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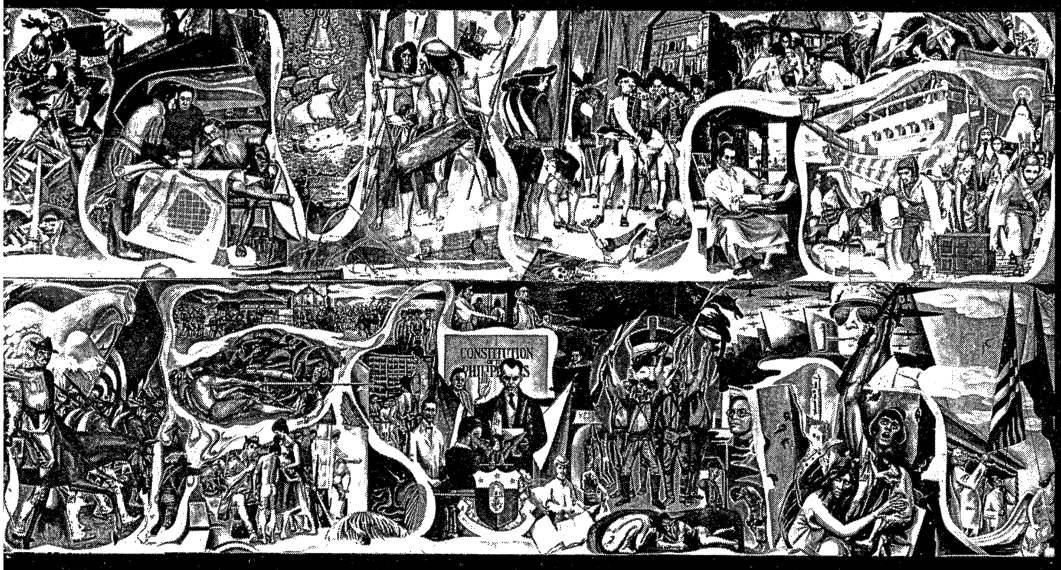

Volume II Number 2
Manila IV Centennial Issue

PHILIPPINE PLANNING JOURNAL

INSTITUTE OF PLANNING UNIVERSITY OF THE PHILIPPINES Volume Two Number 2 April 1971

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LAND USE AND URBAN DEVELOPMENT IN THE MANILA METROPOLITAN AREA*

Urbanization

Purpose of the Land Use Study

The design of any urban system is governed by the consideration of the least capital expenditure for the most effective service. To this end the designer must carefully estimate the present and future demands upon the system. For a sewerage system, these demands depend upon the number of residences and commercial and industrial customers which it must serve throughout its life. Therefore, within the Study Area, a compilation was made of the area and location of existing residential, commercial, industrial, and public land uses. This compilation was the basis for projecting land use throughout the design period.

Various conditions influenced the estimation of wastewater flows including water supply, pattern of water use, plumbing and sewerage facilities, and other criteria. However, the actual coverage of land by residences factories, and shops was the basis upon which the other criteria were applied.

*** Reprinted from Chapter VI of *Master Plan For A Sewerage System For The Manila Metropolitan Area*, Final Report for the World Health Organization by Black and Veatch International dated December 1969. Some graphs and tables and the references thereto have been ommitted due to space limitations.**

The Rate of Urban Expansion

Manila is rapidly expanding into the agricultural countryside. At the turn of the century, the developed portion of the City occupied approximately 2,000 hectares (4,940 acres). By 1966 the urbanized area covered approximately 30,200 hectares including parks, golf courses, cemeteries, and partially developed subdivisions which are listed as "open land" in the land use tables. On the basis of this rough criteria the metropolis increased its urban area by a factor of 15 over the 65 year period. This areal increase is about one and one half times the increase in population over this same period.

The City has not only expanded into agricultural land but also onto fishponds and into Manila Bay. Since 1904 approximately 280 hectares have been reclaimed from the Bay and are now included within the Tondo District. The entire south Port Area of 95 hectares and approximately 180 hectares in Ermita, Malate, and Pasay (along Roxas Boulevard) have been reclaimed. Within Navotas and Caloocan City there has been gradual reclamation from the fishponds of Maypajo, Bangkulasi, Tanza, Tinajeros, and Julong Duhat. Reclaimed fishponds and salt beds are being converted into subdivisions in Parañaque and Las Piñas in the neighborhood of Zapote, Manuyo, La Huerta, and Ibayao. By 1969 there had been little significant reclamation from Laguna de Bay; however, studies were underway to determine the feasibility of such development.[1]

Between 1948 and 1966 the urbanized area increased by 260 per cent, from 11,700 hectares to 30,200 hectares. This averages more than 1,000 hectares of development per year, a rate which would urbanize the Study Area by 1988 if the expansion were to be contained entirely within the Study Area. Suburban expansion has been generally of the housing project or subdivision type, which has bordered the highways. This pattern is indicated on Figure 5-2.

Employment and Family Income

Between 1960 and 1965, the Metropolitan Manila labor force increased by an average of about 33,000 per year[2] and in 1965 numbered about 1.09 million, or approximately 35 per cent of the population; the remainder of the Study Area population were children below 10 years old, students, housewives, and the aged and infirm. The unemployed segment is listed at 9 per cent; however, the figure may be misleading because it does not include casual employees. The "services" category includes professional services but is chiefly composed of personal services (restaurants, hotels, cafes, domestic, etc.). The family income pattern is shown on Figure 5-5.

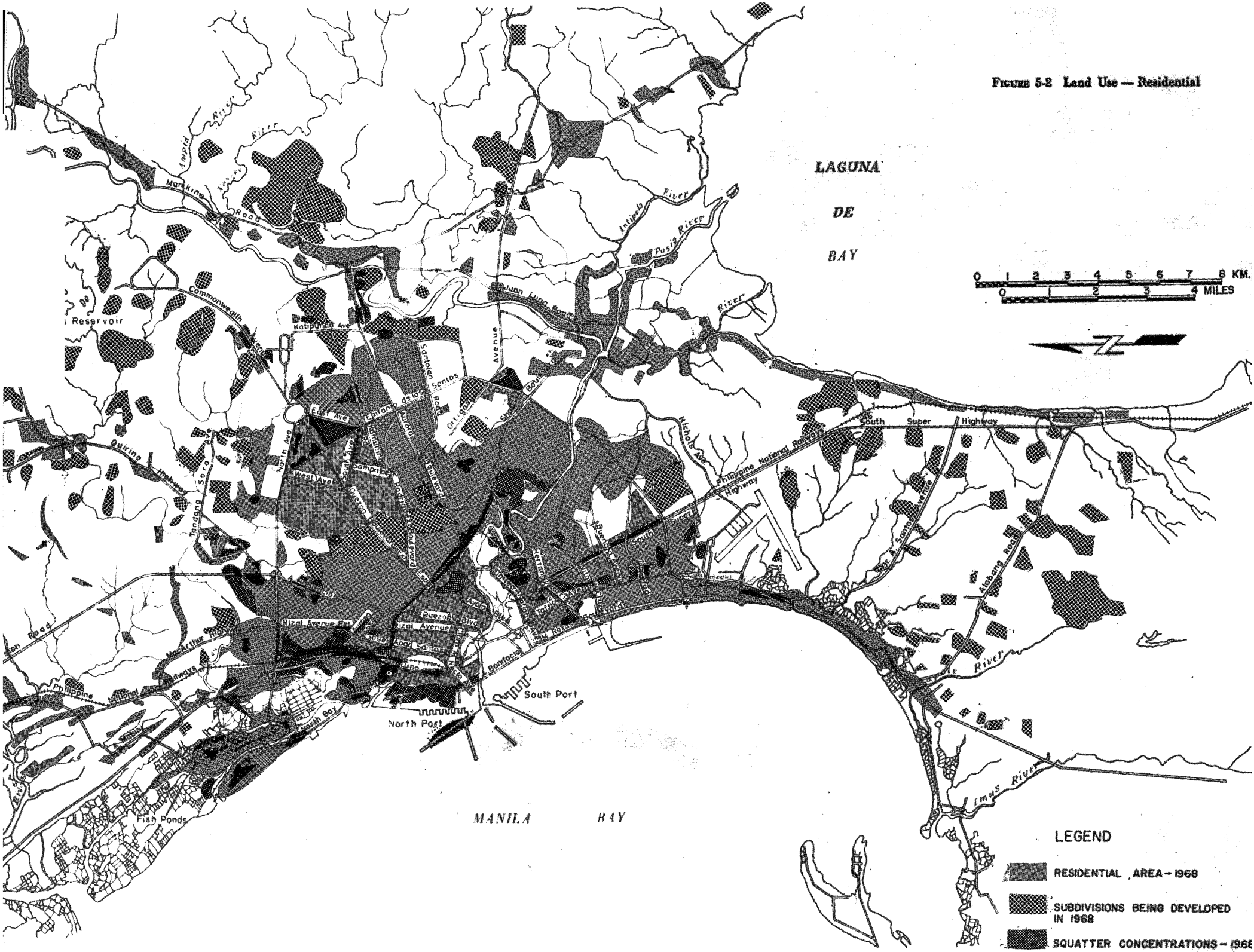

FIGURE 5-2 Land Use — Residential

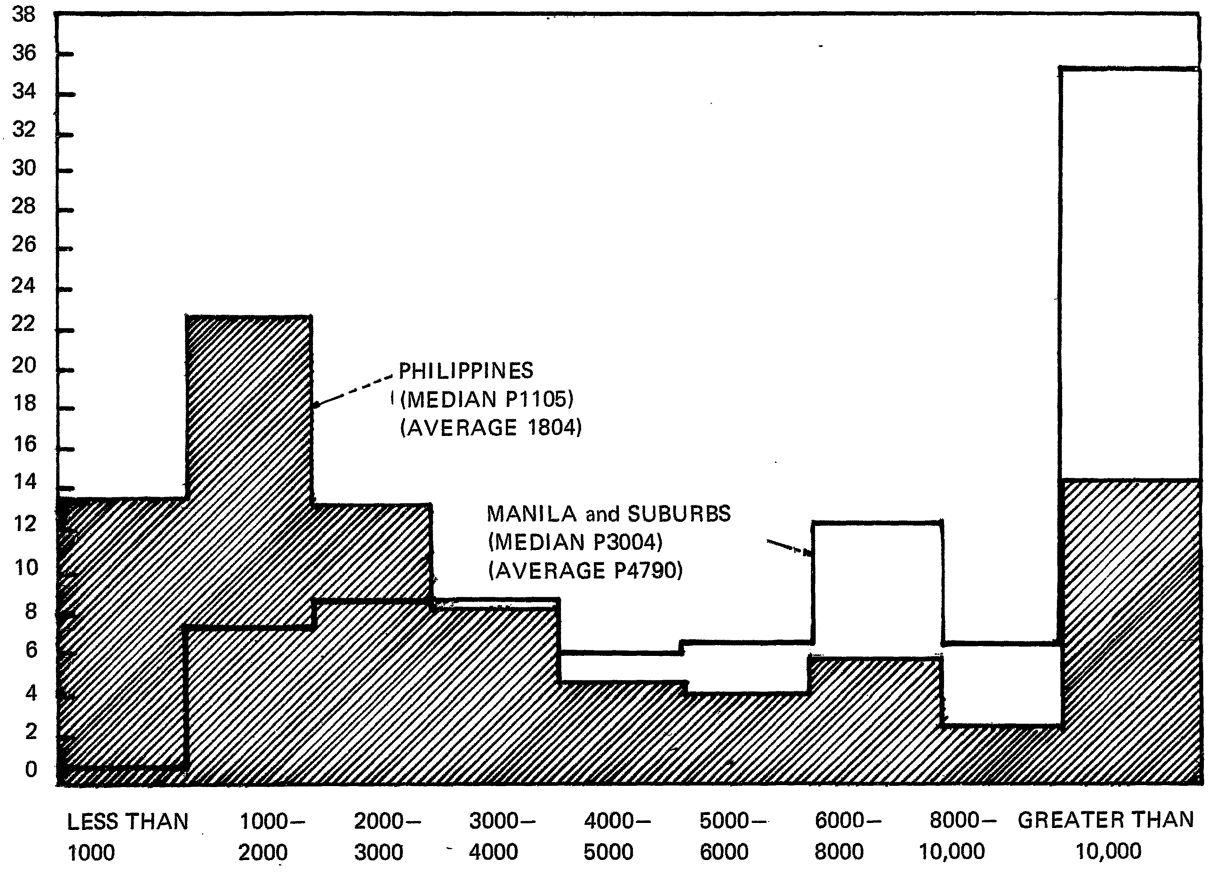

FIGURE 5-5 FAMILY INCOME PATTERN

SOURCE: ECONOMIC ATLAS OF THE PHILIPPINES, 1965 DATA

Education

Students are not included in the labor force within the Metropolitan Manila. Nearly 30 per cent of the total 1960 population, aged 10 years and over, were listed as students[3,4]. As the age group from 10 years through 19 years represents only 23 per cent of the Study Area population, it is seen that a great number of students are older and engaged in post-graduate studies.

A large proportion of the students have immigrated to Manila from the provinces. Manila is the educational center of the Republic, and although there have been recent steps taken to encourage collegiate education in outlying provinces, it is felt that the best opportunities for education and research will be within Manila itself for many years to come. It is anticipated that (1) the schools will continue to expand, (2) the majority of college students will continue to come to Manila for their education, and (3) the private colleges and universities will remain in the Central Manila Area.

Real Property

Construction of roads and subdivisions and the lack of punitive taxes on idle land have resulted in land speculation and an inflation of real estate prices. An examination of 234 real estate sales in 1968[5] revealed that almost no land within the Epifanio de los Santos circumference was sold for less than P100/m^2 (P10/sq ft) and within a radius of two kilometers of the Luneta the prices ranged from P500 to P5,000/m^2. Outside Epifanio de los Santos highway, land prices ranged from P15 to P100/m^2 for developed land down to a minimum of P3/m^2 for raw land. These prices prohibit further agricultural development within the Study Area. Purchases of small areas, such as right-of-way strips, may result in higher unit prices than normal sales of lots.

Housing

Immigrants. Most of the immigrants arrive without urban living experience. They are generally unprepared to cope with the urban environment when they arrive, despite the fact that they may have temporarily lived in medium-sized cities enroute from their provincial origins to the Metropolitan Area. They are not, for example, accustomed to the high costs of utilities, inter-urban transportation, and rentals. Of the squatters within the Study Area, 93 per cent are immigrants.[6] They are soon ready to accept almost any type of employment, permanent or

casual. It is probably upon this stream of immigrants that the economy depends for its continuing supply of cheap labor and a growing market.

Squatters. In April 1966 there were reported to be 1.1 million squatters and slum dwellers in Metropolitan Manila.[6] Of these, 767,000 were squatters and 335,000 were slum dwellers. The number of squatters has increased at a rate of 15 per cent per year which is three times the rate of population increase of the Study Area as a whole. Squatting and slum dwelling are defined as follows: "Squatting is primarily a legal concept and involves the occupancy of a piece of land or building without the permission of the owner. As a violation of property rights, it is punishable under our laws. Slum dwelling, on the other hand, is more of a socio-economic concept. It is living in homes that are so dilapidated and congested that the condition causes a health, fire, life, and crime hazard not only to those living in the slums but to the whole urban community as well. In Metropolitan Manila, squatting and slum dwelling usually occur together, that is, slums are usually squatter areas and vice-versa".[6]

More pertinent to this study is the difficulty of serving squatter areas with sewers. Many squatter villages are haphazard groupings of roughly built shacks with no access beyond narrow paths or walkways, and no practical sewer rights-of-way. Figure 5-2 shows the location of the largest squatter groups within the Study Area. Squatter areas grow up in any available public or private land and particularly those lands which are near sources of employment that depend upon unskilled labor and which give low pay.[6] The best example of this is in Tondo.

Many squatters have been moved. In 1965 about 13,000 were removed from Intramuros to Sapang Palay in Bulacan Province. In 1969 another large group, estimated at about 10,000 persons, were removed from the park in the Quadrangle District. Also in 1969, a group of about 5,000 were removed from the north side of the South Superhighway in Makati and relocated in Carmona, Cavite Province. A smaller group was evicted from the North Bay Boulevard area in Tondo, Manila, in 1969. There have been no authorized large scale resettlements within the Study Area.

Apartments. There is rapid construction throughout the Study Area of multi-family buildings. Population densities in apartment areas range from 2,000 to 3,000 persons per hectare.

Subdivisions. Figure 5-2 indicates the location of about 110 subdivisions being developed during 1969. Subdivisions already fully developed are included in "residential" land. Approximately 300 subdivisions now exist or are in the process of construction within the Study Area. On the average, the subdivisions are less than 20 hectares and contain 200-300 lots. The cost of the lot usually includes streets, water supply, and drainage but seldom sewers. The normal practice, tolerated by the NWSA, is for each householder to install a septic tank, the effluent of which discharges directly to the storm drainage system.

Subdivisions of various "ages" were studied. For example Project 4 in Quirino, Quezon City, is about 15 years old and the original homes have been considerably modified, resulting in a great increase in population density and land coverage. Project 4 is a middle-income development in which lots range from 150 to 300m^2. Higher-income subdivisions, Phil-Am Life in Quadrangle District, Quezon City or San Lorenzo in Makati, are less dense (80-110 persons per hectare) and are not increasing significantly in density. The peripheral subdivisions, being constructed chiefly in Quezon City, Parañaque, Cainta, and Las Piñas in 1969, generally fall within an economic range between Project 4 and San Lorenzo. The forecasts for these developing subdivisions was based upon the "age growth" characteristics of the older subdivisions nearer the city center. The development of residential neighborhoods (including Project 4) is discussed in the chapter on Population (next article).

While subdivisions and housing projects are the most common forms of conversion of agricultural to urban land, it should be mentioned that another type of urban spread is also occuring. Comparison of aerial photographs taken in 1955 and 1966[a] show the gradual house-by-house encroachment of traditional low and middle class neighborhood into areas of rice paddies and fishponds. This type of spread, more dense than subdivisions, is taking place around the poblaciones (town centers) and barrios of the peripheral Study Area municipalities.

Urban Renewal and Public Housing. The most effective public housing organization during the post war years has been the People's Homesite and Housing Corporation. Established as the People's Homesite Corporation in 1938 it has acquired over 49 km^2 of developable land of which 5 km^2 have been developed as middle income housing projects (80 per cent within the Study Area), 6.5 km^2 have been resold as subdivisions (both inside and outside the Study Area), 10.6 km^2 outside the Study Area have been set aside for squatter relocation, and the remainder has been used for various purposes or is still retained.[7] The chartered purposes of this governmental organization are to provide decent housing for those unable to provide housing for themselves, to eliminate slums, and to provide institutional housing for destitute families. However, because subsidy is "irregular and meager" the projects are mostly self-liquidating and not available to the destitute. On the basis of 10 persons per unit, the PHHC had housed about 130,000 persons within the Study Area[7] by 1966.

Table 5-4 Manufacturing Employment and Value of Gross Output Within the Study Area

Year	Employment	Value of Gross Output (P1000)
1961	124,800	2,198
1962	128,142	2,399
1963	136,800	2,601
1964	142,800	2,800
1965	148,800	2,999
1966	154,800	3,197

Source: Journal of Philippine Statistics, Volume 18, Number 1, January to March, 1967. Bureau of the Census and Statistics.

