REPUBLIC OF SINGAPORE

SINGAPORE URBAN TRANSPORT IMPROVEMENT STUDY (SUTIS)

TECHNICAL REPORT No. 3

Study on HDB NeW Towns

NOVEMBER 1988

Japan International Cooperation Agency

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1. INTRODUCTION

It is commonly observed that as the economic situation improves the residents tend to ask higher service levels of various infrastructure and better environment conditions. Improvement of the feeder transport system is also considered as one of the areas to be looked into. This technical report intends to study the present conditions and characteristics of new towns to prepare basis, necessary for identification of the planning opportunities of improving feeder transport services and introducing a new transit system in the new towns.

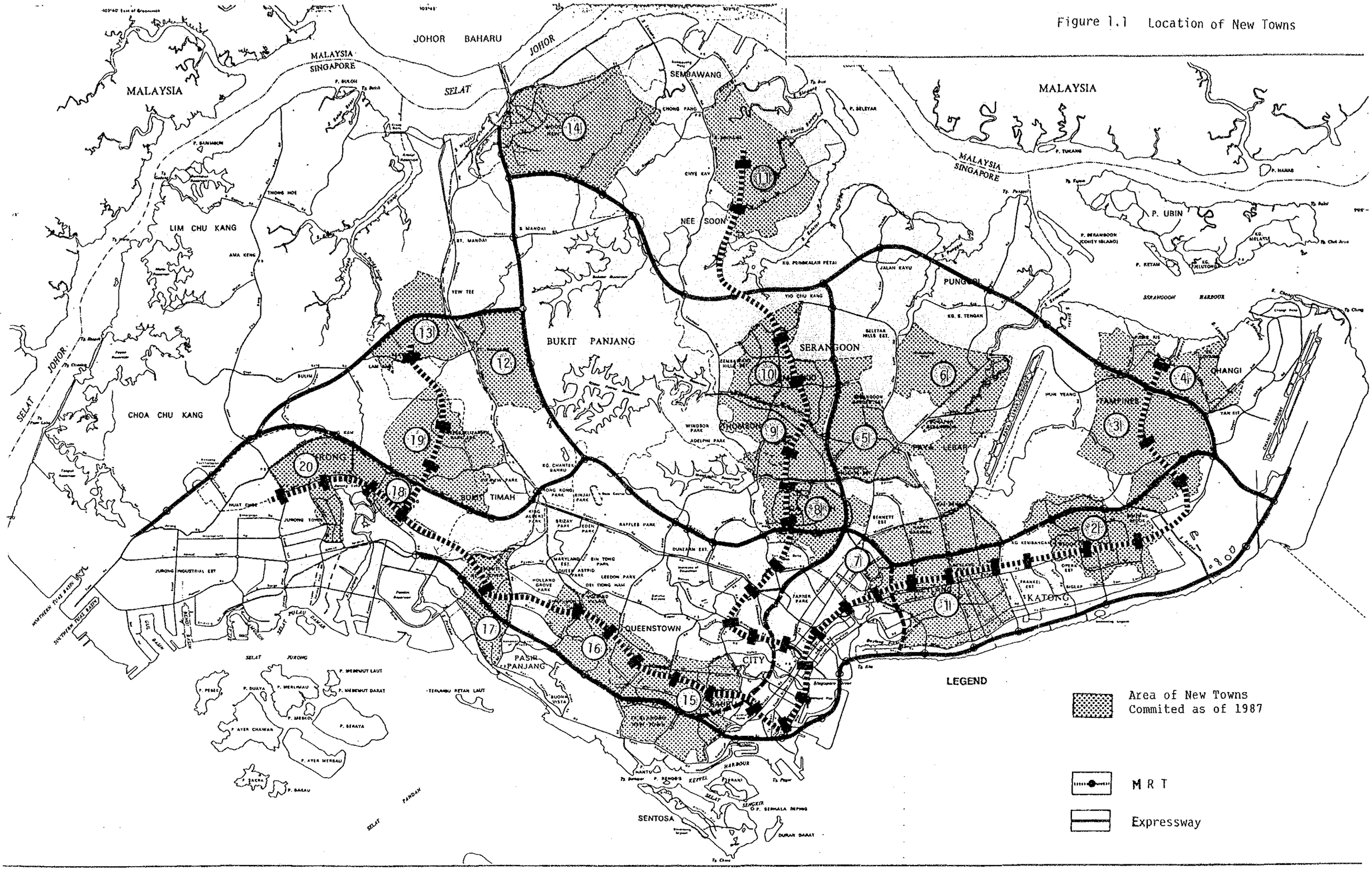
At present, there are twenty new towns as summarized in Table 1.1 and shown in Figure 1.1. They are distributed all over the country which, however, are well connected by either expressway or MRT or both modes.

Table 1.1

Profile of HDB New Towns, 1986/87

CORRIDOR	NEW TOWN	LAND USE				PLANNED SIZE				CURRENT SIZE (as of Mar '86)		FIRST YEAR HDB FLAT COMPLTD	TRANSPORT FEATURES			
		TOTAL AREA :HA	RESID'L AREA: HA	(%)	OTHER MAJOR USE	NO. OF DWELG UNITS	ESTD POP. :000	DENSITY PERSONS/HA GROSS	NET	ESTD POP. :000	(%) COMPLE-TION		DISTANCE TO CBD: KMS	NO. OF MRT STATN	NO. OF EXPRY I.C.	NO. OF BUS I.C.
EAST	1.Geylang	1,085	173	(10)	C.I.	37,300	142	131	821	131	(92)	1962	4 - 6	2	5	-
	2.Bedok	974	285	(29)	I.	57,100	217	223	761	201	(93)	1957	11 - 14	2	2	1
	3.Tampines	1,035	377	(36)	-	65,400	249	241	660	137	(55)	1981	15 - 19	2	6	-
	4.Pasir Ris	998	208	(21)	C.I.	36,000	136	136	654	1	(1)	1987	19 - 22	1	3	-
	SUB-TOTAL	4,092	1,043	(25)		195,800	744	182	713	470	(63)	-				
	5.Serangoon	634	123	(19)	-	21,000	80	126	650	50	(63)	1977	7 - 9	-	3	-
	6.Hougang	1,196	245	(21)	I	41,000	156	130	637	109	(72)	1974	8 - 11	-	-	1
	SUB-TOTAL	1,830	368	(20)		62,000	236	129	641	159	(67)	-				
NORTH	7.Jalan Besar	813	152	(19)	C.I.E	37,400	142	175	934	136	(96)	1962	3 - 4	1	5	-
	8.Toa Payoh	417	167	(40)	E	44,200	168	403	1,006	152	(90)	1966	6 - 9	2	4	1
	9.Bishan	704	115	(16)	I	22,000	84	119	730	45	(54)	1972	9 - 10	1	-	-
	10.Ang Mo Kio	742	248	(33)	C.I	47,500	188	253	758	183	(97)	1975	10 - 15	2	3	1
	11.Yishun	919	315	(34)	-	60,000	228	248	742	163	(71)	1977	17 - 21	1	-	-
	SUB-TOTAL	3,595	997	(28)		213,100	810	225	812	679	(84)	-				
NORTH WEST	12.Bukit Panjang	475	173	(36)	-	30,000	114	240	659	36	(32)	1986	18 - 22	-	3	-
	13.Chua Chu Kang	466	211	(45)	-	35,000	133	285	630	14	(11)	1977	21 - 24	1	1	-
	14.Woodlands	1,244	358	(29)	I.R	66,000	251	201	701	86	(34)	1973	20 - 25	-	1	-
	SUB-TOTAL	2,185	742	(34)		131,000	498	228	671	136	(27)	-				

Figure 1.1 Location of New Towns



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2. NEW TOWN DEVELOPMENT IN SINGAPORE

2.1 HISTORICAL OUTLOOK

The Housing & Development Board (HDB) was formed in 1960 with its main purpose being to provide public housing at a reasonable cost so that Singapore's acute housing shortage could be overcome. It is reported that at that time there were at least 100,000 squatters living in wretched housing on the outskirts.

The First 5-Year Building Program (1960-65): was implemented with a target of 50,000 housing units. During this period, there was a dramatic performance whereupon large number of units (54,430) were completed, consequently housing 23% of the population. It was epoch-making that the HDB's first new town, Queenstown, took shape in 1962 and the first comprehensively planned new town, Toa Payoh, in 1964, based on the neighbourhood concept. In addition, a number of land reclamation projects commenced during this period under the HDB's responsibility: viz East Coast; Kallang Basin and Jurong.

These early estates were characterized as follows :

1) Their location were mainly in urban fringe areas within a 10 km radius of the central district so that the residents could seek employment in/near the central district. This allowed the HDB to concentrate on pursuing its primary target, i.e. provision of basic shelters, without having to make substantial efforts on job oppotunities creation.

2) Only one, two and three room flats were provided in order that the great number of people could be quickly accomodated. This, however, has led to the present problem of flats being too small to meet the rising standard of living and expectation of the people. The average size of an HDB flat constructed during the First 5 Year Plan was 45 sq.m. as compared with 73 sq.m. at present.

3) The public housing program was linked with urban renewal revitalizing the central district and the resettlement program through the process of land transfer from the squatters and the residents of deteriorating buildings to the HDB.

The Second 5-Year Building Program (1966-1970) : was targeted with the provision of another 60,000 units. In all, during the decade of the first two plans, the HDB completed 120,700 units against the 110,000 projected. The public housing policy took on a new dimension during this period, when two government schemes appeared: The Home Ownership Scheme in 1964 and the 1968 enactment regarding the use of the Central Provident Fund (CPF) to pay for HDB flats. People, especially the lower income households, were encouraged to be home owners. The incentives after by low interest rate and availability for the use of the CPF, consequently, stimulated the demands for new flats. This resulted in a larger target of housing units to be prepared in subsequent 5-year plans.

The Third (1971-1975) and Fourth 5-Year Building Program (1976-1980) for 250,000 units more than double the construction target of the previous two plans. In the 1970's the housing policies emphasized on the upgrading of housing quality (more spacious, more confortable community, and more suitable for the traditional family style) as well as the provision of sufficient number of units. Several policies were implemented in response to these demands for better quality housing. Living and environmental facilities such as hawker centers, shopping, recreational and community facilities were built. The Joint-Balloting Scheme was initiated in 1978, which allowed married children to live in adjoining flats or flats in the same neighbourhood as their parents. Furthermore, in 1982 the Multi-Tier Family Scheme was implemented so that HDB housing could meet the people's social needs.

Several large scale new towns were initiated such as Woodlands in 1971; Bedok in 1974; Ang Mo Kio in 1975; Clementi in 1976 and Yishun in 1977. These developments in the 1970's were located mainly on sites well beyond the CBD due the several reasons: 1) difficulties in land acquisition in the areas near the CBD, 2) costly and laborious process in demolition of existing urban slums for creation of the project sites, 3) need for more spacious sites to meet the acute increase in housing demand, and 4) need for a more rationalized and efficient land use under limited land and resources.

