Internal expansion: Singapore high-rise

1. Introduction

According to United Nations (2007) projection, the world is urbanizing rapidly. Most of the world's population is expected to occur in towns and cities. Asia is no exception. China, one of the largest countries in the region and in the world, is expected to double its urban population from about 40 per cent during 2006-2030 to more than 70 per cent by 2050. In many cities, this unprecedented growth has led to pressure on building fabric and spatial expansion with concomitant growth of slums. This in turn has fuelled discussion on sustainable urban development that argues for urban growth management to enhance people's quality of life (Roberts and Kanaley, 2006; Asian Development Bank, 2008). Asian Development Bank (2008), for example, calls for a 'wholesale rethink' about how to lay out cities in an energy-efficient way. Other urban analysts have advocated smart growth, internal expansion and more compact urban living (see, for example, Hall, 1996; Rogers et al, 1999; de Roo and Miller, 2000). With increases in urban population, there is urgent need to revisit internal expansion prescriptions.

This paper examines the case of Singapore. In particular, how this city has turned its space constraint to support growth and promote the development of a liveable, vibrant city. Singapore is a city with a limited land area of 690 sq km and growing population. The current population of 4.5m is anticipated to grow to 6.5m over the next 40-50 years. Against the reality of rapid urban development and the constraint of outward spatial growth, the city has embarked on vertical expansion, both in its residential and business spaces. Even its death spaces have gone high-rise. High-rise public housing is the familiar dwelling for 80% of Singapore's resident population. Its tallest public housing block is 50-storey (under construction). Yet, in contrast to much of the western literature on high-rise living, the Singapore high-rise public housing experience has documented continuing residential satisfaction and increasing sense of belonging. This paper will draw on empirical evidence and analysis to examine the sense of dwelling in Singapore high-rise public housing. Singapore's urban innovations for a liveable city will also be explained.

2. Planning a liveable town

Against the context of limited land and increasing population, Singapore in its urban development has intensified density to meet the city's multiple needs. Its density is among the highest in South-east Asia (Table 1).

Table 1: Population Density in South-east Asian countries

	Population density (population per sq km)				
	1990	**2000**	**2005**	**2006**	**2030**
Brunei Darussalam	45	58	65	66	109
Cambodia	54	71	77	78	118
Indonesia	96	111	119	120	148
Lao PDR	17	22	24	24	40
Malaysia	55	71	78	79	108
Myanmar	59	68	71	72	94
Philippines	204	254	282	288	389
Singapore	4,436	5,908	6,191	6,269	8,022
Thailand	106	118	123	124	142
Timor-Leste	50	55	72	75	158
Vietnam	201	240	258	262	328

Source: UNESCAP (2007).

The urban densification is perhaps best seen in its public-led housing strategy. In order to create a highly liveable city with spaces for play, Singapore in its delivery of housing has made a conscious decision to build high-rise to increase its living space. Despite being 100% urbanised, approximately 50% of Singapore is built-up. In the public sector where the bulk of its housing stock is (81% of its 3.4 million resident population lives in public flats), high-rise is the common dwelling form. As Wong and Yeh (1985, p. 56) explain,

> Physical planning and design in the HDB [Housing and Development Board, Singapore's public housing authority] context are strongly influenced by two major considerations. First is the need to optimize scarce land resources; second is the emphasis on providing a better housing environment than that from which the residents come.

In physical planning terms, Singapore's high-rise public housing development is framed by the ubiquitous new town model. Similar to new town development in many western cities, Singapore's public housing town is established on the spatial organization of major land uses including residential, employment and leisure. Structured around the idea of self-contained, cohesive communities living in landscaped residential areas of neighbourhoods and precincts, each new town with an anticipated population of 200,000 to 300,000 is planned to provide 'a total living environment' that would support quality living, recreation and accessibility to facilities.