Industry

Manufacturing Industries. Reported increase of manufacturing payroll is shown on Table 5-4. The average annual employment increase over the 5 years is 4.2 per cent.

Industrial Sites. Figure 13-1 shows the location of industries in 1968 as well as the projected locations of industries in 2010. It should be noted that very few of the industries existing outside the cities of Manila, Navotas, Caloocan, and Pasay in 1968 were there in 1955. Examining 1955 aerial photographs, it was found that there were three factories along the Marikina River, three in the industrial park within the Shaw Boulevard, E. de los Santos area in Mandaluyong-Pasig, none along the South Superhighway (which did not exist in 1955), and none along the Laguna shore. In 1955, the only real geographic indicator of industrial expansion was at Balintawak, Tinajeros, and along A. Bonifacio Avenue south of Balintawak. Thus, the present industrial corridors in the Marikina Valley and the South Superhighway were not at all obvious in 1955. It is felt that once the industrial corridors shown on Figure 13-1 are saturated, industrial expansion will shift to the South Superhighway and North Diversion Road, beyond the Study Area boundary.

Commerce and Trade

Retail Trade. Commercial land use within the Study Area is shown on Figure 5-6. Retail corridors have developed along Rizal Avenue, Quezon Boulevard, Taft Avenue, Buendia, Shaw Boulevard, the Quirino Highway in Parañaque and Las Piñas, and Ortigas Avenue in the Marikina Valley. The 1960 census listed over 42,000 small general merchandise stores within the Study Area. However, most of these small shops were given no more value as wastewater producers than residential areas because, in general, these shops present a commercial front to the main street but actually occupy only a small part of the building in which they are located. It is quite common for the shops to be no more than three or four meters in depth while behind and above the shops are living quarters. Thus, on the Commercial Land Use Map, Figure 5-6, only those areas which are chiefly commercial, or by nature of their water consumption and wastewater produced are significantly different from residential or industrial areas, are shown as commercial.

Fish Marketing. The primary wholesale fish market for the Study Area is in Navotas. Early each morning, the fishing fleet returns from the Bay and transfers the catch to amphibious vehicles which in turn carry the fish to Navotas markets. Other salt water fish are retailed directly from the fishing boats at Bacoor Bay, Parañaque, Rosario and Baclaran.

A new fishing port and wholesale and retail fish market off Cocomo Island in North Manila were being designed under an Asian Development Bank Study in 1969. Proposed transfer and market facilities will probably eliminate the need for the amphibious vehicles in use in Navotas.

Transportation and Tourism

The Port of Manila. The international port is contained within the South Harbor and offers 26 pier berths and 25 protected anchorages within the breakwater. In 1966, construction began on a new international pier in the North Harbor. There are seven piers in the domestic port in the North Harbor. An additional pier and a marine slipway were under construction in 1968-1969.

Manila International Airport. The Manila airport occupies about 600 hectares (1,500 acres) within Pasay City, 8 kilometers south of the center of Manila. The land is valuable but the facility suffers from the problems common to all closed-in metropolitan airports; congested access, approaches which overfly residential zones and limited room for runway extension.

Suggestions have been proposed for building a new international airport in land reclaimed from Manila Bay, possibly in the vicinity of Sangley Naval Air Station in Cavite, leaving the present airport for domestic air service or other development. Non-aviation development might increase wastewater flows in the present airport area.

Railways. Between 18 and 20 trains are scheduled to depart daily from Tutuban Station at Tondo, Manila for northern Luzon and south to Bicol. The Philippine National Railway owns a considerable length of inactive roadbed in the Study Area, almost all of which is occupied by squatters. These abandoned lines are in the Marikina Valley, Mandaluyong, Pasay City, Parañaque, and Las Piñas. Much of the active railroad line right-of-way has also been taken over by squatters in the urban area, though clearance and resettlement was taking place in 1969.

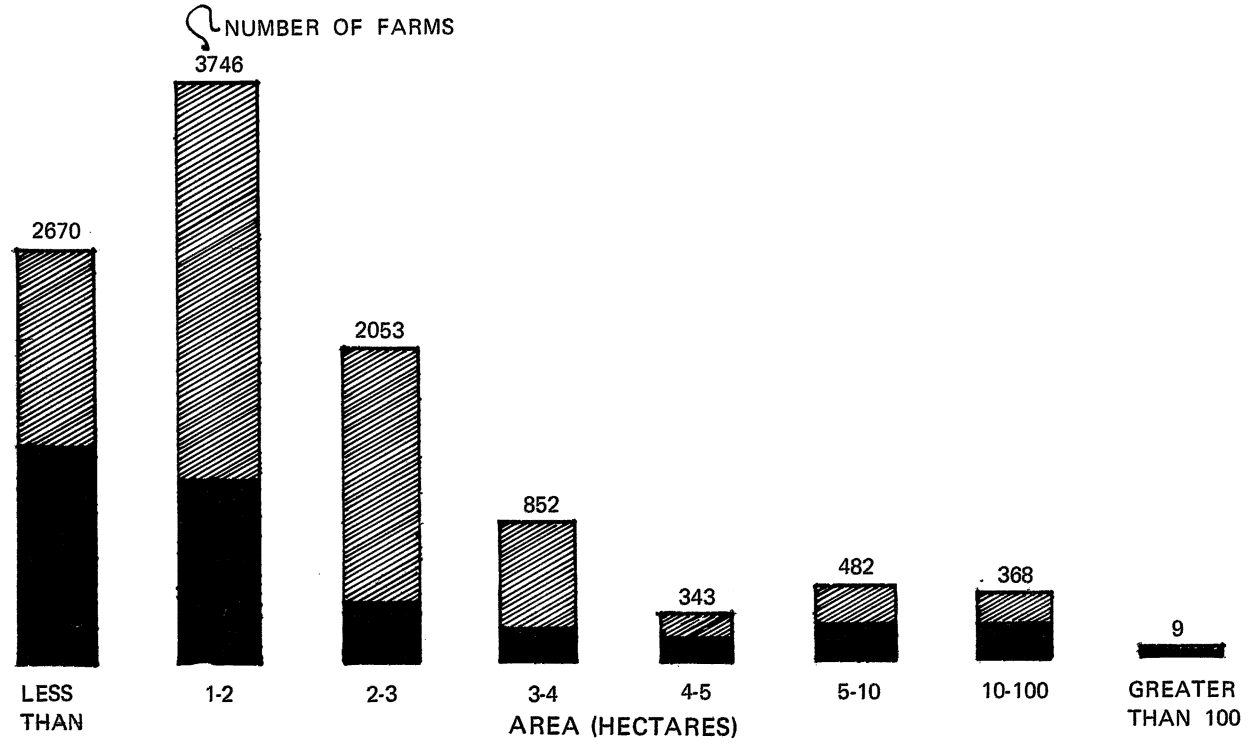

FIGURE 5-9 DISTRIBUTION OF FARMS OF AREA

TOTAL RIZAL PROVINCE – BUREAU OF THE CENSUS 1960. DARK SHADED

The Metropolitan Highway Network. Figure 5-6 shows the location of existing highway arteries and the major highways which have been proposed. In the 1960 census, over 100,000 motor vehicles were registered in the Study Area, increasing to 143,000 in 1965.[8] This is 1 vehicle per 25 persons in 1960 and 1 per 22 persons in 1965. Since there is no unmotorized public transportation (with the exception of horse-drawn carriages and tricycles, the ratio of vehicles to persons will probably increase as the City spreads and the population becomes more mobile.

The highway system is a great influence on the development of new lands both for residential and industrial purposes. It is expected that the opening of the proposed Republic Avenue in Quezon City, which will connect the Capital triangle with the North Diversion Road and Roxas Boulevard extension, will enhance development potential in northern Quezon City, Caloocan, Valenzuela, Malabon, and Navotas. In 1969, concreting of a 3-kilometer four-lane section of the Sumulong (Marikina-Antipolo) Road was completed, and it is expected that development in this direction will follow shortly. A north-south highway in the Marikina Valley is being studied by the Rizal Provincial Engineer. Extension of Roxas Boulevard to the south will hasten development in Las Piñas.

Tourism. Visitor arrivals to the Philippines have increased from 26,000 in 1957 to 102,000 in 1966. Tourist receipts are estimated to have increased from 10.7 million dollars in 1961 to 21.1 million dollars in 1966. First class hotel rooms in 1966 numbered over 2,000 and requirements are estimated to reach 5,200 by 1971.[9]

Utilities

Power. The entire Study Area is served by a single private electric utility, the Manila Electric Company (Meralco). A transmission link for peaking power exists with the National Power Commission hydro network. Meralco's economists estimated electric power demand will increase at a rate of 11.5 per cent per year. All stations listed are oil-fired. In 1962, of all the electric power produced in the Philippines, the Metropolitan Area (Manila plus Rizal) consumed roughly 80 per cent.[10] It is interesting to note that 70 per cent of the Study Area squatters were served by electricity,[6] although few have legal water connections.

Public Transportation. Manila's electric trolley system suffered destruction of its rolling stock in the war and surplus of abandoned jeeps were substituted. The trolley was not replaced, and within five years after the war, the army jeep was modified to carry 8 to 10 passengers; this "jeepney" is relatively expensive, returns a low profit, clogs the streets, and pollutes the air. Buses, which are cheaper to ride and more profitable, have augmented the jeepney routes. Off-highway public interurban transportation has been proposed, but by 1970, none had reached the construction stage.

Agriculture

Figure 5-2 indicates the limits of residential development beyond which the land is chiefly agricultural. Figure 5-9 shows the relative 1960 distribution of agricultural land.

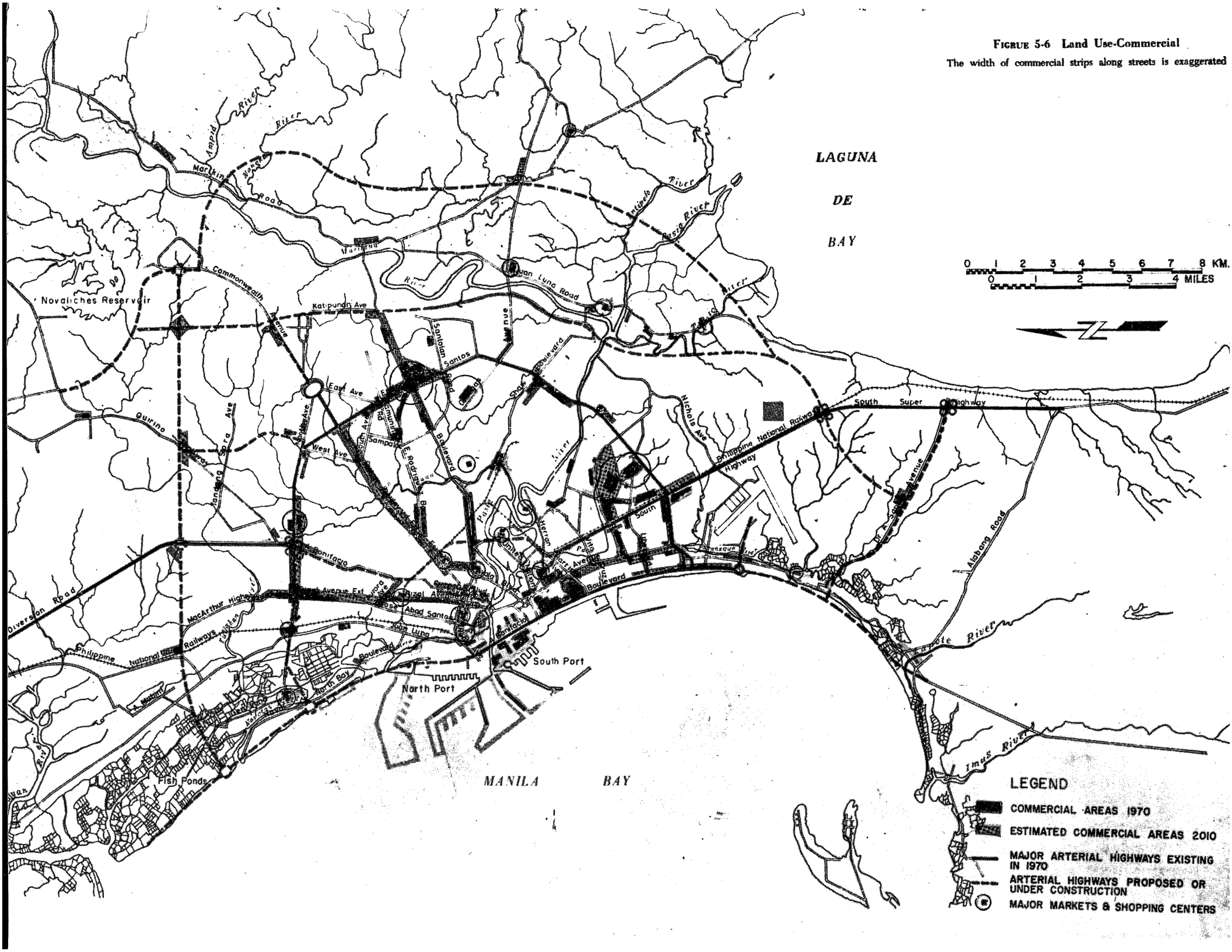

FIGURE 5-6 Land Use-Commercial

The width of commercial strips along streets is exaggerated

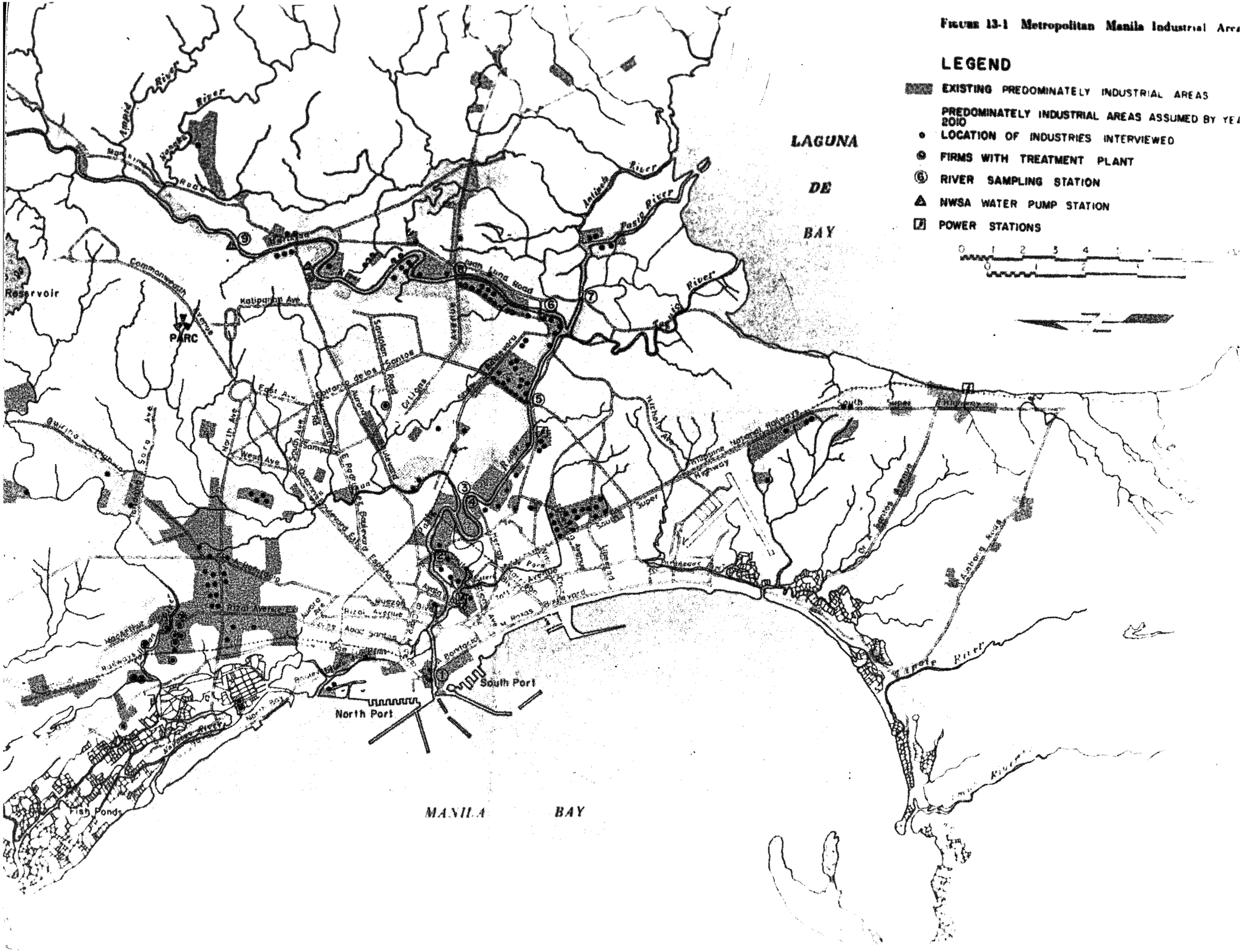

FIGURE 13-1 Metropolitan Manila Industrial Area

Land Use and Land Use Projections

Definitions

Types of Land Use. The various types of land use, listed in Tables 5-6 through 5-13, are listed hereunder:

1. Residential. Residential includes single and multiple family dwellings of all types, squatters, buildings of mixed use in which the non-residential types of use is limited to a "sari-sari" store or shop, and all other types of inhabited structures.

2. Commercial. Included in this category are only those buildings which are purely commercial such as markets, shopping centers, office buildings, warehouses, retail establishments, and the like.

3. Industrial. Industrial land use includes all heavy industry and that light industry to which a significant water use can be attributed. Cottage industries and ground floor family type shops within a residential building are listed as residential.

4. Institutional. Institutional land use includes schools and colleges, most public offices, hospitals, sports stadia, and military bases.

5. Open Spaces. Open spaces include agricultural and vacant lands, public parks, golf courses, cemeteries, airports, and athletic fields.

Population. Populations given in the following basins and sub-areas represent the local contribution to the maximum rate (design) population forecasts for the Study Area. The minimum projections are given in the article on Population.

Land Use Maps

At the outset of this project it was found that no comprehensive land use maps of the Metropolitan Manila area were available. A variety of city and municipal maps were collected. Zoning maps of Manila and Quezon City were obtained and an excellent set of Meralco maps covering almost the entire Study Area at a scale of 1:1,000 were purchased by the NWSA. This set amounted to several hundred separate maps and included virtually every structure within the metropolis. There was no differentiation of the structures shown in the Meralco maps by type or function; however, most non-residential buildings were identified. Aerial photomosaics at a scale of 1:15,000 were prepared for the project. Using these various sources and checking most of the major streets by inspection, a series of land use maps at a scale of 1:10,000 were made. Using these data as a land use basis (identified as "1970 Land Use") and extrapolating the trends listed at the beginning of this chapter, maps of projected 2010 land use were also made at a scale of 1:10,000. The 1970 Land Use map was reduced to a scale of 1:25,000 and submitted to the Institute of Planning of the University of the Philippines and the National Planning Commission for their inspection. A number of suggestions were made by these agencies, particularly with respect to identification of the various types of land use in accordance with their procedures. Steps have been taken by these agencies to arrange for the printing by the Bureau of Technical Surveys and Maps of the resulting maps at a scale of 1:25,000 in a multi-color form for distribution. The general land use data are shown in Figures 5-2, 5-6, and 13-1.