In 1982, the HBD took over the management of flats formerly managed by the Housing and Urban Development Company (HUDC) and the Jurong Town Corporation (JTC) and became the sole public housing authority, and became involved in housing developments for middle-income households. At the start of the Fifth 5-Year Building Program, in 1981, there were still and upsurge in demands for the HDb new flats, resulting in many more applicants on the waiting list. This lasted till the end of the Fifth Plan. A more efficient construction led to a huge construction capability.

The Fifth 5-Year-Building Program (1981-1985): has a target of 155,000 units, but the HDB actually built 189,300 units, including 5,035 HUDC units during this period. Thanks to this, the HDB flats accommodated 85% of the population, of which 78% were owner-occupied in 1986. The cumulative achievements since 1960 accounts for as much as 554,000 dwelling units at the end of the Fifth Plan (1986), which means that 17,000-18,000 dwelling units have annually and ceaselessly been constructed for the last two and a half decades.

The Sixth 5-Year Building Program (1986-1990): has a target of 150,000 units with an annual completion program ranging from 36,000 units in 1986 to 24,000 units in 1990. Although the speed of construction slows down, several major new town developments are still underway, namely Bishan, Bukit Batok, Hougang, Jurong West, Tampines, Yishun and Bukit Panjang. These projects are located in areas even further beyond the CBD about 15-20 km. Although the HDB's efforts over a quarter century have dramatically contributed to facilitate people's well-being in terms of shelter provision, its housing policies have faced another new turning point, i.e. from development-oriented to adjustment or redevelopment-oriented polices. As the HDB annual report of 1985/1986 mentions, there are several changes in demand: 1) lower demand for HUDC flats, 2) lower demand for the HDB industrial shops/workshops except for special industries but increase in demand for commercial units, 3) lower demand for rental housing due to the home Ownership Scheme, 4) increase in demand for more spacious flats.

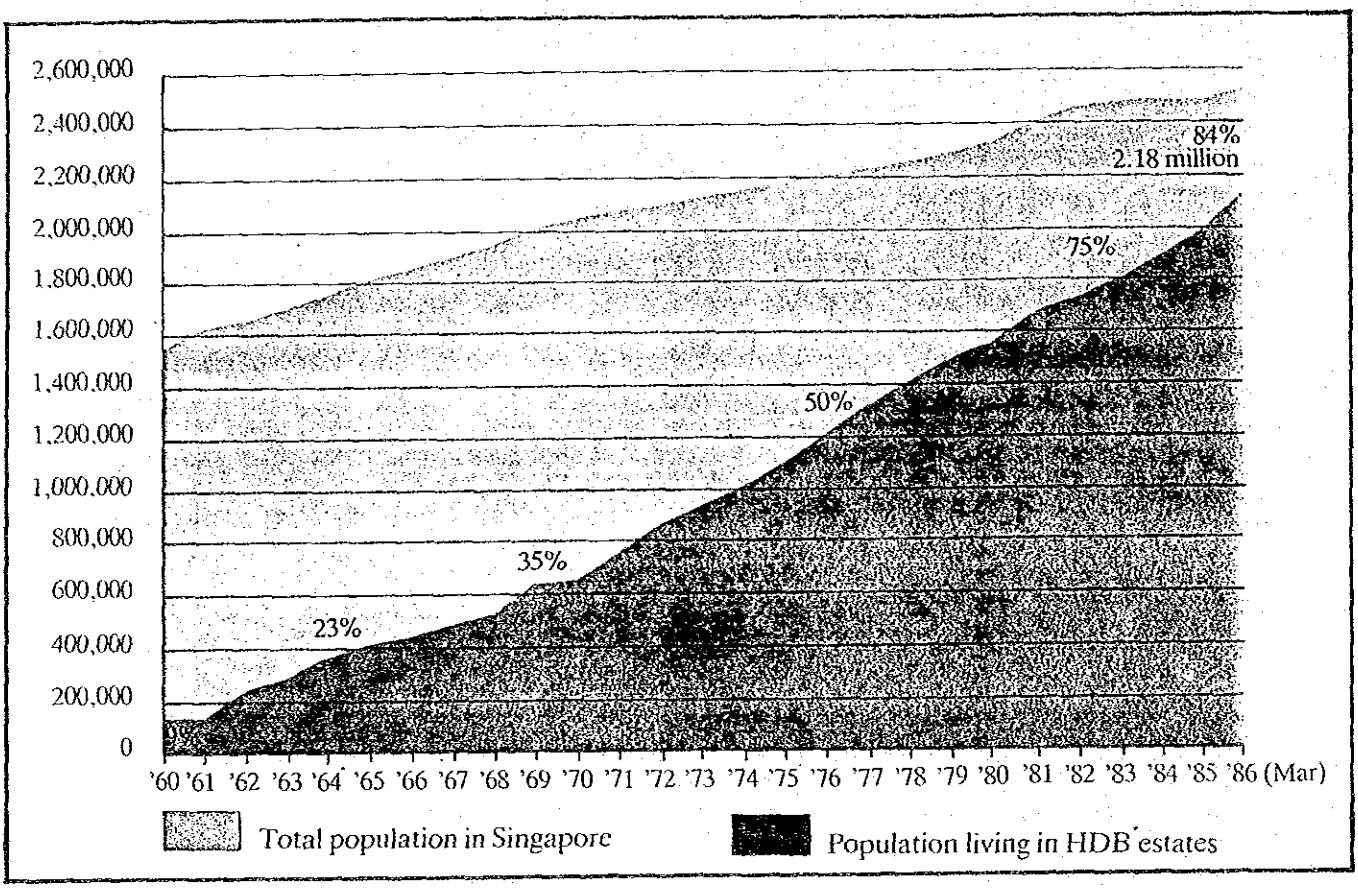
In order to meet the above changes in social requirements, several new projects/scheme have been implemented or are being planned. A notable scheme is the "Demolition and Redevelopment of Existing Estates" whereby old houses and its surrounding temporary structures are demolished and of 3 rooms or more converted to flats. This scheme is being applied for the new towns developed during the early stage, namely Queenstown and Toa Payoh.

2.2 ROLE AND ACHIEVEMENT OF HDB NEW TOWNS

Public housing in Singapore is a bold urban experiment in scale and speed. Within a relatively short time, the majority of its population have been housed in high-rise buildings at a density seldom surpassed elsewhere in the world. In the process, brave attempts have been made to help people to adjust to new lifestyles and to nurture new communities. Public housing is decisively one of the key facets of independent Singapore. (Housing A Nation, March 1985, HDB). As shown in Figure 2.1, people have been accommodated in HDB new towns at a tremendous speed and about 85 percent are now housed in HDB flats. Table 2.1 shows the significant contribution of HDB new towns.

Figure 2.1

Population Housed in HDB Flats



Source: 1985/86 HDB Annual Report

Table 2.1

Selected Indices of HDB New Town Contribution

	Singapore (1)	HDB New Towns (2)	%(2) /(1)	Year
Environmental				
(1) Housing units (Completed)	577,200	503,100	87	Dec 1984
(2) Land developed/ under development (ha)	29,500	6,600	22	June 1985
Social				
(1) Population housed (persons)	2,590,000	2,090,000	81	Mar 1985
(2) Resettlement cases cleared (cases)	239,900	223,800	93	Dec 1984
Economic				
(1) Contribution to by construction industry	11%	6%	55%	1984

Source: Housing A Nation, HDB march 1985

3. CHARACTERISTICS OF NEW TOWNS

3.1 PLANNING CONCEPTS OF NEW TOWNS

Physical planning of new towns is made on the following concepts:

a) satellite development
b) optimization of scarce land resources
c) provision of better housing environment than that from which the residents came from
d) application of neighbourhood principle

Generally speaking, new towns are planned satellite developments which are essentially very large residential developments that are comprehensively planned, usually with facilities to support the new community so that it can lead to an adequate existence, fairly independent from the city and other major centers. Its appeal lies in the fact that they offer new and better ways in the organization of the urban environment for work and living, in comparison to the traditional alternative of contiguous physical expansion within the metropolis. Singapore's new towns have a unique characteristics which are almost exclusively all high-rise, high-density public housing development. Each has a large population and many of which develop rapidly. It enjoy a fair degree of self-sufficiency in terms of day-to-day needs for the family as well as recreation and, to a certain extent, work opportunities. However, because of the relatively small size of the republic, the new towns are functioning more as nodes within a highly compact and interrelated urban sustem rather than as interlinked by a high capacity transportaion network that should offer the best in decentralization and good accessibility to the various major activity centers (Housing A Nation March 1985 HDB).

During the early periods, emphasis was given to find a viable alternative to the slums/squatter housing. Therefore, the initial building programmes had to concentrate on low-cost units. With rising standards of living and expectations of better-quality housing, larger and improved models of flats were designed and more comprehensive housing was planned and developed. Efforts have been taken to improve HDB physical planning and design work covering flat design, building block design, site planning and new town planning to meet the ever increasing demand of quality environment.

In the neighbourhood concept, a new town is divided into neighbourhoods of around 4,000 to 6,000 dwelling units. Each neighbourhood houses about 20,000 to 30,000 people which is sufficient to support basic community and shopping facilities provided in a neighbourhood center located within walking distance of three to five minutes for most residents. These neighbourhoods are further divided into precincts, each comprising of 500 to 1,000 dwelling units. Each houses between 2,500 to 5,000 people to enhance social interaction among the residents. A town center is provided in each new town and it is normally located in its geographical center. Generally, for a new town of 40,000 dwelling units, some 41% of the land are

set aside for housing development, 10% for schools, 20% for industries, 4% for the town center, 3% for institutional uses, 7% for sports/open space development and the remaining 15% for roads and other infrastructure services. Table 3.1 compares land use distribution among the selected new towns and prototype new town, while the Figure 3.1 shows the typical land use plan of one of the latest new towns.

