



The Aga Khan Program for Islamic Architecture

at Harvard University and the
Massachusetts Institute of Technology

*Room 10-390, M.I.T.
Cambridge, Massachusetts 02139*

*Telephone: (617) 253-1400
Telex: 921473 Cable: MITCAM*

SAUDI ARABIA, National Context

Background Paper Update, by Vinay Shah

RIYADH, Urban Context

Background Paper Update, by Nadia Al Hasani

DIPLOMATIC QUARTER AND ASSOCIATED HOUSING, RIYADH, SAUDI ARABIA

Project Summary Paper, by Nadia Al Hasani

Prepared for

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MALAYSIA, National Context

Prepared from reference material collected by
Imrana Inayatullah

KUALA LUMPUR, Urban Context

Prepared from reference material collected by
Imrana Inayatullah

HOUSING IN KUALA LUMPUR, MALAYSIA

Abstract from the Architect's Statement

Full statement is available upon request

Prepared for

The Aga Khan Program for Islamic Architecture

MALAYSIA

Primary Information

Country:	Federation of Malay States
Capital:	Kuala Lumpur
Population:	14.2 million
Growth Rate:	2.1%
Density:	43 persons per square kilometer
Urban:	30%
Urban Growth Rate:	3.3%
Area:	330,000 square kilometers
Geography:	Two geographic segments separated by 400 miles of the South China Sea. West Malaysia occupies the southern third of the Malay Peninsula and East Malaysia consists of two states on the northern quarter of Borneo. Tropical rainforests predominate. West Malaysia has a central mountain range along its length, flanked by coastal lowlands.
Climate:	The climate is marked by seasonal heavy rains, high humidity, and a fairly constant year-round temperature of 27°C.
Languages:	Malay (official) Chinese English
Religion:	Muslim (official)
Currency:	Ringgit (R). R2.28 = US\$ 1.00
Per Capita Income:	US\$ 1,840
Major Cities:	Kuala Lumpur, Penang
Production:	Industry 36% Services 41% Agriculture 23%

MALAYSIA

National Context

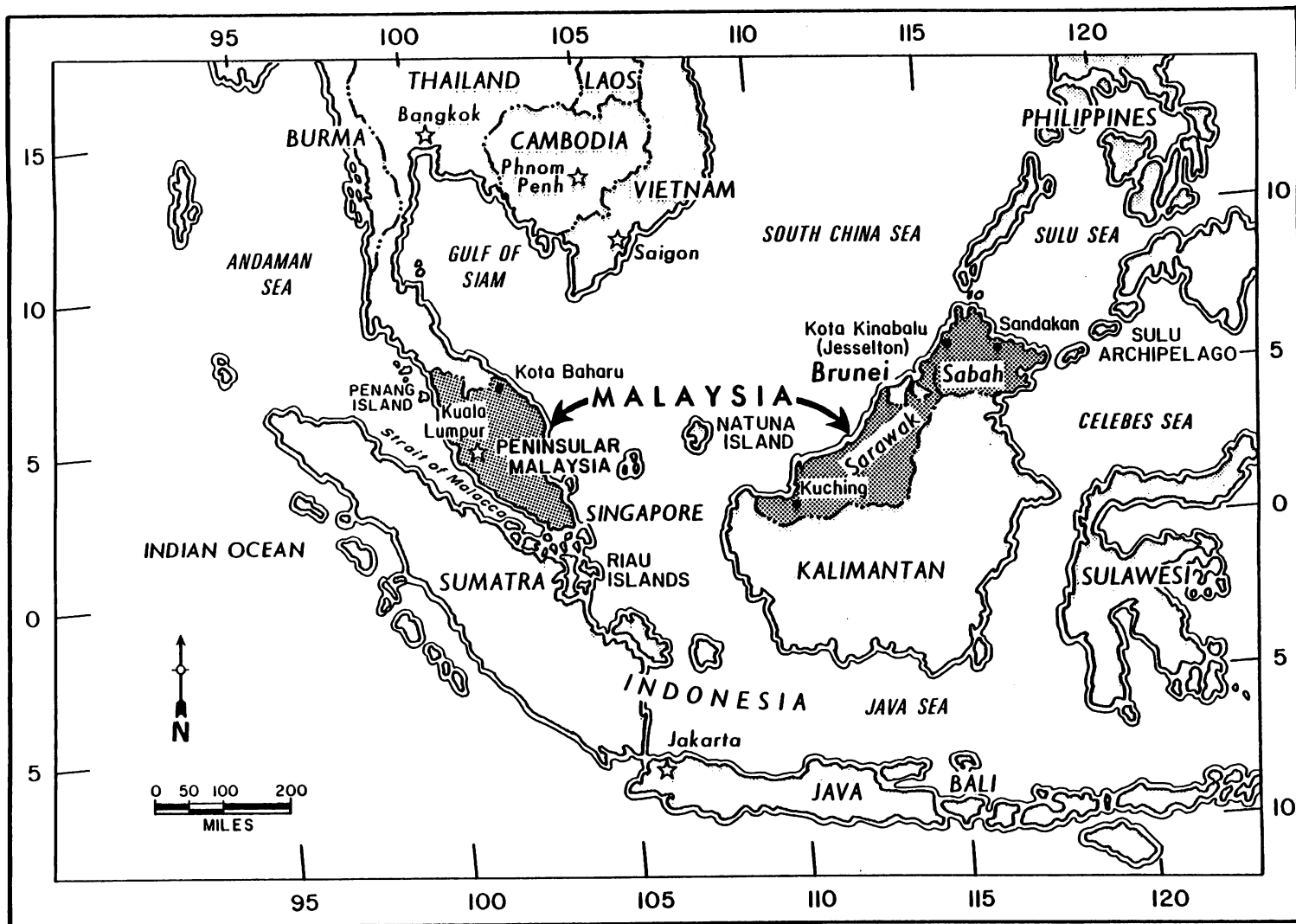
Malaysia lies between 2° and 7° north latitude and between 100° and 119° east longitude. It consists of two geographic segments, separated by 400 miles of the South China Sea. West Malaysia contains 85 percent of the population and has 40 percent of the land area in 19 states; it occupies the southern third of the Malay Peninsula and is bounded to the north by Thailand. East Malaysia consists of two states, Sabah and Sarawak, on the northern quarter of the island of Borneo. It has a land boundary with Brunei--a British colony on the northern coast of Borneo, and another with Kalimantan--the Indonesian state that occupies most of the island.

The total area of Malaysia is 330,000 square kilometers, almost 70 percent in tropical rainforests. The country has nearly 3,500 kilometers of coastline, but few natural harbors. West Malaysia is largely mountainous with coastal lowlands flanking the steep, forested mountain ranges along both the east and west sides. Sarawak has a broad coastal plain, frequently swampy, that merges into jungle-covered hills in the interior. Sabah has a narrower coastal plain backed by mountain ranges that include Mount Kinabalu, the highest peak in Malaysia (4,100 meters).

