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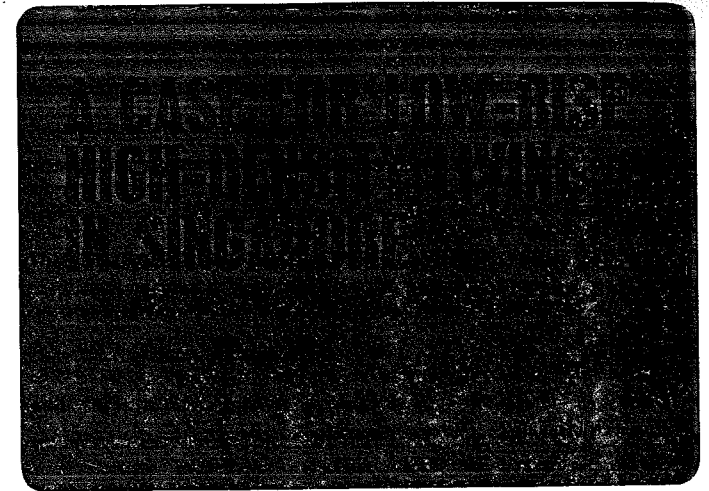
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A CASE FOR LOW-RISE HIGH-DENSITY LIVING IN SINGAPORE*

INTRODUCTION

The present controversy whether Singapore should continue to build high-rise public housing or whether it should and can consider the construction of low-rise high-density housing is inevitable. The reasons are: (1) better understanding about density and its environmental impact in relation to high-rise and low-rise buildings; (2) the tremendous success of the public housing programme in Singapore in providing accommodation in high-rise buildings for more than half the population; (3) the realisation that low-rise high-density housing can provide a positive alternative solution; and (4) the implication of effective population control towards a more moderate residential density in public housing.

A QUESTION OF DENSITY

For many decades, Lewis Mumford, Frank Lloyd Wright and advocates of garden cities criticized the de-humanising effects of high-density living in the urban environment. Their theories provide a sociological and philosophical basis towards the suburbanization of western urban centres. With increasing affluence and the intensive usage of private vehicles since World War II, low-density suburban single-house development has been widely adopted for the majority of middle and upper-income housing in the urban centres in western countries. Suburban living has become identified with social success and improvement in the quality of life especially for the poorer section of the urban population. Millions of tin-can housing units have been constructed and sold.

Le Corbusier, Walter Gropius, Jose Luis Sert and other architects unsuccessfully challenged the concept of suburban development in defence of the viability of urban centres. However, low-density suburban development has necessitated the construction of massive driveway systems, has accelerated the encroachment into agricultural land and has substantially increased travelling time to and from work. Furthermore, this pattern of urban development has also substantially contributed to the deterioration of the Central Business Districts (CBD) and often accentuated the class, income and often race stratification. Recently, Jane Jacobs' and others have now convincingly argued that high-density living in urban centres produces its own dynamics which are essential for human interaction and creativity.

The term high-density living requires some clarification. It is necessary to understand the determinant factors which govern the maximum density achievable in order to provide an acceptable quality of life in a particular cultural environment. These factors include climatical conditions, size of housing units, income of residents, subsidy available, the acceptable customary way of life, cultural values and lifestyles of residents. Requirements of privacy, the extended families and cooking facilities and the relationship between members of families should be reflected in the layout of housing estates and the design of the buildings as well as individual house units. When the density exceeds the maximum level, additional cost is needed to provide more floor areas in multi-storey structure to accommodate community facilities and carparks and to build needed open spaces into buildings at upper levels. Otherwise, the environment will be

A CASE FOR LOW-RISE HIGH-DENSITY LIVING IN SINGAPORE

by

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The housing programme was initiated as an act of political will and understanding of the social and political dynamics of society. The large investment in public housing and other social services were considered at that time by most economists as premature and even counter-productive for economic development. Professional manpower was very limited as nearly all expatriate officers resigned from government service. Housing units constructed were very small. Construction cost was kept to the minimum with simple high-rise blocks on a regular structural grid. Land available for construction was limited, as legislation had not been implemented for effective land acquisition.