Table 3.1

Comparison of Land Use Distribution of New Towns

LAND USE	Toa Payoh New Town 36,758 du Constructed in 1965-77		Ang Mo Kio New Town 49,482 du Constructed in 1973-82		Prototype New Town 40,000 du Post 1982	
	Land Area (ha)	Percentage	Land Area (ha)	Percentage	Land Area (ha)	Percentage
1. Commercial (Town Centre & Neighbourhood Centres)	33.5	9.0	54.0	7.6	86	13.7
2. Residential	150.1	40.3	248.2 2/	34.8	207	33.1
3. Schools	49.8 1/	13.1	58.6	8.2	73	11.7
4. Open Space	12.7	3.4	42.2	5.9	23	3.7
5. Sports Complexes	11.3	3.0	11.7	1.7	13	2.1
6. Institutions	19.0	5.1	32.3	4.5	23	3.7
7. Industry	47.0	12.6	128.5	18.0	120	19.2
8. Major Roads	44.5	11.9	116.7	16.4	75	12.0
9. Utilities & Others	4.8	1.3	20.9	2.9	5	0.8
Total	373.0	100.0	713.1	100.0	625	100.0
Gross New Town Density	99 du/ha 446 persons/ha		69 du/ha 304 persons/ha		64 du/ha 282 persons/ha	

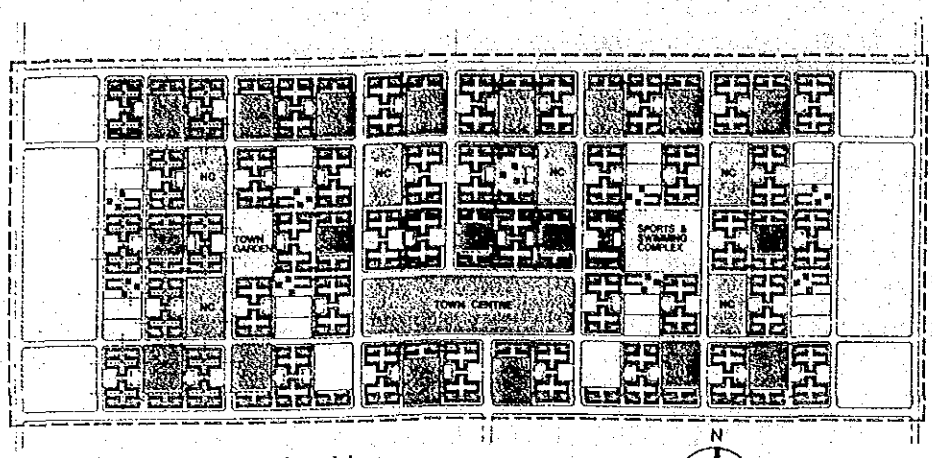
Source: Housing A Nation, HDB March 1985

1/ Includes all existing schools within the new town boundary thourh not provided by HDB

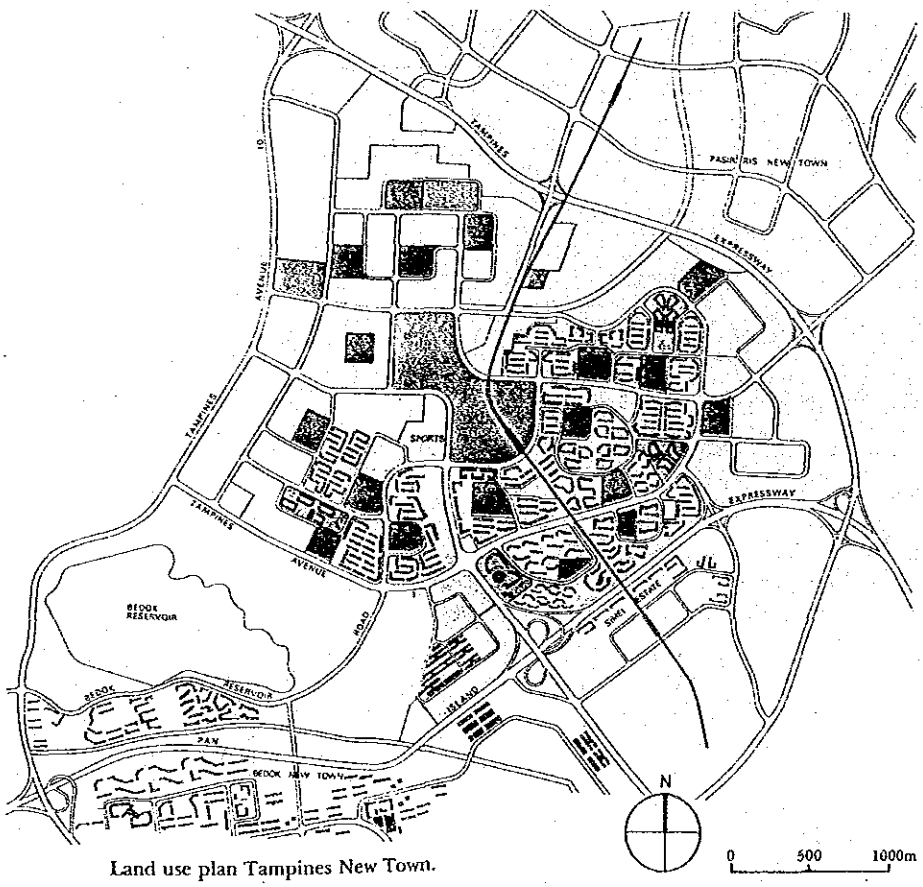
2/ *Excludes 5 private estates which fall within the new town boundary.*

Figure 3.1

Structural Model and A Typical Landuse Plan of New Town



New town structural model.



Land use plan Tampines New Town.

Legend

- Commercial
- Residential
- School
- Industrial
- Institutional
- Reserve Site
- Precinct Centre
- Pedestrian Path
- Open Space
- New Town Boundary

Planning/design concepts and standards, though revisions and improvements have regularly been made, are quite similar among the various new towns. Selected indices are compared in Table 3.2, Table 3.3, Table 3.4.

Table 3.2

Characteristics of Public Housing1/

Type of Flats	Percentage	Floor Area (Sqm.)	HH Size Person	Net Density		Plot Ratio	No. of Du To One Car Park
				D.Units /ha	Person /ha 2/		
1 -Room	12	33	3.5	245	856	1.0	7.7
2 -Room	10	44	4.3	245	1054	1.3	5.2
3 -Room	45	65	4.6	200	920	1.6	2.1
4 -Room	23	94	4.9	175	857	2.0	1.7
5 -Room	8	124	4.4	150	660	2.3	0.9
Executive	1	145	3.4	100	340	1.8	0.9
HUDC	1	160	3.1	80	248	1.6	0.9
Weighted Average	100	72	4.4	198	878	1.7	2.7

Source: Housing A Nation, March 1985 HDB

1/ All Existing public housing as of 31 March 1985
2/ Assuming full occupancy

Table 3.3

Car Park Provision Standards

Type of Flats	Number of dwelling units to one car parking lot		
	Pre-1984	Projected for 1986	Projected for 1990
1 - Room	10.0	7.7	5.5
2 - Room	5.0	5.2	3.9
3 - Room	3.0	2.1	1.6
4 - Room	1.5	1.7	1.4
5 - Room	1.0	0.9	0.7
Executive	1.0	0.9	0.7
HUDC	1.0	0.9	0.7

Source: Huosing A Nation,March 1985, HDB

Table 3.4

Average Household Size In Public Housing Estates 1/

Year	Average Household Size (persons)	Source
1968 1973 1977 1981	6.2 5.7 5.2 4.8	HDB Sample Household Surveys2/
1984	4.4	Computer Services 2/ Department, HDB
1990 *2000*	4.0 3.5	Projected

Source: Housing A Nation, March 1985, HDB

1/ The average household size of public housing by the Census of Population for 1970 and 1980 are 5.5 and 4.8 persons respectively.
2/ Definitions

The Census board defines a household as a group of persons living together in the census house and sharing the same food arrangements or a person living alone or a person living with others but having his own food arrangement. (There could be more than one household per housing unit).

HDB defines a household as a group of persons jointly occupying a housing unit, or a person living alone in a separate unit (Only one household occupies one housing unit regardless of the food arrangement).

Table 3.5

Percentage Distribution of Type of Flats
(as of 31 March 1985)

Types of Flats	Toa Payoh New Town (Constructed in 1965/1977)	Ang Mo Kio New Town (Constructed in 1973/1982)	All Public Housing Under Management	Current Building Programme (Jan 1985 to Dec 1989
1 - Room	30.9	5.4	11.9	0.1
2 - Room	15.4	11.0	9.5	0.1
3 - Room	42.0	54.0	45.2	17.0
4 - Room	7.1	23.0	23.3	50.8
5 - Room	2.1	6.6	8.0	18.9
Executive	0.0	0.0	1.1	11.1
HUDC	2.5	0.0	1.0	2.0
Totals:%	100.0	100.0	100.0	100.0
No. of Units	36,758	49,483	508,242 1/	180,000

Source: Housing A Nation, March 1985, HDB

1/ Excluding 21,482 du already demolished for redevelopemnt and 3,172 du lost in the conversion programme from smaller units to bigger units as of 31 March 1985.

3.2 PHYSICAL CHARACTERISTICS

3.2.1 Scale of Developements

The existing new towns have different scales of development. This is not only because of the difference in planned size but also of the different speed of the development. Figure 3.2 shows both planned and existing development scales of the new towns. They can be divided into three categories, namely:

a) Large-scale New Town: with approximately 50-70,000 dwelling units with a population of 200,000 to 300,000

b) Medium-scale New Town: with approximately 30-45,000 dwelling units with a population of around 150,000

c) Small-scale New Town: with approximately 20-28,000 dwelling units with a population of around 100,000.

Large-scale new towns include 7 development plans to provide a total of 423,800 dwelling units. The number of units completed or are under construction as of 31 March 1986 is 302,750. Of these, 71% have been completed. Medium-scale new towns include 8 developments with 305,100 planned units, of which 184,980 units have been completed or are under construction. Small-scale new towns include 5 developments with 117,000 planned units, of which 93,590 units have been completed or are under construction.

These new towns are as follows:

A. Large-scale New Towns

1) Bukit Merah	59,150 d. units	:	97% completed
2) Bedok	54,110 d. units	:	95% completed
3) Ang Mo Kio	49,480 d. units	:	completed
4) Woodlands	23,120 d. units	:	35% completed
5) Tampines	37,000 d. units	:	57% completed
6) Jurong West	35,590 d. units	:	54% completed
7) Yishum	44,300 d. units	:	74% completed
Sub-total	302,750 d. units		71% completed

