社会開発協力部報告書

NO 8

REPUBLIC OF INDONESIA

FEASIBILITY STUDY REPORT

LOW COST HOUSING PROJECT IN CENGKARENG

MARCH 1981

JAPAN INTERNATIONAL COOPERATION AGENCY

LIST OF ABBREVIATION

PERUM PERUMNAS:	-PERUSAHAAN UMUM PEMBANGUNAN PERUMAHAN NASIONAL -NATIONAL URBAN DEVELOPMENT CORPORATION -
(RE)PELITA II(III):	-RENCANA PEMBANGUNAN LIMA TAHUN II(III) -2 ND(3 RD) 5 YEAR DEVELOPMENT PROGRAMME -
BTN :	-BANK TABUNGAN NEGARA -NATIONAL MORTGAGE BANK -
DKI JAKARTA:	-DAERAH KHUSUS IBUKOTA JAKARTA -CAPITAL CITY JAKARTA -
JABOTABEK:	-JAKARTA-BOGOR-TANGERANG-BEKASI (JAKARTA METROPOLITAN REGION) -
PLN:	-PERUSAHAN LISTRIK NEGARA -NATIONAL ELECTRICITY COMPANY -
PAM - (JAYA):	-PERUSAHAAN DAERAH AIR MINUM (JAYA) -(JAKARTA) WATER SUPPLY COMPANY -
PBJR:	-PROJEK BANJIR JAKARTA RAYA -JAKARTA FLOOD CONTROLE PROJECT -
DPU:	-DEPARTEMEN PEKERJAAN UMUN -MINISTRY OF PUBLIC WORKS -
CIPTA KARYA:	-DIRECTORAT JENDERAL CIPTA KARYA -DIRECTORATE GENERAL OF HOUSING, BUILDING,PLANNING AND URBAN DEVELOPMENT -
BINA MARGA:	-DIRECTORAT JENDERAL BINA MARGA -DIRECTORATE GENERAL BINA MARGA -
PENGAIRAN:	-DIRECTORAT JENDERAL PENGAIRAN -DIRECTORATE GENERAL PENGAIRAN -
NEDECO:	-NETHERLAND ENGINEERING CONSULTANT -

EXCHANGE RATE:	Rupiah = Rp. 100Rp.= 33.4 Yen = 0.163 US$ (December, 1980)

PREFACE

It is with great pleasure that I present this "FEASIBILITY STUDY REPORT,LOW COST HOUSING PROJECT IN CENGKARENG" to the Government of the Republic of Indonesia.

This report embodies the result of a feasibility study on the said project which was carried out in Cengkareng area,Jakarta,from October,1979 to March, 1981 by the Japanese study team commissioned by the Japan International Cooperation Agency following the request of the Government of Indonesia to the Government of Japan.

The study team,headed by Mr. Jiro Suzuki, had a series of close discussions with the officials concerned of the Government of Indonesia and conducted a wide scope of field survey and data analyses.

I hope that this report will be usefull as a basic reference for development of the project.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the Japanese team.