The climate is marked by seasonal heavy rains, high humidity, and a fairly constant year-round temperature of 27°C. The intense radiation of the tropical sun creates a striking difference between sun and shade in terms of both temperature and quality of light.

DEMOGRAPHY

The population of Malaysia in 1980 was estimated at 13.8 million, with about a third living in urban areas and the remainder in rural areas, mostly along the coastal lowlands. The interior regions of both Sabah and Sarawak are virtually uninhabited. Most of the major towns, including Kuala Lumpur, the federal capital, are in West Malaysia. The average population density, nationwide, is about 40 persons per square kilometer, although in the arable zones density is about four times higher. The annual growth rate of the population is 2.4 percent; urban growth is 3.5 percent.



Malaysia, Position in Southeast Asia

Immigration has been restricted since 1939 under the Aliens Ordinance Act. It was further limited in 1946 and again in 1953, and is currently minimal. Significant internal migration occurs from East to West Malaysia.

Of the various ethnic groups that make up the country's population, the Chinese are predominantly urban (75 percent), while the majority of Malays (85 percent) live in rural settlements. About 80 percent of the population is comprised of three main groups: the Malays (47 percent), the Chinese (34 percent), and Indians and Pakistanis (10 percent). The remainder consists of numerous tribal groups who are descended from earlier inhabitants of their areas and who maintain their own cultural identities.

The Malays (a term applied initially by the British to Muslims for whom Malay is the mother tongue) are the predominant political group. Their primacy is assured by provisions in the constitution (for example, only Malays can hold the office of head of state or prime minister), the establishment of Islam as the official religion and Malay as the official language, and their status as "sons of the soil"; vast areas of state land are reserved for Malays, and they are given certain political rights and privileges.

The Chinese dominate the economy, especially commerce and trade, and provide a large part of the professional and general labor force. They have remained culturally close knit and somewhat isolated from Malay society. Of the Indians and Pakistanis, some are merchants and white collar workers; others work on the plantations.

Sociological cleavages in Malaysia are strong. The ethnic cleavage is most serious, dividing communities along lines of religion, language, cultural traditions, wealth, and geographic separation. Income inequalities are an additional cause for concern, working to the disadvantage of rural areas, while the urban rich get richer. There are also sharp differences between West and East Malaysia, between urban and rural, and between the need for centralization and the desire to maintain strong regional identities. The government is encouraging a sense of nationalism, hoping that industrialization and improved distribution of wealth, coupled with changes in life style and attitude brought about by the influence of wider urbanization, will help overcome divisive ethnic loyalties and stimulate integration, cooperation, and consensus-building.

HISTORY

As the southernmost projection of the Asian mainland, Malaysia lies across the historic sea lanes connecting the Indian and Pacific oceans. It was an important center of trade and a crossroads of culture for seafaring nations--India, China, Japan, countries of the Middle East, and Spain, Portugal, the Netherlands, and Great Britain. In the late nineteenth century, the tin and rubber industries attracted a large influx of foreign labor, which is reflected in today's multiracial society.

In 1948 the Federation of Malaya was created under British protection. In 1957 Malaya became a sovereign independent nation. Malaysia was established in 1963 through the union of the independent Federation of Malaya, the self-governing state of Singapore, and the former British colonies of Sabah and Sarawak. Singapore left the federation in 1965.

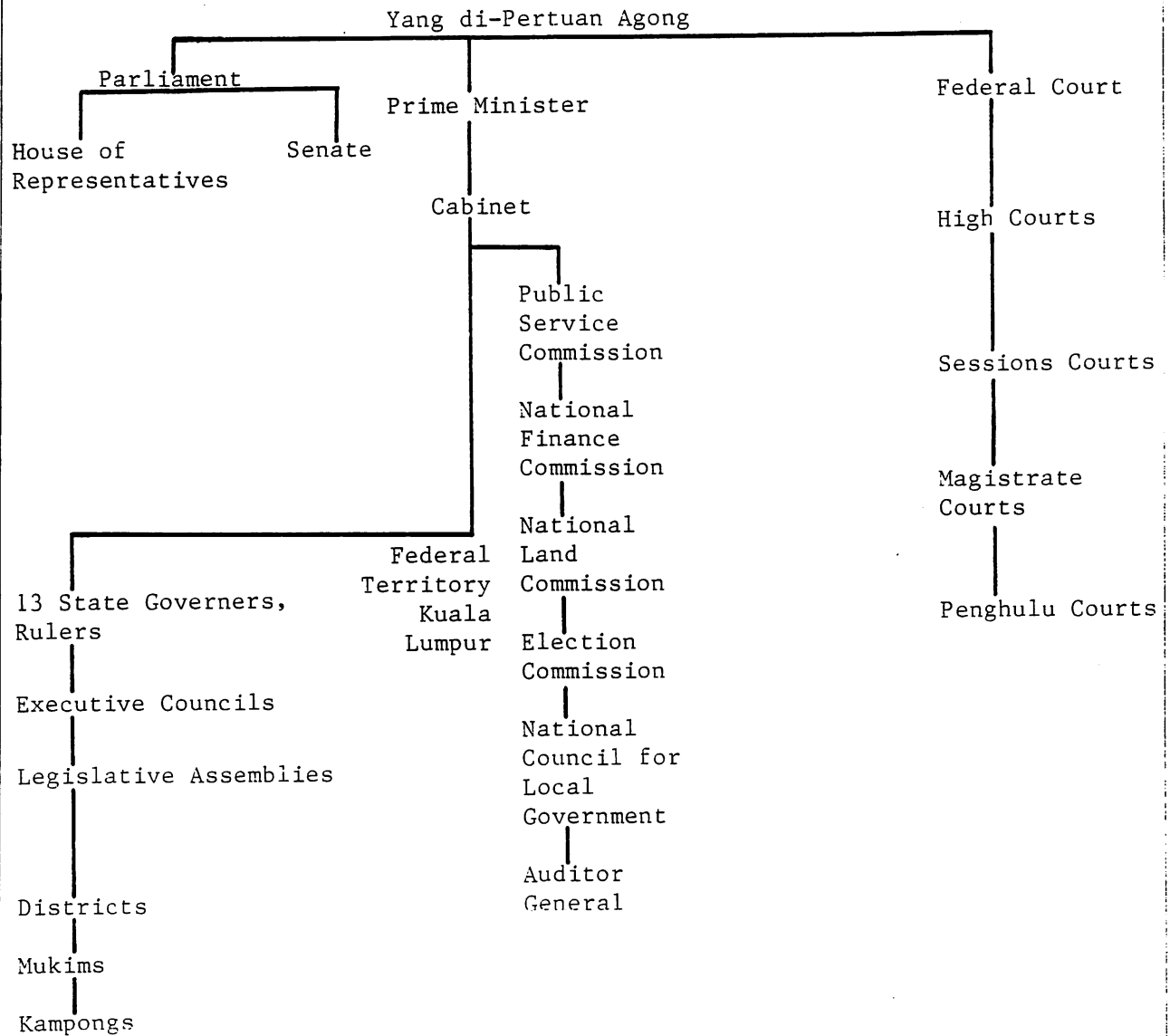
Malaysia joined the UN in 1957 and is also a member of the Colombo Plan and the Association of Southeast Asian Nations. It has had since 1970 a Treaty of Friendship with Indonesia, which initially opposed the establishment of Malaysia. The government has tended in the past to maintain a pro-Western stance; in 1974 diplomatic relations with the People's Republic of China were established as part of an effort to adopt a more neutral line.