Credit must be given to the professional and administrative personnel in the HDB responsible for successfully implementing the first 5-year building programme. 52,748 housing units were constructed. In the second 5-year building programme (1966-1970), 66,239 units were constructed; and in the third 5-year building programme (1971-1975) 113,819 units were completed.⁷ In 1964, the "Home Ownership Scheme" for the people were introduced to sell HDB flats by ballot. Singapore citizens with individual incomes of not more than S\$800 per month or total household incomes of not more than S\$1,000 per month were given the opportunity to purchase flats outright or to use their pension funds known as Central Provident Fund (CPF). There are strict conditions governing sub-lease or re-sale of units in order to avoid abuse. The household income ceiling was subsequently raised to S\$1,200 per month in 1970 and again to S\$1,500 per month in 1971.⁸ This experimental home ownership programme has been extremely successful and well-received by the public. By 1977, 120,340 units of flats have been sold.⁹

In 1970, the government established a separate agency known as the Urban Redevelopment Authority (URA). The main responsibility of URA is to co-ordinate and develop the central area and to initiate projects of urban redevelopment for both public and private sectors. A subsidiary company known as Housing and Urban Development Company (HUDC) was established in 1974 to construct middle-income housing in response to the run-away escalating prices of private housing during the boom years in the early 70s. The HUDC was scheduled to complete 3,240 units by 1976.¹⁰

By 1977, HDB has constructed 272,420 housing units.¹¹ 56% of the population is accommodated in public housing.¹² This is a remarkable achievement particularly for a developing country. The island-state has no rural hinterland and there is strict immigration control. Furthermore, the rate of population growth has decreased rapidly in recent years. Economic development has also been extremely successful. Per capita income in Singapore is S\$6,329 (1976).¹³ However, Singapore's success in providing public housing cannot easily be duplicated. In the economically less developed Third World countries, a different strategy will have to be adopted to provide sufficient residential accommodation for the lower-income group.¹⁴

The Singapore government has only provided marginal subsidies for public housing. However, large loans are given to HDB, and land is provided at nominal cost. Indeed, public housing has now become an integral part of the social services together with health and education. These services have pro-

adversely affected as clearly shown in many examples of urban redevelopment in high-rise buildings for low-income housing both in Asia and elsewhere. Very high density can be achieved in mega-structures of 1,000 metres high or more as illustrated in visionary architect Paolo Soleri's theoretical projects.² However, the construction cost and energy consumption in such mega-structures is likely to be very high. In addition the social implications can also be serious.

There is no direct relationship between density and heights of buildings. It is possible to have high-rise low-density development or low-rise high-density development. However, with the present building regulations in most tropical countries, high-rise buildings will provide higher acceptable housing density than low-rise buildings. The application of knowledge already available about ventilation and sunlight requirements in tropical climates will go a long way towards determining more appropriate regulations relating particularly to site coverage and distance between buildings. If new regulations are introduced, they can have important effects on layout and architectural design as well as density particularly low-rise high-density housing.

As a small island-state, the issue in Singapore is not whether high-density living should or should not be acceptable. With very limited land area available, it is inevitable that a large majority of people in Singapore must accept high-density living. What we should establish is the residential density that is needed for public housing in Singapore in order to accommodate its present and future population. And secondly, whether the population should and can be accommodated in low-rise or high-rise buildings.

SINGAPORE HOUSING PROGRAMME

Public housing in Singapore started in 1927 with the formation of the Singapore Improvement Trust (SIT). Under its original function with regard to public housing, SIT was empowered to provide housing only for people who were actually made homeless under urban improvement projects. By 1932, SIT was given more power to construct public housing. From 1927 to 1942, SIT constructed 2,049 units. During the war years, there was no construction. The programme was resumed and accelerated after the war. From 1947 to 1959, 20,907 units were constructed accommodating 8.8% of the population.³ However, the rate of construction was insufficient to meet even half the population increase which was at a very high rate of 4.1% (1959).⁴

The urban poor was accommodated in two- or three- storey buildings often at a density of 2,000 persons per hectare (ppha) or more. This acute housing shortage had serious implications to health, children's education as well as social and political stability. In 1959, the People's Action Party (PAP) came into power. In early 1960, the Housing and Development Board (HDB) was established under the portfolio of the Ministry of Law and National Development to take over the functions of SIT with considerably more funds and legal powers to deal with public housing construction and management, urban renewal and other related problems. The target of the first 5-year building programme (1960-1965) was to construct 50,000 units.⁵ It is important to note that the per capita income in Singapore in 1959 was only \$1,240.⁶ Regional trade and the British military base were then the main pillars of Singapore's economy. Very few industries were established and there was a high rate of unemployment.