B. Medium-scale New Towns

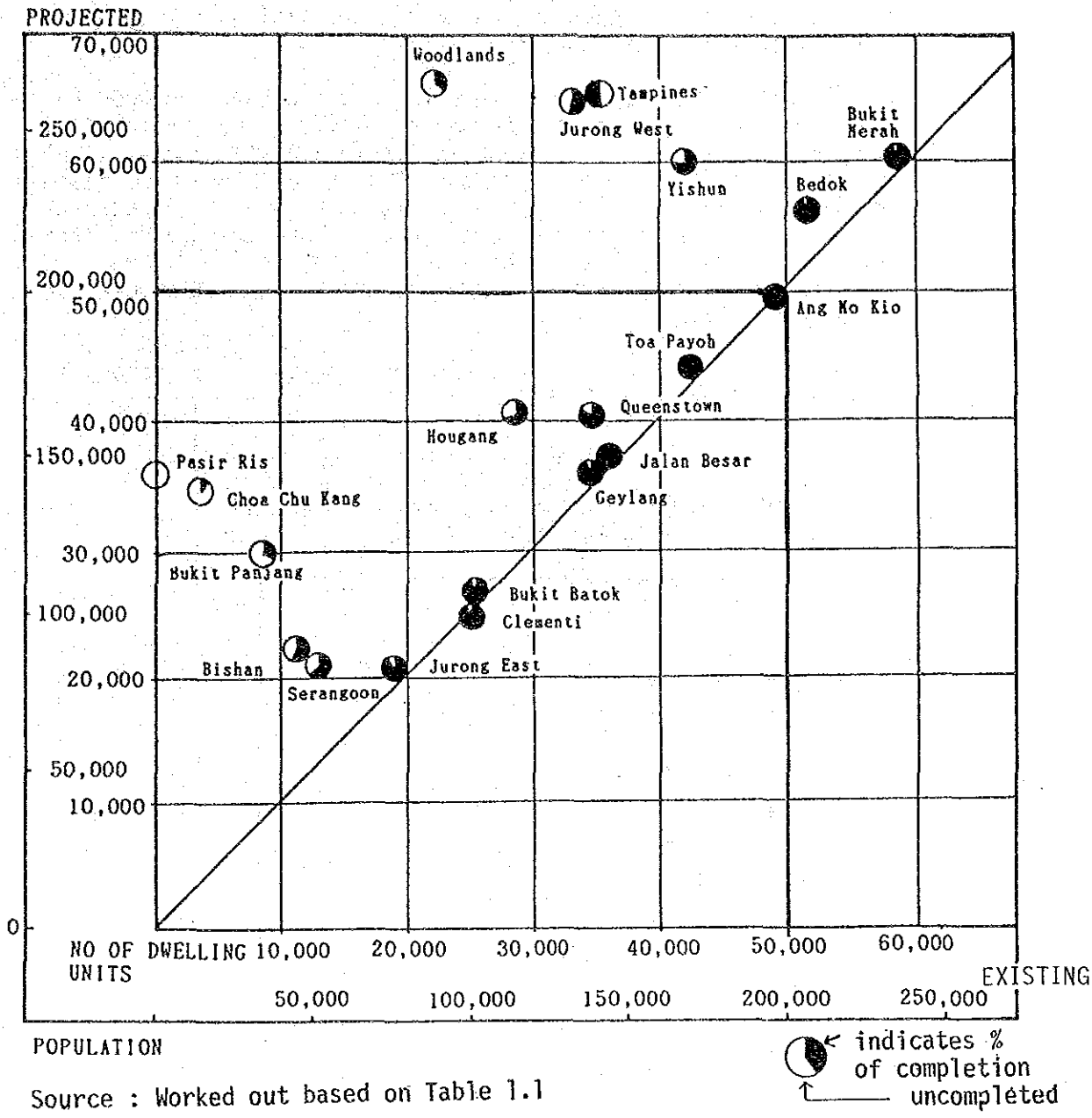
1)	Toa Payoh	41,150	d. units	: completed
2)	Queenstown	34,200	d. units	: 84% completed
3)	Jalan Besar	36,500	d. units	: 98% completed
4)	Geylang	24,050	d. units	: 96% completed
5)	Hougang	35,380	d. units	: 95% completed
6)	Pasir Ris	240	d. units	: 1% completed
7)	Choa Chu Kang	3,730	d. units	: 11% completed
8)	Bukit Panjang	9,730	d. units	: 32% completed
	Sub-total	184,980	d. units	61% completed

C. Small-scale New Town

1)	Bukit Batok	24,600	d. units	: 88% completed
2)	Clementi	24,050	d. units	: 96% completed
3)	Jurong East	19,610	d. units	: 93% completed
4)	Serangoon	13,340	d. units	: 64% completed
5)	Bishan	11,990	d. units	: 55% completed
	Sub-total	93,590	d. units	: 80% completed

Figure 3.2

Planned and Present Development Scale of New Towns



Source : Worked out based on Table 1.1

3.2.2 Location Characteristics

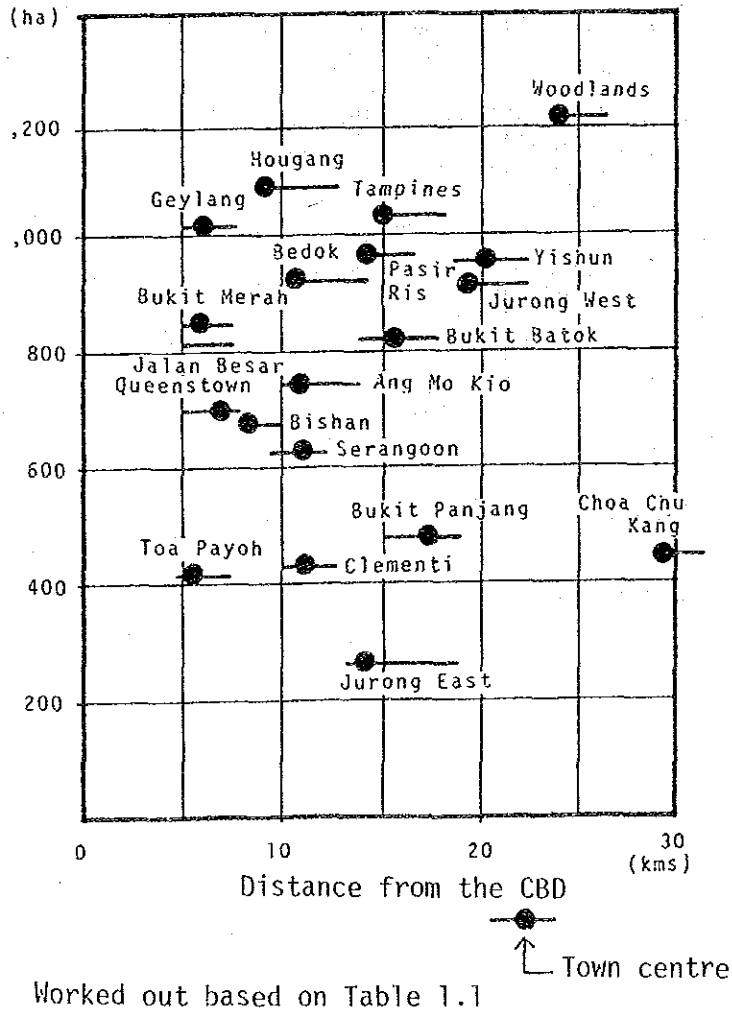
The tendency for land area of New Towns to become larger as their location gets further from the CBD is not necessarily true as shown in Figure 3.3. The development size of a new town appears to be dependent mainly on the availability of land where the project was/would be executed.

On the other hand, the distance between a new town and CBD has same relation on the development density of the residential area of the new town. As shown in Figure 3.4, those new towns located within 10 km. from the CBD have high population densities. Toa Payoh's net density is as high as 1000 persons /ha, while most of the new towns located more than 10 km from the CBD have population densities of between 600 and 800 persons/ha. Jurong West New Town has the lowest net population density of 585.

Moreover, it can be seen that new development are generally located further from the CBD.

Figure 3.3

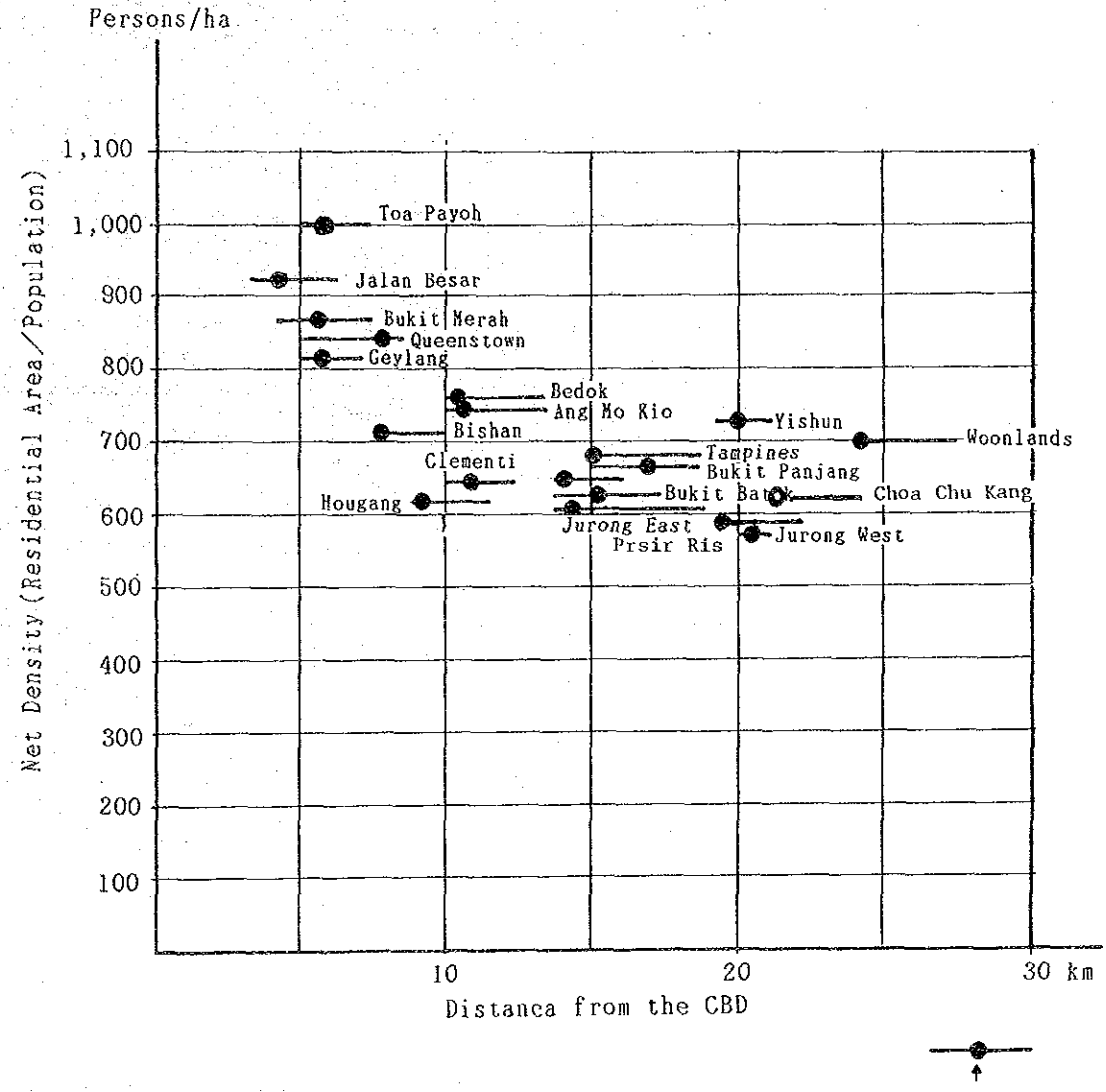
Relation Between New Town Project Area And Distance From The CBD