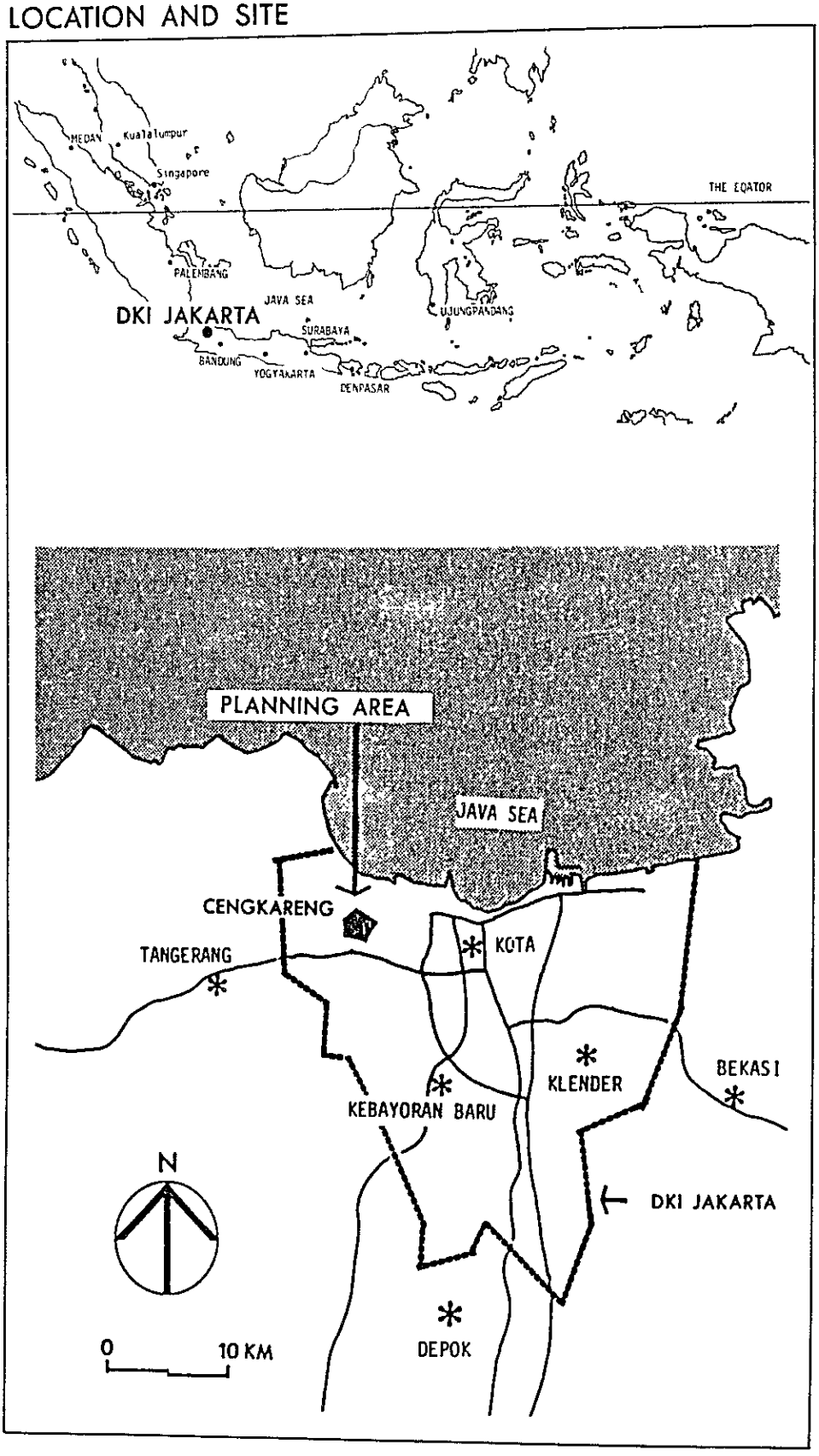
March,1981

Keisuke Arita

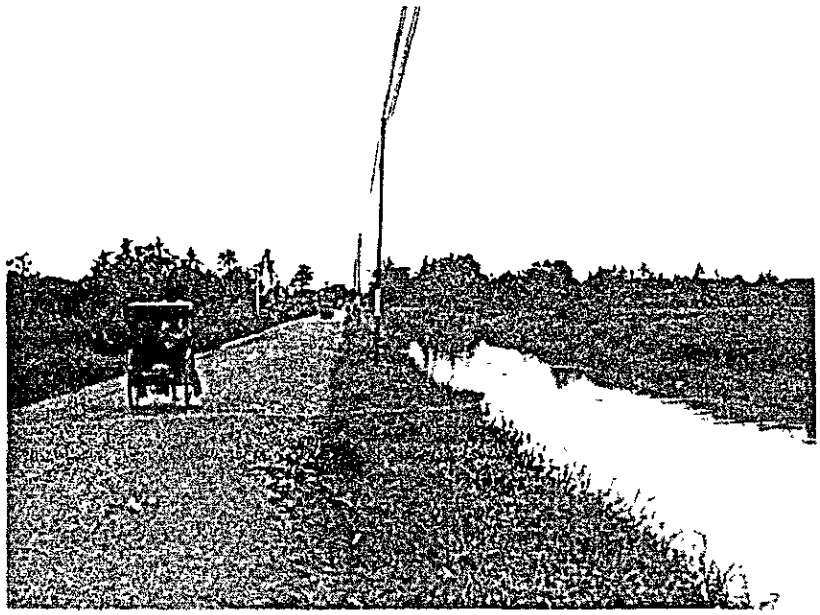
President

Japan International Cooperation Agency

LOCATION AND SITE



General View of Planning area.
(PHOTO) March, 1981.



Access road to the Planning area. - Kamal Raya St.
(PHOTO) March, 1981.


PLANNING AREA

TABLE OF CONTENTS

(DATA SOURCE)

(1) SOCIO-ECONOMIC SURVEY OF DKI JAKARTA - 1976

FIG. 4-2-1 INCOME DISTRIBUTION AND TARGET GROUP

(2) STATISTIC DATA OF DKI JAKARTA - 1977

FIG. 4-1-1 SHORTAGE IN DKI JAKARTA

(3) STATISTIC DATA OF DKI JAKARTA - 1979

FIG. 3-2-1 POPULATION
FIG. 4-1-2 TYPE OF HOUSES (1979)

(4) GENERALIZED LAND PRICE MAP OF JABOTABEK - 1979

FIG. 3-2-4 LAND PRICE

(5) JAKARTA OBSERVATORY

FIG. 3-3-1 CLIMATE DATA - DKI JAKARTA

(6) JAKARTA FLOOD CONTROL MASTER PLAN

FIG. 3-3-12 EXISTING DRAINAGE SYSTEM

(7) JABOTABEK MASTER PLAN

FIG. 3-4-2 JAKARTA METROPOLITAN DEVELOPMENT PLAN

(8) DKI JAKARTA MASTER PLAN

FIG. 3-3-7 EXISTING LAND USE
FIG. 3-3-11 TRANSPORTATION NETWORKS (FUTURE)
FIG. 3-4-3 DKI JAKARTA MASTER PLAN
FIG. 3-4-4 DKI JAKARTA MASTER PLAN