The Singapore new towns are more intense urban concentrations. In its basic conception, a new town of 200,000 people is composed of 5 to 6 neighbourhoods. There are between 4000 and 6000 dwelling units (80-100 hectares) housing between 20,000 and 30,000 people in each neighbourhood. Since 1978, following findings that showed neighbourhoods are too large to bring about a sense of community each neighbourhood has been restructured into 6 or 7 precincts to better promote community interaction among residents. Each precinct is made up of 7 or 8 residential blocks with 400 to 800 dwelling units to house between 1500 and 3000 persons. The aim is to provide not just shelter but also a sense of community spirit and belonging among the high-

rise population.

Each new town is planned with an ascending hierarchy of public facilities and spaces, from the block, precinct and neighbourhood to the town centre. As shown in Table 2, such facilities could occupy as much as half of the new town land. Right from the outset of its high-rise public housing development, facilities provision is considered the key theme to a pleasant environment. In contrast to other housing forms, high-rise public housing is intentionally oriented towards doorstep convenience to daily life facilities like open spaces, car parks, schools and shops, which are located within an easy access of 5 minutes' walking radius to the resident. This integration of the different facets of daily existence (home, school, recreation, work and social spaces) within proximity of one another has created an urban environment built around walkability with spaces that support direct and spontaneous interactions, contributing to the sustainability of social activity at the local level. To minimise the journey to work, more workspaces are being planned in and around the new towns, in the regional centres. The new towns are well served by public transport including the mass rapid transit network.

Table 2: Land Use and Gross Density of Toa Payoh New Town

Land use	**Land area** 373 ha 36,758 dwelling unit	**%**
residential	150	40
commercial (town centre and neighbourhood centre)	34	9
industry*	47	13
school and institution	69	19
open space, sports and recreational	24	6
roads	44	12
utilities and others	5	1
gross new town density	99 dwelling units per hectare	

Note: * non-pollutive industries only
Source: Wong and Yeh (1985), p94; 97.

Aided by advances in construction technologies, building height in the public new towns has risen in the past four decades from 4-storey walk-ups to the present 40-50 storey buildings. Construction of 30-storey public housing largely appeared in the 1990s, and 40-storey and 50-storey in the 2000s (Yuen et al, 2006). According to the Singapore Department of Statistics (2000), the majority of Singapore's residential buildings--90% of public housing and 84% of private housing--are 12-storey or lower. About 0.2% of public housing and 1.3% of private housing are 25-storey or higher. With the rise in urban population, more high-rises can be expected. As outlined in Singapore's long-term Concept Plan,

> More homes will be built in the city. There are currently 30,000 housing units in the city. Those who prefer the downtown buzz can look forward

> to having 90,000 more units to choose from, mostly in the New Downtown at Marina South. The average plot ratio for housing in the New Downtown can be increased to between 6.0 and 7.0 (Urban Redevelopment Authority, 2001, p18).

High-rise living is increasingly being celebrated in other cities around the world too.

3. High-rise yet again

Cities that have once abandoned high-rise such as London, Manchester and Melbourne are again building high-rise housing as part of the urban housing strategy. The world's tallest and most active high-rise building construction countries are in Australia, Middle East and Asia. China is leading the world in high-rise construction. Many of these buildings are constructed in recent decades for residential living. Q1 Tower (78 floors), Eureka Tower (91 floors), Emirates Crown (63 floors) and Millennium Tower (60 storey) are some examples. The Council on Tall Buildings and Urban Habitat has labelled these buildings as supertall buildings, and is predicting "its impending commercial appearance, not too far in the future." (Ali and Armstrong 1995, p15)

Contrary to earlier development, the new high-rise is often designed by established architects and marketed as a symbol of affluent inner city living; "the chic choice for London living" as one columnist describes the recent high-rise of London in the International Herald Tribune (13 Jul 2006). Many of these high-rises are purpose-built luxury apartments. The proposed Pan Peninsula building (50-storey) in Canary Wharf, for example, is designed by Skidmore, Owings and Merrill. Scheduled for completion in 2009, it is anticipated to be one of the tallest high-rise housing in United Kingdom.