Source: Worked out based on Table 1.1

Figure 3.4

Relation Between Net Population Density
and Distance from the CBD



Source: Worked out based on Table 1.1

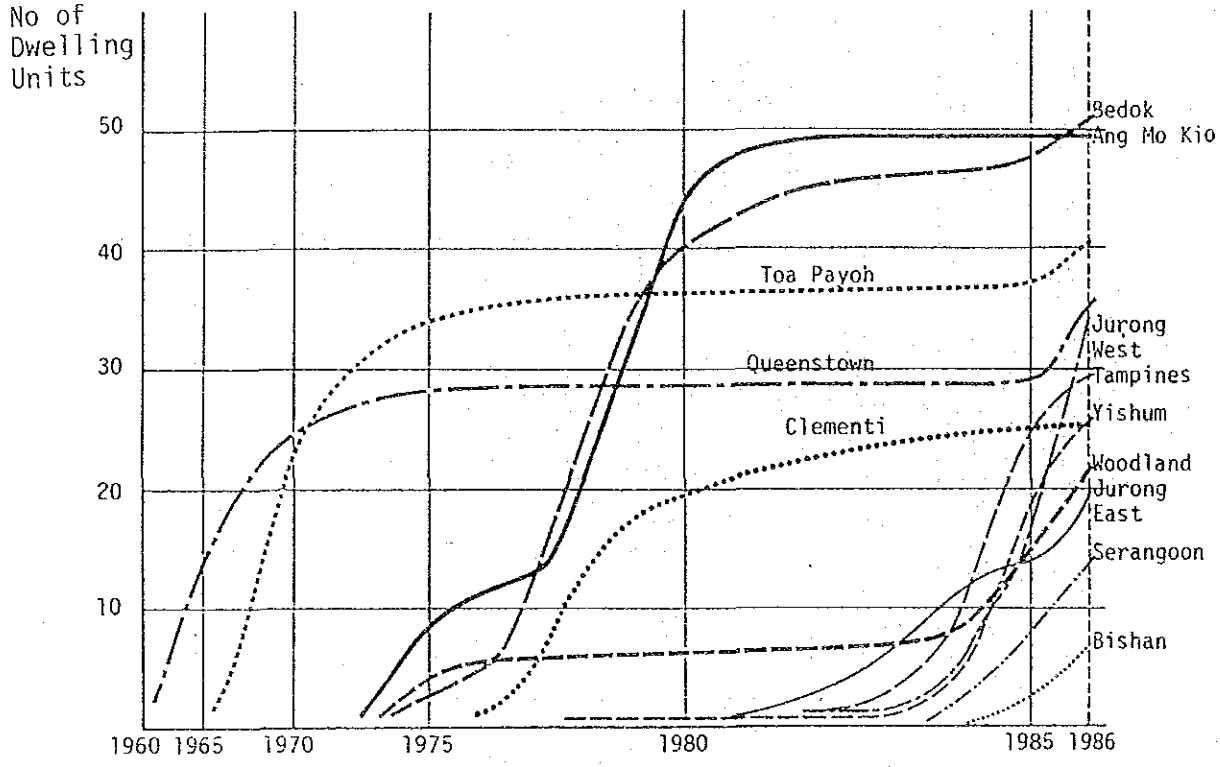
Notes: Net Density is based on the projected population

3.2.3 Speed of Development

Figure 3.5 shows the speed of the new towns development. Two epoch-making new towns initiated in the 1960s, Queenstown and Toa Payoh, had only reached their final stage of construction around 1975, while the others started after 1970 usually grew much faster with the exception of Woodlands. It took only about five years for Ang Mo Kio and Bedok New Town to reach their planned scale. New Towns construction started in the 1980s have also been growing quickly. For the two new towns of Toa Payoh and Queenstown, redevelopment have been taking place since 1985.

Figure 3.5

New Towns Development Process



Source: Worked out based on the information provided by HDB

3.2.4 Physical Structure

As all new towns are similarly planned on a neighbourhood concept, the physical structure do not vary much. Each new town has a town center and most of them have bus interchanges/terminals. This section, therefore, looks in the new towns with particular regard to the transport network. With opening of the MRT which will be expected to form the dominant public transport trunk system, the transport network of new town can be assessed in relation firstly with the MRT and secondly with the expressways. Other factors to be considered are :

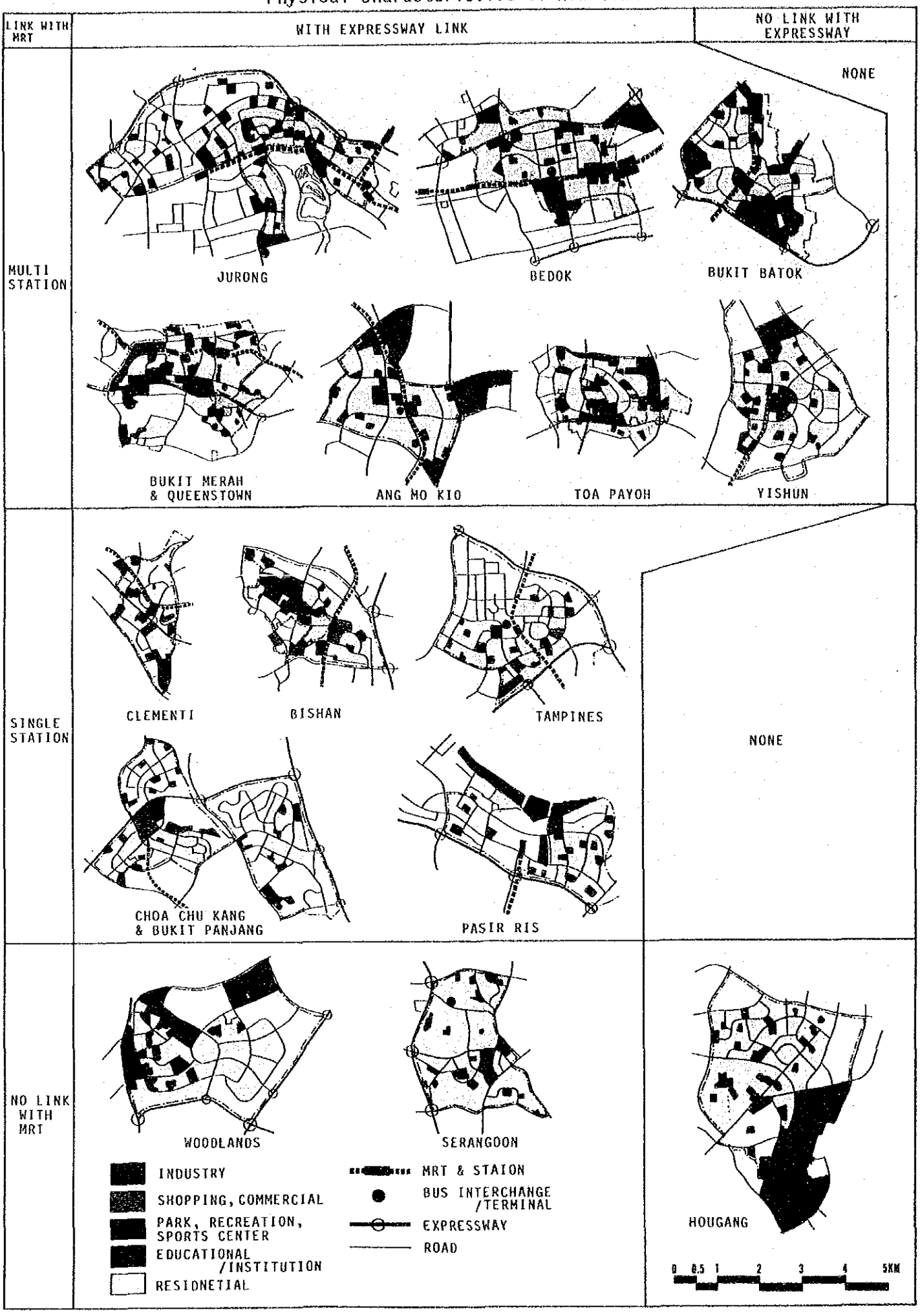
a) location of town center and other major traffic generating sources in new towns such as industrial area, tertiary school etc.

b) existence and location of bus interchange/terminal in relation with MRT and expressways.

The physical characteristics of the new towns are shown in Figure 3.6 which also classify them according to the links with MRT and expressways. Most of the new towns are served by both MRT and expressways, while Woodlands and Serangoon new towns are only by MRT and Hougang new town by neither of them.

Figure 3.6

Physical Characteristics of New Towns



3.3 Socio-economic Characteristics

3.3.1 Residents Profile

1) Demographic Characteristics

At the end of March 1985, about 81 percent of 2.09 million of Singapore's 2.54 million population live in HDB flats. The HDB population is multi-ethnic and of similar composition to the national population (See Table 3.6). Average household size is 4.4 with a slightly higher figure for Malays (See Table 3.9). HBD's labour force population (aged 15-54 years) constitutes 68.0 percent of its total, while 11.1 percent of HBD's population are aged 55 years and above. HBD population composition by age group has similar distribution with that of the country (See Table 3.8).

The structure of families in HBD estates has been changing significantly since 1968. The nuclear family households have continued to be dominant type of household in public housing estates (See Table 3.9). The trend towards nuclear families is the result of several factors. One is the availability of HBD housing which is affordable to the majority of the population thereby reducing involuntary double-up. Another factor could be attributed to the government's encouragement for people to own flats through the Central Provident Fund (CPF) scheme where purchasers of public flats can utilize their CPF savings for both downpayment and installment payments. The third factor has been the buoyant economy and the corresponding increase in income which in turn raise the ability of young married couples to secure their own housing instead of living with their parents.

The gradual increase in households with no family nucleus from 0.8 percent in 1968 to 2.5 percent in 1981 should be noted. This may indicate a trend towards more single persons or unrelated persons occupying a flat. The formation of a single person households could be the end sequence of the natural family life cycle where grown children have moved out and a spouse has passed away. The single surviving spouse can take in another person to stay with him in the flat.

HBD also has policies allowing unrelated persons to live together in HBD flats. These housing scheme, known as "Scheme for Housing of Senior Citizens", was implemented in July 1977. Under this scheme two or more single persons may rent or purchase a HDB flat provided that one person must be at least 50 years old if male or at least 40 years old if female.

Table 3.6

Percentage Distribution of HDB Population By Ethnic Group, 1985

Ethnic group	HDB Population (%)	Singapore Population (%)
Chinese	77.7	76.5
Malays	14.7	14.8
Indians	6.3	6.4
Others	1.3	2.3
Total	100.0	100.0

Source: Housing A Nation, HDB 1985

Table 3.7

Average HDB Household Size by Ethnic Group, 1985

Ethnic Group	Average Household Size (Persons)
Chinese	4.4
Malays	5.0
Indians	4.5
Others	4.3
Total	4.4

Source: Housing A Nation, HDB 1985

Table 3.8

Percentage Distribution of HDB Population
By Age Group and Sex, 1985

Age Group	HDB Population			Singapore Population		
	Male	Female	Total	Male	Female	Total
Below 14 years	21.4	20.2	20.9	27.4	26.7	27.1
15 - 19	9.6	9.4	9.5	12.0	11.8	11.9
20 - 24	11.5	11.9	11.7	12.4	12.1	12.3
25 - 34	24.3	24.0	24.2	19.2	19.3	19.2
35 - 44	13.9	13.7	13.8	11.0	11.2	11.1
45 - 54	8.8	9.0	8.8	8.4	8.2	8.3
55 - 59	3.3	3.3	3.3	3.0	2.9	3.0
60 - 69	4.3	4.7	4.5	4.3	4.7	4.5
70 yrs & Above	2.9	3.8	3.3	2.2	3.1	2.7

Source: Housing A Nation, HDB 1985, and Census of Population
1980 Singapore HDB Population, 1985, Singapore Population, 1980

Table 3.9

Percentage Distribution of HDB Households by Household Type

Year	Household Type (%) 1/				
	Nuclear Family	Extended Nuclear Family	Multi-Family	Non-Family Nucleus	Total
1968	70.8	14.8	13.6	0.8	100.0
1973	72.4	14.3	11.9	1.5	100.0
1977	77.9	10.9	9.7	1.5	100.0
1981	79.2	12.5	5.8	2.5	100.0

Source: "Housing A Nation", March 1985, HBD.