(9) INFORMATION FROM PERUM PERUMNAS

FIG. 3-4-1 HOUSING SUPPLY PROGRAM BY PERUM PERUMNAS
FIG. 4-2-2 HOUSING SUPPLY SYSTEM AND INCOME GROUP

(10) SURVEY OF THE STUDY TEAM - 1980

FIG. 3-3-5 GEOLOGICAL CONDITION
FIG. 3-3-6 SOIL CONDITION
FIG. 4-3-1 EXPENDITURE FOR HOUSES
FIG. 4-4-1 FLOOR AREA OF HOUSES
FIG. 4-4-2 HOUSING TYPE AND MONTHLY INCOME
FIG. 4-4-3 SIZE OF LOT

* BIBLIOGRAPHY IS ATTACHED AT THE TECHNICAL REPORT.

1

SUMMARY AND CONCLUSION

1. INTRODUCTION

o This is a feasibility study for the low cost housing project in Cengkareng (about 10 km west of the centre of Jakarta, the capital) in accordance with the Scope of Work agreed upon in 1979 between the Government of Indonesia and the Japan International Cooperation Agency.

This report is a summary of the Pre-feasibility study performed in 1979 ∿ 1980 (Phase I Study) and the Feasibility Study performed in 1980 ∿ 1981 (Phase II Study). In addition, in order to supplement this report, Technical Report, mainly centreing around technical content, Socio-economic Survey, Geological Survey, and Drainage Survey are prepared in a separate volume.