Sub-Areas

The land use characteristics are described by basin and sub-area as shown in Tables 5-6 through 5-13 as "1970 Land Use" Projected data used for system design is labeled "2010 Land Use".

The land use comments which follow are directed not only to trends of industrial and commercial development but also to the factors which may influence population density. The Central Service Area (North and South Manila Basins) is described in somewhat greater detail than the peripheral basins.

North Manila Basin

In this text the North Manila Basin is divided into Manila City Districts with references to sub-areas. Refer to Table 5-6 for land use and population data.

Tondo. This district includes Tondo, Juan Luna, North Harbor, Tutuban, Tayuman, Tecson, and Balut Sub-areas. Tondo is Manila's largest and most populous district. It is predominantly residential, containing families who have lived in Tondo since the Spanish era as well as being the refuge for the City's newest arrivals. Tondo contains the largest slum and squatter concentrations in the Study Area.

Industry is located along the esteros. There is a concentration of sawmills and lumber yards along the Estero de Reina and Estero de Vitas in the Juan Luna sub-area. A group of factories and cold storage plants ring the northern edge of Balut. The PNR depot and switching yards occupy about 40 hectares in Tutuban. The estero de Vitas is zoned for heavy industry, so projected industrial development is concentrated in this area.

The only significant retail commercial areas are the textile markets near C. M. Recto (Tondo sub-area) and Pritil Market (Juan Luna sub-area). Commercial expansion is expected to take place along Juan Luna between these two centers with a simultaneous expansion of the centers themselves. The BPW has programmed warehouse construction along the North Harbor Piers.

Some 278 hectares were added to Tondo during the period 1956-1963 through landfill along the north shore of the Bay. By 1966 about half of the reclaimed area had been occupied by squatters and by 1968 squatters had settled upon virtually all of the

Table 5-6 Land Use Distribution, 1970 and 2010, in the North Manila Basin*

Sub-Area	Year	Area in Hectares						Population
		Residential	Commercial	Industrial	Institutional	Open	Total	
A. Existing North Manila System								
Santa Mesa	1970	18.7	4.5	0.5	0.8	–	24.5	9,800
	2010	10.7	8.5	4.3	1.0	–	24.5	8,400
M. de la Fuente	1970	40.0	2.3	1.0	1.7	–	45.0	21,100
	2010	34.8	4.0	4.2	2.0	–	45.0	27,200
Legarda	1970	167.9	14.4	9.3	38.1	5.3	235.0	71,350
	2010	86.6	42.5	31.3	74.6	–	235.0	68,020
Quiapo	1970	46.8	14.7	1.5	21.6	–	84.6	28,110
	2010	13.5	46.3	2.0	21.6	1.2	84.6	13,440
Rizal Avenue	1970	169.0	7.1	1.6	38.3	10.8	226.8	104,400
	2010	117.4	56.0	4.0	40.4	9.0	226.8	100,640
C. M. Recto	1970	80.7	17.9	8.1	6.9	1.1	114.7	47,030
	2010	50.0	48.0	3.4	13.3	–	114.7	51,230
Juan Luna	1970	49.2	1.3	6.4	3.9	–	60.8	30,650
	2010	27.1	13.5	10.6	9.6	–	60.8	24,640
Tondo	1970	72.2	15.1	4.1	3.9	1.5	96.8	43,770
	2010	24.3	51.7	7.4	11.1	2.3	96.8	43,780
Sub-Total, Existing North Manila System	1970	644.5	77.3	32.5	115.2	18.7	888.2	356,210
	2010	364.4	270.5	67.2	173.6	12.5	888.2	337,300
B. Proposed North Manila System								
10th Avenue	1970	218.3	3.9	15.8	33.3	1.0	272.3	69,400
	2010	158.3	16.7	61.5	34.4	1.3	272.3	110,710
6th Avenue	1970	187.8	1.9	27.0	7.0	39.0	262.7	60,990
	2010	124.2	18.0	111.5	8.8	0.2	262.7	89,000
Maypajo	1970	92.2	1.0	0.6	2.2	54.0	150.0	35,500
	2010	135.4	1.2	8.0	5.4	–	150.0	99,400
Balut	1970	190.4	2.5	3.6	4.4	14.5	215.4	99,400
	2010	152.8	9.7	42.4	10.4	0.1	215.4	127,800
Tecson	1970	78.0	0.8	2.3	7.5	–	88.6	48,900
	2010	52.8	3.5	15.2	16.4	1.0	88.6	47,530
Tayuman	1970	140.5	2.1	11.6	13.9	–	168.1	87,645
	2010	102.4	14.4	32.4	18.4	–	168.1	92,710
Tutuban	1970	18.0	–	13.0	–	–	31.0	11,200
	2010	14.4	–	16.6	–	–	31.0	13,100
North Harbor	1970	192.0	2.8	27.2	11.7	2.0	235.7	120,060
	2010	173.5	63.4	39.7	10.5	1.1	288.2	157,840
Cemetery						129.0	129.0	
Sub-Total, Proposed North Manila System	1970	1,117.2	15.0	101.1	80.0	239.5	1,552.8	533,005
	2010	913.8	126.9	327.8	104.3	132.7	1,605.5	738,170
La Loma	1970	165.2	4.0	3.1	20.5	7.2	200.0	68,500
	2010	142.3	27.7	4.7	20.0	5.3	200.0	81,200
P. Leoncio	1970	62.5	0.1	1.7	1.7	0	66.0	24,000
	2010	42.2	19.0	1.9	2.9	0	66.0	33,100
C. Proposed Sampaloc System								
Galas	1970	150.5	1.5	1.5	5.4	0.1	159.0	64,400
	2010	135.7	11.5	3.2	8.6	0	159.0	81,500

Table 5-6 (cont.)

Constancia	1970	45.5	0.2	0.3	1.7	0	47.7	24,000
	2010	42.9	3.5	0.1	1.2	0	47.7	33,630
Balic-Balic	1970	97.0	0	0	1.0	0	98.0	51,100
	2010	94.2	2.3	0	1.5	0	98.0	73,800
Nagtahan	1970	10.1	0.6	2.3	0.8	0.2	14.0	11,400
	2010	6.3	1.1	4.3	2.0	0.3	14.0	4,600
Bacood	1970	107.2	0.1	6.8	3.6	0.9	118.6	56,400
	2010	67.3	0	38.7	12.6	0	118.6	52,700
Sub-Total, Proposed	1970	638.0	6.5	15.7	34.7	8.4	703.3	299,800
Sampaloc System	2010	530.9	65.1	52.9	48.8	5.6	703.3	360,000
Total, North Manila Basin	1970	2,399.7	98.8	149.3	229.9	266.6	3,144.3	1,189,015
	2010	1,809.1	462.5	447.9	326.7	150.8	3,197.0‡	1,436,070

* *Shown on sewerage system basis.*
‡ *Includes Landfill.*

open land. Thus, population growth in Tondo, which had shown signs of levelling off in 1960, has increased. Several factors which may dampen the Tondo population increase rate are:

1. Single family, one and two storey house construction which limit population density.

2. BPW proposals for the north foreshore which would occupy potential residential land, e.g. bodegas (warehouses) and storage yards for the North Harbor, the extension of Roxas Boulevard, Fishermen's Pier, possibly expansion of the city dump, and the construction of Pier 16 and the marine slipway and their attendant appurtenances such as access roads and warehouses.

3. Possible slum and squatter clearance programs and neighborhood improvement which limit the congestion.

Thus, the higher population projection assumed the continued influx of squatters and a minimum of public works improvements whereas the lower projection assumed the reverse in both cases.

Sampaloc. Sampaloc includes all or part of the sub-areas of La Loma, Leoncio, Galas, Constancia, M. de la Fuente, Balic-Balic, Santa Mesa, Bacood and Nagtahan. Second only to Tondo in both area and population, Sampaloc is also primarily a residential district. By 1960 nearly all available land had been developed.

Sampaloc's growth rate decreased between 1948 and 1960 and most of the district has reached a saturation condition with respect to the type of residences now extant. Much greater densities are not anticipated. If multi-storey apartments are to be built it would be more reasonable to expect that they would be located in other districts, except where slum clearance might be undertaken.

The southwest corner of Sampaloc contains not less than eleven colleges and universities including three of the largest, Far Eastern University, University of the East, and the University of Santo Tomas. At least another 13 colleges and universities are located in the immediately adjacent districts. The enrolments of these institutions approach 200,000 and, although many of the students live at home in various parts of the City, there are a great number of boarding houses in Sampaloc and Santa Cruz. Since it is unlikely that the colleges will move from their downtown locations it is reasonable to expect that the boarding student population will remain high within this zone for years to come. It may be that some low rental apartments will be erected but unless they are very large indeed, they are unlikely to bring about greater densities. The population projections assume at most only a moderate increase in population.

Industries are grouped along the Pasig River and retail commerce along Magsaysay Boulevard, G. Tuazon, Earnshaw, and España. Little change is anticipated other than a consolidation of this pattern.

Santa Cruz. Santa Cruz includes Rizal Avenue and parts of Quiapo and C. M. Recto sub-areas. Stretching for 5 kilometers from the Pasig River to the north City boundary and yet averaging only 800 meters in width, the Santa Cruz district bisects the northern half of Manila and contains a variety of land use features.

Adjoining the river is the Echague district which includes office buildings, colleges, Quinta Market, and mixed residential-commercial structures of two to seven floors. Since 1948 there has been migration from this district as new buildings are constructed for office rental. This trend is expected to continue.

The Quiapo sub-area is an area of intense commercial activity and light industry. This area is bisected by Rizal Avenue which is lined with cinemas, restaurants, and shops. This highly commercial activity is duplicated on Quezon Boulevard, 300 meters east. Again, the upper floors in this area are frequently occupied by apartments although the trend is to offices and restaurants.

Continuing north of C.M. Recto, Rizal Avenue remains as the hub of commercial activity and both sides of the street are occupied by major department and especialty stores. However, off Rizal Avenue, the character of development is almost entirely residential, consisting of accessorias (row houses), individual homes (some of which are boarding houses), and some multi-storey apartment buildings. San Lazaro Hospital and the San Lazaro Race Course occupy about 10 hectares each. The dense residential character of the area continues up to the Chinese and La Loma Cemeteries which are the northern boundary of the district.

It is expected that both multi-storey apartment and commercial-office construction will prevail during the study period. From a population point of view these two types of land uses are generally off-setting and the preponderance of one over the other makes the difference between the high and low projections. Three new cinemas were constructed in the Quiapo sub-area in 1968-1969 indicating that the thriving entertainment activity is expected to continue.

San Nicolas. Although zoned for heavy and light industry, San Nicolas, which includes parts of Tondo and North Harbor sub-areas, contains a dense residential population located particularly between San Fernando and C.M. Recto. Divisoria Market and its peripheral shops are in the northeast corner of the district. Squatters have moved into the Del Pan area.

A glass factory, ice plant, and rope factory are the major industries. At least seven full blocks are occupied by warehouses. The resident population has occupied some buildings which were once commercial.

The population projections assume a decline in population more or less in conformity with the observed 1948-1960 decline during which there was an 18 per cent decrease from the 1948 population. The living conditions are crowded, water pressure is low, and sewers exist but wastewater is much in evidence in the gutters. The buildings are old, many dating from the Spanish era, and the streets are crowded and frequently flooded.

Binondo. This includes parts of Tondo, Quiapo, and C.M. Recto sub-areas. The key activities in Binondo are commerce and light industry. Escolta, Dasmariñas, Ongpin, Soler, and Juan Luna streets contain the offices and shops for which this district is known. The upper floors of the buildings are more often than not occupied by apartments, and quite a large number of new, multi-storey apartments have been constructed along the Estero de la Reina, most of which are of the condominium type.

The vast number of Chinese enterprises in Binondo will remain for many years to come, and changes in the area will probably be gradual. At the present time the market is extremely active.

The higher rate population projection assumes a continued construction of apartments. The lower rate projection assumes the continued high rate of commerce and improvement of marketing facilities and commercial and industrial structures.

San Miguel. San Miguel is part of the Legarda sub-area. Malacañang Palace, the President's residence, a brewery and yeast plant dominate the middle quarter of the San Miguel river front. Factories and bodegas extend from the San Miguel Church to the Quezon Bridge and are interspersed with crowded, rundown apartments. The area surrounding Malacañang Palace and extending north to Concepcion de Aguila contains colleges and student apartments.

The west portion of the district, which is between the Estero de San Miguel and the Pasig River west of the church, is a commercial-industrial area and contains a considerable number of deteriorating apartments, accessorias, and houses.

The population declined between 1948-1960 and this trend is expected to continue but at a reduced rate. The expansion of institutional land use is projected.

Quiapo. Parts of Legarda and Quiapo sub-areas are included. To zone Quiapo as "light industrial" as it is presently classified, is not indicative of its character. There are a number of light industries such as furniture, dressmaking and auto repair, but the area is essentially commercial, institutional, and residential. Quezon Boulevard, Rizal Avenue, Raon, Bilibid Viejo, Echague, and Hidalgo are heavily commercial streets. But the "minor" streets are purely residential and contain concentrations of four and five storey buildings which contribute to a high density of population. It is estimated that there will be a certain amount of improvement in the shops, new buildings for shops and offices, and apartment construction similar to that in Binondo.

The higher population projection for the Study Area district assumes no population increase and the low projection indicates a slight decline. The existing gross district density of 400 persons per hectare is considered too high to be maintained in the future unless bolstered by the construction of more apartments. Commerce is expected to expand.

Caloocan City. Caloocan is divided into two parts: the north part which is outside the Study Area, and the south part which is almost entirely included within the North Manila Basin and includes the sub-areas of 10th Avenue, 6th Avenue, and Maypajo.

There is an industrial concentration extending an average of 300 meters each side of Rizal Avenue and almost 2 kilometers from North to South. The rate of industrial expansion has decreased in the sixties and it is felt that new industrial development will consist mainly of improvement of existing industries rather than immigration of new industries.

Table 5-7 Land Use Distribution, 1970 and 2010, in the South Manila Basin*

Sub-Area	Year	Area in Hectares						Population
		Residential	Commercial	Industrial	Institutional	Open	Total	
A. Existing South Manila System								
Intramuros	1970	10.0	40.0	5.0	30.0	124.0	209.0	3,000
	2010	18.0	108.0	13.0	35.0	35.0	209.0	18,000
Ermita	1970	50.5	24.0	3.0	92.5	82.0	252.0	19,500
	2010	33.1	35.8	7.3	101.7	74.1	252.0	25,600
Malate	1970	173.5	12.4	0.2	34.0	11.5	231.6	66,800
	2010	116.6	38.0	0.2	62.4	14.4	231.6	89,200
Paco West	1970	22.0	5.5	6.0	2.0	1.0	36.5	8,900
	2010	9.0	12.0	7.0	7.5	1.0	36.5	6,000
Sub-Total, Existing South Manila System	1970	256.0	81.9	14.2	158.5	218.5	729.1	98,200
	2010	176.7	193.8	27.5	206.6	124.5	729.1	138,800
B. Proposed South Superhighway System								
Bangkal	1970	156.2	1.3	2.0	0.7	1.5	161.7	48,000
	2010	127.5	31.2	2.3	0.7	–	161.7	69,300
San Isidro	1970	94.3	0.7	5.6	0.3	2.6	103.5	29,200
	2010	75.8	14.0	10.2	3.5	–	103.5	41,900
Buendia	1970	267.2	12.0	13.9	2.0	76.5	371.6	15,800
	2010	280.0	56.5	19.4	8.2	7.5	371.6	34,900
Vito Cruz Extension	1970	93.2	0.9	8.4	0.3	23.8	126.6	32,200
	2010	87.3	1.5	14.7	0.6	22.5	126.6	47,300
Zobel Roxas	1970	88.7	2.6	3.6	3.4	0.1	98.4	34,600
	2010	82.5	3.7	7.7	4.4	0.1	98.4	48,800
Estrada	1970	35.2	–	–	0.2	–	35.4	14,300
	2010	35.2	–	–	0.2	–	35.4	23,300
Harrison	1970	79.8	1.0	–	–	–	80.8	31,400
	2010	77.8	3.0	–	–	–	80.8	56,700
Concordia	1970	46.5	3.1	3.5	0.2	8.0	61.3	18,800
	2010	50.4	4.6	5.6	0.7	–	61.3	33,400
Otis	1970	75.0	9.2	37.0	8.2	14.3	143.7	30,400
	2010	52.7	19.0	55.0	9.0	8.0	143.7	34,900
Jesus	1970	48.0	–	45.0	0.2	5.1	98.3	19,500
	2010	36.8	0.5	60.0	1.0	–	98.3	24,400
Paco East	1970	50.9	0.5	3.0	2.5	–	56.9	20,600
	2010	42.9	7.0	3.0	4.0	–	56.9	28,300
Francisco	1970	143.8	3.0	4.8	3.3	8.0	162.9	58,200
	2010	117.3	17.5	15.0	13.1	–	162.9	77,600
Sub-Total, Proposed South Superhighway System	1970	1,178.8	34.3	126.8	21.3	139.9	1,501.1	353,000
	2010	1,066.2	158.5	192.9	45.4	38.1	1,501.1	520,800
C. Proposed Pasay System								
San Rafael	1970	103.6	2.6	1.5	13.7	3.8	125.2	31,580
	2010	65.6	30.7	2.0	26.9	–	125.2	46,000
San Isidro	1970	36.6	3.0	1.0	2.0	–	42.6	11,120
	2010	31.5	8.1	1.0	2.0	–	42.6	22,000
San Jose	1970	107.0	6.3	5.0	4.0	1.0	123.3	32,620
	2010	66.6	41.6	5.0	9.1	1.0	123.3	46,800
Santa Clara	1970	130.0	4.0	2.0	8.0	2.0	146.0	39,650
	2010	103.6	30.9	2.5	9.0	–	146.0	71,200
San Roque	1970	66.5	1.0	2.0	0.6	4.0	74.1	20,250
	2010	59.2	11.8	2.1	1.0	–	74.1	38,800
Sub-Total, Proposed Pasay System	1970	443.7	16.9	11.5	28.3	10.8	511.2	135,220
	2010	326.5	123.1	12.6	48.0	1.0	511.2	224,800

D. Proposed Roxas System (Second Stage)								
Bonifacio	1970	90.0	2.0	–	42.0	333.8	467.8	6,100
	2010	285.0	20.0	–	149.0	13.8	467.8	64,000
Ayala	1970	372.0	67.1	15.5	12.1	170.6	637.3	22,200
	2010	417.5	172.1	19.8	12.9	15.0	637.3	52,100
MIA-Nichols	1970	88.8	2.5	0.2	1.5	107.0	200.0	10,000
	2010	121.4	28.0	0.6	20.0	30.0	200.0	18,000
Malibay	1970	48.8	–	0.3	0.1	6.8	56.0	14,800
	2010	39.3	2.8	12.8	0.2	0.8	56.0	27,500
Land Fill	1970	–	–	–				
	2010	100.0	35.0	–	65.0	10.0	210.0	42,000
Maricaban	1970	11.5	–	–	30.0	131.2	172.7	800
	2010	59.5	–	–	102.0	11.2	172.7	13,200
Sub-Total, Proposed Roxas System	1970	611.1	71.6	16.0	85.7	749.4	1,533.8	54,000
	2010	1,022.7	257.9	33.3	349.1	80.8	1,743.8	214,900
Punta, Santa Ana (Second Stage)	1970	34.9	2.5	7.7	4.2	46.0	95.3	14,100
	2010	9.3	4.0	8.3	36.7	37.0	95.3	6,100
Total, South Manila Basin	1970	2,524.5	207.2	176.2	298.0	1,164.6	4,370.5	654,520
	2010	2,601.4	737.3	274.6	685.8	281.4	4,580.5	1,105,400

**Shown on sewerage system basis.*

Commercial activity exists along Rizal Avenue and Samson Road (E. de los Santos) with a concentration of shops, banks and other commercial activities surrounding the Monumento Rotunda. These are typical "commercial belt" retail stores in all cases, because Caloocan had become urbanized prior to the suburban shopping center age. The north edge of the basin includes part of the University of the East and Manila Central University compound in Portrero.