1/ Nuclear Family refers to a household with two or more related persons who form a family nucleus living together, such as a married couple with/without children. Extended Nuclear Family refers to a household with one nuclear family plus other relatives who do not form a nuclear family. Multi-family refers to a household with two or more family nuclei or extended nuclear families living together. Non-family nucleus refers to a household with one or more persons who do not form a nuclear family living together. They are: (a) one person living alone; (b) two or more unrelated persons living together; and (c) two or more related persons who do not form a nuclear family, such as grandparent and grandchild.

2) Ownership of Housing

As shown in Table 3.10 HDB has contributed significantly to the improvement of housing structure as well as ownership. Of the total housing units of 630,500, 502,300 units or about 80% are owner-occupied. Number of small (1 to 2-room) units which were mostly constructed in the early stage of development and are mostly rented have decreased from 99,500 units in 1977 to 64,200 in 1987, while the larger units have increased significantly.

Government policy will be continuously directed towards the promotion of owner-occupied housing as shown in Table 3.11.

Table 3.10

Ownership of Housing

Housing Type	1977			1987			% to Total 1/			
	No. of Units (000)			No. of Units (000)			1977		1987	
	Total	Owner Occup-ied	Rental	Total	Owner Occup-ied	Rental	Owner Occup-ied	Rental	Owner Occup-ied	Rental
A. HDB										
1) 1/2-room	99.5	5.3	94.2	64.2	6.0	58.4	(2.5)	(44.7)	(1.2)	(11.6)
2) 3-room	88.9	70.1	18.8	224.6	214.9	9.7	(33.3)	(8.9)	(42.8)	(1.9)
3) 4-room	17.4	15.7	1.7	245.1	144.1	1.0	(7.5)	(0.8)	(28.7)	(0.2)
4) 5-room	4.9	4.9	0.0	50.7	50.6	0.1	(2.3)	(0)	(10.1)	(0)
5) Executive	-	-	-	11.4	11.4	0.0	(-)	(-)	(2.3)	(0)
6) HUDC	-	-	-	6.1	6.1	0.0	(-)	(-)	(1.2)	(0)
HDB TOTAL	210.7	96.0	114.7	502.3	433.1	69.2	(45.6) 26.5	(54.4) 31.6	(86.2) 68.7	(13.8) 11.0
B. PRIVATE	59.0	29.5	29.5	92.8	46.4	46.4	8.1	8.1	7.4	7.4
C. SHOPHOUSES	15.9	5.6	10.3	11.7	4.7	7.0	1.5	2.0	0.7	1.1
D. ATTAP/ZINCE ROOFED HOUSES AND OTHERS	77.2	67.5	9.7	23.7	21.8	1.9	18.6	2.7	3.5	0.3
TOTAL	362.8	198.6	164.2	630.5	506.0	124.5	54.7	45.3	80.3	19.7

Source: "Straits Times", dated 14 August 1987

1/ Figures in parenthesis are percentages to the total HDB units, while those not in parenthesis are to the total of all housing types.

Table 3.11

Projection of Owner-occupied Households

Year	1987		1997	
Table of Households	NO (000)	%	NO (000)	%
Total No. of Households	630.5	100.0	630.5	100.0
Owner- Occupied Households	506.0	80.3	591.4	93.8
Rental & Other Households	124.5	19.7	39.1	6.2

Source: "Straits Times", dated 14 August 1987

3) Household Income

In line with overall income improvement of the country, the average income of HDB households has also increased from $318 in 1968 to $1,363 in March 1985 in nominal terms. This is an improvement of 95.3% or 4% per annum in real terms.

Household income group in relation to income eligibility for HDB home ownership is shown in Table 3.12.

Table 3.12

Household Income Group by HDB Home Ownership Eligibility

Monthly Income: ($)	% Distribution	Type of Flat
4,000 & below	90	Any type of flat (-3, -4, 5-room or Executive Flat)
4,001 - 6,000	6	HUDC flat
Above 6,000	4	-
Total	100	-

Source: Estimated by HDB

As shown in Table 3.13, the average household income varies directly with the type of housing. The larger the flat type, the higher the average household income. The HDB housing covers a considerable wide range of household income groups. The market for HDB executive apartment and HUDC housing overlaps with that of private apartment and terrace house of private owner-occupied households.

Table 3.13

Average Household Income by Housing Type

Type of Housing	1968	1973	1977	1981	1985	1987	Growth 1977/87
A HDB household							
1) 1-room rental	180	267	398	623	693	650	1.63
2) 2-romm rental	294	400	617	842	934	800	1.30
3) 3-room	447	605	795	1,113	1,323	1,200	1.51
4) 4-room)	667	) 900	1,045	1,522	1,837	1,770	1.69
5) 5-room)		)	1,485	2,168	2,482	2,740	1.85
6) Executive Apartment	NA	NA	NA	NA	2,693	3,440	-
7) HUDC	NA	NA	NA	NA	3,981	4,940	-
8) Overall HDB	318	445	681	1,113	1,363	NA	
B. Private Owner-Occupied Household							
1) Private Apartment	NA	NA	1,670	NA	NA	3,540	2.12
2) Terrace House	NA	NA	2,200	NA	NA	4,400	2.02
3) Semi-detached	NA	NA	3,020	NA	NA	5,970	2.00
4) Detached	NA	NA	11,820	NA	NA	17,940	1.52

SOURCE: "Housing a Nation" March 1985 HDB, for the data on A between 1968 and 1985. Straits Times dated for B and 1987 Figure of A.

4) Standard of Living

From discussions of the previous sections, there has been a tremendous improvement in the standard of living for the people and this is particularly reflected in a progressively higher proportion of families owning larger HDB flats. The rise in the standard of living can be also explained by the ownership of consumer durables among HDB families. As shown in Table 3.14, telephones, refrigerators, TV sets have reached saturation point, while continuous increase will be seen for air conditioners, piano, personal computers etc. The contradictory item is cars which are greatly affected by the Government car ownership policy.

The anticipated continuous rise in the standard of living among residents will inevitably be accompanied by a rise in aspirations and demands on the quality of the environment and sevices.

Table 3.14

Asset Profile of HDB Owner-Occupied Households

PARTICULARS	1977			1987				
	3-room	4-room	5-room	3-room	4-room	5-room	Exec. Apart.	HUDC
1. Monthly Income ($)	780	1,030	1,490	1,200	1,770	2,740	3,440	4,940
2. Market Value	13.1	22.2	36.2	42.5	75.4	118.6	122.9	228.5
3. Consumer Durables Owned (% to Total HH)								
1) Car/Van	24.1	42.7	70.5	17.9	35.9	65.7	78.0	90.8
2) Motorcycle/ Scooter	15.9	13.7	7.8	15.8	15.3	5.9	4.3	1.5
3) Telephone	49.6	68.1	81.5	not covered by the survey as the percentage is close to 100%				
4) Refrigerator	94.6	95.8	98.4					
5) TV Set	91.5	91.1	90.7	96.6	97.4	99.3	98.8	98.3
6) Air Conditioner	1.6	5.1	9.8	6.8	14.1	36.4	58.7	78.1
7) Hi-Fi Set	NA	NA	NA	32.6	41.7	52.4	53.3	55.5
8) Piano/Organ	NA	NA	NA	6.1	8.7	25.9	30.2	45.3
9) Personal Computer	NA	NA	NA	3.3	8.0	24.2	27.8	40.8

Source: "Straits Times", dated 14 August 1987

3.3.2 Function of New Towns

As discussed in Section 3.1, new towns are planned basically on satellite development concepts. Table 3.15 and Table 3.16 shows further that the required facilities for commercial, institutional and recreational activities are determined to meet the demands of the residents, and at the same time a considerable space is allocated for industrial development to provide jobs.

Table 3.17 summarizes the other major functions that are provided by each new town. Although they do not basically vary much from each other, they can be classified as folows:

a) New Towns with Multi-Function

Ang Mo Kio, Bedok, Jurong East/West, Bukit Merah, Clementi, Toa Payoh and Queenstown.

b) New Town with Industrial Function

Woodlands, Tampines, Bukit Batok, Hougang, Geylang and Jalan Besar.

c) New Towns with Mainly Residential Function

Yishum, Bukit Panjang, Bishan, Chua Chu Kang, Pasir Ris and Serangoon.

However, these new towns are not self-sufficient, due largely to the fact that quite a number of new towns are located in relatively small area, but interact with each other and between the CBD to a considerable extent. The opening of the MRT will further accelerate these movements.

Table 3.15

Planning Standards of Facilities for a New Town

Facilities	Planning Standard
A. Commercial	
1. Shops (30 m to 400 m)	1 Shop to 70 du,20% in TC,50% in NC & 30% in Precincts.
2. Kiosk (5 m to 6,500 m)	One to 600 du, 30% in TC and 70% in NC.
3. Emporiums (4,500 m to 6,500 m)	1 to 2 nos. per New Town.
4. Supermarkets (1,200 m)	1 to 2 nos. pe New Town.
5. Eating Houses (450 m)	1 Eating House to 750 du 7% in TC, 23% in NC, 70% in Precincts.
6. Restaurants (90 m to 2,000 m)	1 to 1000 du 30% in TC & 70% in NC. In addition, 2 or 3 fast food restaurants and 1 or 2 bigger restaurants in TC.
7. Office Space	60 m to 450 du, 70% in TC & 30% in NC.
8. Cinemas (1,800 m)	2 nos. per New Town in TC.
9. Mini- Market (450 m)	1 to 6000 du.
10. Market Produce Shop (130 m	1 to 3000 du.
11. Market Produce Lock- up shop (40 m)	1 to 500 du.
12. West Market-cum- Cooked Food Centre	1 to 5000 du replaced by (9) to (11) since 1982.
13. HDB Area Office (2000	One 0.28 ha site to 15,000 du approx.
B. Institutional:	
1. Primary School Site (1.8 ha)	2,300 du to 1 P.S.
2. Secondary School Site (2.7 ha)	4,100 du to 1 S.S.
3. Junior College Site (6 ha)	One per New Town
4. Vocational Institute Site (6ha)	One per New Town
5. Library (0.3 to 0.4 ha)	One per New Town
6. Polyclinic (0.5 ha)	One per 30,000 du
7. Community Centre (0.4 ha)	One site to 4,000-5,000 du to be sited in NC.
8. Mosque (3,000 m)	One site per New Town
9. Chinese Temple (0.2 ha)	One site to 1 9,000 du.
10. Church (0.3-0.4 ha)	One site to 12,000 du.
11. Hindu Temple (0.2 ha)	One site for two new towns
12. Others, e.g., Residents' Committee Centre, Community Hall, Neighbourhood Police Post Kindergarten, Child Care Centre Senior Citizens' Club etc.	These non-profit communal uses are usually located ate the ground floor void decks of the apartment blocks. For other institutional uses, there are 6 to 7 reserve sites of 0.2 ha to 0.4 ha per neighbourhood.
C. Sports and Recreation:	
1. Swimming Complex (1.5 ha)	One per New Town.
2. Sports Complex (3 ha)	One per New Town.
3. Indoor Stadium (1.2 ha)	One per New Town.
4. Football Field (140 m x 100 m or 95 m x 70 m)	Min. one epr Neighbourhood.
5. Hard Courts for badminton, volley ball, etc.(16.5m x 8.5m)	One court to 1,000-1,200 du.
6. Multi-purpose Court(30m x 18m)	One court 10 2,500-3,000 du.
7. One court to 2,500-3,000 du.	One per Neighbourhood.
8. One per Neighbourhood Equipment	One to 3,000 du.
9. Precinct Garden (0.2 ha)	One to 3,000 du.
10. Neighbourhood Park (1-1.5ha)	One per Neighbourhood
11. Town Garden (5 to 10 ha)	One per New Town.