GOVERNMENT AND ADMINISTRATION

West Malaysia, although smaller than East Malaysia in land area, has most of the population and is the seat of national government and the center of political, cultural, and economic activity. The national constitution, drafted in 1957, contains amendments to accommodate the special interests of Sabah and Sarawak in matters of land law, local government, finances, official language, and official religion.

Malaysia has a federal system of government under a strongly centralized constitutional monarchy. The supreme head of state is the Yang Di-pertuan Agong, who is elected for five years by the conference of rulers from among their number. The conference of rulers consists of the nine hereditary rulers and the governors of states without rulers. It is consulted in matters of Malay and Muslim privileges, appointment of judges and high officials, alteration of state boundaries, amendments to the constitution, legislation affecting Muslim religion, and regulations affecting the

ORGANIZATION OF MALAYSIAN GOVERNMENT



special position of East Malaysia.

Executive power is vested in the prime minister and cabinet, which are based on the British model and are responsible to the Parliament. The Parliament consists of a partially appointed senate and an elected house of representatives. It has sole authority over external affairs, defense and internal security, justice (except Islamic law), citizenship, industry, commerce, finance, communications, transportation, and education. Administration of the states is carried out by rulers and governors under the advice of state executive councils. The constitution grants to Malays, as "sons of the soil," a favored position with respect to education and public service.

Other constitutional bodies include the National Land Council, the National Finance Council, the Election Commission, and the National Council for Local Government.

States have their own constitutions and state executive and legislative assemblies. The chief state executive in the nine dynastic states of West Malaysia is the hereditary ruler, who holds office for life. The remaining states have governors chosen by the Yang Di-pertuan Agong and usually appointed for a four-year term. Each state also has an executive council or cabinet responsible to the state legislature.

The basic unit of local government is the district, headed by a district officer--usually a civil servant. Within the districts are the Mukims, collections of kampongs or villages, each with an elected local leader.

ECONOMY

Malaysia has a free-market economy in which the private sector is dominant. The economy is export-based and therefore vulnerable to changes in world prices of its principal raw materials: rubber, palm oil, tin, and, to a lesser degree, petroleum and timber. The gross national product in 1977 was US\$ 12.1 billion. The average annual rate of growth of the gross domestic product in the 1970s was 7.8 percent. Income inequalities are pronounced, with 10 percent of the population (mostly urban) accounting for nearly 40 percent of the country's wealth, while the bottom 20 percent (predominantly rural) receives only 3.3 percent. Ten percent of the nation's population lives in absolute poverty. Chronic unemployment among

the young is seen as a threat to the government's stability, because well over half of the electorate is between the ages of 21 and 35 years.

Planning is the responsibility of the cabinet, under the prime minister. The National Development Planning Committee and the Economic Planning Unit are responsible for formulating, implementing, and evaluating plans. Major ministries also have their own planning divisions. Private enterprise planning is coordinated by the Capital Investment Committee.

The Third Malaysian Plan, launched in 1976, called for major investments in agriculture and rural development, social services, and transport; followed by security; utilities; commerce, industry, and economic services; and administration. Agriculture accounts for almost a third of all economic activity, trade and finance for nearly a quarter, and manufacturing for about a sixth--but growing twice as fast as the two dominant sectors. Mining is also a significant economic activity (7.3 percent), as are transport and communications (5.2 percent) which are growing even faster than manufacturing.

Government programs have striven to preserve nonrenewable resources, to achieve price stabilization in agricultural export commodities, and to stimulate industrial development through increased domestic consumption.

The incidence of poverty is decreasing, but is nonetheless a serious problem, especially in rural areas, despite government programs to improve the rural infrastructure, education, medical services, and electricity. Smallholders of rubber plantations, paddy farmers, tenant farmers, and estate workers are usually poor, earning a mean monthly income of M\$ 47. Productivity is adversely affected by insufficient drainage or irrigation and lack of fertilizers and insecticides. As a consequence, rural outmigration is exacerbating problems of unemployment and underemployment in urban areas, and contributing to the numbers of poor people in the cities, where the median household income of M\$ 160 is inadequate to compete with rising prices of essential commodities.

Malaysia has borrowed extensively as well as receiving foreign aid in the form of technical assistance, equity participation, project loans, and export credits. Its external public debt in 1977 amounted to US\$ 158 per capita.

EDUCATION AND HEALTH

The educational system is centralized in the federal Ministry of Education, except that Sabah and Sarawak operate their school systems autonomously. Schooling consists of six grades of primary school, three of lower secondary, two of upper secondary, and two of pre-university classes. The state provides free but not compulsory education for children aged 6 to 13 years. The enrollment ratio is 94 percent for primary students and 45 percent for secondary. Girls constitute slightly under half the school population through primary school, somewhat less in secondary school.

The medium of instruction is Malay in state schools; there are also over 500 English-language schools of considerable prestige, more than a thousand Chinese-language schools, and about 600 Tamil. In East Malaysia, Sarawak is moving toward a full English-language education, while Sabah has adopted the West Malaysia educational plan.

Compulsory religious education in Islam is provided during regular school hours in all schools receiving government funds (except in East Malaysia). Adult education is available, under the Ministry of National and Rural Development.

There are five universities in Malaysia (three are in Kuala Lumpur), with a total enrollment of approximately 50,000, of which about one-third are women. About 20,000 Malaysian students attend institutions of higher education abroad--primarily in the United States, the United Kingdom, Australia, Singapore, India, and Canada.

The educational budget was over 19 percent of the national budget in 1977. The national literacy rate is 61 percent, falling to 15 percent in East Malaysia.

A critical shortage of trained Malaysian teachers is partly made up by employing Indonesians and Commonwealth and Peace Corps volunteers. East Malaysia also suffers from a shortage of vocational and professional training institutions: it has only four, compared to 82 in West Malaysia.

Health: There is a high incidence of waterborne diseases, primarily in rural areas, and some malnutrition. However, today 62 percent of the population lives in malaria-free areas, typhoid and infectious hepatitis are under control, water is being chlorinated, and environmental sanitation is improving.