These industry-commerce-school activities make Caloocan somewhat self-sufficient economically. There are, of course, many commuters who work in Manila, but the Caloocan labor force is fairly well in balance with local labor opportunity. Thus, an orderly growth in Caloocan is expected in the future, with an increase in apartment construction as the population grows.

Squatters occupy the creek valley and railroad right-of-way and the hillside west of A. Mabini. There has been a gradual encroachment onto the fishponds (Maypajo, for example, is reclaimed land). It is felt that the fishponds probably will be developed as subdivisions or industrial sites.

South Manila Basin

Land use characteristics are listed in Table 5-7.

Intramuros. This district was practically destroyed in 1945 during the Battle of Manila. Republic Act No. 1818, of 22 June 1957 declared it a commercial, residential, and educational district and this zoning act has generally been adhered to. About 40 hectares are occupied by high-rise office buildings and 30 hectares are in schools. Almost 90 hectares were still vacant in 1969.

The higher population forecast assumes construction of high-rise apartments in part of the vacant land and the lower forecast assumes more emphasis on continued office building and university construction. Fort Santiago has become an attractive national park and museum. Its landscaping may influence other portions of the district, particularly as it is within the so called "tourist belt". A few pre-war two-storey apartments remain.

Ermita. The higher population projection is based upon continued construction of apartments and hotels and a levelling off of institutional and government constructions as government activity gradually moves to the proclaimed national capital in Quezon City.

Recent zoning has encouraged the establishment of retail commerce. Many stores in this district are tourist oriented. Ermita is projected to remain a high class commercial and institutional area. It is not likely that existing institutions such as the Philippine General Hospital, various branches of U.P., and government offices will expand here. More likely is the expansion of private offices and hotels. During 1966-1970 five high-rise buildings were constructed along Roxas Boulevard in Ermita and Malate.

The population forecast assumes continued commercial expansion (retail stores and restaurants) and private office construction. The triangle bounded by Herran, General Luna, and Taft Avenue, now residential, may gradually be replaced by hospitals, schools, colleges, and shops.

Port Area. This is part of Intramuros Sub-area. The Port Area was reclaimed from the Bay in about 1910. This area with its five large piers has been the international shipping terminal. About 40 hectares

are occupied by warehouses. The Bureaus of Customs, Public Works and Communications, Printing, Public Highways and the National Power Corporation and other governmental and quasi-governmental entities hold office here. However, private commercial firms are the largest segment, generally comprising shippers and importers. A large steel fabricating company and government shipyard are the major industries.

Some private companies moved out of the Port Area in the late 1960's. With the completion of the new international harbor in the North Port Area anticipated in the early 1970's there is the possibility that some customs divisions and brokerage firms may also move. There were several empty lots in 1968 and, without proper control, there is the possibility that the South Port Area could become a squatter's haven. For sewerage projections the area was assumed to remain highly commercial.

Pandacan. This district includes portions of Sub-areas of Otis, Jesus, and Concordia. The district of Pandacan is shaped by the Estero de Pandacan into a figure eight. The north loop is almost completely industrialized whereas the south loop is largely residential. Joining the two loops is the Pandacan market, a church, and St. Joseph High School.

The north loop, bordering the Pasig River and served by the railroad, is expected to remain industrial chiefly because of the large oil company investments in the Jesus sub-area. The one residential area within the north loop, Barrio Obrero, may eventually be occupied by industries.

The south loop contains the Barangay Housing Development, 17 low-rent, 3-floor apartment buildings which were built 15 years ago. A great number of squatters have penetrated Pandacan and now occupy a large part of the south loop; many of these will be displaced by the new South Superhighway extension.

Both maximum and minimum population forecasts for the Pandacan district assume a general overall maintenance of the status quo. The only change expected is a gradual expansion of the industrial zone.

Santa Ana. Sub-areas of Concordia, Congressman Francisco, Punta, and Zobel Roxas are included. Santa Ana is the only district of Manila which is located on both sides of the Pasig River. While containing large industrial tracts along the river, extensive commercial areas, and residential land of all classes, Santa Ana has also suffered a great infusion of squatters in recent years. The squatter shacks line the Estero Tripa de Gallina and Estero Concordia and occupy a large part of the Francisco sub-area between Pasig Line and Calle Onyx (particularly the areas originally reserved for schools), and line both sides of the South Superhighway.

Within the curve of the river (Punta) are three large industries and crowded residential districts, mostly of squatter or slum character. In Punta is also located a seven-floor tenement apartment. This structure houses some 4,500 persons within a tract of land of about 3 hectares. It should be noted that the net density achieved at the Punta tenement might be realized on a large scale if a subsidized tenement development were to be constructed, as has been proposed by the PHHC.

The Santa Ana population projections presume a continued influx of squatters until 1980. Simultaneously, existing squatter areas will improve as streets are dedicated and paved, water and sewerage provided, and houses improved and rebuilt. The years beyond 1980 are expected to see some improvements in public housing and possible vertical expansion. The Punta area will probably become even more industrialized. The difference between the maximum and minimum projections is the degree of control of squatters; the rate of construction of public, multi-storey housing; and the rate of industrialization.

Malate. Split into quarters by Taft Avenue and Harrison Bouelvard, Malate is generally composed of residential dwellings of two and three storeys. The southwest quarter contains the Philippine Navy Headquarters, the Manila City Hospital, the Manila Zoo, the Rizal Sports Stadium complex, and de la Salle College.

Shops, hotels, and residences occupy the northwest quarter. An increase in commercial activity, particularly hotels, is expected along the Roxas Boulevard shore front and the adjacent streets. New high-rise office buildings (such as the Magsaysay Center) are being constructed along Roxas Boulevard and such structures containing apartments and condominiums would account for some increase in population density compensating for the replacement of domestic residences by office buildings and institutions.

The two east quarters are more dense residential areas. Little change is anticipated beyond the encroachment of commercial establishments in the streets adjacent to Taft Avenue, Harrison Boulevard, and San Andres. A slum exists upon PNR land between Harrison Boulevard, San Andres, and the South Superhighway.

The difference between the higher and lower rates of growth forecast in Malate is based upon the possible rate of commerical expansion which will take over residential land as contrasted with increased numbers of squatters and apartment development.

Paco. Paco and Otis are the sub-areas. Paco contains almost every type of development which can be found within Manila; industries in the northeast corner, schools and colleges in the northwest corner,

a commercial belt along the center (Oregon Street, Gen. Luna and Josefa Escoda Llanes) and residences in the south.

Paco is expected to maintain its moderate growth rate for at least five years before levelling off. A few small areas are still vacant and, being near squatter settlements, may be appropriated by squatters. There is moderate apartment construction which may accelerate between 1975-1985. Maximum population growth estimates reflect a gradual increase; minimum estimates show no gain.

Pasay City. This contains the sub-areas of San Isidro, Santa Clara, San Roque, San Rafael, and Nichols. Pasay is chiefly residential with commerce limited to two principal parallel belts, Roxas Boulevard and Taft Avenue. Libertad Avenue, perpendicular to Taft and Roxas, is also lined with shops and its intersection with Taft Avenue is the major market and retail center.

The residences in general improve in quality from east to west, squatters occupy the estero bed along the eastern side, middle to high quality homes are located in the center, and high quality residences, embassies, and hotels are found west of F.B. Harrison. The valuable land bordering Roxas Boulevard is occupied by entertainment buildings, hotels, mansions, and institutional buildings.

High-rise construction portends a continued improvement in quality along the Bay front. This strip was projected to contain additional hotels and office buildings in the future. It is also anticipated that Taft Avenue will see addtional hotels and office buildings in the future. It is also expected that there will be additional multi-storey high quality construction along Taft Avenue and by 1990 it will contain a continuous commercial frontage from Malate to Baclaran.

The 200 hectares programmed landfill along the Bay (also known as the Stonehill development) has been stopped in the courts as an infringement upon a national wild life preserve. However, it is anticipated that this landfill will be developed during the next several decades. It is likely to be chiefly residential, and the proposed second stage Roxas system is sized to carry the wastes from this area.

At Nichols Air Base, the Philippine Air Force maintained about 8,000 personnel (including dependents) in 1968. The base contains the PAF Chief of Air Staff's headquarters and auxiliary staff functions, PAF Comptroller, Procurement, and Auditor General Staffs, a Troop Carrier Squadron, a Rescue Squadron (Helicopter), Presidential air facilities, and others. The command functions will likely be kept in the Manila Area, even if the operational units are dispersed. The maximum population projection assumes this base will grow as the staffs are enlarged and the housing density will increase. The lower forecast assumes that the base (Nichols Sub-area) will be maintained at about its present level. Design of sewerage works was based upon the high forecast; however, since these works are part of the proposed second stage construction (Roxas system) this development can be reevaluated and the design modified if it appears that wastewater quantities will be significantly less than anticipated.

Makati. The sub-areas of Zobel Roxas, Vito Cruz, Buendia, San Isidro, Bangkal, and Ayala are included. Retail commerce in Makati is concentrated within the Makati Commercial Center and the South (Magallanes Village) Shopping Center, and along Pasong Tamo, Buendia, and Makati Avenue. Multi-storey office buildings are located along Ayala and Makati Avenue and wholesale distributors and bodegas on Pasong Tamo Extension.

The Makati (Ayala) commercial and residential development is the largest and most modern integrated planned community in the metropolis. By 1970 the high-quality "villages" of the Ayala Corporation were becoming saturated. San Isidro and Bangkal sub-areas were about 70 per cent occupied.

Continued office building construction is anticipated in the Ayala Avenue area with this area projected to contain the most dense concentration of office space in the Study Area, mainly because of its vertical character and desirable controlled zoning features. A strip of multi-storey apartments is planned on the east side of Ayala Avenue between Makati Avenue and E. de los Santos.

Continued construction of accessoria type apartments in San Isidro and Bangkal is projected to greatly increase population density there.

Fort Bonifacio. This contains Bonifacio and Maricaban sub-areas. Fort Bonifacio houses the headquarters of the Chief of Staff, Philippine Army, and other staff functions. Within the Maricaban sub-area (along Nichols Road) are medical and dental units. Two memorial military cemeteries are partially included within the South Manila Basin.

As at Nichols, the future of Fort Bonifacio is uncertain. The 1,100 hectares portion south of Nichols Road was relatively valueless in 1950. Then, a section was opened for settlement and a seven storey tenement was constructed. The tenement was the first part of a PHHC plan which was eventually to house over 100,000 persons. However, in 1969, this housing scheme was apparently abandoned and construction of the 100 hectares Greater Manila (South) Terminal Food Market was begun. During the 1960's the South Superhighway was extended to Alabang and the land became immensely valuable. Because of political considerations it is difficult to assess with respect to future development. Still, it seems certain that the land will be developed within the 1970-1980 decade, and the development will likely be of a

Table 5-8 Land Use Distribution, 1970 and 2010, in the Parañaque Basin

Sub-Area	Year	Area in Hectares						Population
		Residential	Commercial	Industrial	Institutional	Open	Total	
Baclaran	1970	152.0	4.0	8.0	8.0	–	172.0	59,800
	2010	107.0	26.0	20.0	19.0	–	172.0	53,500
San Dionisio	1970	145.5	4.0	5.5	16.0	32.0	203.0	33,300
	2010	137.0	33.0	7.0	21.0	5.0	203.0	68,500
Zapote	1970	115.0	2.0	22.0	5.0	377.0	521.0	15,800
	2010	400.0	22.0	56.0	8.0	35.0	521.0	178,200
Highway 1	1970	226.0	–	26.0	1.0	1,045.0	1,298.0	5,960
	2010	1,021.0	72.5	92.5	38.0	74.0	1,298.0	411,900
Manuyo	1970	25.0	–	0.5	–	456.5	482.0	600
	2010	417.0	30.0	4.0	4.0	27.0	482.0	167,800
Sucat	1970	54.0	–	67.0	–	1,839.0	1,960.0	1,300
	2010	1,594.5	87.0	110.0	45.5	123.0	1,960.0	516,800
La Huerta	1970	85.0	0.5	34.0	0.5	1,565.0	1,685.0	10,500
	2010	1,417.5	45.0	99.0	19.5	104.0	1,685.0	419,000
Nichols	1970	175.0	11.0	0.5	2.0	637.5	826.0	18,000
	2010	396.0	82.0	9.0	81.0	258.0	826.0	120,800
T o t a l	1970	957.5	21.5	163.5	32.5	5,972.0	7,147.0	145,320
	2010	5,490.0	397.5	397.5	236.0	626.0	7,147.0	1,936,500

non-military character. The high population projection assumes that the development will be residential, the low projection assumes a slower development devoted to institutional, warehouse, and industrial uses.

Parañaque Basin

The Parañaque Basin includes Parañaque and parts of Las Piñas, MIA and Fort Bonifacio and is divided into the eight sub-areas shown in Figure 5-10. The land use characteristics are listed by sub-area in Table 5-8.

The towns of Parañaque and Las Piñas have existed for years as strips of development along the bayshore. Parañaque grew rapidly between 1900 and 1920 as Pasay expanded towards it along the Bay front. However, it ceased to develop after 1920 because the bayshore portion was becoming saturated and the inland portion (which is 90 per cent of its area) was relatively inaccessible. Then, after 1950, first the Sucat Road and then the South Superhighway were constructed, and by 1969, inland Parañaque was being very rapidly developed. Las Piñas, being further from the metropolis, followed Parañaque expansion after the war. By 1969 both communities were being rapidly filled with subdivisions and the original seacost towns had reached a population density approximating that of Manila itself.

More than 40 factories were built along the South Superhighway between 1959 and 1968. In 1969 another 17 were under construction. Four had been built along the Sucat Road by 1968, and 18 along the Zapote-Alabang Road.

By 1969, there were no provisions for cheap housing near the industries although the many subdivisions offered plentiful middle class housing. Thus, it is anticipated that the industrial growth will be accompanied by a growth of the barrios of Alabang, Bule, Sucat, Bagumbayan, and Bicutan along the Laguna coast as well as within the original towns of Parañaque and Las Piñas as these are apparently the only low cost housing areas.

The higher population projection assumes that industry will be limited to a strip approximately 500 meters wide along the major highways and that the "interior" land will be entirely residential subdivisions, increasing in density from north to south. This projection assumes that this area will be one of the largest exclusively residential centers of the metropolis. On the other hand, off-highway industrial expansion would limit residential development resulting in a lower population. In either case, wastewater disposal will be a major problem in this area within the 1970-1980 decade.

Malabon Basin

The Malabon basin stretches across the northern edge of the Study Area. It includes the catchment of the Tuliahan River and a large fishpond area on the coastal plain. Land use characteristics of the 11 sub-areas are described in Table 5-9. It is an area of

great diversity, opening to subdivision development in the hills within Quezon City, and developing more slowly along the coast.

The Quezon City uplands are ideal homesites. During the 1960's, raw land was being sold for P5 to P15/m^2. By 1970 large estates were no longer obtainable and land was either being held for subdivision development or sold as lots. Novaliches town experienced a more gradual development during the decade and a number of industries were established on the upper Tuliahan River. The sub-areas of California Village, Santa Monica, Quigrande and Constitution Hill are accessible by two highways. The urbanization of these areas is expected to be completed by 1990.

Both Malabon and Navotas are old towns. In 1903 they were the largest towns in Rizal Province. However, as the Metropolitan Area developed, these conservative towns did not keep pace. There are no modern streets, minimum enforcement of zoning, and little control of squatters. Both towns are barely above sea level and are surrounded by fishponds. Landfill to reclaim ponds is expensive but since most of all the ponds still return a profit, expansion has been contained within the settled area, and more in the case of Navotas than Malabon, this has led to construction of shacks and squatter houses.

One of the largest Study Area industrial concentrations is in Tinajeros and room for expansion, above the flood level, still existed in 1969. However, Tinajeros is expected to be saturated by 1975 and new industry will probably settle in the north along the McArthur Highway.

Future expansion of Navotas and Malabon will depend upon highway and flood control construction. If Roxas Boulevard is extended to meet the proposed Republic Avenue at Navotas, it is unlikely that this area will be able to resist expansion and the fishponds will probably be filled at a fast pace. A third highway, the extension of E. de los Santos to the Bay, would have the same effect. So much hinges upon these uncertainties that there is a wide range in the population projections.