In Asia, high-rise housing has a long sustained development in Hong Kong and Singapore. Even though not the traditional form of housing, high-rise housing has displaced traditional vernacular (shophouses and attap houses) to become the ubiquitous architecture in Singapore. The transformation marks the development and adaptation of a city and nation to industrialisation and the internalisation of modernist housing. The extensive high-rise housing development in the public sector may be analysed in four time periods, distinguished by their evolving approach and innovations towards liveability:

- 1960-77---solving housing shortage and providing housing options;
- 1978-84---providing a total living environment;
- 1985-89---improving housing quality; and
- 1990 and beyond---enhancing identity and sense of place.

1960-77---Solving housing shortage and providing housing options

This is the period when the foundations of large-scale public housing

development in Singapore were cemented. Like many other cities, public housing was built to meet housing shortage and provide decent, secure and affordable housing. The acute housing shortage in Singapore was the result of unremitting pressure of a rapidly growing population on an increasingly short supply of housing stock. The situation was made worse by the destruction and interruption to house building during the 2nd World War and the unwillingness of the colonial state and the private sector in the post-war years to shoulder the expense of providing housing for the labouring classes as such investments yielded lower returns compared to those in economic and commercial development.

To expedite public housing construction in the 1960s (post-independence period), a strategy of standardisation was applied. Prototype flats were built. Not one but a range of flats: 1- to 4-room flats were offered to provide housing choice. As explained earlier, the building norm was high-rise. Blocks of 10- to 12-storeys were constructed to free up land for amenities provision. The role of the public housing authority was not just planning and development but also encompasses the entire building cycle including estate management and maintenance to ensure that the housing units do not degenerate into slums over time. Comprehensive and routine maintenance was conducted through a centralised management system of branch offices distributed across Singapore.

1978-84---Providing a total living environment

Rapid economic growth through the 1960s and 1970s produced a population with higher purchasing power, expectations and aspiration for a better living environment. The challenge for public housing was increasingly to understand more fully and respond to these expectations and aspirations. This resulted in a 2-pronged strategy of building larger flats, and providing a total living environment in public housing estates.

In 1960s, the average size of public housing unit was 42 sq. m. but by the mid-1970s, it was increased to 74 sq. m. In addition to 1-, 2-, 3- and 4-room flat, the 5-room flat was introduced in 1971. Its introduction marked an important milestone in the evolution of public housing in Singapore; for the first time, the government was addressing the housing needs of the sandwich class: the lower middle-income group. The Singapore flats are relatively large by international standards—an average of 90 sq m for a 4-room flat (3 bedrooms) and 110 sq m for a 5-room flat (4 bedrooms) or about 18-22 sq m of living space per person as compared with about 7-15 sq m in cities such as Tokyo and Seoul.

Public housing estates were organised along the new town model. A growing number of new towns were developed at increasing distances from the city centre. As land near the city centre becomes developed, suburbanisation is inevitable. To minimize travel, the trend is towards greater self-containment of the new towns. In consequence, the Singapore public housing towns are designed to provide not just shelter but a total living environment with the dual aim of creating physical settings and nurturing a greater sense of community

spirit and belonging. Needless to say, an important aspect of community development is residents' satisfaction. A well-maintained estate is likely to be more attractive to the residents. Increasingly, innovation is on improving services to residents through mechanisation and computerisation of maintenance operations. The public housing authority expanded its maintenance services to include emergency repair and installation of lift tele-monitoring system to enhance security in high-rise.

1985-89---Improving housing quality

By the mid-1980s, more than 80% of Singaporeans were living in public housing flats. As more and more land was developed for public housing, the emphasis in the 1980s was to consolidate housing development under the spatial parameters of the country's long-term development plan, the Concept Plan. The Concept Plan provides a framework for the development of infrastructure to support housing requirements and quality of life. As quality of life took centrestage in the planning agenda, there was greater scrutiny on design and quality of housing.

More emphasis was directed to the quality of building components and finishes. More stringent quality control and construction management system were introduced to produce better quality works. Greater use was made of urban design to break the monotony of public housing. The key to continuous innovation lies in promoting new town character so as to create a stronger sense of community, identity and belonging. On a spatial level, a smaller territorial unit in the form of precincts was introduced into the new town model since the late 1980s to help foster social interaction among residents. Innovative design features were applied to give each precinct a unique identity.