URBANIZATION

Malaysia's development has in the past been adversely affected by regional and political differences of interest, but abundant natural resources, a strong economy, and careful national development strategies have combined to make Malaysia the second-most prosperous country in Southeast Asia today. There are few natural harbors, but a rapidly expanding network of roads, an efficient rail service, and a domestic airline provide good transportation and communications and have stimulated economic expansion. Improved mobility and growth in the manufacturing and services sectors have contributed to a rapid rate of urbanization which is seen by the government as desirable from the point of view of creating better integration and a sense of national unity among the country's rather compartmentalized ethnic groups. However, migration from rural areas to the cities has outpaced urban employment opportunities, resulting in high labor mobility, proliferation of slum and squatter areas, and urban instability.

In the postwar period, high rates of natural increase and rural-urban migration contributed to rapid population expansion of towns throughout the country. The physical, social, and economic resources of the cities were overwhelmed by the rate of urbanization, and housing shortages became acute. Estimated housing needs over the plan period of 1976 to 1980 were 515,000, implying a major construction effort in both the public and private sectors.

A report prepared for the Legislative Council in 1949 recommended setting up a Housing Trust. The Trust was established in 1950 and became operative in 1952--the first intervention by government authorities in the field of public housing. Under housing construction programs carried out by local authorities and the Housing Trust, the rents to be charged on the houses were intended to cover the cost and show a modest return on capital, even though it was recognized that this might result in the fixing of rents at a higher level than that which the lowest income groups could afford. Nevertheless, it was felt that the lower income groups would benefit indirectly, as every increase in the number of houses available would relieve the pressure on existing accommodation and tend to bring rents down.

Current rates of construction per annum fall far short of the nation's needs. It has been estimated that over the 20-year period from 1970 to 1990, a total of about two million new units will need to be built if the

population of Peninsular Malaysia is to be provided with adequate housing.

Government programs to alleviate the housing problem have been largely inadequate, for three main reasons. Housing investment has tended to comprise a relatively small portion of the national budget, seldom rising to more than five percent of the gross domestic product. A cumbersome administrative structure has also been a contributing factor: while the states are theoretically responsible for housing provision, funds generally emanate from federal sources; and responsibility for government housing programs has shifted from one ministry to another, recently falling under the administration of the National Housing Department (within the Ministry of Housing and Village Development). A third factor is high costs: an attempt to replicate the success of Singapore's housing program led to the implementation of similar highrise, prefabricated schemes without taking into account the economic and cultural disparities between the two countries. Administrative delays in conversion, subdivision, and distribution of legal titles are another problem.

Land purchase and improvement in Malaysia amount to about a quarter of the total cost per housing unit. The cost of materials has risen considerably since 1973 due to world inflation and the building boom in Southeast Asia. A growing need is seen for research on the use of timber--a valuable and abundant resource in Malaysia whose exploitation could lead to substantial reductions in construction costs.

Labor costs have doubled in the last few years, forcing many developers, both public and private, to consider semi-industrialized building techniques as an alternative to traditional labor-intensive methods.

Most standards and regulations reflect the values of British colonial administrators rather than today's realities. Even a moderate reduction in the level of standards can reduce construction costs substantially, as has been shown in experimental projects in Kuala Lumpur at Salak South and Chevas.

KUALA LUMPUR

Urban Context

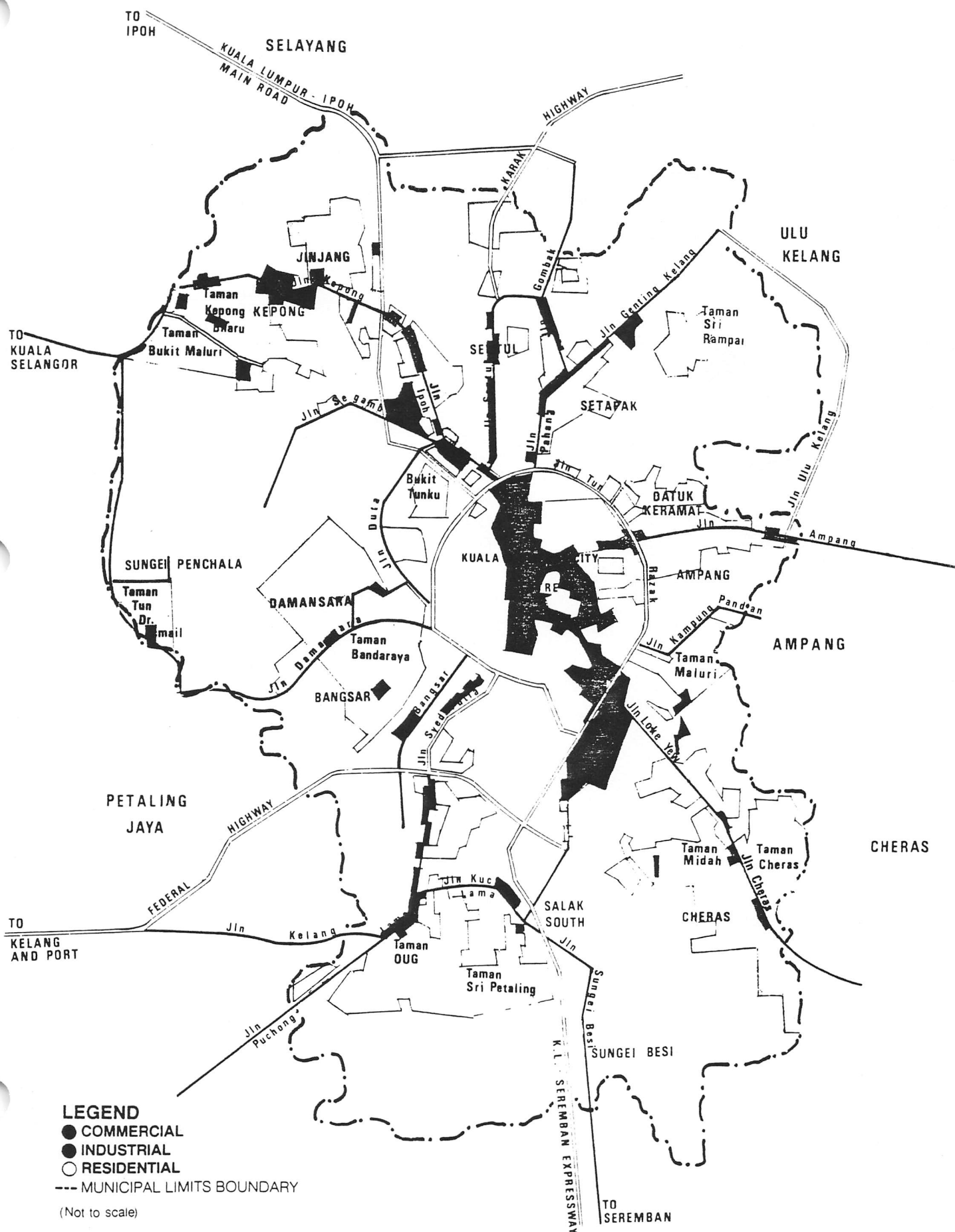
Kuala Lumpur, the capital of Selangor state and the seat of the federal government of Malaysia, is located 40 kilometers inland from the west coast in the foothills of the central mountain range that extends the length of the Malay Peninsula. It sits at the confluence of the Kelang River and one of its tributaries. At the time when Chinese miners founded the settlement, it was accessible only by poled boat up through the coastal marshes of the Kelang delta, but the town flourished from its earliest days and a railway connecting it to ports on the coast of the Strait of Malacca was soon built.