Table 5-9 Land Use Distribution, 1970 and 2010, in the Malabon Basin

Sub-Area	Year	Area in Hectare						Population
		Residential	Commercial	Industrial	Institutional	Open	Total	
Constitution Hill	1970	57.0	–	8.5	2.0	1,516.0	1,583.5	20,800
	2010	1,297.0	33.9	44.5	79.0	129.1	1,583.5	558,600
Santa Monica	1970	49.3	2.3	20.3	7.2	616.8	695.9	17,700
	2010	570.2	30.3	49.2	10.4	35.8	695.9	226,900
California Village	1970	91.2	–	41.3	2.5	513.2	648.2	32,800
	2010	487.0	14.2	63.7	4.1	79.2	648.2	210,900
Quigrande	1970	43.1	0.8	14.2	3.0	437.5	498.6	12,300
	2010	412.1	6.4	39.9	5.6	34.6	498.6	172,100
Torres Bugallon	1970	183.5	1.9	15.7	99.7	200.1	500.9	33,400
	2010	349.1	5.0	31.7	104.3	10.8	500.9	148,500
Tinajeros	1970	460.9	4.3	146.9	7.7	249.9	869.7	92,900
	2010	634.8	17.1	176.5	8.9	32.4	869.7	294,400
Hulong Duhat	1970	107.3	0.7	2.3	0.8	274.2	385.3	25,700
	2010	284.3	7.0	27.1	2.9	64.0	385.3	135,500
North Navotas	1970	26.5	–	–	0.8	692.7	720.0	10,300
	2010	464.6	18.9	43.5	4.8	361.3	893.1	219,400
South Seaside	1970	204.8	2.1	14.4	5.0	143.7	370.0	79,700
	2010	446.1	56.9	63.9	10.0	13.8	590.7	210,600
Poblacion	1970	164.2	4.6	5.1	5.0	250.6	429.5	39,400
	2010	312.8	34.8	43.2	7.5	31.2	429.5	149,200
Sangandaan	1970	70.5	0.8	0.5	7.8	80.7	160.3	19,000
	2010	132.6	10.8	1.7	8.8	6.4	160.3	41,600
Total	1970	1,458.3	17.5	269.2	141.5	4,975.4	6,861.9	384,000
	2010	5,390.6	235.3	584.9	246.3	798.6	7,255.7	2,367,700

Table 5-10 Land Use Distribution, 1970 and 2010, in the San Juan Basin

Sub-Area	Year	Areas in Hectare						Population
		Residential	Commercial	Institutional	Industrial	Open	Total	
San Bartolome	1970	33.0	–	0.4	2.5	463.0	499.5	2,000
	2010	389.1	9.0	70.4	6.0	25.0	499.5	149,500
Capitol	1970	103.9	–	–	–	352.1	456.0	12,000
	2010	404.5	10.5	11.0	–	30.0	456.0	144,800
Bahay Toro	1970	235.0	2.9	97.7	6.6	225.1	567.3	30,500
	2010	342.3	19.4	170.9	14.3	20.4	567.3	144,700
Bago Bantay	1970	258.3	10.3	3.3	11.0	250.9	533.8	49,200
	2010	441.5	14.3	28.4	17.0	32.6	533.8	176,800
Tandang Sora	1970	143.5	0.3	1.4	36.0	607.4	788.6	7,500
	2010	592.6	23.5	26.6	52.2	93.7	788.6	215,600
University of the Philippines	1970	129.9	1.1	–	127.9	253.3	512.3	38,600
	2010	232.8	9.0	–	219.3	51.2	512.3	113,100
Balintawak	1970	468.8	5.1	34.2	11.0	214.7	734.7	96,100
	2010	588.1	23.6	93.2	26.7	3.1	734.7	261,600
Quadrangle	1970	933.8	25.9	54.8	70.8	496.5	1,081.8	140,100
	2010	594.5	94.9	79.3	86.6	226.5	1,081.8	285,400
Quirino	1970	559.8	11.2	9.9	170.5	324.9	1,076.3	190,700
	2010	768.9	34.3	25.7	233.9	13.5	1,076.3	382,200
Santol	1970	239.0	15.0	4.0	37.0	162.0	457.0	73,000
	2010	354.0	50.0	10.0	43.0	—	457.0	73,000
New Manila	1970	704.6	51.7	19.1	159.9	474.1	1,409.4	200,100
	2010	1,046.7	116.0	43.6	173.9	29.2	1,409.4	472,600
Shaw Boulevard	1970	336.6	22.4	41.3	69.4	312.4	782.1	117,200
	2010	445.2	72.0	113.9	77.2	73.8	782.1	224,600
Mandaluyong	1970	108.0	6.0	30.9	49.9	220.2	415.0	42,600
	2010	137.1	31.5	145.5	90.9	10.0	415.0	74,000
Pasig	1970	172.2	4.1	58.0	12.6	161.3	408.2	45,800
	2010	216.7	32.0	126.5	18.0	15.0	408.2	111,600
Total	1970	3,927.0	156.0	355.0	766.0	4,518.0	9,722.0	1,045,400
	2010	6,554.0	540.0	945.0	1,059.0	624.0	9,722.0	2,885,500

San Juan Basin

The San Juan Basin contains all of San Juan and Mandaluyong municipalities, most of Quezon City and the western edge of Pasig. The basin is predominantly residential. Land use and population characteristics are listed in Table 5-10.

Commercial development is strip-oriented, chiefly along Quezon Boulevard and Aurora Boulevard and Epifanio de los Santos with the major centers being at the intersections of these thoroughfares.

Industry is concentrated along the Pasig River and at Balintawak with a scattering along the San Juan River. Industrial growth potential is limited because of the general residential character and zoning ordinances of Quezon City. Continued industrial expansion is expected in Pasig along E. de los Santos and along the Quirino Road between Balintawak and Novaliches.

Commercial expansion will probably consist of solidifying and improving the present commercial strips, the completion of the Greenhills and New Frontier Shopping Centers, and potential commerical development in the north, probably along the proposed Republic Avenue and quite possibly at its junction with the Novaliches Road.

Institutions and parks occupy a significant part of the San Juan basin. The largest among these are:

University of the Philippines (Diliman Campus)
Ateneo de Manila (University).
Camp Aguinaldo (AFP Headquarters)
Camp Crame (PC Headquarters)
Welfareville and National Mental Hospital
Veterans Memorial Hospital
Balara Water Treatment Plant (NWSA)
Quadrangle National Park Area
Wack-Wack Golf Course
Capitol Hills Golf Course

However, residential lands predominate throughout the basin. The PHHC had developed seven housing projects by 1968 and still held developable land north of Tandang Sora. On the other hand, private developers were still responsible for most of Quezon City's housing estates such as New Manila, Greenhills, the Araneta Subdivisions, Santa Mesa Heights, PALI Homes, and others. These are generally high or middle class homes, and the subdivisions now under construction north of Tandang Sora will be similar although having smaller lots on the average. The area between Tandang Sora and the Malabon Basin is expected to be completely urbanized by 1990.

Quezon City's squatter population was second to Manila's in 1968,[6] but was scattered. It is easily conceivable that Quezon City, the nation's capital, could have the largest squatter population in the Republic by 1980. Development in the sub-areas of Santol, New Manila, Shaw Boulevard, and Mandaluyong has reached the stage where sewerage is immediately necessary and early sewer construction has been proposed.

Marikina Basin

The Marikina Basin includes the flat valley of the Marikina River from Montalban to the Pasig junction and the steep slopes on each side. Industries have been quick to take advantage of the cheap, flat land, relatively good access, and ample ground and cooling water along the Marikina River. The river itself serves as a wastewater receiver. For these reasons, between 1955 and 1965, approximately 40 manufacturing industries were established along the river. During this period another four were built along the Pasig, about 25 along the Antipolo Road (Ortigas Avenue) and approximately 10 along the Nangka River.

Future industrial development, continuing the same pattern, will doubtless expand as far as residential pressure will allow. It is felt that residential subdivisions will dominate in the Marikina and Cainta areas such that industrial expansion there will be more limited than in the south edge of the basin (bordering Laguna de Bay) and directly adjacent to the river. Land use characteristics are listed in Table 5-11.

Table 5-11 Land Use Distribution 1970 and 2010, in the Marikina Basin

Sub-Area	Year	Area in Hectare						Population
		Residential	Commercial	Industrial	Institutional	Open	Total	
Reservoir	1970	62.0	–	–	–	1,354.0	1,416.0	2,400
	2010	1,290.0	15.4	68.0	20.0	22.6	1,416.0	450,000
Burgos	1970	220.0	0.5	1.0	2.0	1,364.5	1,588.0	33,300
	2010	1,417.0	24.0	85.0	31.0	31.0	1,588.0	423,600
Balara	1970	69.0	–	–	103.0	917.0	1,089.0	6,700
	2010	850.0	23.0	21.0	130.0	65.0	1,089.0	326,500
Nangka	1970	85.0	1.0	14.0	2.8	849.2	952.0	22,500
	2010	841.0	8.0	72.0	24.0	7.0	952.0	338,900
Katipunan	1970	231.0	3.0	19.0	55.0	649.0	957.0	59,500
	2010	713.0	26.0	96.0	77.0	45.0	957.0	281.000
Hill Crest	1970	130.0	2.0	33.5	5.5	318.0	489.0	33,000
	2010	345.0	7.0	122.0	12.0	3.0	489.0	216,600
Pinagbuhatan	1970	198.0	2.0	21.0	6.0	1,243.0	1,470.0	44,100
	2010	1,252.0	28.0	114.0	48.0	28.0	1,470.0	552,500
Ortigas	1970	275.0	2.5	67.0	7.5	1,944.0	2,296.0	51,600
	2010	1,880.0	64.0	246.0	64.5	41.5	2,296.0	796,600
Parang	1970	99.0	–	6.0	8.0	1,274.0	1,387.0	18,100
	2010	1,096.0	12.0	121.0	118.0	40.0	1,387.0	470,700
Santa Elena	1970	180.0	2.5	47.0	14.5	824.0	1,068.0	51,400
	2010	845.0	12.0	146.0	30.5	34.5	1,068.0	443,600
Kapasigan	1970	51.0	–	2.0	6.0	269.0	328.0	14,800
	2010	250.0	2.0	46.0	21.0	9.0	328.0	157,000
Total	1970	1,600.0	13.5	210.5	210.3	11,005.7	13,040.0	337,000
	2010	10,779.0	221.4	1,137.0	576.0	326.6	13,040.0	4,457,000.

Table 5-12 Land Use Distribution, 1970 and 2010, in the Upper Laguna Basin

Sub-Area	Year	Area in Hectares						Population
		Residential	Commercial	Industrial	Institutional	Open	Total	
Bagumbayan	1970	167.0	2.0	–	–	460.0	629.0	14,300
	2010	446.0	23.0	71.0	31.0	58.0	629.0	199,000
Bicutan	1970	125.0	–	3.0	26.9	1,418.0	1,572.0	21,600
	2010	1,243.0	50.0	50.0	146.0	83.0	1,572.0	496,000
Taguig	1970	203.0	5.0	15.0	6.0	1,032.0	1,261.0	52,700
	2010	969.0	37.0	96.0	65.0	94.0	1,261.0	386,000
Total	1960	495.0	7.0	18.0	32.0	2,910.0	3,462.0	88,600
	2010	2,658.0	110.0	217.0	242.0	235.0	3,462.0	1,081.000

Marikina follows the San Juan and Parañaque Basins in the rate of subdivision development. The projection assumes the valley will be completely urbanized by 1990 and will reach a gross population density in excess of 150 persons per hectare (60 persons per acre) by the end of the study period.

Upper Laguna Basin

Pateros and Taguig municipalities and a sizeable portion of Fort Bonifacio drain to the Taguig River, forming the Upper Laguna Basin. Both municipalities have expanded in the post-war years but are still country towns, on the fringe of the City but not greatly influenced by progressive urban concepts. Both towns are low, flat, and clinging to the winding rivers and canals. They are surrounded by rice paddies and only gradually expanding into them.

By 1968 there was no manufacturing industry or commerce to speak of except at Napindan. Numerous duck farms line the canals, rivers, and Laguna de Bay. The towns are almost entirely residential.

Industrial development could expand along the Pasig, and this was assumed in the projection. The remainder of Pateros-Taguig was considered to remain residential throughout the study period with no other development beyond the limited commercial areas, cemeteries, city buildings, and schools required by such a community. The basin was considered to be saturated by 2010 except along the Laguna coast.

The northern edge of Laguna de Bay was under study in 1968-1969 (for consideration of its development) as a possible landfill industrial park.[1] This area is not included in the Study Area; however, if such a development were to be carried out, it would affect flows from the Upper Laguna Basin.

The north portion of Fort Bonifacio which includes the Upper Laguna Basin was an active military base in 1963 but the south portion along the Laguna coast was undeveloped. The forecast assumes the northern portion will be retained as a military base and the southern part will become residential, mainly through the expansion of the coastal barrios. Land use characteristics are listed in Table 5-12.

Guadalupe Basin

The Guadalupe Basin is formed by a small undulation in the Guadalupe Hills on the south bank of the Pasig River and is directly tributary to the Pasig.

About a third of the "military" portion of Fort Bonifacio was included and this area is expected to remain as it is, with increasing density of military housing. The remainder of the basin is within the municipality of Makati, including portions of Guadalupe, Bel Air, Olimpia, and the Makati Poblacion. In 1970 the area was completely urbanized and the projection assumed an increase in population density, mainly through the replacement of older homes with apartments or accessorias. Land use characteristics are listed in Table 5-13.

METROPOLITAN PLANNING

No Metropolitan Manila regional planning organization exists. This lack hampers the designers of urban system (such as the Sewerage Master Plan). It also inhibits coordination between various system designers.

The NWSA should cooperate with any proposed Metropolitan Planning Commission by furnishing maps, population and land use data, planning programs, water use projections, and economic and customer data, should such a Commission be formed. There has been at least one case (Melbourne, Australia) where the regional planning entity was an outgrowth of the metropolitan sewerage agency. The NWSA, with its regional jurisdiction, is certainly in a position to be a leader in such an endeavor, and as such, a leader in community development and improvement.

A regional planning commission would also benefit the NWSA. Such benefits would be in the form of economic and population projections, borrowing and funding information, zoning, right-of-way coordination with utilities, and early stage planning of urban rehabilitation and suburban development.

Table 5-13 Land Use Distribution, 1970 and 2010, in the Guadalupe Basin

Sub-Area	Year	Area in Hectares						Population
		Residential	Commercial	Industrial	Institutional	Open	Total	
Nuevo	1970	50.5	3.0	0.5	32.5	99.5	186	7,700
	2010	49.0	16.0	1.0	45.0	75.0	186	13,700
Campo	1970	138.5	–	–	45.5	56.0	240	15,200
	2010	142.0	6.0	–	56.0	36.0	240	31,700
Palm	1970	119.5	1.5	14.0	12.0	1.0	148	21,300
	2010	88.5	4.5	29.5	25.5	–	148	30,800
Olimpia	1970	78.0	2.0	8.0	2.5	15.5	106	13,900
	2010	60.0	10.0	16.5	4.0	15.5	106	20,900
T o t a l	1970	386.5	6.5	22.5	92.5	172.0	680	58,100
	2010	339.5	36.5	47.0	130.5	126.5	680	97,100

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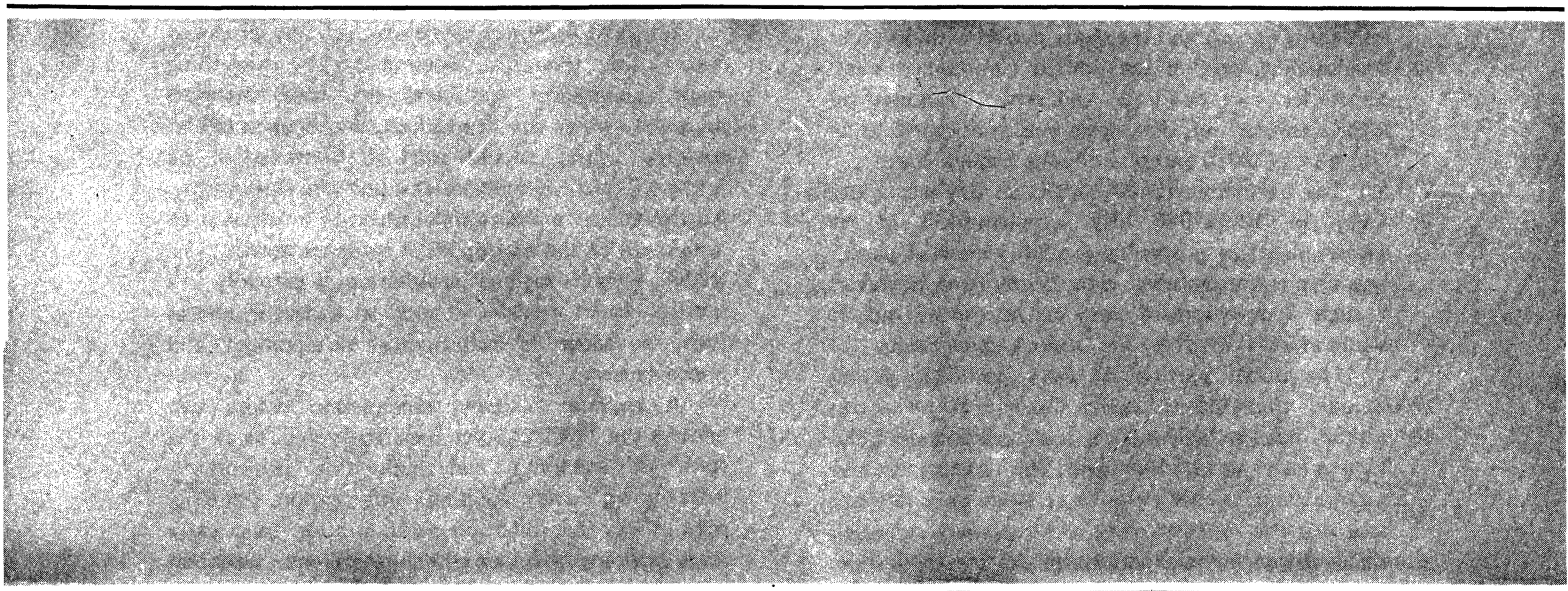

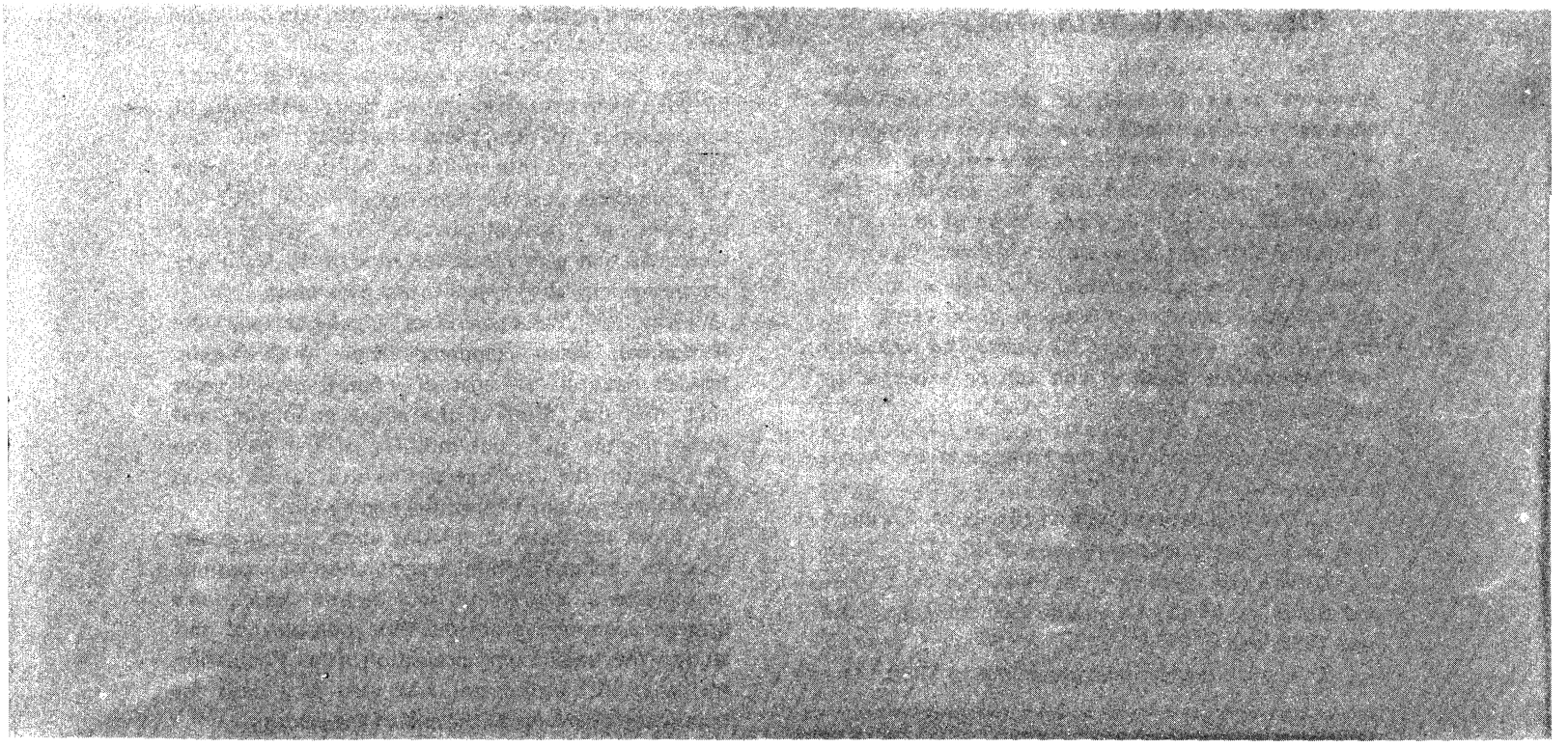

POPULATION

The foundation established in the preceding article for land use and urban development may now be applied to the important matter of population growth. It is essential to a study of this type that an accurate reckoning of existing population be established and that a population projection be made which is reasonable in the light of all predictable influences upon the Study Area. Such influences are:

1. Growth trends of the national population,
2. Internal (Philippine) migration,
3. Population densities,
4. Opportunity for self-improvement, and
5. Social environment.