To further improve the quality of public housing, a multi-million dollar upgrading programme was initiated to improve the facade and environment of existing housing blocks. Many of the 1-room emergency flats built during the 1960s were demolished to make way for new developments while others were converted into larger 3- and 4-room self-contained flats. The upgrading programme offered an opportunity to re-plan old towns, improve facility provision and achieve a better social mix by introducing different types of flat. In addition, explicit rules were introduced to ensure that the racial mix in new towns and individual blocks of flats reflected roughly the racial proportion in the total population. Estate management was devolved to town councils in the late 1980s in a move to have greater resident involvement in the management of public housing.

1990 and beyond---enhancing identity and sense of place

As housing development entered the 1990s, even greater attention was directed on place identity and quality development and environment. Such a focus is not new. As early as the 1960s, there has been progressive renewal of housing conditions. This has been achieved through changes in physical aspects of the housing stock, rules and regulations regarding access to public

housing, and increasingly through how much land is given to private sector housing. But, in addition to these past upgrading efforts, the 1990s saw the introduction of a formal upgrading plan (Main Upgrading Programme in 1991) that would last 15 years (from 1991), and benefit 95% of public housing residents (*The Straits Times* 12 July 1989). The Main Upgrading Programme is targeted at flats of more than 17 years old, thus arresting the potential deterioration of these properties.

At the same time, an Interim Upgrading Programme was introduced to complement the Main Upgrading Programme for flats between 10 and 17 years old. The Interim Upgrading Programme is totally funded by the government and entails improvement works to the blocks and precinct surroundings that can further strengthen the sense of place. The upgrading plan is seen to fulfil several objectives. From the state's perspective, upgrading is part of an asset enhancement policy to raise the value of public flats, and share Singapore's economic growth with the larger population. It presents an entry point to meet people's growing expectations of an improved quality of life. The programme offers a way to ensure that those conditions are put in place and maintained regardless of the age of development. On a social level, upgrading offers a way to create new flats, often taller housing in older estates that would help to stop the decline of older towns - there is a growing tendency for young people to shun the older towns in their preference for a new flat. Through upgrading, residents can continue to dwell in place, and not move to new housing areas to enjoy new and improved facilities.

The common upgrading works would comprise the creation of precincts and facilities (such as barbeque pits, landscaped gardens and children's playgrounds) where they did not exist previously, updating the facilities of markets and lifts (lifts that stop on every floor instead of every few floors in the older blocks, and clear window panels on lift door to enhance safety in the lifts), architectural improvement to blocks such as including motif, dormer and colour to make the once uniform-looking blocks individually distinctive, and enlargement of individual dwelling units by adding prefabricated spaces such as an utility room or an extra toilet for flats that have only one bathroom/toilet.

Residents are consulted in the upgrading proposals, and asked to decide on the upgrading by voting for the upgrading, which will only proceed if there is a 75% in favour vote. In most cases, residents are not required to relocate during the upgrading process. They are, however, required to pay a small portion of the upgrading costs, 8-21% depending on the size of their flat, with the government and town council paying the balance. To help residents with the upgrading cost apportionment, easy repayment terms and special assistance measures have been set up for senior citizens and families in financial hardship.

What is perhaps remarkable is not just the spread of high-rise public housing but also the acceptance of this form of housing by an increasing number of residents. The next section examines some of the data.

4. Some responses to high-rise

Singapore has continued to register consistently high residential satisfaction scores with rising height (Wong and Yeh, 1985; HDB, 2000). In the most recent sample household survey, the majority, 82.3%, of residents had expressed a sense of belonging to their public housing estates (HDB, 2000). The sense of belonging was found to be positively correlated to the length of stay, and strongest among those who had lived more than 10 years in the place. Other reasons for having a sense of belonging include good neighbours and pleasant surroundings (Table 3). Among those expressing a lack of sense of belonging, the common reason was that they were new or unfamiliar with the place. Their average length of stay was less than 2 years.