2. BACKGROUND

o The Republic of Indonesia has mapped out and fostered THE 5-YEAR NATIONAL DEVELOPMENT PLAN (PELITA) since 1967 for advancing the people's living standards and for developing the economy. In THE 2ND 5-YEAR NATIONAL DEVELOPMENT PLAN - PELITA II (1973/75 ∿ 1977/78), the development of urban infrastructure and the mass supply of housing were envisaged as part of its major goals, and they continue to be a part of the major policies of the State in its 3RD 5-YEAR NATIONAL DEVELOPMENT PLAN - REPELITA III (1978/79 ∿ 1983/84), too. In the background of this policy, there is a concentration of population in urban areas, which aggravated the housing shortage and the environment. An expeditious solution is expected to stabilizing the people's livelihood. Especially in Jakarta, the Capital, such phenomena are so remarkable that the solution of housing problems is one of the most urgent problems.

o As a concrete housing policy, the mass construction of low cost housing mostly consisting of low-rise houses was performed in PELITA II. In order to supply such low cost housing, the National Mortagage Bank - BANK TABUNGAN NEGARA (BTN) and the Urban Development Corporation - PERUM PERUMNAS were established to fix a supply system for public housing.

In the following REPELITA III, some changes have been made in the housing policy, and the development of not low-rise but walk-up flat is established as an important subject for the higher utilization of land. In other words, out of total of 120,000 low-cost houses supplied by PERUM PERUMNAS during the period of REPELITA III, 6,000 are determined to be walk-up flat.

o Meanwhile, the securing of land for supplying this hosuing has become so difficult in recent years that the development of lower lands on the coast of the Java Sea which have hitherto been left undeveloped has come to the fore. These lower lands are ill-drained and their ground conditions are poor with many difficulties for development into housing lots. Nevertheless, the study of technological methods for developing these lower lands has become one of the most important subjects for urban development.

o Under the above-mentioned policy for development of the urban infrastructure, mass supply of housing -- construction of walk-up flat, and the development of lower lands, the housing project in Cengkareng where partial land acquisition had already been progressing were thrown up by the Government of Indonesia as a project in a pilot role.

It was as early as 1970s that this Cengkareng district was selected as land for housing development. At that time, although this district was picked together with the Klender district in the west suburbs of Jakarta and the Depok district in the south suburbs, its priority for development was ranked lowest among them because its lowness was unfavorable for development. However, both Klender and Depok have been developed as housing complexes and the development is almost complete at present. Consequently, at present, Cengkareng district whose development conditions were regarded as the poorest among these three districts has been picked up concretely and politically by the Government of Indonesia as an object of development.

As a result, technical cooperation in performing this project with the pioneering content in Indonesia was requested by the Government of Indonesia to the Government of Japan. And the development study therefore is to be performed by the Japan International Cooperation Agency.

3. OBJECTIVES

o The objective of this study is a feasibility study of low cost housing project in Cengkareng. The purpose of this study, however, is not a feasibility study of development into housing lots, but mostly a study of its developing method on the presupposition of a decision of the Indonesian Government to develop it into housing lots. In concrete, it is to prepare alternative plans for developing low cost housing, taking socio-economic conditions into accunt, while developing new housing types on the basis of physical location characteristics, and to present the most appropriate alternative plan.

o Within the Scope of Work, the development of walk-up flat which is effective both for high utilization of land and the mass supply of housing is part of the major items of this study. In other words, this means to study whether or not the construction of low cost walk-up flat is feasible in this site where ground conditions are poor, and, at the same time, to develop maisonette type housing and 2-5 storied flats corresponding to demands for higher density housing in place of the hitherto one-storied duplex type housing generally presupposing expansion. On the other hand, the main purpose of this study is a study of effective development of lower lands into housing lots to function as low cost housing lots. In other words, this means the development of methods to lessen the land relating cost, keeping a certain level of environment, and the methods developed here will be useful for developing lower lands extensively distributed along the coast of the Java Sea.

o Further, another of its purposes is, through a feasibility study for this pioneering project, to make a technology transfer by means of cooperative work in Indonesia and Japan with the Indonesian counterpart.