The 1970 population of the Study Area was estimated to be 3.9 million and is increasing at a rate in excess of 5 per cent per year. The national growth rate is about 3.5 per cent per year, so the Study Area population is growing considerably more rapidly than the nation as a whole. This is due to in-migration. Of the Study Area incremental increase of more than 50 persons per thousand per year, about 35 are added by natural increase and the rest are immigrants.

People are flocking to the metropolis. The attractions are job opportunity, education and research, and cultural and political activity. The immigrants stay with friends and relatives or build rough homes in the squatter clusters. At the same time more affluent citizens are moving out of the metropolitan core to suburban developments. Thus, while the Metropolitan Area is rapidly gaining population, the districts within the area have their own varying patterns of growth. The City of Manila, for example, while still growing, has more out-migrants than in-migrants. Some Manila districts are losing population. Still, the overall picture throughout the Study Area is one of rapid population increase accompanied by the problem of inadequate services.

The forty year projection predicts a Study Area population somewhere between 10.6 million and 15.3 million in 2010. The difference between the high and low estimates, 4.7 million, is due to those factors which cannot be accurately predicted. These factors are:

1. Future utilization of government (particularly military) lands and private fishponds,
2. Future living costs and real estate prices,
3. Programs of slum clearance, urban renewal, and low-cost public housing,
4. Change in the birth rate.

***Reprinted from Chapter V of *Master Plan For A Sewerage System For The Manila Metropolitan Area*, Final Report for the World Health Organization by Black and Veatch International dated December 1969. Some tables and maps and the references thereto have been ommitted due to space limitations.**

POPULATION GROWTH – PHILIPPINES

The 1968 Philippine rate of natural increase was estimated to be about 3.3 per cent. Although vital rates are seriously under-registered,[1,2] it is reasonable to accept that the birth rate is between 45 and 50 births per thousand and the mortality rate between 12 and 14. For a population of its size the Philippine birth rate is the world's highest. Figure 6-1 shows that from a population of 8 million in 1905 the Philippine population doubled in 35 years, then doubled again in the next 23 years. The mortality rate has steadily declined and can be expected to continue to fall.[3]

Three projections for the Philippines are shown on Figure 6-1:

1. The Population Institute (Frank M. Lorimer) A, B, and C projections to the year 2000,[4]
2. The projections of the Bureau of the Census and Statistics of the Philippine Government to the year 1975, and
3. The United Nations projections to 1980.[5]

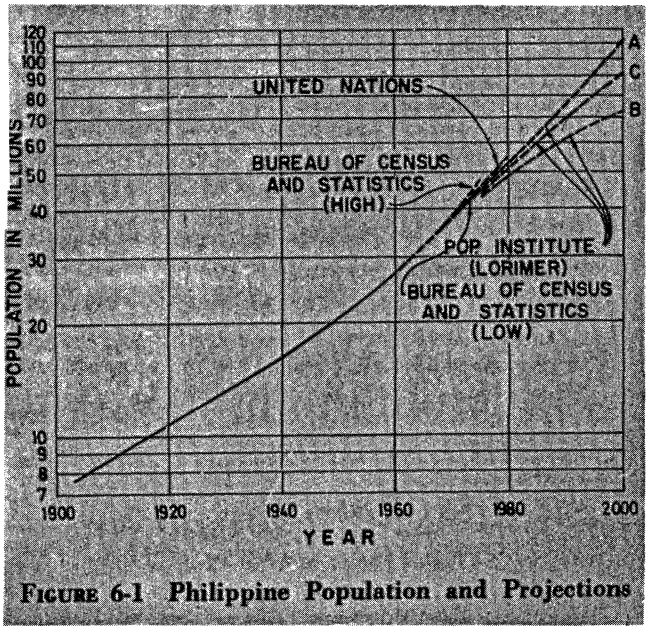

FIGURE 6-1 Philippine Population and Projections

The Population Institute "A" curve presumes a constant birth rate and gradual reduction of mortality rate to realize a net rate of natural increase rising from 32.3 per thousand in 1960 to 37.4 per thousand in 2000. A study by the Department of Education on school enrollment data indicates that even the "A" curve is being exceeded and that the rate of increase seems to be following the United Nations projections or the median BCS curve.[6]

Only in recent years has the Philippine economy experienced an industrial revolution and the beginning of an urban society which eventually had much to do with reducing the birth rate in England and Japan.

In postwar Japan the natural birth rate reduction which accompanied the industrial growth was accelerated by a far-reaching national program, which included birth control education, ready availability of contraceptive devices, and subsidized abortion. Japan's birth rate rose to 20 per thousand persons in the immediate post-war baby boom but in 1967 fell to seven per thousand persons.[7] The Japanese case illustrates that a dramatic lowering of the birth rate can be accomplished in less than a generation.[7]

Population characteristics of Japan and the Philippines, when compared, show that Filipino females between the ages of infancy and 24 years constitute one third of the entire population and these are the potential mothers of the next two decades. On the Japanese profile this age-sex group represents only one fifth of the population.

From all these conflicting data demographers conclude that the Philippine population will continue to increase at a dramatic rate despite the nation's present economic problems. For purposes of this study, the maximum projection (the Population Institute "A" projection) was used as a basis for population estimates to the end of the century.

POPULATION GROWTH – THE STUDY AREA

The registered historical census populations of the 4 cities and 16 municipalities (or portions thereof) which are included within the Study Area are listed in Table 6-1. The Study Area population has increased by a factor of 7.35 between 1903 and 1960 compared with 3.55 for the nation as a whole.

In 1903 the Metropolitan Area contained 4.4 per cent of the national population; by 1960 it held 9 per cent. Figure 6-4 indicates graphically the preeminence of Metropolitan Manila in the Philippine economic picture. So long as this unbalance exists (and the only indication of a decentralizing trend has been the recent migration to Mindanao) the Metropolitan Area is likely to continue to grow faster than the remainder of the archipelago.

Migration

The rate of natural increase (births less deaths) for the Metropolitan Area is about the same as the rate for the nation as a whole. Therefore, the higher growth rate of the metropolis is due to its absorption of migrants from all parts of the Republic.

The City of Manila has, in the last two decades, suffered a net out-migration. On the other hand, Rizal Province has attracted more in-migrants than any other province.

Internal migration in the Philippines has been recently studied by the Population Institute.[8] Three methods of estimating migration were used:

1. Place of birth compared with place of residence in 1960.

Table 6-1 Study Area Population– 1903-1960

Location	1903	1918	1939	1948	1960
Manila	219,928	285,306	623,492	983,906	1,138,611
Caloocan City	6,000	13,000	36,000	55,000	140,986
Pasay City	8,201	18,600	55,161	88,728	132,672
Quezon City	3,062	8,759	39,013	107,977	397,990
Cainta	1,760	2,690	3,080	3,692	6,800
Las Piñas	2,762	2,872	6,822	9,280	16,093
Makati	2,700	12,612	33,530	41,335	114,540
Malabon	20,136	21,695	33,285	46,455	76,438
Mandaluyong	4,349	5,806	18,200	26,309	71,619
Marikina	7,062	7,818	15,166	23,353	40,455
Montalban	2,500	4,000	5,000	4,000	7,426
Navotas	11,688	13,459	20,861	28,889	49,262
Parañaque	6,507	22,121	21,125	28,884	61,898
Pasig	10,552	15,833	27,541	35,407	62,130
Pateros	4,105	4,113	7,160	8,380	13,178
San Juan del Monte	1,431	5,506	18,1870	31,493	56,861
San Mateo	4,510	4,841	6,134	6,811	12,044
Taguig	6,829	8,423	12,087	15,340	21,856
Taytay	5,000	6,000	8,000	10,000	15,294
Valenzuela	4,000	4,500	6,000	7,500	17,000
T o t a l	333,082	468,076	996,527	1,547,737	2,453,149

Source: "Census of the Philippines –1970 – Population Housing" Volume I in seoarate volumes for Manila, Rizal Province and Bulacan Province, Bureau of Census and Statistics.

2. Place of residence in 1948 compared with place of residence in 1960, and
3. Cohort (age-sex group) survival ratios for the 1949-1960 period.

The residence data in the 1960 census were supplemented by a special sampling of 0.5 per cent of the population. As the study was based upon political units, the closest approximation to the Study Area is Manila plus Rizal Province (including the cities of Caloocan, Pasay, and Quezon). This is a reasonable comparison.

During the intercensal period 1948-1960 Rizal Province increased at a rate almost three times the national average while Manila's growth was less than one half the average.

The estimated number of in-migrants is shown on Table 6-4. Of the people living in Rizal Province in 1948, 97 per cent were still there in 1960; in Manila the figure is only 66 per cent.

Table 6-4 Estimated Number of In-Migrants

	Manila	Rizal Province	Total
Net migration estimate by survival method (1950-1960) age 10 and over	78,442	315,973	237,531
Net migration estimate by residence method (1948-1960) age 11 and over	64,600	389,000	324,000

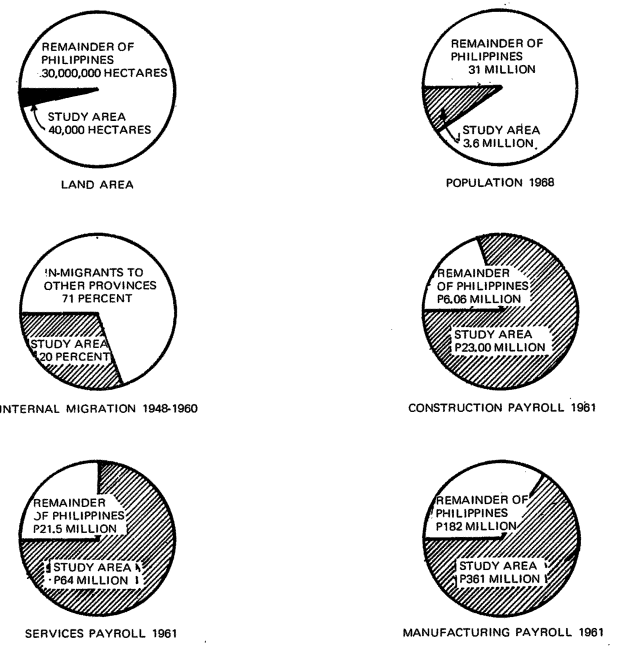

FIGURE 6-4 PRE-EMINENCE OF METROPOLITAN MANILA IN PHILIPPINE ECONOMICS

"STUDY AREA" REFERS TO MANILA PLUS RIZAL PROVINCE EXCEPT IN AREA AND PROJECTION CHARTS. DATA TAKEN FROM THE ECONOMIC CENSUS OF THE PHILIPPINES, 1960.

Table 6-5 Study Area Population Projection

Year	Population in Thousands					
	Group AB			Group ABC		
	Max	Avg	Min	Max	Avg	Min
1960	2,120	2,120	2,120	2,491	2,491	2,491
1965	2,598	2,598	2,598	3,076	3,076	3,076
1970	3,204	3,180	3,159	3,821	3,793	3,768
1975	3,970	3,888	3,814	4,771	4,672	4,584
1980	4,937	4,751	4,528	5,978	5,752	5,483
1985	6,155	5,797	5,303	7,512	7,072	6,470
1990	7,697	7,013	6,134	9,461	8,621	7,539
1995	9,644	8,409	7,010	11,944	10,414	8,681
2000	12,126	10,012	7,963	15,130	12,493	9,936

Source – Population Institute.

Population Projections

Projections of the Population Institute. The Population Institute[9] made two projections for the Master Plan Study Area in March 1967 and in June 1969. Only the latter is discussed herein. Projections were made for the group of cities shown below:

A. and B.
Cities of Manila, Caloocan, Pasay, and Quezon and Municipalities of Makati, Mandaluyong, Parañaque, and San Juan

C.

Las Piñas	Pasig	Montalban
Malabon	Pateros	San Mateo
Marikina	Taguig	Taytay
Navotas	Cainta	Valenzuela

The projections are shown on Table 6-5. No separate projections were made for the A and B areas. It should be noted that these projections included the total areas of all the cities and municipalities whereas the Study Area does not include some of the outlying portions of some municipalities.

The NWSA Long-Range Water Study Projection. In early 1968, population projections were made by an engineering consortium acting as water supply consultants for the NWSA.[10] The NWSA water supply study area is somewhat larger than that of the Master Plan Study Area but with respect to population the differences are negligible.

The NWSA projections were derived from:

1. Differential growth rate,
2. Ratio Estimation, both of which are based upon trends of national and study area growth rates, and
3. Land Use Characteristics.

Projection of the UNDP Laguna de Bay Feasibility Survey. A population projection was made in February 1968 by consulting economists for the United Nations Development Programme study of the drainage basin of Laguna de Bay.[11] The Master Sewerage Plan Study Area is included within the scope of the Laguna project. The technique employed by this project was to sub-regionalize the area into units of distinct growth characteristics, evaluate each sub-region, and assign growth rates. The evaluation included such criteria as industrialization and "industry-housing", transportation, and population dispersion factors.

The Urban Growth Cycle

The historical population graph of a city of constant and limited area characteristically has the shape of a flattened S. At first, in the "pioneer" stage, the growth is usually slow and the slope is flat. Then the socio-economic environment ignites a more rapid growth which is self sustaining. The curve of growth bends sharply upward. The city becomes a magnet which attracts migrants from the rural country-side. Eventually, the city fills to its borders and the pressure of high density forces the rate of increase to diminish. The curve flattens again and growth slows, stops, or decreases.

The City of Manila has just such a population curve (see Figure 6-8). The years 1910-1950 were the years of the City's most rapid growth. There has been a flattening of Manila's curve in the past two decades. This was due to the acquisition of land by government agencies and commercial or industrial enterprises, to migration to the developing suburbs, to increase in land value, but mainly to the pressure of crowding.

Manila's rate of growth would continue to decrease if land area and housing conditions did not change. However, land is steadily being reclaimed from Manila Bay; in the last 10 years the north harbor foreshore area was added. This reclaimed land was covered with squatters within five years. Also, single family dwellings are being replaced by apartments. Binondo and portions of San Nicolas have a number of five to seven-story apartments of modern design. Two story apartments, in which 30 to 40 persons may be housed in a 225 m^2 lot, are being built in various areas of the City. These accommodations tend to raise the tolerable population density. Therefore, Manila's growth rate, although diminished, has by no means reached zero.

Population Density and Saturation

In the normal growth cycle, when population increase becomes negligible, a point of saturation has been reached. The flattening of the population curve and the out-migration to the suburbs of Rizal Province indicate that Manila has almost reached saturation. The density at which resistance to further growth is reached is not a fixed value but depends upon environmental facilities which change with

time. Transportation, water supply and sewerage as well as housing are factors which influence tolerable density. Nevertheless, density and saturation provide one parameter for the projection of population within a limited area.

Densities are included in the population curve for the City of Manila (Figure 6-8). The curve begins to flatten around 1945-1950, the point at which a density of about 260 persons per hectare is reached; by 1960, with a density just under 300, the rate has approached zero. Figure 6-8 also includes a curve of historical population growth for the Study Area and for the Sampaloc District, Manila. An inverse ratio relates the density effects with size of sample. These three areas are all larger than a normal domestic neighborhood and they contain various land use functions other than residences. Thus, the densities listed are gross densities and include industrial, commercial, and park land. If these non-residential lands are subtracted from the total area, the net residential land, including streets, can be measured and net population density derived.

Net densities are not saturation densities. The Barangay Housing Project density of 864 persons per hectare is not high for public housing. The seven-floor tenements in Punta, Santa Ana, and those near the South Superhighway house nearly 4,000 persons on a land area of less than 2 ha. Highrise public housing in the United States yields densities well over 1,000 per hectare. The saturation density, if used as a measure of maximum projected population, must be modified by consideration of vertical expansion.

Density also increases through lot subdivision. Owners of lots who find it necessary to provide homes for growing families or relatives, or who desire added income, frequently subdivide the lot upon which they live, renting or selling the extra property. This practice was studied in the eastern section of Project 4-B, Quezon City. When constructed by the People's Homesite and Housing Corporation, this subdivision included lots varying from row-house size of approximately 150 m^2 up to about 400 m^2. Table 6-8 shows the additions which have been made to the original lots as well as an estimated saturation condition which assumes continued additions of a similar type. It is emphasized that in 1954, Project 4-B was fully constructed and each lot contained a house. Thus, the density increase is not at all due to filling vacant lots but in subdividing lots, adding apartments to the existing house, or replacing the original home with an apartment. This subdividing characteristic is, of course, not limited to Project 4-B.

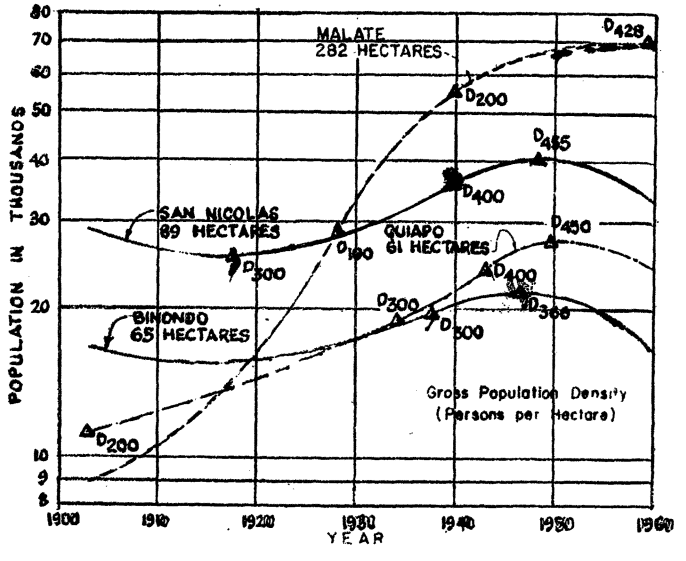

FIGURE 6-10. Census Populations of Four Manila Districts

Figure 6-10 shows population curves for four Manila districts. These districts have all passed a saturation point and, for one reason or another, lost population. All are located in districts of intense commercial activity and light industry. Almost all residences within Quiapo and Binondo are multi-story apartments.