University mathematicians-turned-architects — Leslie Martin and Lionel March.²⁵ His theoretical analysis of neighbourhood II of Toa Payoh, one of the earlier higher-density housing estates of HDB, shows that an equivalent density of about 1,300 ppha can be achieved with 4-storey buildings. On the same principle, he has suggested that 2-storey houses grouped in units of four built on land not less than 24 hectares can also achieve a density of about 700 ppha. The concept no doubt merits serious consideration. However, there are yet unresolved problems. In the ring block layout, orientation problem cannot be easily overcome with sun-shading or planting especially in 4-storey buildings. Furthermore, there are serious constraints in design layout achieving more interesting arrangements if density is maximised. Questions relating to identity and monotony cannot be resolved just by colour schemes or different elevational treatments. To achieve a satisfactory total environment for high-density residential development, it may be too simple to just co-relate in reverse ratio between height of building and site coverage.

Low-rise housing can be defined as buildings which a mother can recognise the face of her own child in the street below from the uppermost floor.²⁶ By this definition, low-rise housing should not be more than 4-storey high. Low-rise high-density housing has many advantages. They are: greater speed in construction, less sophisticated technology is needed, less technical skill is required, savings in less use of imported materials and equipment, more effective use of unskilled labour, and construction can be undertaken by small local contractors. Furthermore, low-rise high-density housing can be more easily adapted to the use of solar energy devices in providing for water heating, cooking and in the not too distant future, unit air-conditioning. Energy saving is particularly important in view of the inevitable increase in energy cost.

Low-rise low-density housing does not automatically produce a satisfactory environment. In fact, it is more difficult to provide an interesting and varied environment in low-rise high-density housing than high-rise housing of the same density. Without sufficient professional design input, low-rise high-density housing can be as dreary as the tin-can low-rise speculative suburban development in western countries. Fortunately, there are now many professionals with sufficient experience and expertise in Singapore in both the public and private sectors to provide the necessary services. More professional time will be needed to produce environmentally satisfactory and visually interesting plans especially during the experimental stages. By-laws relating to site coverage, distance between buildings, vehicular access etc. will have to be derived from first principle to maximise the advantages of low-rise high-density housing.

Cost of maintenance and control against vandalism are serious problems in high-rise flats, notwithstanding HDB's long experiences in carrying out effective maintenance and control against vandalism. This concern has recently been expressed in local newspaper. "HDB housing estates are densely populated. Residents come from all walks of life. This has made maintenance work in these places more difficult resulting in frequent complaints about poor maintenance. There are also many bad elements among the residents who lack civic-mindedness and wilfully damage public properties".²⁷

vided the working population with a certain quality of life and have kept the cost of living at a reasonable level notwithstanding the relatively low wage level of unskilled workers.

The ratio of rent to overall household income of public housing tenants is only 10 to 12% (1973).¹⁶ This is substantially lower than what the working population has to pay for reasonable accommodation in other urban centres at a similar stage of economic development. However, in the process of slum clearance and resettlement many poor families living in HDB single-room units are still badly affected.¹⁶ Suicide rates, emotional problems, drug addiction and vandalism against properties are increasing, though we cannot easily attribute these phenomena just to high-rise living. Modernization, value changes and changes in family relationship must also be some of the contributory factors. Between 1965 to 1975, 7,703 units of private flats have also been built.¹⁷ As the majority of the population in Singapore is now living in high-rise buildings, we can certainly say that "high-rise living is now a way of life in Singapore".

LOW-RISE HIGH-DENSITY HOUSING

Recent sociological studies and surveys are greatly concerned with the long-term effects of living in high-rise buildings. In some western countries, new construction of high-rise public housing is positively discouraged. The public in some of these countries are even reluctant to move into high-rise public housing. The results of recent sociological findings by Riaz Hassan¹⁸ and Chang Chen-Tung¹⁹ on Singapore and Robert E. Mitchell²⁰ on Hong Kong are certainly disturbing. Residents in high-rise flats tend to be more lonely, and have less communication and interaction with their neighbours. They are more self-centred and tend to keep young children within the flats. However, these findings are certainly not conclusive, as it is difficult to isolate the impact of high-rise living in societies undergoing rapid economic development and changing values. Stephen Yeh, Honorary Consultant to the Statistics and Research Department of HDB, and others continue to justify the correctness in building high-rise public housing in the context of Singapore.²¹ However, the author has disputed Yeh's sociological argument, but is prepared to accept with reservations, the case of high-rise public housing based on density and land shortage.²²

Liu Thai Ker, Deputy Executive Officer of the HDB, indicated that some theoretical exercise was carried out to compare density achievable between high-rise and 4-storey low-rise buildings for 2,000 units of similar sizes. The result of the study suggested that the achievable density of the low-rise scheme is still very high at 600 persons per hectare.²³ However, 70% more land is required for the low-rise scheme. For purpose of comparison, high-density public housing in London is about 300 persons per hectare.