4. GENERAL CONDITIONS

(Area Covered by This Study)

o Cengkareng, the site covered by this study is located about 10 km west of the centre of Jakarta (Kota district, the business centre), and 3 km from the Java Sea coast. Since this Cengkareng district is adjacent to the Jakarta-Tangerang road which connects Jakarta, the Capital, with a total population of more than 5 million and the suburban city of Tangerang, has steadily urbanized in recent years with remarkable move-in of inland industries and housing complexes. Further, in the near future, construction of the Harbour Road, Outer Ring Road, New International Airport, etc. are planned, and this district's potentiality is extremely high. Topographically speaking, the Cengkareng district is composed of a coastal ridge and lower land, and the ridge portion of a relatively high elevation has mostly been developed hitherto. On the the other hand, the lower land is mostly used for paddy fields, partially dotted by uncultivatable swampy lands, Even these low lands are steadily being developed into housing lots by land filling in recent years.

o An area where this development of low cost housing is to be performed in the Cengkareng district, the planning area for low

cost housing is an area mostly consisting of present paddy fields and hamlets for farming houses located about 2 km north of the Jakarta - Tangerang road. This planning area is roughly 2 km × 2 km occupying an area of 370 ha. Of this planning area, an area where the land acquisition for this projects is most advanced enabling the development project to be performed in advance is the project area, whose area is 110 ha. In this study, a feasibility study for developing low cost housing shall be made on this 110 ha.

(Housing Demand)

o The population flow into Jakarta, the Capital, is so intensive that the housing shortage is aggravated with a shortage of 150,000 houses as of 1980 and 300,000 houses estimated for 1984. This housing shortage has become quite apparent not only in housing for the low-income group but also for housing of all groups. In particular, the competition rate for entering low cost housing supplied by PERUMNAS is outstandingly high due to its substantial infrastructural facilities, high quality, etc. Therefore, in consideration of its nearness to the city centre, the low cost housing in Cengkareng is expected to attract the highest-ever demand.

(Target Group)

o This project is to supply low cost housing principally covering the low-income group. In other words, the purpose of this project is to supply housing affordable for the low-income group. This affordability, however, varies according to the repayment method of loan. Therefore, in this study, three cases are set: (1) percentile of 20% ∿ 70% and (2) the same for 30% ∿ 70% both for fixed repayment, and (3) the same for 20% ∿ 80% for gradual repayment. In these cases, monthly incomes as of 1984 when the occupancy is scheduled will be 57,000 ∿ 143,000 Rp for case (1), 70,000 ∿ 143,000 Rp for case (2), and 57,000 ∿ 191,000 Rp for case (3) respectively. The affordable unit prices at that time will be 2,400,000 ∿ 5,970,000 Rp for (1), 2,850,000 ∿ 5,970,000 Rp for (2), and 3,470,000 ∿ 10,340,000 Rp for (3), or roughly 40 times of the monthly income.

(NOTE) Rp = Rupiah. 100 Rp = 33.4 Yen = 0.163 US Dollars. (Dec.'80)

(Implementing Body)

o The implementing body of this project is the Urban Development Corporation - PERUM PERUMNAS, which is affiliated with the Ministry of Public Work and mainly responsible for the implementation of low cost housing projects. PERUMNAS acquires land, develops land, constructs housing, and determines the occupants with low-interest (13.5% per annum) loans from BTN or other Government financing bodies and with its own fund. At the time of concluding the purchase contract with the occupants, the housing units are transferred to BTN and PERUMNAS will receive from BTN the sum equivalent to the selling price, and thus PERUMNAS completes its work. These projects of PERUMNAS are to be self-sustaining by each project as a rule, and no subsidy or so is to be introduced from outside in general. Therefore, a cross-subsidy within a project is practiced.

In other words, the project financing is balanced by utilizing the profits obtained through the supply of housing lots to higher-income groups or selling commercial lots for the fund to lower the selling prices of low cost housing.