Source: Housing A Nation HDB 1985

Legend: TC - Town Centre
NC - Neighbourhood Centre

Table 3.16

Facilities in a Typical New Town,
Ang Mo Kio, 1985

ELEMENTS	Standard Provision in a Typical New Town	Actual Provision in Ang Mo Kio New Town
1. Land area (ha)	780	713.1
2. Residential units	50,000 (approx.)	49,480[1]/
3. Commercial:		
(a) Shop	853	759
(b) Eating House	68	60
(c) Restaurant	2	2
(d) Emporiom	2	2
(e) Supermarket	2	2
(f) HDB area office	4	4
(g) Market/food centre	10	8
(h) Petrol station/auto centre	11	8
4. Industrial (ha)	155	128.5
5. Institutional:		
(a) Primary school	20	18
(b) Secondary school	14	10
(c) Junior college	1	1
(d) Vocational institute	1	1
(e) Community centre	6	5
(f) Religious site	7	12
(h) Others	37	43
6. Sports & rcreation:		
(a) Swimming complex	2	2
(b) Sports complex	1	1
(c) Indoor stadium	1	1
(d) Football field	6	4
(e) Town Garden	1	2
(f) Neighbourhood park	6	5

Source: "Housing A Nation", March 1985, HDB
1/ Excludes 1,285 units of private housing

Table 3.17

New Towns and Urban Functions

	Commercial & Business	Industrial	Recreational	Medical	High Educational	Administration
1. East Corridor						
1) Geylang	x	x	x	.	.	.
2) Bedok	x	x	x	.	x	.
3) Tampines	.	x	.	.	.	.
4) Pasir Ris	.	.	x	.	.	.
2. N. East Corridor						
5) Serangoon	.	.	x	.	x	.
6) Hougang	.	x	.	x	.	.
3. North Corridor						
7) J. Besar	x	.	.	x	.	.
8) Toa Payoh	x	x	x	x	x	x
9) Bishan	.	x	.	.	x	.
10) Ang Mo Kio	x	x	.	.	x	.
11) Yishun	.	x	.	.	x	.
4. N. West Corridor						
12) Bt Panjang	.	.	.	.	.	.
13) Chua Chu Kang	.	x	.	.	.	.
14) Woodlands	.	x	.	.	.	.
5. West Corridor						
15) Bt Merah	x	x	x	x	x	x
16) Queenstown	.	x	.	x	.	.
17) Clemeneti	x	.	x	.	x	.
18) Jurong E/W	x	x	x	.	x	.
19) Bt Batok	.	x	.	.	.	.

Source: Worked out by the Study Team

Interaction among the new towns or between and the rest of the country can be best understood from the analysis of the OD tables. Table 3.18 shows a summary of SBS bus passenger movement during the evening peak hours (1645-1845) on a weekday to/from the selected new towns of Ang Mo Kio, Toa Payoh, Bedok and Jurong Residential. The following feature were noted:

a) All new towns have higher percentage of passenger traffic volume for inter-zonal movement than intra-new town movement. Percentages of external traffic are 86.5 for Toa Payoh and 76.9% for Bedok.

b) The inter-zonal traffic is not predominantly one directional since 30% to 35% of the total traffic are still outgoing during the evening hours from the respective new towns.

c) Major destinations to/from the new towns are not necessarily the CBD areas. The respective new towns interact with the other areas roughly as follows:

Ang Mo Kio :

(i)	CBD areas (Sector B)	22.6%	of two way inter-zonal
(ii)	Adjoining Areas (A).....	16.6%	traffic
(iii)	South (C).....	16.0%	
(iv)	Adjoining East (E).....	14.9%	
(v)	North West.....	9.7%	

Toa Payoh

(i)	CBD Areas (B)	22.7%
(ii)	South (C).....	21.0%
(iii)	East (D).....	21.0%
(iv)	Adjoining East (E).....	14.7%
(v)	Adjoining Areas (A).....	12.7%

Bedok

(i)	Adjoining Areas (G).....	45.8%
(ii)	CBD areas (B).....	24.0%

Jurong Residential

(i)	Adjoining Areas (G).....	43.1%
(ii)	Adjoining East (F).....	20.8%
(iii)	CBD Areas (B).....	13.5%
(iv)	East Middle (C).....	11.1%

It can be seen that Ang Mo Kio and Toa Payoh interact with other areas more widely than the other two new towns where the people complete their trips within more limited areas.

Table 3.18

SBS Bus Passenger Movement To/From Selected Major New Towns, 1985

No. of persons during the evening peak hours (1645-1845)

SECTOR1/	ANG MO KIO		TOA PAYOH		BEDOK		JURONG	
	To AMK	Fm AMK	To TP	Fm TP	TO BK	Fm BK	TO JR	Fm JR
A. Yishun, Ang Mo Kio Bishan, Toa Payoh	2,422 (14.0)	1,875 (22.1)	1,540 (9.6)	1,670 (17.8)	697 (7.7)	681 (3.0)	427 (4.6)	295
B. Orchard Rd, Shenton Way, Chinatown, Marina	5,028 (29.0)	818 (9.7)	4,733 (29.6)	1,023 (10.9)	5,304 (30.6)	959 (10.9)	2,266 (16.0)	516 (8.1)
C. Balestier, Bendemeer Bt.Timah, Thomson Rd	3,046 (17.5)	1,091 (12.9)	3,329 (20.8)	1,987 (21.2)	1,200 (6.9)	449 (5.1)	1,624 (11.5)	667 (10.4)
D. Pasir Ris, Tampines, Bedok,Changi,Geylang East Coast	1,195 (6.9)	950 (11.2)	1,443 (14.4)	1,347 (9.0)	6,612 (38.2)	5,354 (60.0)	328 (2.3)	262 (5.0)
E. Punggol,Jln Kayu Hougang, Serangoon, Paya Lebar Road, Aljunied, MacPherson	2,309 (13.3)	1,540 (18.1)	2,068 (12.9)	1,646 (17.6)	1,369 (7.9)	648 (7.3)	244 (1.7)	132 (2.1)
F. Bt.Merah,Tiong Bahru, Telok Blangah, Pasir Panjang, Ulu Pandan, Commonwealth	1,285 (7.4)	555 (6.5)	1,469 (9.2)	740 (7.9)	1,488 (8.6)	487 (5.5)	2,828 (20.0)	1,447 (22.6)
G. Jurong Resd'l,Clementi Jurong Ind. St.1, Bt.Batok,Pandan/Teban, Lim Chu Kang	857 (4.9)	365 (4.3)	881 (5.5)	647 (6.9)	494 (2.8)	188 (2.1)	6,050 (42.7)	2,815 (44.0)
H. Woodlands, Zhenghua, Sembawang, Mandai, Lornie/Adam, Sg.Kadut	1,219 (7.0)	1,295 (15.3)	520 (3.3)	308 (3.3)	149 (0.9)	63 (0.7)	388 (2.7)	263 (4.1)
TOTAL INTER ZONE	17,361 (100.0%)	8,489 (100.0%)	15,978 (100.0%)	9,368 (100.0%)	17,313 (100.0%)	8,829 (100.0%)	14,155 (100.)%)	6,397 (100.0%)
INTRA NEW TOWN	6,934 (21.2)		3,953 (13.5)		7,857 (23.1)		4,808 (19.0)	
TOTAL	32,784 (100.0%)		29,299 (100.0%)		33,999 (100.0%)		25,350 (100.0%)	

Source: SBS

1/ Location of the sectors is shown in Figure 3.7.

d) Table 3.19 shows that passenger movements between new towns are not significant except for a new pairs of areas. Ang Mo Kio relates to Toa Payoh but this traffic shares only 9.6% of its total inter-zonal traffic volume. Similarly, Toa Payoh relates to Ang Mo Kio but only with 9.6% of its total inter-zonal traffic volume. On the other hand, Bedok and Geylang has a 19.7% share of the former total inter-zonal traffic volume while inter-zonal traffic between Jurong Residential and Jurong Industrial is 22.8% of Jurong Residential total inter-zonal traffic volume.

Figure 3.7

Location of Zones and Sectors

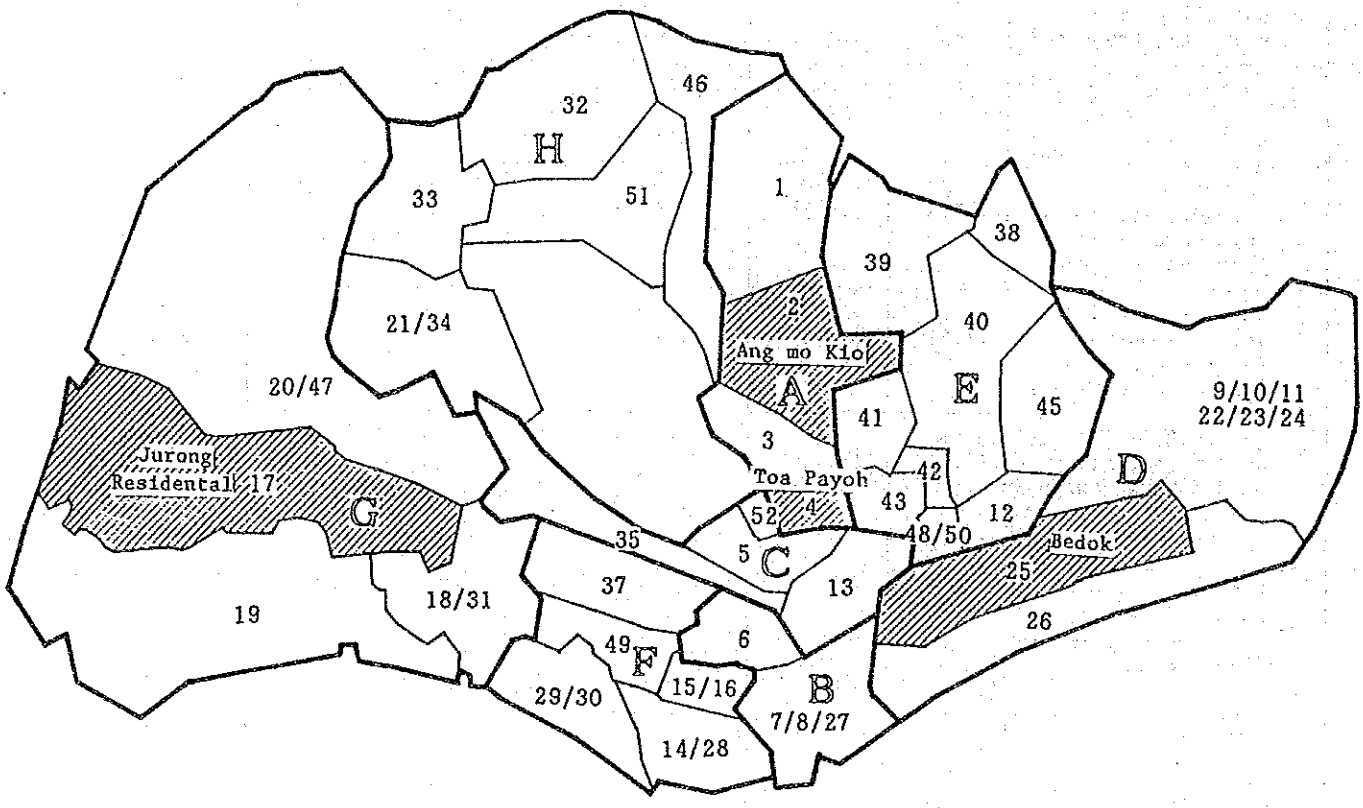


Table 3.19

SBS Passenger Movement Between Selected New Towns and Other New Towns

No. of persons during the evening peak hours (1645-1845)