By the end of the nineteenth century, the original settlement of thatched huts in the midst of malarial jungle had become a well laid-out modern town and the economic center of a region of prosperous tin mining operations and rubber plantations. The original rail line was subsequently superseded by road and rail linkages to Singapore, with its harbor deep enough for ocean-going ships.

Regional Context: Selangor is the second-largest of the states of Malaya in population (1 million in 1957) and the seventh in area (8,200 square kilometers). After World War II, there was a large-scale resettlement of urban and rural refugees and 18 new villages were created. According to the 1957 census about two-thirds of the state's population lived in 40 towns. The population of the capital, Kuala Lumpur, is half Chinese and about a fifth Indian, with most of the remainder Malay. The Chinese dominate the economy, and Malays are usually in government service; the Indian minority is connected with nearby rubber estates.

Administration: The state legislature consists of the sultan and the legislative assembly. The ruler appoints from among the members of the assembly an executive council whose advice he acts on, except in certain matters. The legislature's responsibilities include land tenure and local government.

WILAYAH PERSEKUTUAN Kuala Lumpur



Economy: The history and economic development of Selangor have been closely bound up with the Kelang River. In addition to having large mangrove-covered islands on its deltaic fringe, it is a source of alluvial tin deposits, especially in the foothill zone around Kuala Lumpur. Dredging and mining operations have drastically modified the river's drainage pattern, diverting it in many places and hastening coastal sedimentation. Selangor's tin mining operations yield about 20 percent of the national output.

The state's economy is broad-based. Agricultural crops include rubber and rice, as well as pineapples and palm products. The industrial sector has iron foundries and engineering works, and processes food, soap, and margarine. Cement is manufactured at Rawang, and small-scale tin and rubber smelting is common. Kuala Lumpur has diversified manufacturing based on tin and rubber, plus light industries and distributing trades; while industrial planning is underway in the adjacent estates of Petaling Jaya and Batu Tiga.

Kuala Lumpur is a nodal point for rail, road, and air communications nationwide. It has become the junction of passenger and freight services by road to Penang, Singapore, and eastern Malaya.

ARCHITECTURE AND URBAN PATTERNS

Malay Houses: The traditional Malaysian house is a wooden post-and-beam structure enclosing a rectangular space, covered by a high pitched roof. The design is well suited to the local climate since it allows good ventilation; there are few interior walls, and access to the outdoors is easy. Typically, the house is raised on stilts and gaps are left between the floor planks to allow cool air to rise through the house.

Construction materials are bamboo and timber. The walls are made of panels of split bamboo, often woven into a pattern. The steep roofs are covered with mats made of interwoven palm-leaves fixed to thin bamboo poles and tied from inside to the rafters.

British Colonial Houses: These houses are international in character, but definitely tropical and therefore more similar to the Malay house than to the Chinese. They are lifted off the ground, and use timber extensively in their construction--mainly in the verandas which usually surround the

house on all sides. The core is of brick, and a wide roof overhang provides protection against sun and glare, sometimes to the point of creating a Victorian gloom within.

Traditional Malay villages: The kampongs closely reflect the configurations of the surrounding landscape. The two most common forms are the cluster--usually found on flat plains, at river deltas, in the jungle, or as infill in urban areas; and the linear form--generally a response to a strongly defined characteristic in the land such as a river, coastline, road or jungle path, or line of foothills. Groupings of small kampong communities often merge to form a larger entity, eventually growing into a city. It is common for the urban kampongs to retain their identity and autonomy within the larger city, functioning more like isolated villages than integrated neighborhoods.

Typically, an open public space within the cluster of houses provides an opportunity for social intercourse. Pedestrian movement occurs along informal paths created by the activity pattern of each settlement.

Colonial Heritage: Colonial residents tended to maintain a semblance of their own traditional manner of living, designing and disposing buildings in a manner reminiscent of their homeland. At the same time, the cities were developing within the framework of a colonial economy which provided the necessary infrastructure. When upper class natives tried to copy the manners of the European ruling class, the result, culturally and architecturally, was a confusing admixture. In the 1970s, an attempt was launched to establish a sense of Malaysian identity in architecture. Unfortunately, most of the discussion was on the level of cosmetic, surface appearance, failing to discover the principles at the heart of Malaysia's indigenous architecture.

Kuala Lumpur today presents a mixture of modern and Moorish architecture, traditional Chinese shop houses, squatters' huts, and Malay stilt kampongs. Its center, along the banks of the Kelang, is heavily congested, but the municipal area and suburbs are well planned. The commercial quarter is concentrated on the east side of the river where there are modern banks, insurance offices, and hotels. Government buildings and the railway station are on the river's hilly west bank. This nucleus is surrounded by

a zone of Chinese two-story wooden shop houses and mixed residential areas of Malay kampongs, modern bungalows, and middle-income brick flats.

URBANIZATION

Kuala Lumpur, as the capital of the federation, is naturally a focus for redevelopment. Land acquisition has gone ahead faster in primary cities such as Kuala Lumpur, Johore, Bahru, and Malacca, and less rapidly in secondary urban center. Kuala Lumpur has undergone rapid increase in population over the last decade, growing from around 500,000 to more than a million. The central area is still relatively small in scale, however.

The city shows today a confluence of building styles ranging from highrise high-income apartments financed by the Hong Kong Land Development Group to kampong settlements. The kampongs are self-built, unplanned, low-cost units that provide accommodation for families preferring not to live in apartments or who are ineligible or unable to afford housing built under governmental redevelopment programs. The momentum of urban development in Malaysia has resulted in the clearance of kampongs, even though they offer economic, social, and environmental advantages to low-income residents. Their residents strongly resist attempts at evicting them to provide land for highrise apartment blocks.

All buildings built before 1948 are subject to rent control, which fixes rents at artificially low rates, contributing to the deterioration of the housing stock and aggravating an already serious housing shortage. The urban housing deficit is increasing rapidly, while the condition of the existing housing stock continues to deteriorate and illegal squatter settlements proliferate. Approximately 40 percent of Kuala Lumpur's total population are squatters, and it is rare to find a sizable tract of uninhabited land anywhere in the city.

Penang and Kuala Lumpur have a higher average of households per dwelling unit than the national average (a density of 2.7 persons per room exists in urban areas and 2.8 in rural areas). The housing shortage is further aggravated by the fact that 27 percent of the houses in Peninsular Malaysia are deteriorating or dilapidated, 40 percent lack water connections, 56 percent have no electricity, and 84 percent are without sewerage.

Firms based in Kuala Lumpur account for over half of the total housing construction output in Malaysia today. It is clear that private developers could play an important role in alleviating housing shortages, and that the government should make every effort to involve them in its programs to provide shelter to low-income populations.