5. PROPOSALS

(Optimum alternative plan)

o In view of the high potentiality, vigorous demands for housing, and the high costs of developing lower lands in Cengkareng district, such urban type housing shall be positively introduced as medium-storied housing, 2 ∿ 5 storied flat-type housing, and maisonette-type housing, capable of encountering demands for highly dense housing development. Here, on the assumption that the project account will be balanced, alternative plans are these types of housing in versatile combinations. Out of these plans, the optimum alternative plan has been selected on condition that housing density is 60 units per hectare or more, empty lots sold at market price are 30% or less of the productive area income groups of the 20th percentile may purchase under the gradual repayment system, and so forth.

o According to this optimum alternative plan, walk-up flats are 900 units, and urban style housing such as two-storied flat housing and maisonette housing including walk-up flat housing is 5,300 units or 70% of the total of 7,500 units supplied. As the results, it will be possible to build up a highly dense housing complex of 70 units per hectare which will be 40% over the average housing density of 50 units per hectare of existing PERUM PERUMNAS housing complexes.

o According to this optimum alternative plan, walk-up flat housing and two-storied flat housing are supplied to lower income groups, while maisonette type and row-house type housing, capable of expanding in future are supplied to higher income groups. This is considered to be the most appropriate supply system at this juncture in view of the purchasers' ability to expand, maintenance of environment standards, unclear preference for walk-up flat housing, etc.

(Overall urban development project)

o This project covers a site of 110 hectares in which the project is to be implemented for the time being, and is a large-sized urben development project accommodating 7,500 dwellings or 45,000 persons. While promptly improving community facilities for the population to be accommodated, commercial and business functions are positively introduced to increase the employment chances for occupants and inhabitants of the surrounding area, to reduce commutation costs by making working places closer to residences, and to lessen the business concentration in the city centre. Here, commercial functions are established along the access road, and a town centre at the central position. On the other hand, housing lots for sale are laid out along the spinal trunk road of the Project Area, capable of providing the introduction of not only residences but also home industries. These lots for sale will become an arena of inhabitant's (for example, those who had been in the Planning Area and became unable to engage in farming due to the development) livelihood reconstruction to build up the whole area into a community complex.

In other words, this project formed a harmonized structure as a "town" with not only hospitals, health centres, schools, etc. but also enough chances of employment.

Meanwhile, this project is scheduled to cover 110 hectares for the time being, but ultimately expects to be an areal development covering 370 hectares. Therefore, this is a project to be a "nucleus of ordaly urbanization" in the western suburbs of Jakarta and is to contribute to the harmonized development covering not only 110 hectares but also the whole Cengkareng district. Furtheremore, this project, different from previous projects, is an areal overall development centering around housing closely connected with the urban infrastructure improvement, and is very meaningful as a model project consolidating project methods and project systems.

(Substantial infrastructural facilities)

o For the sake of the development of low land, the repletion of infrastructural facilities is essential. In this

project, open spaces, roads and green lanes are expanded above the PERUM PERUMNAS standards, while repleting drainage faiclities and sewage treatment facilities. Consequently, the ratio of the housing area to the Project Area is decreased from 64% of the standards to 51% and that of productive area from 68% to 58%, both by more than 10%. On the other hand, there are existing greenery zones (wooded zones dotted by farming houses) in the Planning Area. This project proposed in the General Plan to positively preserve these zones in the future as contrasted to the highly dense housing areas.

6. EVALUATION

(Financial evaluation)

Although projects of PERUM PERUMNAS are not directly subsidized by the Central Government, etc., they loan funds whose interests are as low as 13.5% per annum or nearly 50% of those of private loans from Government-connected financial organs, bodies and make it a rule to balance their accounts by unit project. Therefore, the financial analysis and evaluation of this project are made in accordance with such a principle. As a result, this project ultimately obtained an income of Rp. 43,012,264 million against the investment of Rp.41,143 million to almost maintain the balance.

o Meanwhile, the total size of the project will be Rp. 350,000 million or more if the construction of 120,000 houses is scheduled by PERUM PERUMNAS under REPELITA III. Since the total amount invested for this project out of this amount is about Rp. 40,000 million, the ratio of this project to the total size of the project will be about 11%. On the other hand, the total number of houses to be constructed under this project is 7,500 houses or 6% of 120,000 houses showing a big investment amount of this project in comparison with the number-of-houses ratio. However, this owes to the fact that this project is located in an area with the highest land prices in Indonesia and the high cost is needed for improving infrastructure to develop lower lands. Other projects are located in areas where land prices are lower and developments are easier to relatively lower the investment amount per house. Thus, it can be said that this project would not adversely affect the overall balance of PERUM PERUMNAS projects.