The public controversy of low-rise high-density housing was brought to the forefront with the publication in a local newspaper of a theoretical project by architect Tay Kheng Soon.²⁴ The scheme is based on the ring or perimeter-block concept, with flats being built in a continuous line along the periphery of the site. Car parking is located off the feeder roads along the periphery, and communal facilities is provided within the open precincts of the housing blocks. According to the architect, the concept is based on studies of two Cambridge

establish the quantum of accommodation and the density of the private sector. When housing in the private sector has an averagely low-density and is building in large numbers, it will substantially increase the average density of the public sector. Adversely, when it has a density approaching the national average and provides only a small percentage of housing, the effects on the average density for public housing will be small.

In the context of Singapore, it is realistic to envisage that public housing, including housing by Housing & Urban Development Company (HUDC), Jurong Town Corporation (JTC) and Port of Singapore Authority (PSA), will provide 75-85% of the total housing stock. As residential land value is relatively high compared with other urban centres, we can assume the average density for private housing to be 150-250 ppha. Some intensification in the redevelopment of existing low-density residential areas can also be envisaged. We can now make the following computations (see Tables I-III).

TABLE I

Private Housing at 150 ppha.						
% of Public Housing	Persons in Public Housing	% of Private Housing	Persons in Private Housing	Land required for Private Housing	Land available for Public Housing	Avg. density Public Housing
75	3.0 m	25	1.0 m	6,667 ha	6,333 ha	474 ppha
80	3.2 m	20	.8 m	5,333 ha	7,667 ha	417 ppha
85	3.4 m	15	.6 m	4,000 ha	9,000 ha	378 ppha

TABLE II

Private Housing at 200 ppha.						
% of Public Housing	Persons in Public Housing	% of Private Housing	Persons in Private Housing	Land required for Private Housing	Land available for Public Housing	Avg. density Public Housing
75	3.0 m	25	1.0 m	5,000 ha	8,000 ha	380 ppha
80	3.2 m	20	.8 m	4,000 ha	9,000 ha	356 ppha
85	3.4 m	15	.6 m	3,000 ha	10,000 ha	340 ppha

In low-rise high-density housing estates, community participation in management to maintain common areas and control of vandalism can be introduced more effectively, especially when small open spaces and other common areas are situated in response to specific groups of housing units. Furthermore, house owners given the opportunity will certainly respond positively to participate in maintaining their own immediate environment.

To achieve a satisfactory total environment, it may still be true that high-rise housing can still provide higher density than low-rise housing especially when additional budget is available to incorporate carparks and other communal facilities in multi-storey buildings. The questions we need to ask in the context of Singapore are: What is the maximum density achievable in low-rise high-density housing in providing for a satisfactory total environment? Will sufficient residential land be available to justify low-rise public housing to be constructed within this density?

DENSITY AND POPULATION

One of the most spectacular achievements in Singapore is the rapid decline in the rate of population growth. According to a recent report, the present population is 2.28 million, the rate of population growth is 1.4% and the population will stabilize at 3.5 million in 2030.²³ Though the report is not an accurate projection, it is based on the present trend of fertility and mortality. The success of the population programme can be attributed to (1) value changes and economic development, (2) strict control of immigration, and (3) government efforts including the legalisation of abortion and sterilisation as well as economic and educational disincentives for big families. There are far-reaching socio-economic implications towards manpower planning, employment opportunities, education and health services, physical planning, housing provision, public utilities, recreational facilities and environmental services. From these population projections, two important implications relating particularly to housing development emerge: (1) the present programme of HDB to construct 30,000 units per annum should be drastically reduced especially after the present backlog of demand has been met, and (2) the overall average residential density can now be computed.

In most major urban centres, about 40% of the land is utilised for residential usage. In the Singapore case, we have to allocate land for defence, agriculture and nature reserve. The present general land use on the main island of Singapore (1975) are as follows: Residential 15.4%, Commercial 2.0%, Industry 4.6%, Transportation 5.2%, Utilities and Communications 1.2%, Institutions (excluding schools) 1.8%, Schools 1.3%, Special Use 11.0%, Open Space (including cemeteries) 3.3%, Water Catchment and Reservoir 8.5%, Agriculture 21.2%, and Miscellaneous (including Water Areas; Vacant Buildings; Under Construction; and Undeveloped & Unused Land) 24.5%.²⁹ Singapore has a total land area of 597 sq. k.m.,³⁰ i.e. 59,700 ha. For the purpose of this exercise, we will assume 13,000 hectares, i.e. about 22.3% of land is available for residential development. If we assume the population will stabilise at 4 million, the average residential density will be about 300 ppha (i.e., 4 m 13,000 ha).