SECTOR NEW TOWNS	ANG MO KIO		TOA PAYOH		BEDOK		JURONG RESIDENTIAL	
	To AMK From	From AMK To	To TP From	From TP To	To BK From	From BK To	To JR From	From JR To
A Yishun	231	330	26	2	5	2	1	-
Ang Mo Kio			1,011	1,423	330	353	98	124
Bishan	739	520	503	245	15	27	41	24
Toa Payoh	1,452	1,025	347	299	287	147		
D Pasir Ris	-	-	-	-	-	-	-	-
Tampines	36	97	36	157	616	1,211	21	24
Bedok	353	334	294	343			66	82
Geylang	562	395	643	557	3,116	2,025	127	80
E Hougang	489	487	243	269	166	135	31	38
Serangoon	453	526	304	392	91	87	10	34
F Bukit Merah	180	96	204	154	180	88	552	378
G Jurong Resid'l	124	98	147	287	78	66		
Clementi	212	169	172	140	138	49	1,105	904
Jurong Ind'l	359	51	347	50	211	43	4,045	642
Bukit Batok	51	16	142	125	31	10	289	445
H Woodlands	169	219	48	18	21	1	172	143
Bukit Panjang	-	-	-	-	-	-	-	-
TOTAL INTER-ZONAL	17,361	8,489	15,978	9,368	17,313	8,829	14,155	6,397

Source: SBS

4. PRELIMINARY ASSESSMENT OF NEW TOWNS

4.1 Residents' Views on New Town

HDB has been regularly conducting sample household surveys every four to five years. To date a total of five surveys have been conducted in 1968, 1973, 1977, 1981 and 1985. Table 4.1 gives a summary of resident's view on various aspects of new towns. During the early years improvements were seen except for certain areas. Major areas of dissatisfaction in 1977 were as follows:

a) Efficiency of lifts: Although considerable improvements were made, 35% of respondents remained dissatisfied.

b) Bus Service: Although the percentage of satisfaction increased from 57% to 75%, dissatisfaction also increased from 22% to 23%.

c) Nearness to Police Station, Work, Secondary School: Percentage of dissatisfaction were still 33%, 13% and 12% for each of these facilities respectively.

It can also be said that the residents are more easily satisfied with amenities of static facilities and environment than accessibility to various services and transportation.

The sample survey based on more problem-oriented aproach conducted in 1981 gives the following areas of dissatisfaction:

a) On Flats: Approximately 40% of the respondents mentioned at least one complaint.

- Size of flats by those living in smaller units: 19.6%, 15.1% and 6.9% for 1-, 2- and 3-room flat residents, respectively.

- Maintenance: 8% of the total complaints involve leaking and choked pipes, low water pressure, dirty water, smelly bin chutes, damaged rubbish bins and dirty bin compound.

- Others include "flats facing the setting sun", "being too near the lift or the staircase" and "noisy neighbours".

b) On Floor: About 30% of the residents mentioned at least one complaint.

- Problems related to neighbours (60% of the total complaints): Of these 27% complaining about noise from neighbours staying on the same floor or upstairs and 9% about others.

- Common and central corridors (25% of the total complaints): This include poor ventilation, dark and narrow common corridors, lack of privacy, dirty and wet corridors etc.

c) On Block: Approximately 36% of the residents expressed some complaints.

- Problems related to maintenance (62% of the total complaints): These include dirty lifts, frequent breakdown of lifts, dirty void deck, vandalism, stinking bin chutes etc. This has improved substancially with the introduction of computerized fault-detecting devices which was completed in 1986.

- Location of Blocks (8.5% of the total complaints): These include block too far away from market/hawker center, blocks too close together,playground too far away, insufficient car parking facilities, etc. It should be noted that these comments were made by those residing in estates built in the 1960s.

Table 4.1

Percentage Distribution of Households by Level of Satisfaction

Item	1968			1977			1981 or 1985		
	Satis -fied	Accept -able	Dissatis -fied	Satis -fied	Accept -able	Dissatis -fied	Satis -fied	Accept -able	Dissatis -fied
1) The Flat	67.6	23.6	8.8	73.0	19.1	7.8			
2) The Floor	62.1	24.7	13.2	73.5	21.4	5.1			
3) The Block	68.2	27.1	4.7	71.4	24.9	3.7	not available		
4) The Estate	71.7	25.7	2.6	73.4	23.8	2.8			
Nearness to:									
1) City	48.7	41.0	10.3	60.6	31.9	7.5			
2) Work	40.4	38.5	21.1	55.9	31.2	12.9			
3) Clinics	69.1	23.9	7.0	69.0	25.7	5.2			
4) Police Station	36.8	27.0	36.2	37.4	29.3	33.3	not available		
5) Primary Schools	61.0	23.9	15.2	67.2	24.4	8.4			
6) Secondary Schools	43.8	34.7	21.5	61.2	26.6	12.2			
1) Efficiency of Lifts	39.0	-	61.0	65.3	-	34.7			
2) Level of Noise	38.8	35.9	25.3	55.0	41.2	3.8	not available		
3) Bus Service	56.9	21.2	21.9	75.4	1.9	22.7			

Source: "Housing A Nation" March 1985 HDB

4.2 Transportation Services

4.2.1 Overall Transport Services

There are extensive bus services running on well-developed road system for each new town . People can easily travel to/from their residence either by private cars or by buses. When it is assumed that an average travel speed of 18 kph for trunk services and an average time of 15 minutes for feeder transport, there are a number of new towns where it takes more than an hour to/from CBD by bus whereas all the new towns are less than an hour drive by private car from the CBD.

For instance, residents living in Ang Mo Kio can reach the CBD in about 20-26 minutes by car, while it would take 35-50 minutes by bus. The difference becomes larger as the location is farther from the CBD. Generally, the time distances by public transportation are considered to be about 1.5 to 1.8 times as large as that by private car.

Since the public bus system is configurated with trunk and feeder services, transfer is usually required between the services at bus interchanges/terminals. Although the respective services are fairly efficient, the additional time for transfer is significant for relatively short trip such as between Toa Payoh and CBD.

However, the forthcoming MRT will considerably change this picture. With the exception of four new towns Woodlands, Bukit Panjang, Hougang and Serangoon, the other new towns will enjoy a reduction in travel time by the usuage of MRT plus feeder bus or walking. The largest improvement will take place in Tampines (by 30 minutes), followed by Jurong West and Yishun (by 20-25 minutes). Travel time on public transport will become very competitive with private car travel in terms of travel time even without changes in feeder transport system for many new towns. This implies that feeder transport including interchange function will become the more critical factor in the further improvement of efficiency and competitiveness of public transpot system in Singapore.

4.2.2 Assessment of Bus Services

Questionaire survey conducted for PWD officials gives an indication on how people are assessing the current bus services both for trunk and feeder systems as shown in Table 4.2 and Table 4.3, respectively. The following characteristics are:

a) Generally speaking, people are more satisfied with feeder bus service than trunk service.

b) Regarding trunk services, complaints are seat availablility, riding comfort and travel time during assessment of peak hours, waiting time during off-peak hours. Level of service appears to be slightly better with HDB new town residents.

c) As for feeder services, complaints are significant for the following areas:

i) Service frequency during off-peak hours
ii) Operating hours during night
iii) Discomfort in bus, heat, noise and air pollution.

d) Overall level of service for feeder bus services within HBD's new towns are assessed to be slightly better than those of other areas.

Areas of improvement desired by people can be shortlisted:

a) Increase in frequency and extension of operating hours.
b) Improvement of internal environment condition of buses.

Table 4.2

Assessment of Trunk Bus Service by PWD Officials 1/

ITEM	Waiting Time at Bus Stop		Riding Comfort		Seat Availability		Travel Time		Fare Level System
	Peak Hours	Off-peak Hours	Peak Hours	Off-peak Hours	Peak Hours	Off-peak Hours	Peak Hours	Off-peak Hours	
Other than HDB New Towns	-0.7	-1.2	-1.7	0.2	-2.1	0.5	-1.5	-0.1	-0.3
HDB New Towns	-0.6	-1.0	-1.4	0.3	-2.0	0.7	-1.3	0.3	-0.5

Source: SUTIS/PWD 1987

Table 4.3

Assessment of Feeder Bus Service by PWD Officials 1/

ITEMS		Other than Towns	Total HDB New Towns	Ang Mo Kio	Toa Payoh	Bedok	Other New Towns
1) Service Frequency	Peak Hours	-0.6	-0.5	-0.9	-0.5	0.2	-0.6
	Off-peak	-1.3	-1.3	-0.7	-1.4	-1.3	-1.4
2) Operation Hours	Morning	-0.7	-0.4	-1.0	0.0	0.3	-0.5
	Night	-1.2	-0.9	-0.3	-1.4	-0.1	-1.2
3) Attitude of Driver		0.0	-0.1	0.8	-0.3	0.3	-0.3
4) Availability of Seats		0.0	-0.4	0.0	0.0	-0.9	-0.4
5) Riding Comfort		-0.3	-0.2	0.0	0.3	-0.3	-0.3
6) Cleanlines		-0.4	-0.6	0.3	-0.8	-0.5	-0.7
7) Discomfort in Bus	Air Pollution	-1.4	-0.8	-0.9	-0.3	-0.3	-1.1
	Noise	-1.3	-1.1	-1.3	-0.3	-0.5	-1.4
	Heat/Temperature	-1.7	-1.7	-1.9	-1.9	-1.7	-1.6
8) Step/Door	Step	-0.5	-0.4	0.0	0.0	-0.3	-0.5
	Width of Door	-0.5	-0.3	-0.5	-0.5	-0.1	-0.3
	Safety	-0.4	-0.2	0.0	0.0	-0.5	-0.2

Source: SUTIS/PWD 1987

1/ Values were calculated by assigning -5, -3, - +3 for the response "very bad", "bad", "acceptable" and "good", respectively.