Table 3: Main Reasons for Having a Sense of Belonging

Main reasons	**%**
Stayed there for a long time	42.2
Good neighbours	12.6
Pleasant surroundings/environment	10.2
Considers his/her flat as home	9.2
Good neighbourhood/estate	7
Good location	5.2
Good provision of estate facilities	4.8
Family/friends are here	4.6
Safe and secure place to live in	2
Others	2.2
Total	100

Source: HDB (2000), p85.

Neighbourly interactions among residents appear to be extensive rather than intensive. Data from the HDB Sample Household Survey 2000 indicate that 1 in 3 residents reported they know 5 or more neighbours, and the top 5 places in the estate where residents would meet another are the common public spaces---the corridors, lift lobbies, void decks on ground floor of block, markets or along the pathways to the apartment blocks. The most common types of neighbourly interaction include exchange of greetings, small talk, exchange of food on special occasions while some would even keep house keys for their neighbours when necessary.

With rising height, there appears to be a growing preparedness to live in taller blocks. While living on 5th floor is generally considered to be too high in most Western cities designed with suburban-style housing, in Singapore and also Hong Kong SAR, our data indicate that such living is considered to be too low.[1] As shown in Table 4, sampled residents on lower floors in Hong Kong SAR and Singapore appear less satisfied with the floor that they are staying as compared with those on the upper floors. Only 15.7% in Hong Kong SAR and 24.1% in Singapore living on 1st-5th floor considered the floor level that they were living was just right.

[1] For details of the study methodology, see Yuen et al (2003).

Table 4: Comparison of Satisfaction of Living Height, Hong Kong SAR and Singapore

Present Floor Level	Too High		Not High Enough		Too Low		Just Right		Don't Care/Never Thought About It		Total	
	Hong Kong SAR	Singapore	Hong Kong SAR	Singapore	Hong Kong SAR	Singapore	Hong Kong SAR	Singapore	Hong Kong SAR	Singapore	Hong Kong SAR	Singapore
1 - 5 Floor	-	0.0%	13.0%	17.2%	62.0%	44.8%	15.7%	24.1%	9.3%	13.8%	100.0%	100.0%
6 - 10 Floor	-	1.7%	31.6%	25.0%	21.8%	15.0%	34.6%	55.0%	12.0%	3.3%	100.0%	100.0%
11 - 15 Floor	-	0.0%	33.9%	19.6%	10.2%	0.0%	52.0%	73.9%	3.9%	6.5%	100.0%	100.0%
16 - 20 Floor	2.4%	14.8%	10.7%	14.8%	1.2%	7.4%	82.1%	59.3%	3.6%	3.7%	100.0%	100.0%
21 - 25 Floor	1.3%	15.6%	15.2%	9.4%	0.6%	3.1%	74.7%	65.6%	8.2%	6.3%	100.0%	100.0%
26 - 30 Floor	9.7%	8.3%	8.8%	12.5%	1.8%	0.0%	72.6%	79.2%	7.1%	0.0%	100.0%	100.0%
31 - 35 Floor	9.1%	-	6.6%	-	3.3%	-	72.7%	-	8.3%	-	100.0%	
36 - 40 Floor	9.3%	-	5.6%	-	3.7%	-	64.8%	-	16.7%	-	100.0%	
41 Floor or Above	18.4%	-	7.9%	-	2.6%	-	60.5%	-	12.1%	-	100.0%	
Total	**4.1%**	**5.5%**	**16.7%**	**17.9%**	**12.8%**	**11.5%**	**58.1%**	**59.6%**	**8.3%**	**5.5%**	**100.0%**	**100.0%**

On closer examination, a higher percentage of those living on the 1st-5th floor in Hong Kong SAR (62%) reported that they were living too low in Hong Kong as compared with Singapore (44.8%). In both Hong Kong SAR and Singapore, residents staying in floors above 16th floor registered a higher satisfaction level with living height than those in lower floors. The satisfaction level is over 60% in both places. Because of the difference in the contextual environment of tall buildings (Hong Kong SAR have taller housing blocks), the satisfaction level of those living above 16th floor in Hong Kong SAR is higher than those in Singapore. For most of the residents living in the tall buildings in Hong Kong SAR, only a small percentage of less than 15% considered the floor that they are living to be too high. Even for those living on 41st floor or above in Hong Kong SAR, only 18.4% considered that it is too high.