Residential accommodation is provided by both the public and private sectors. In order to arrive at the average density of the public sector, it is necessary to

decade and systematic local research findings are only carried out in the last few years; (7) planning regulations have always been based on modified western models, though there is now a better understanding of basic planning principles relating to low-rise high-density housing in tropical conditions; and (8) bureaucratic and professional inertia and political risk to change and restructure a highly geared and for a long time successful building programme.

The more relevant question is whether conditions are now suitable to change the policy from high-rise to low-rise high-density housing and whether there are sufficient justifications for this change. In my opinion, the most important development that can influence a basic policy-change is the ability for Singapore now to control its rate of population increase and to achieve zero population growth. However, this has only become obvious in the last couple of years. We can now confidently assume that there will be enough land available to build low-rise high-density public housing. Notwithstanding the still inconclusive psychological and sociological findings of high-rise living, we must be concerned about its possible adverse implications. Furthermore, it must be reasonable that the public should be given a choice, when a choice is feasible, to live in low-rise high-density housing of similar unit sizes and construction cost. In any case, it is evident that we can now lower the average density of public housing to provide a better total environment whether we continue to build high-rise or low-rise. To some degree, this has already been done in the new housing estates of HDB.

The more delicate issue, which is as much administrative and professional as political, is: What will happen when HDB builds the first 20,000 units of low-rise housing and receives an overwhelming response from the public to the extent that many applicants are reluctant to accept high-rise units. Let us assume half the applicants and present occupants of HDB units prefer to live in low-rise and the other half in high-rise. The response to low-rise housing will still be overwhelming, as to-date no low-rise public housing has yet been built by HDB. There is no easy answer to this problem. Frank and careful explanations must be made to the public regarding the reasons for the policy-change. Initially, the demand of low-rise units may have to be regulated by putting a premium price on these units. If this policy-change can gradually take place in the next few years, there should be a minimum disruption to the housing programme. It is still possible for Singapore to provide a reasonable percentage of 30% to 40% public housing in low-rise, when we reach zero population growth in the year 2030. Relocation and priority can be given to families with young children and to senior citizens. It must be remembered that buildings are built to last a long time — normally 60 years or more. If the present policy is not changed and we continue to build high-rise public housing, the long-term psychological and sociological consequences may be serious.

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TABLE III

Private Housing at 250 ppha.						
% of Public Housing	Persons in Public Housing	% of Private Housing	Persons in Private Housing	Land required for Private Housing	Land available for Public Housing	Avg. density Public Housing
75	3.0 m	25	1.0 m	4,000 ha	9,000 ha	334 ppha
80	3.2 m	20	.8 m	3,200 ha	9,800 ha	327 ppha
85	3.4 m	15	.6 m	2,400 ha	10,600 ha	321 ppha

From the above analysis, the average density for public housing will be between 321 to 474 ppha. If we assume 20% is private housing and at an average density of 200 ppha, the average public housing density will be 356 ppha. However, the land area allocated for residential development is based on general land use classification and not on nett residential density. This density normally includes feeder and internal roads, local shops and local recreational facilities. Some adjustment upwards of about 20% will be necessary in order to make a direct comparison to HDB nett residential density.

There would be no dispute that low-rise high-density housing can be constructed to a nett density of 300-450 ppha based on existing or even improved standard of accommodation and to achieve a satisfactory total environment. In some instances, the buildings can even be of 2-storey with small private garden for each unit to cater for the varied needs. It is also possible to have a combination of low-rise and high-rise buildings. With a comprehensive land-use and land management policy, sufficient land can be allocated to HDB to provide low-rise high-density housing for the public.

CONCLUSION

There is no necessity to defend the public housing programme in Singapore as it has been extremely successful in providing very reasonable standard of accommodation for more than half the population. However, critics may ask: If low-rise high-density housing is possible, why is it not being implemented? Let me suggest some of the possible reasons: (1) during the initial stage of the housing programme of HDB, very limited land was available and there was an acute shortage of manpower; (2) strict immigration policy is enforced only after Singapore has achieved independence status in 1965; (3) comprehensive planning in response to changing conditions was only completed in 1971 to provide an overall prospective of general land-use with important qualifications regarding population projection and transport system;³⁾ (4) it is the deliberate intention to maximise density in public housing estates to conserve land;²⁾ (5) economic development and value changes have escalated in the last decades bringing into increasing focus problems relating to alienation, loneliness, drug addiction and vandalism; (6) the possible adverse psychological and sociological problems relating to high-rise buildings have only become obvious in the last

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