Making use of the land use data presented in the preceding article, ultimate densities have been estimated for each part of the Study Area. In order to fit the estimates of density and saturation into a time sequence the rate of urbanization should be considered.

Urbanization

The rate of urbanization spread into the agricultural countryside is indicated by Figure 3-13. A study of existing and proposed highways, housing developments and subdivisions, real estate cost, terrain, and proximity to utilities, industries, and commercial centers resulted in a forecast of the spread of urbanization for the study years 1970, 1990 and 2010. Table 6-9 gives the results of this study in terms of per cent of areal development. Urbanized area is defined as that having streets and utilities and at least 10 per cent lot occupancy. The approximate urbanized area within the Study Area was 11,700 ha. (29,000 ac) in 1948 and 30,200 ha. in 1966, nearly a three-fold increase in 18 years.

Study Area Population Projections

Population projections have been made for each city and municipality and are shown on Table 6-11. Referred to drainage basins, the maximum rate projection is shown on Table 6-12. The maximum rate projection was used for estimates of design flows and pipe design. The minimum projections were used as a guide to the estimation of future revenue collection.

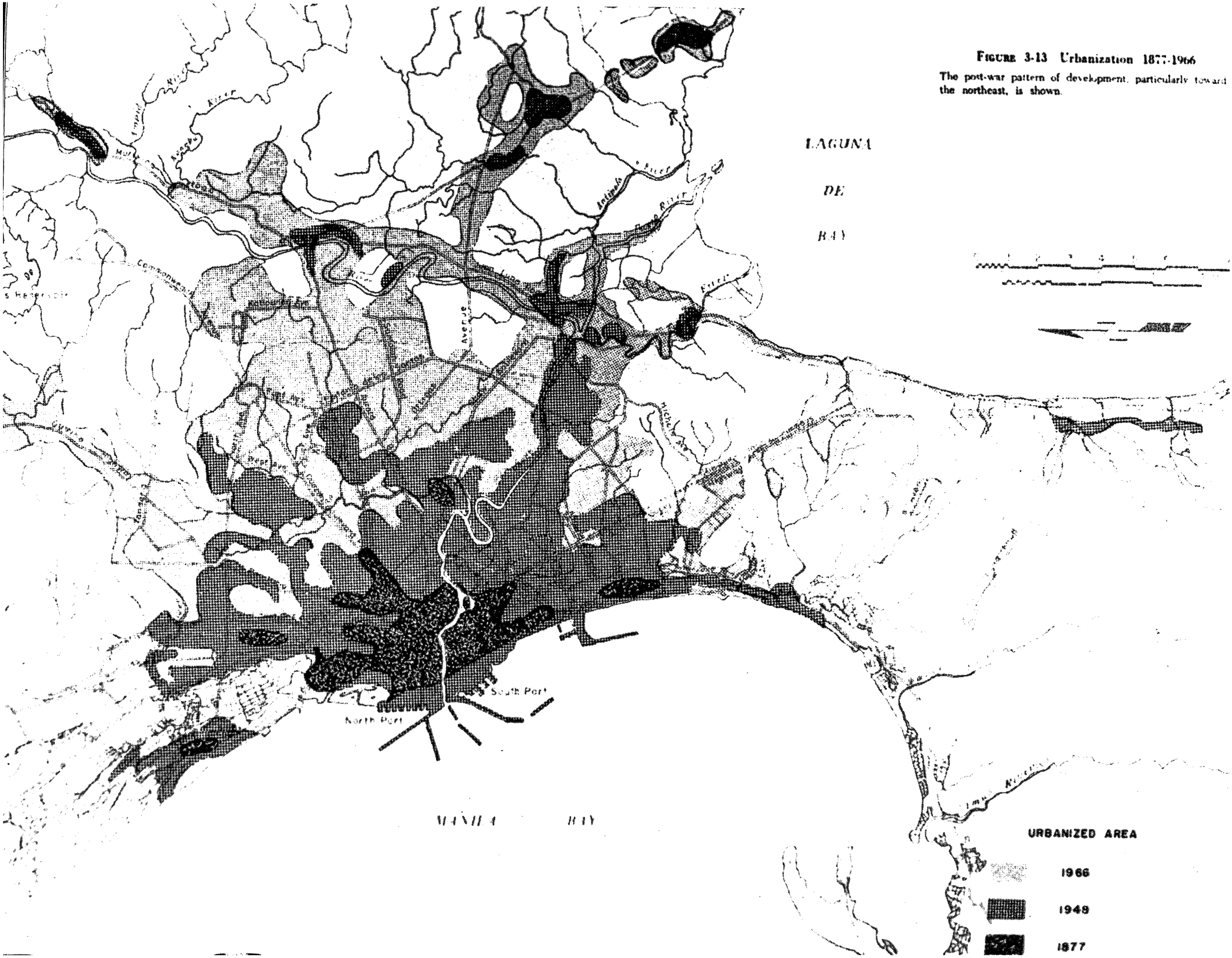

FIGURE 3-13 Urbanization 1877-1966

The post-war pattern of development, particularly toward the northeast, is shown.

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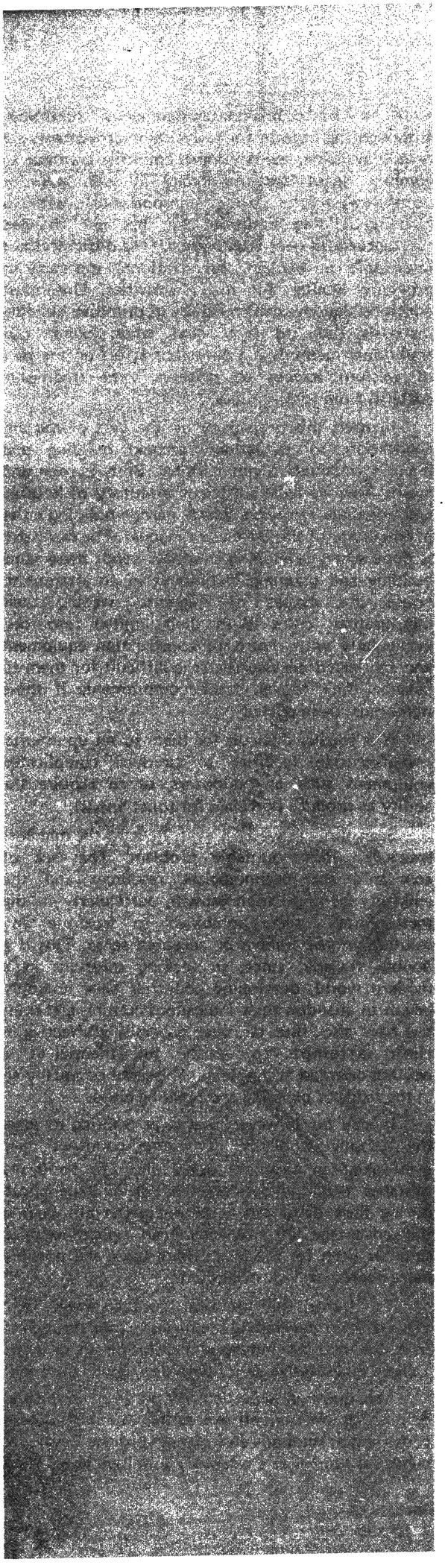

HOUSING FOR DEVELOPING COUNTRIES

A. Bruce Etherington

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In the city of Manila, 50,427 families or approximately 12% of the population are living under conditions which, measured by the living standards of Europe and North America, would be deemed at best to be sub-standard and at worst to be inhuman.[1] Nor are these conditions limited to Manila. They are in fact, typical of most metropolitan areas of the developing countries of the world. It is estimated that in developing countries, from 10 to 40% of the people are living under conditions which the United Nations describes as —

> "a building, group of buildings, or area characterized by over-crowding, deteriorations, unsanitary conditions or absence of facilities or amenities which, because of these conditions or any of them endanger the health, safety or morals of its inhabitants or the community."[2]

To further complicate an already difficult situation, the majority of these families are living on land to which they have no legal title. With this sense of impermanence of place there is little effort on the part of the inhabitants to invest time, money or energy in improving either their surroundings or the minimum hovels which they build for themselves from stolen or discarded wood crates or metal cans. The result is entire metropolitan districts of chaotic, jumbled, patched together dwellings huddled together beside muddy lanes, surrounded by pools of stagnant water and sewage and littered with abandoned building materials, furniture and garbage.

The majority of squatters, originally, were migrants to the city from rural areas either driven from the land by overcrowding or lack of food or lured to the city by the illusion of a better life. With little or no money they are compelled, in the absence of public housing, to improvise a temporary dwelling place to use as a "halfway house" while they seek jobs and save money in order to enter the legitimate community.

The flow of migrants from rural to the urban areas is only beginning if measured by the history of the more developed countries. Both Europe and North America presently have from 65 to 90% of their total population living in urban centers while

the developing countries have only 10 to 40% of their total population now in urban centers. Added to this is the problem of rate of flow of migrants to the cities which greatly exceeds the capacity of most developing countries to provide, within sufficient time, the necessary housing, roads, schools, hospitals and all the other requirements of contemporary metropolitan life.

Barring natural or man-made catastrophes and, even with successful world-wide birth control programs, there appear to be no solutions in the forseeable future of developing countries that can cope with, what is literally, a city-bound flood of migrants.

If the dilemma of housing cannot be solved and if migrants continue to pour into cities of developing countries at the present rate, an already difficult situation might well turn into a politically and culturally unstable one. Blaming the political system, however, is missing the mark. The real problem is related not to the system itself but to the adoption of cultural and technological solutions borrowed from the more developed countries.

Developing countries, in their anxiety to achieve parity with the developed countries, tend to follow blindly the same painful technological evolutionary process in order to become quantitatively equal. Because of their limited resources, however, painful decisions, such as goods vs. education, agricultural vs. industrial development, must constantly be made in establishing priorities between the various paths to parity.

In following western building technology for example, developing countries are, in effect, retracing 3,000 years of building tradition. Architectural schools, as proof of this statement, teach almost exclusively western architectural and planning history commencing usually with Greece at the time of the temple builders. The technical colleges teach engineering methods developed in the west which utilize extensively heavy construction equipment, a commodity which most developing countries cannot afford.

The metropolitan centers of developing countries, similarly, follow western planning methods and develop city plans which are an unhappy combination of medieval and renaissance street patterns. These are bisected by half completed expressways constructed in anticipation of that happy day when every citizen will have his own car; a day which, if it ever comes, may see the automobile and its internal combustion engine hopelessly outdated and without fuel on which to run.

Clearly, however, the aspirations of the migrant squatters tend toward emulation of western living standards; television, automobiles, western clothing. On the other hand, old habits die hard and village social patterns, sense of kinship and native skills in handling materials persist.

This dichotomy between acquiring the new and refusing to discard the old is not unique to developing countries. Both Europe and North America live in such a historical-contemporaneous condition. Although the options for technical improvements are readily available, the developed countries continue to combine space-age technology in such areas as communications and transportation with a planning-building tradition that has not changed substantially in over 5,000 years. It is difficult if not impossible to explain this irrational approach to providing shelter for man's activities. One must conclude that the continued use of primitive building materials such as brick and wood plank and traditional methods is a conscious effort on the part of western society to preserve some traditional patterns from former times.

In itself, this propensity on the part of western civilization to perpetuate archaic building and planning methods is not harmful. Both Europe and North America have sufficient inventory of housing and adequate resources which permit building cities in this wasteful and inefficient manner. The real harm is done when developing countries adopt these same building and planning techniques in an attempt to house the masses of migrants swelling their metropolitan cities. With their limited resources, particularly with regard to construction equipment and fabricated accessories, it is difficult for them to balance their foreign trade commitments if these items must be imported.

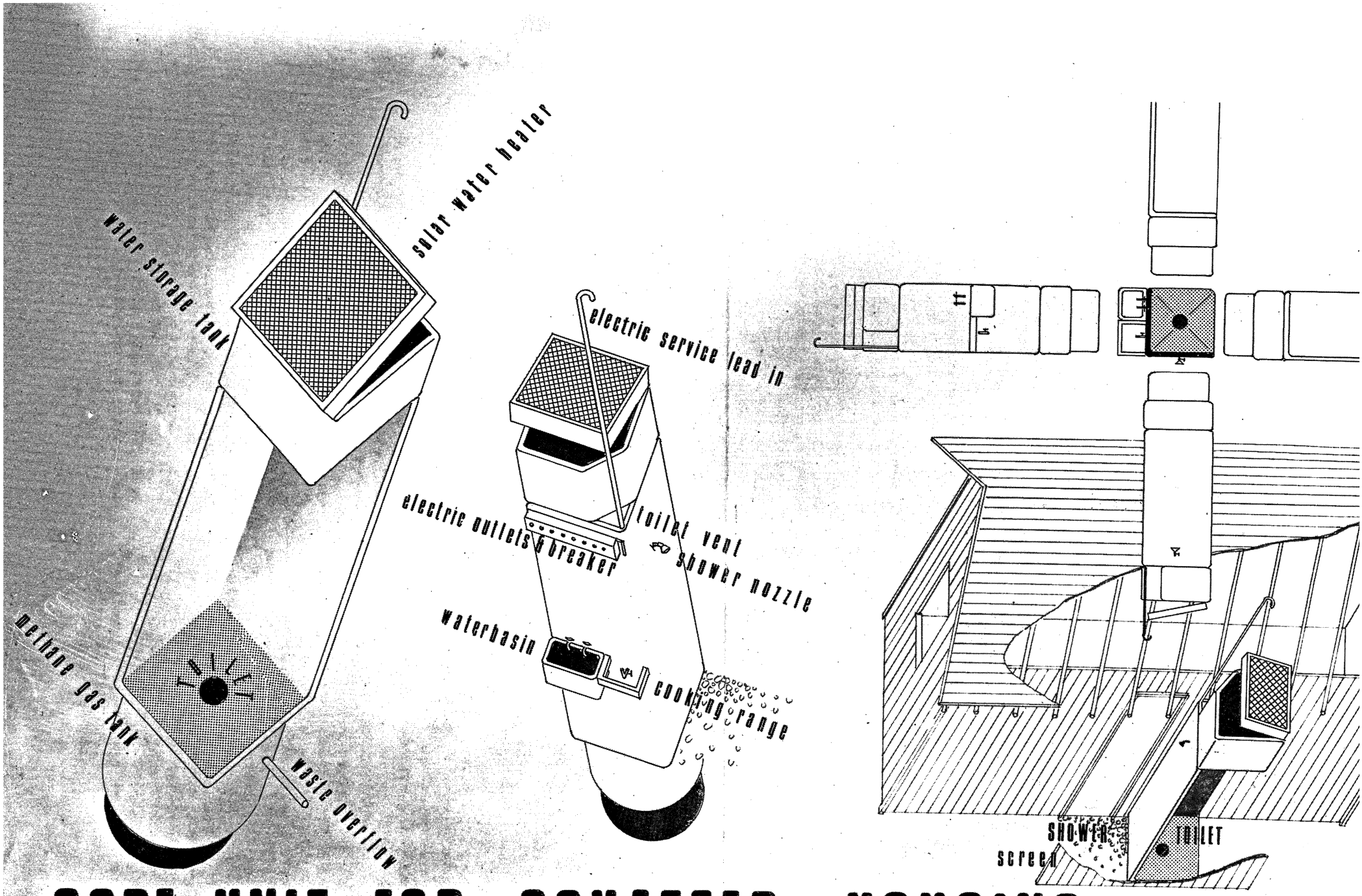
It is equally difficult for them to set up internal manufacturing facilities to produce complicated equipment such as bulldozers, or to acquire the ability to produce porcelain for toilet bowls.

Seen through western eyes, housing the migrants seems an insurmountable problem. The lack of economic and technological resources and the enormity of population growth, particularly in the metropolitan areas, combined to frustrate any solution in the known or accepted sense. This is a double tragedy, since, in seeking solutions in a modern world, developing countries have not only begun to abandon their indigenous cultures and skills but have also, thus far, been generally ineffective in their attempt to create for themselves a western-oriented technology. This applies equally so in the fields of planning and building cities.

It may be, however, that in attempting to solve the housing problems, developing countries have overlooked an excellent opportunity to avoid the mistakes that the developed countries experienced during their development period. After all, what is the advantage of exchanging an underdeveloped squatter slum for the much more toxic and possibly more depressing industrial slum?

To frame the question another way, is it necessary for developing countries to pass through an iron age and an industrial revolution in order to achieve quantitative parity with developed countries?

This question is particularly pertinent in the area of housing. As pointed out earlier, the architecture, construction methods and planning of the developed countries remain at a relatively primitive level. There



CORE UNIT FOR SQUATTER HOUSING

PLATE ONE

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is no practical advantage for developing countries, therefore, to exchange one primitive building technology for another. The only possible advantage is purely stylistic; by adopting western architectural styles, developing countries begin to "look" modernized. Furthermore, by adopting styles and plans from another culture, climate and geography, many disadvantages and costs must be unnecessarily borne; materials must be imported; such refinements as natural ventilation are lost and indigenous social structures begin to disintegrate.

Developing countries, therefore, must seek alternative solutions to their housing and planning problems by adopting western technology where appropriate, synthesizing design to incorporate the relevant factors of indigeneous and alien construction, and planning techniques and re-examining their cultural values. In seeking solutions in this manner, it will be necessary for each developing country to re-examine not only its development policies but also the very premises and values upon which the developing society is being founded. This process will in all likelihood be a difficult period, since in most cases, legitimacy of government, elitist planning, participatory politics, and developmental policies are all involved and may at different periods be in conflict with one another.

By this process of re-evaluation of imported and indigenous values and techniques, it may be possible for developing countries to leapfrog over the traditional steps of development (through which the developed countries are still moving) and move into the forefront of development. Previous experiences at a national level tend to verify this hypothesis. Germany, for example, after World War II, although losing the war and with all her productive facilities demolished, was able to surpass Britain, the winner, in production capability and move into a position of international leadership in a relatively short period of time. This is attributed in part to the reorientation of German culture after its defeat as well as completely modernized production facilities which surpassed Britain's capabilities in this area. A similar argument may be drawn for Japan.

In the context of social values and goals, this re-evaluation would include the development of new life-styles strongly influenced by new kinds of habitations, communities, and transportation and communication networks.

Presented herewith, then, are some possible futures for developing countries which in a relatively short period of time could move squatters from socially stigmatized and physically depressed enclaves to a physically and socially mobile situation, which, if pursued rigorously might turn an apparent deficit into a positive asset. This assertion is made in view of the complacency, atrophy, trade unions and conventional business practices in the developed countries which have thus far stifled innovation in the construction industry. There is good reason to expect, therefore, that innovations in architecture, building and planning techniques will rise, not from the developed countries themselves, but from those countries who must seek other solutions in these disciplines.

To launch into speculations of the future for approximately 1/3 of the world which presently subsists in substandard housing is to ignore their immediate plight. Furthermore, although the technology and resources are on hand to effect a drastic improvement in their condition, there remains the inability to conceptualize and organize such a future. Present social and political institutions in most developing countries are more concerned with emulating the more developed countries than in charting their own economic, social and urban destinies.