The average highest preferred floor level is higher in Hong Kong SAR than Singapore (Table 5). It is 29.3 for Hong Kong SAR and 20.9 for Singapore. Only 15.3% of the respondents in Singapore were willing to living above 31st floor, whereas this proportion has jumped to 37.4% for Hong Kong SAR; 11% of those in Hong Kong SAR were willing to live above 46th floor. The findings lend support to the argument that contextual difference in the physical setting of Hong Kong SAR and Singapore has influenced the higher preferred floor level. Hong Kong SAR has more and taller buildings than Singapore and its residents are consequentially emboldened by the familiar living experience, and more willing to live higher in Hong Kong SAR than Singapore.

Table 5: Comparison of Highest Preferred Floor Level

Highest Preferred Floor	Hong Kong SAR		Singapore	
	No.	%	No.	%
1 - 5 Floor	2	0.2%	2	1.0%
6 – 10 Floor	24	2.8%	23	10.7%
11 - 15 Floor	17	2.0%	33	15.3%
16 - 20 Floor	168	19.6%	40	18.6%
21 - 25 Floor	82	9.6%	26	12.1%
26 - 30 Floor	244	28.5%	58	27.0%
31 - 35 Floor	77	9.0%		13.0%
36 - 40 Floor	139	16.2%		
41 - 45 Floor	10	1.2%		
46 - 50 Floor		11.0%	28	
51 Floor or Above	94		5	2.3%
Total	**857**	**100.0%**	**215**	**100.0%**
Average Floor Level	**29.3**		**20.9**	

It seems that there is little difference in the concerns about high-rise living in Hong Kong SAR and Singapore (Table 6).

Table 6: Comparison of Concerns about High-Rise Living

Concerns about high-rise living	Hong Kong SAR		Singapore	
	%	Rank	%	Rank
Fire risk	25.8	1	9.0	5
Lift breakdown	13.3	2	20.0	2
Who you have as your neighbours	11.9	3	14.0	3
Crime in the lift	9.0	4	14.0	4
Accidental falling off of family members	8.8	5	5.0	6
Lack of neighbourhood facilities	7.9	6	26.0	1
Power failure	6.9	7	2.5	7
Travelling time in lift	6.3	8	2.5	8
Collapse of the building	3.0	9	2.5	9
Walking along the common corridor to reach your flat	2.7	10	2.0	10
Other worries	2.4	11	1.5	11
Height of the building	2.1	12	1.0	12
Total	**100.0**		**100.0**	

The first six concerns are the same between Hong Kong SAR and Singapore. They are fire risk, life breakdown, neighbours, crime in lift, accidental falling off the building, and lack of neighbourhood facilities. They constitute 76.7% and 88.0% of the concerns of the respondents in Hong Kong SAR and Singapore respectively. Perhaps because of the difference in housing design, their order of importance is slightly different. Hong Kong's respondents had ranked fire risk as their number one concern, whereas fire risk was ranked 5th for respondents in Singapore. Lack of neighbourhood facilities appeared the top concern in Singapore but ranked only 6th in Hong Kong SAR. The ranking of other minor concerns such as power failure, travelling time in lift, collapse

of building, and walking along the common corridor to reach your flat are the same in Hong Kong SAR and Singapore. The height of building is of very low concern in both cities. This is perhaps a reflection of respondents' perception of building tallness, and also their general satisfaction and familiarity with the tall environment.

Conclusion

Taller buildings look set to be the trend of future urban form in Singapore, Hong Kong and also many other cities. Against the limited spatial expansion, Singapore's long-term development plan has envisaged more high-rise housing for its enlarged population of 6.5 million. Although initially criticised for their monotony and architectural insensitivity, high-rise public housing in Singapore has over time with physical renewal and improvement become synonymous with comfortable, middle-class housing concomitant with a growing sense of belonging for most Singaporeans. High-rise while not the only building form has offered a solution in vertigo urban densification. If the Singapore experience is any indication, this expansion can yet offer a satisfying living experience with careful and sustained planning and management.

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