furthermore, issues of access may reduce the efficiency of the building and make retro-fitting expensive, particular if different uses are ‘topped’ above another, which would necessitate separate vertical access.

Post-colonial cities that went through a process of demolishing and rebuilding (and thus have structures potentially newer and more capable of rooftop topping up) may, however, provide opportunities for application. Singapore, like Hong Kong, is faced with the spatial constraint of being an island. With an urban density of 8,350 persons per kilometre and an increasing population that is set to grow from 4.98 million people in 2010 to 5.5 million people by 2050, the need to house the additional population has seen ever increasing plot ratios in urban areas.\(^{38}\) This has given rise to an enbloc sale culture. Enbloc sale refers to a process whereby residential buildings of a particular age and plot ratio are sold by resident collectives for both the economic gain of the residents and the economic opportunities (through the increased plot ratio permitted by the state) for the purchasing developer, who would demolish and redevelop the land. The resulting redevelopment of sites leads to increasing building density to cater for the population increase.\(^{39}\)

Should the existing housing development retain a certain structural integrity, however, the ability to create rooftop extensions could be a viable alternative to the less sustainable approach of demolishing and rebuilding through enbloc sale. This would make the exploitation of air rights and rooftop spaces an additional solution to the densification of Asian city centres by locally increasing existing plot ratios and, in doing so, provide an opportunity for further social and spatial enrichment of the city at the rooftop level.

Increasing the density through rooftop extension in inner-city centres makes use of existing energy systems, maximises the use of existing public infrastructure and helps reduce the pressure to develop on open spaces. The importance of ensuring that the existing social and spatial infrastructure is not overloaded, however, necessitates the preservation of not only the social spaces on the ground, but also the creation of social spaces in the sky to allow for social interaction and a reduction in perceived density.

**Conclusion**

Population increase and inner city migration coupled with technological advancement have seen the shift in urban habitat from the city of spaces to the city of objects. Despite there being alternative ways of creating higher densities, the tall building has become a prerequisite in many an Asian city as a sign of economic prosperity and progress as well as a means of addressing building density in areas of spatial shortage. Tabula rasa, freed from overt planning restrictions and preservationist by-laws in the interest of rapid urbanisation, has enabled this to happen, but has also come at the cost of the conventional 20th-century tall building’s association with particular socio-physiological ills. Self-same repetition and artificially controlled internal environments have, however, seen a paradigm shift in their design, whereby more hybrid forms that reaffirm the importance of incorporating social space have been sought to create more conducive high-density living environments.

Spatially, skycourts can potentially reduce the perceived density of high-density developments by the interplay of solids and voids within their private curtilage in a way that is analogous to the historical precedents of the court and arcade. Such an approach allows one to consider the tall building not as an object in undifferentiated space, but as a hybrid form that captures space within its private curtilage and, in so doing, vertically extrapolate Nolli’s figure ground diagram to create a figure section. The provision of skycourts also allows natural light and ventilation to penetrate deeper into the building. When coupled with the topping up of existing rooftops, higher densities can also be achieved, subject to the load-bearing capacity of the existing structure, the vertical circulation management of the interface between a potential mix of uses, and the ability to increase the plot ratio on a given site.
Socially, the ability to balance the provision of open space vertically as one would normally find within more ground-scraping developments helps to foster new communities within the vertical urban habitat. As destination spaces, skycourts and skygardens within high-density environments create a more conducive forum for social interaction, which can permit social groupings to engage through either planned or chance meeting. This can potentially enhance the sense of vertical neighbourhood by providing individuals, groups or associations with the choice of coming together in space, rather than being kept apart or relying on the ground plane as the forum for meeting. As transitional spaces, they provide a greater level of permeability from the ground, through the tower and beyond if part of a broader complex or when integrated with other modes of transport (for example, the subterranean mass rapid transport systems). Such strategies enhance the connectivity of the tall building and its residents to the surrounding urban fabric and community, respectively.

Notes and References
15. Pruitt Igoe’s socio-economic ills included cost-cutting which compromised social amenity, poorly conceived tenancy arrangements, which did little to foster community, and an over-scaled development which required a particularly mature architectural understanding of using modernist spaces. See Hall, Ref. 14 above for a more in-depth account of Pruitt Igoe.
19. The Kampung is a traditional village consisting of dwellings and essential conveniences, often created using locally sourced materials, and is indigenous to South East Asia.
25. His research involving the New York Projects during the 1970s concluded that tall buildings were more prone to crime and social disjuncture, given their sense of disconnection from the more integrated environments at street level — places that provided natural surveillance by those who lived and worked there as well as opportunities for the community to play out one’s youth; socially interact, rest and recuperate.
32. ‘Topping up’ is a term for building on a roof, often adding the same social, functional and even architectural programme on an existing building in the interests of increasing volume and density.
37. In order to address issues of population increase and shortage of housing, the 2002 Symposium ‘The Hague: in search of an extra 2 million square metres of land and housing’, set the challenge to four architects to each find 500,000 square metres for housing and to share their proposals. The architect Eric Vreedenburgh demonstrated that, by identifying the total number of homes in The Hague (215,000) and their average surface area (79 square metres), a total housing surface area of 16,985,000 square metres could hypothetically yield 6,329 new homes within the 500,000 square metres allocation after the flatness, structural integrity and accessibility were factored (Melet. E. and Vreedenburgh, E. (eds) (2005), ‘Rooftop architecture’, NAI, Rotterdam, p. 157).

Further reading