Project Reference Sheet

Project Name: Setapak Jaya: An Experimental Housing Project

Location: Kuala Lumpur, Malaysia

Consultants: Akitek Tenggara

Contractor/Builder:

Client:

Date of Commission: 1976

Implementing Status: Completed

Estimated Cost:

Summary Description: Setapak Jaya is a low-middle income housing project in a peripheral development using flexible design and groupings of buildings to accommodate two ethnic groups with different traditions and lifestyles. The 1,650-unit development on 21 hectares was part of a series of studies experimenting with high-density lowrise onground housing. This form was conceived to be more economical to build and maintain, and suitable to foster social interaction without sacrificing individuality and privacy. The cluster form--although violating existing building and planning regulations--relates efficiently to urban infrastructure and services, and can be designed to resolve successfully the contradiction between individual and community needs. Each cluster of 100 to 150 units has a small commercial area and some community facilities; the project has a completely self-contained drainage system and sewage treatment pond.

SETAPAK JAYA: AN EXPERIMENTAL HOUSING PROJECT

KUALA LUMPUR, MALAYSIA

Project Summary Paper

The Setapak Jaya project came about as a direct follow-up of a pilot housing project built in a suburban location south of Kuala Lumpur, called Cheras. The project at Cheras was part of the low-cost housing program of the Dewan Bandaraya (City Hall). It was the first time the clustered link house concept was applied in Malaysia. The government wanted to build houses for lower income groups in urban areas, costing not more than M\$ 5,000 per dwelling, exclusive of land cost. This budget had to include professional fees, foundations, and site and infrastructure works.

A density of 60 dwellings per acre was planned; enclosed floor area per dwelling is 49 square meters, and each dwelling has two or three bedrooms, a kitchen, a living room, a dining room, and a toilet/bath/wash room.

THE SITE

The high-density, compact, lowrise character of the clustered link house enables it to be applied to swampy land. In the context of highly built-up Kuala Lumpur, the choice sites close to the city have already been developed. Lower cost housing must of necessity be built on land left undeveloped because it is not desirable. Many such areas exist at the edge of the city in the form of disused tin mines. The ground surface conditions are very muddy and waterlogged, and the mining operations have also left ponds. Because of the availability of water supply, many of these fringe areas around the mining ponds are occupied by squatters. The re-use of ex-mining land is therefore intimately tied to squatter clearance and resettlement.

In the Setapak project, the developer had three basic options for the foundation design. He could use expensive soil improvement techniques or friction piles to achieve the required supporting strength, or he could use a raft foundation--which the clustered link house enabled him to do. He calculated that, where the basic raft foundation failed, it would be cheap-

er to demolish those houses and use piled foundations to rebuild them, than to use piled foundations throughout.

Construction was delayed considerably by the difficulties involved in the construction of the underground sewer system which had to be on piles and required excavations varying in depth, close to the buildings. The zigzag layout of the blocks also caused greater length and difficulties in the sewer works. Technically, the sewers should have been constructed before the houses, but this would have involved higher front-end capital investments which the developer was unwilling to advance. In the end, the construction cost of the sewerage system was higher than if it had been constructed at the start; however, the developer was able to put his houses on the market earlier, which enabled him to collect progress payments from sales to help him finance construction.

STRUCTURAL ASPECTS

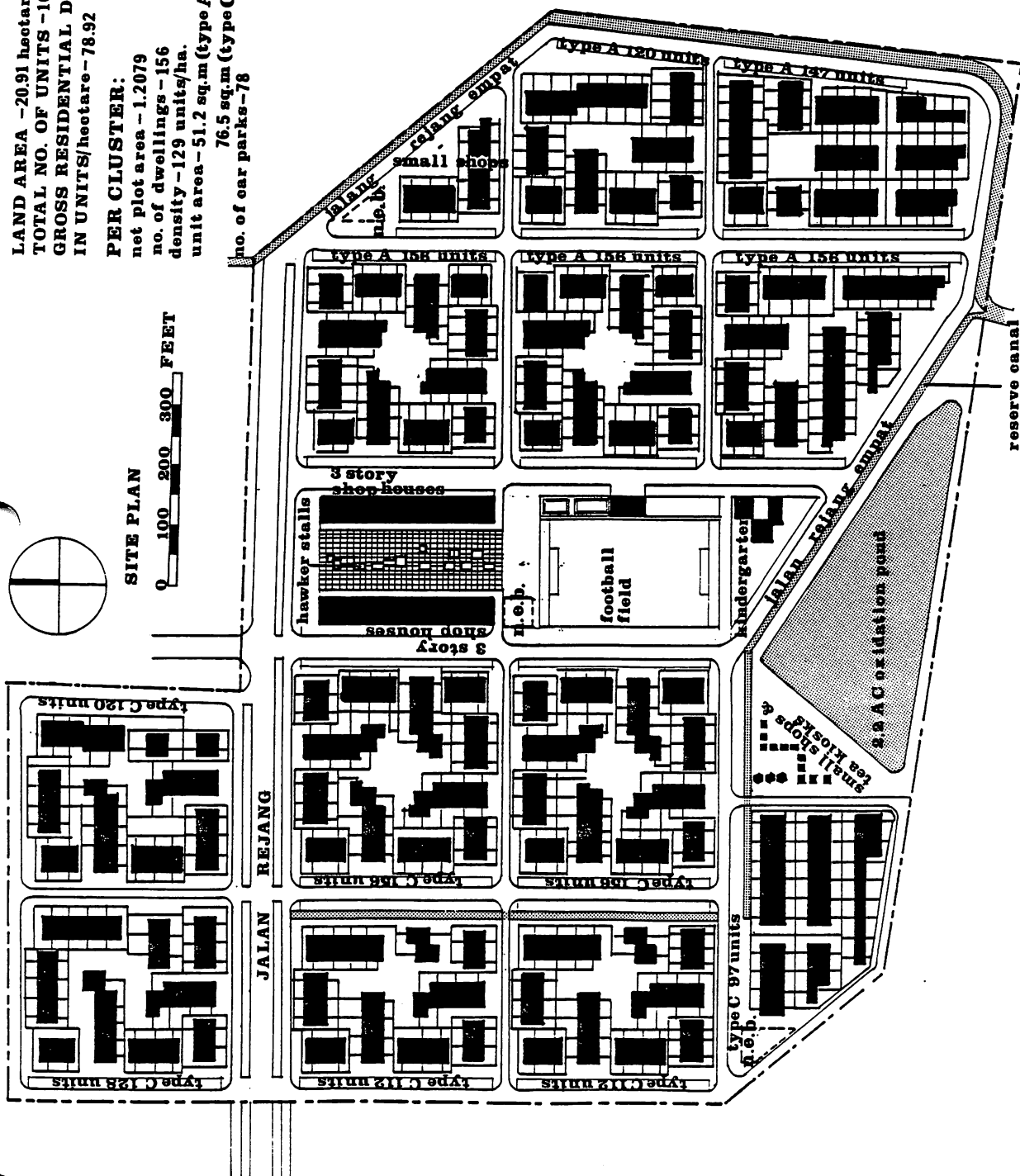
The construction system for the Setapak Jaya project was based on that employed in the Cheras project, namely, loadbearing walls of cement block reinforced masonry. The cement blocks were 6" x 6" x 18" (longer than normal in order to decrease block-laying time). The selection of the cement block building system was based on the availability of suitable gravel, which is a byproduct of mining operations. The cement blocks were manufactured on the site using secondhand block-making machines. A two-month lead time in block-making ensured a continuous supply of blocks when construction began. Each machine produced between 10,000 and 15,000 blocks per day of consistently high quality blocks, in terms of standard of finish and strength.