It would appear profitable, therefore, to introduce alternative future solutions gradually in order to solve immediate problems as well as set the stage for future steps. In this manner, the immediate problems of hygiene, shelter, clean water, sources of energy and other problems related to the essentials of existence would be solved first. This could be followed by development of communication and transportation necessary to improve standards of living, education and information in order to prepare for the "take off" into the distant future. No attempt is made at these two preliminary steps to treat with the social and political fabrics or economic factors of the immediate or intermediate futures (3 to 30 years). Rather, solutions which are economically and technically possible for developing countries to implement immediately are presented as concrete proposals.

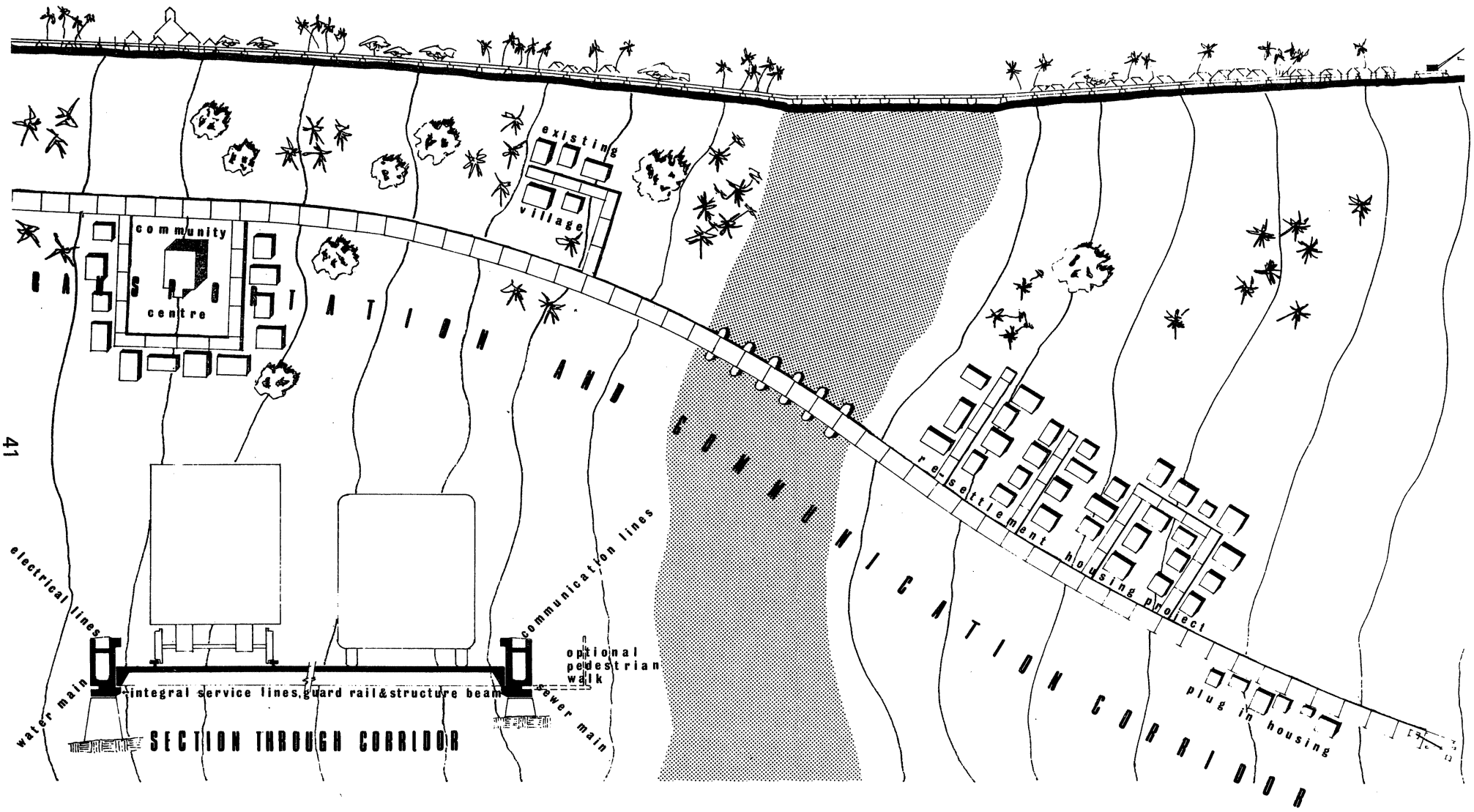
The immediate future for squatters in developing countries, as stated previously, is concerned with survival against disease, starvation and exposure. The immediate solution, therefore, should provide the essentials for survival. Of the three problems facing the squatter, two – namely disease and exposure, are physically related problems that can be solved by technology.

At this elemental stage of existence, disease is usually linked with hygienic conditions – impure water, sewage disposal, ablutionary convenience, and waste disposal.

As an example, in Barrio Magsaysay[3] a squatter settlement in Manila, 70.2% of the houses have no toilet facilities and dispose of their feces by wrapping them in newspaper and throwing them in the sea, vacant lots or garbage heaps. In fact, only 1.2% of the squatter houses have flush toilets, the balance use the "wrap and throw" method. Piped water is available only to approximately 20% of the houses while electricity fares a little better, with approximately 30% of the houses so equipped.

Cooking in the same settlement is done mainly with wood or charcoal (approximately 75%) kerosene (approximately 20%) or electricity (approximately 5%) all of which must be purchased.

Thus, the bare necessities of life – drinking water, fuel and waste disposal are considered the most essential problems by the inhabitants of Barrio Magsaysay.



TRANSPORTATION AND COMMUNICATION CORRIDOR FOR DEVELOPING COUNTRIES

PLATE TWO

A solution to these problems, therefore, must include the following:

(a) Pure drinking water and storage of same
(b) Waste disposal
(c) Fuel for cooking
(d) Ablutionary facilities
(e) Provision for electrical power
(f) Low cost

The accompanying diagram (Plate 1) illustrates an economical and effective mechanical core which provides, through a series of options, the accessories needed to satisfy (a) through (e).

The basic unit is made of concrete formed in a simple plywood mold with the required pipe and conduit chases poured or trowelled integrally with the basic shell. The pipes act as reinforcing bars as well as carriers and conduits. In its most basic form the core will provide a pit toilet with a water trap, a concrete basin and cold water faucet and a bracket for a cooking element. To the basic unit may be added the following accessories.

(a) An overhead water storage tank to provide water pressure as well as on-site water storage. (Storage of water is desirable because of unreliable sources.)

(b) A waste disposal tank which replaces the pit toilet and acts and provides as follows –

> Feces and urine are introduced into the main tank (animal feces where available, should also be added). The solid waste settles to the bottom and the effluent is drained off through an overflow outlet to a ditch sewage treatment system or as liquid fertilizer. Methane gas generated by anaerobic action of solid and liquid wastes is captured and storaged in the upper portion of the sealed tank and is then piped through the walls of the core unit to the cooking element. Gas pipe jets and valves located inside the cooking element bracket complete the installation and provide a rudimentary gas stove and oven.

(c) A solar heating unit which utilizes the heat of the sun to warm water for bathing and washing. The unit consists of a heat transfer coil, darkened glass heat absorber and storage tank and is connected to the hot water pipe embedded in the walls of the core. Solar heating is practical for most developing countries since they are mainly located within the tropical or sub-tropical region and enjoy a sufficient number of hours of sunlight during the year to maintain a constant flow of warm water.

(d) A shower nozzle and valve which can be connected to the water storage tank or the solar heater or both.

(e) A simplified and combined electrical circuit breaker and outlet box mounted on the upper portion of the wall of the core unit. Electrical service is brought into a mast which fits into a threaded socket embedded in the wall of the concrete core which in turn is connected to the circuit breaker box. Electric lighting connections to the various rooms are then made by plugging extension into the combined circuit breaker/outlet box.

While the core unit provides minimal sanitary, cooking and ablutionary facilities, protection from exposure is still needed in the form of enclosed living space or spaces. Here, recognition should be given to the idiosyncrasies of living style of the various peoples to be housed. Habits of living, kinship structure and so on, prohibit preconceived notions of the configuration of space enclosure. Natives of the Solomon Islands, for example, might be more inclined to separate the core unit from the space enclosure, while squatters from northern Luzon possibly would prefer the core unit as an integral part of the space enclosure.

In either case, the core unit can be used as a stabilizing structural element around or beside which the space enclosure may be built. Materials for the space enclosure will continue to be adapted by-products of industrialization (sheet iron, etc.) since costs of specially designed materials would be prohibitive. Internal divisions of the space enclosure would be made as individual decisions to suit the needs of each family.

Design of housing at this stage would be similar to present squatter slums and externally would appear the same. Minor modifications however, could be made to the street or lane systems in order to introduce open ditch sewage treatment, fire breaks, a pipe and water tower connection to the sewage treatment system in order to siphon off the treated water for reuse, and the creation of conveniently located community open garbage pits.

A supplement to these improvements to the living standards of the squatters would be the establishment of Information Centers which would act as an on-site educational facilities. The message of the Information Centers would be twofold: (a) practical how-to-do-it suggestions on improvement to their present housing conditions and (b) exciting visions into the future with the implied message that improvements are possible and just around the corner. Messages would be audio-visual, delivered automatically and continuously, interspersed with regular T.V. programming and news of local interest. The Centers would be distributed on a neighborhood basis and located in the social centers of neighborhoods (usually the local cafe or grocery and meat shop).

Primarily, messages from the Information Centers would be concerned with the intermediate future; a future that most of the inhabitants of the community could expect to see within their lifetime. The time element is rather important in lending credibility to the fact that the future portrayed on the screen could be achieved and enjoyed by the viewers. Subjective projection into the future would then become possible since the viewers would recognize that the time span was relevant to his own life expectancy.

In viewing the intermediate future in terms of the shortcomings of the present, numerous important

problems may be identified. One of the most important problems is that of transportation and communication of people, goods, services, information and energy. Present city planning is static and completely uncoordinated with respect to transportation or communication and is based on a time when the energy available was minimal[4] and goods, people, services and information had to be concentrated in order to interact. Medieval European cities (upon which all planning precepts unfortunately appear to be based) came into existence, not only as walled fortresses for protection from marauders but also as focal points for interchange of people, goods, services and information, and additionally, sometimes as transportation nodes. Because of the minimal energy available, it was necessary to limit distances travelled in order to conserve a reasonable balance of energy for productive use.

Today, energy capability has been multiplied many times but is strangled by a city pattern and way of life that have changed little in the last 500 years. In this regard, many contemporary planners continue to view place as more important than movement and relegate movement from building to building or place to place to a low priority. The result is strangulation of transportation and communication as building concentrations become greater and the street grid system fails to response to the increased movement loads. Furthermore, as cities continue to expand horizontally, the distances between places in the city also increase, thus, further increasing the energy required to bring about interaction of people, goods, and services.

From the squatters' point of view, the transportation and communication problem acts as a barrier to improving his situation. His source of livelihood is usually within the city where land to squat upon is hardest to find. If, however, he moves to the country side near the city, the land is more easily procured but costs or lack of public transportation make it impossible for him to enter the city daily in order to make his livelihood. This observation is borne out by the experiment of the Philippine government[5] in relocating squatters from Manila to vacant land approximately twenty miles from the city. Within a few years most had returned to Manila to once again squat within the city limits. The main reasons given by the squatters for returning were lack of services (water and electricity, roads, etc.) and costs of commuting to the city for employment.

In considering the intermediate future, it appears more logical therefore, to start by planning an adequate transportation and communication system (plate 2) which would remove the obsolete and imaginary city wall that separates the city from the country side. The grid road system of the typical city (in which a circulation conflict occurs at every right angle intersection) should be discarded. The tenuous transportation and communication links connecting cities should be strengthened to become a continuous energy source as well as transportation corridors. The results would be a dispersal of urban concentrations into smaller units "plugged into" the transportation and communication corridors.

Each corridor would contain continuous water, sewage, communication (telephone, T.V. cable, etc.) electrical and where available, gas lines, as well as road or rail beds for some means of mechanical, automated, free transportation. At regular intervals, valve connections would be installed so that communities could set up living accomodations and connect their living units to the service main. The land parallel to the corridor would be public land, available as living space in much the same manner as the National Park Services presently allocate camping sites. Since the corridor would make the parallel areas relatively accessible and the movement of goods and people inexpensive, there would no longer be any need to concentrate facilities and people in order for them to interact. This, in, turn would reduce the demand for land in the cities as an economic commodity; and because land beside the corridors would be free to use for housing, squatting would become an accepted life style.

A precedent for the concept of combining transportation corridors and land grants lies with the railroads and national government of the U.S.A. The purpose in this instance was to settle people in the hinterlands in order to generate business for the expanding railroad lines. In the case of développing countries, the corridors would serve to reverse the movement to cities, disperse squatter communities and possibly foster a return to agriculture activities by the squatters.

The corridors would also serve to open up development lands not previously accessible. In the case of the Philippines, for example, the Friendship Highway connecting the North to the South (Luzon to Visayas) could be enlarged to include services and mechanical transportation and through government policies, including land reform, be made an instrument for development.

As a means of communication, the corridor would serve as a diffuser of innovation and information to rural communities through which it passed. At certain invervals greater concentrations of housing would occur brought about by some tourist attraction, natural resources such as mines or as amusement centers. These larger concentrations would be connected to the corridors by secondary laterals which would also contain services and means of transportation.

A second important problem in the intermediate future that developing countries and their squatter population face is providing sufficient and adequate housing. The transition from present squatter settlements to something which approximates western housing is not economically feasible. In the sense that western housing equates building to place, it is not even desirable to pursue this path as a possible solution. To do so would merely duplicate the problems now confronting today's megalopolis of the west.

A more feasible path might be to further develop the core unit envisaged in the immediate future to a more sophisticated level and to provide a form of space enclosure that would ensure flexibility of movement.[6]

Since weight and movement are interdependent, the core should be as light as possible, indicating the use of lightweight plastic rather than concrete. Furthermore, the plan of the core can become more articulated to reflect its manifold functions. The list of accessories should be enlarged and made more sophisticated.

The core unit would contain space enclosures to house the activities of ablution, human waste disposal and food preparation. Pipe and conduit connections would be in chases within the core walls and optional connections to "plug-in" to transportation corridor devices or independent energy sources would be provided. The core should also have wheels so that ability to move along the transportation corridors could be achieved in much the same manner as today's trailers move from place to place along highways. Optional accessories would include water storage tank, methane gas generator, solar heating for hot water and audio-visual communication.

Space enclosures should be correspondingly light and flexible and made of either permanent or throw away plastics or fibres. Structural rigidity can be achieved by inflation or folded plate. In the case of inflation, an air lock is necessary as well as air conditioning since developing countries are generally located in the tropics. Lightweight folded plate, therefore, seems more feasible and economical. The space enclosures may be attached to and stored as an integral part of the core so that a complete unit of core and collapsed spaced enclosure is possible. Future squatters then, may be visualized as moving from place to place along the transportation and communication corridors taking with them their collapsed core-space unit. Probably a permit to "camp" at certain locations may be required in order to avoid overcrowding. Upon arriving at their destination the squatter family would connect the core to the nearest Trans/Comm corridor valve, unfold the space enclosure and become for whatever length of time they chose, members of that particular (squatter) community.

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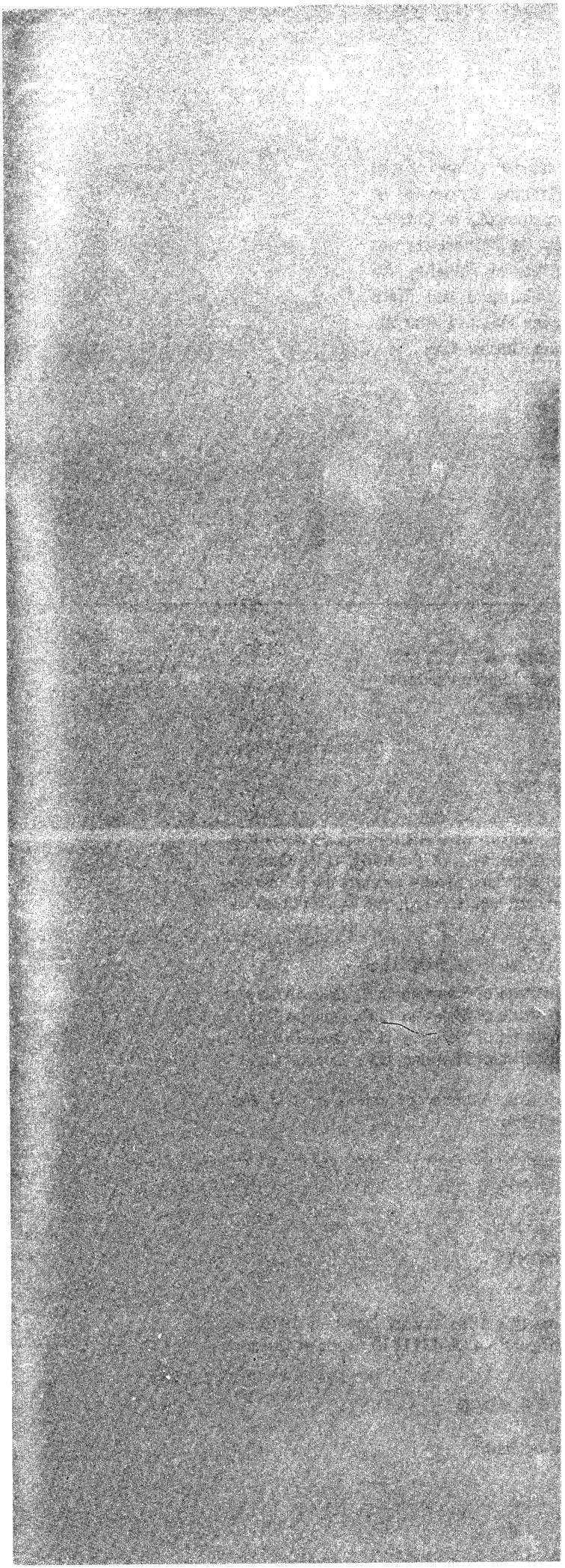
[4] **McHale, John,** *The Future of the Future*, **New York: George Braziller, 1969. pp. 208-237.**

[5] **Laquian, Aprodicio,** *op. cit.* **pp. 11-12.**

[6] **A number of architects and architectural groups including the Archigram Group of London, Architecture Principle of Paris, Yona Friedman, Buckmister Fuller, Hans Hollein, Frei Otto, Metabolist Group of Tokyo, Arthur Quaimby, Sonel Schein, Eckhard Schultz-Fielitz, Paulo Soleri, Josef Weber have done considerable research and development in the problems of "soft" and "hard" space enclosures.**



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The Philippine Planning Journal is the official journal of the Institute of Planning, University of the Philippines, published semi-annually in October and April. Views expressed by the authors are not necessarily those of the Institute of Planning. All communications should be addressed to: THE MANAGING EDITOR, Philippine Planning Journal, UP Institute of Planning, Diliman, Quezon City.

Price per copy
Domestic: P5.00
Foreign: US $2.50

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Publisher	Institute of Planning, U.P., Quezon City
Office of Publication	Institute of Planning, U.P., Quezon City

In case of publication other than daily, total number of copies printed and circulated of the last issue dated October, 1970 – 1,000

1. Sent to paid subscribers 65
2. Sent to others than paid subscribers 935

TOTAL 1,000

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PHILIPPINE PLANNING JOURNAL