In the Setapak Jaya project, a reinforced concrete floor was used, rather than the timber floor preferred by Malay families. This not only was less expensive, but also had the advantage of providing a solid working platform for the block work at the upper level. The roof structure is timber with colored concrete interlocking roof tiles; corrugated asbestos cement roof sheets would have been slightly cheaper.

LAND AREA - 20.91 hectares
 TOTAL NO. OF UNITS - 1651
 GROSS RESIDENTIAL DENSITY
 IN UNITS/hectare - 78.92

PER CLUSTER:

net plot area - 1.2079
 no. of dwellings - 156
 density - 129 units/ha.
 unit area - 51.2 sq.m (type A)
 76.5 sq.m (type C)
 no. of car parks - 78



EXPERIMENTAL HOUSING - K. L. Malaysia
 Cluster link house in cluster formation - completed 1980

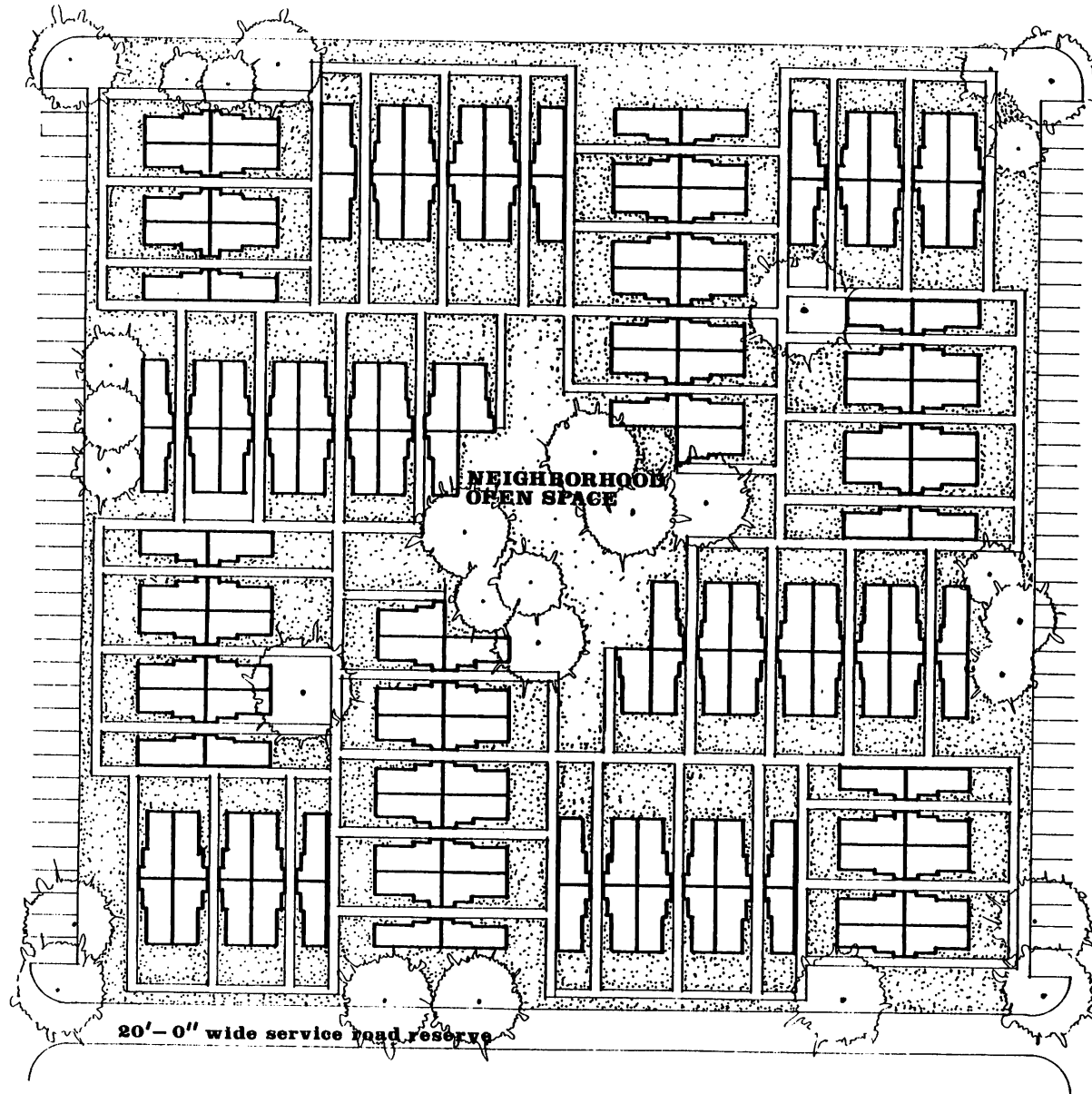
LAYOUT

The site of 51 acres was divided into 13 clusters grouped around a central access road and a neighborhood center, a football field, and a kindergarten. The access road runs east-west, and off-street parking is provided around each cluster. The clusters of Type A units (which are the two-bedroom, two-story units), are on the eastern part of the site and comprise 156 units per cluster. On the western part are the three-bedroom, three-story units, arranged in clusters of 112 to 156 units. Sewage treatment relies on an oxidation pond located to the south adjacent to the existing large mining pond, and separated from it by a dike.

Vehicles are kept at the perimeter of each cluster where parking and access ways are provided. The clusters are totally free of vehicular circulation. A network of footpaths connecting a hierarchy of open spaces starts from the common breezeway to the house plots and proceeds to the communal open space. Efficient mini-bus service is provided; residents have to walk only a short distance to the bus stop, a condition that is difficult to arrange in the standard suburban subdivision with densities of 10 to 12 dwellings per acre.

Car ownership in Setapak Jaya is still relatively high, on the order of one car per two dwellings. The car is such a status symbol that residents resent the necessity of having to park their car in a parking area away from their house. They feel that they should be able to park right in front of their house for protection, as well as for pride. Indeed, some residents do bring their cars into the communal areas by cementing over drains and other obstacles. Many of those who live in the interior of clusters and cannot bring their cars to their front door have put up shelters in the perimeter parking areas to protect their prized possessions.

All the retail, food, and refreshment facilities are concentrated in the neighborhood center and in the adjacent hawker pitches. It is clear from present-day occupation that retail facilities provided are inadequate. The number of hawkers--reflecting effective demand--has far exceeded the space allocated to them, and there are littering and pollution problems.



TYPICAL CLUSTER



RESPONSE OF OCCUPANTS

In 1978, the two-bedroom units were offered at M\$ 12,500 and the three-bedroom units at M\$ 18,000; and all units were sold out within two weeks. After the completion of the project, the units appreciated substantially. Resale prices rose from M\$ 30,000 in 1980 to current prices of M\$ 70,000 per unit.

The Refuse Collection Department of City Hall will collect refuse only from projects which have obtained a Certificate of Fitness. This certificate is granted when all alterations and additions have been approved by the authorities. Under the present regulations, as soon as the developer can obtain a temporary occupancy permit, tenants move in and, despite instructions to the contrary, embark on alterations prior to official granting of a Certificate of Fitness. Developers are unable to control these activities, so strong is the enthusiasm of the new homeowners. There is an impasse which results in refuse collection having to be organized on a private basis, creating problems in the collection of levies from owners and residents. Attempts by the residents to organize their own refuse collection may stimulate the setting up of a viable community organization.

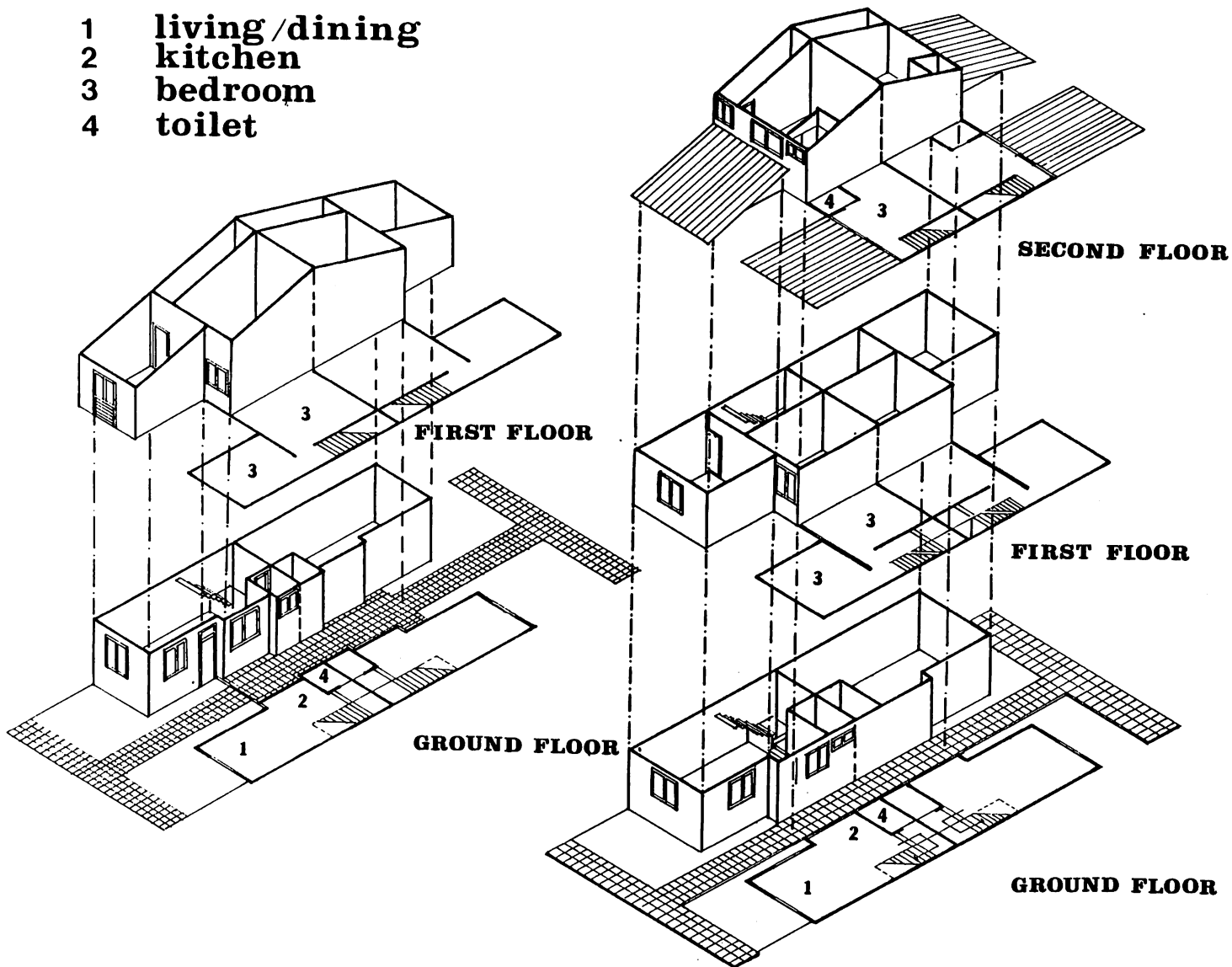
SCHEDULE OF EVENTS

April 8, 1976: Submission for development permission
 September 1, 1976: Granting of development permission
 July 1977: Approval of building plans for houses
 June 16, 1977: Commencement of construction
 Construction period: 70 weeks
 Actual occupation: Early in 1979

SELLING PRICES

1977:	Two-bedroom unit	M\$ 12,500
	Three-bedroom unit	M\$ 18,000
1980:	Two-bedroom unit	M\$ 22,000 to 25,000
	Three-bedroom unit	M\$ 40,000 to 45,000
1984:	Two-bedroom unit	M\$ 40,000 to 45,000
	Three-bedroom unit	M\$ 65,000 to 70,000

- 1 living/dining
- 2 kitchen
- 3 bedroom
- 4 toilet



**TYPE A
AXONOMETRIC VIEW**

**TYPE C
AXONOMETRIC VIEW**

STATISTICS

Type A: Communal cluster houses, 14' x 39' wide:	765 units
Type C: Communal cluster houses, 16' x 39' wide:	<u>881 units</u>
Total:	1,646 units

Type A: Total floor area per unit:	586 square feet
Type C: Total floor area per unit:	849 square feet

Three-story shophouses, 20' x 70' plots:	30 units
Hawkers' stalls, 10' x 10':	44 units
Tea Kiosks, 8' x 8':	12 units
Small shops, 15' x 15'	5 units

Community Facilities:

- Community hall
- NEB substations (3)
- Football field
- Badminton courts (2)
- Children's playground
- Kindergarten
- Car parking spaces (907)

Site Area: 51.69 acres

Percent of built-up area (residential): 42.9%

Percent of site occupied by roads: 20.18%

Total population (5 persons per unit): 8,280

Gross density (persons per acre):	160
Gross density (dwellings per acre):	32
Cluster density (dwellings per acre):	52