o This project supplies 900 units of walk-up flat housing to account more than 10% of the total number of housing to be

constructed. At this moment, since this walk-up flat housing is of a pioneering type, people's preference therefore is not yet clear and there are some anxieties whether or not it would securely attract effective demands.

This project, however, supplies walk-up flat housing to the lowest income group, although its construction cost is more than double of other housing, and the lowest selling prices are established. Therefore, even if there remain some units unsold, it would affect the financial framework of this project to a little extent only, and this can be said to be a financially safe supplying system.

(Economic evaluation)

o This project schedules to supply 7,500 units, which is 10% of 70,000 houses expected to be privately constructed in DKI Jakarta during PELITA III. Further, it is 30% of 23,000 houses being planned in DKI Jakarta by PERUM PERUMNAS. The number of houses supplied by this project can be said to be much contributing to the national mass housing supply policy.

o This project not only supplies mass housing but also intends to arrange hospitals, health centres, schools, mosques and other various social facilities. Further, since substantial urban infrastructures shall be improved, the inhabitants will be able to spend pleasant and healthy daily lives different from their former lives. In other words, this leads to the furnishing of stabilized labour, to the improvement of labour productivity and further to the increased individual incomes, and thus these developmental effects will further expand propagationally.

o This project is a pioneering areal development project in Cengkareng, and is to initiate harmonized development of surrounding areas. Therefore, planned establishment of commercial/business functions and planned introduction of home industries are scheduled. The increased employment chances thereby will lead to the increased income of inhabitants living in and around this district. Further, the approached working and living places will bring about the saving of traffic costs and time, relative reduction of traffic load in the whole city of Jakarta, and energy saving.

Meanwhile, since this district has high potentiality, inorderly urbanization will progress and farmers will be obliged to change their jobs unplannedly because farmland would be converted to housing lots. In other words, there will be a big

possibility that farmers would move into cities in increasing numbers as unskilled labour to spend unstable lives. Therefore, it is very meaningful to introduce home industries as arenas where farmers would plannedly rebuild their living. For such purposes, it is necessary to provide vocational training institutes and vocational schools for livelihood rebuilding education. This project has secured land lots for such uses, too.

o Since this project would supply more than 30,000 stabilized workers, it is forecast that various industries would locate around this district expecting such labour. At present, inland-type industries are conspicuously moving in along the main roads in the district. With the construction of the Outer Ring Road and the renovation of Kupuk Street to improve the physical conditions of locationing, industrial locationing will rapidly progress thanks to the stabilized labour, too.

o In the past, the low income group who flowed out of farming life has not been blessed with chances to save up their assets as stocks. Especially in Indonesia where natural environment is gentle, such a necessity has been low and their intention for savings has been relatively low. However, with the economic development of the State, the advancement of urbanization, and the improvement of living standards , it is forecast that the necessity for stocking of personal assets of low income group will further be heightened. Supplying low cost housing to such a low income group on this occasion will not only provide them with arenas of healthy and pleasant life but also give them chances to stock their personal assets. And it can be said to be a very meaningful project for stabilizing people's livelihood throughout the nation.

o In this project, 7,500 dwellings shall be constructed, and drainage facilities and sewage treatment facilities, roads, etc. shall be arranged. For such purposes, many labourers will be induced during the on-site construction period. In other words, this is a project which needs more than a million labourers in the aggregate total or about 2,000 labourers per day during the construction period lasting about two years. Further, in addition, since a multitude of primary products and industrial secondary products with be used, the needs for allied labour will expand propagationally to bring about a very big effect during this construction period.

o Multiple and versatile economic benefits mentioned above shall be quantitatively estimated as follows:

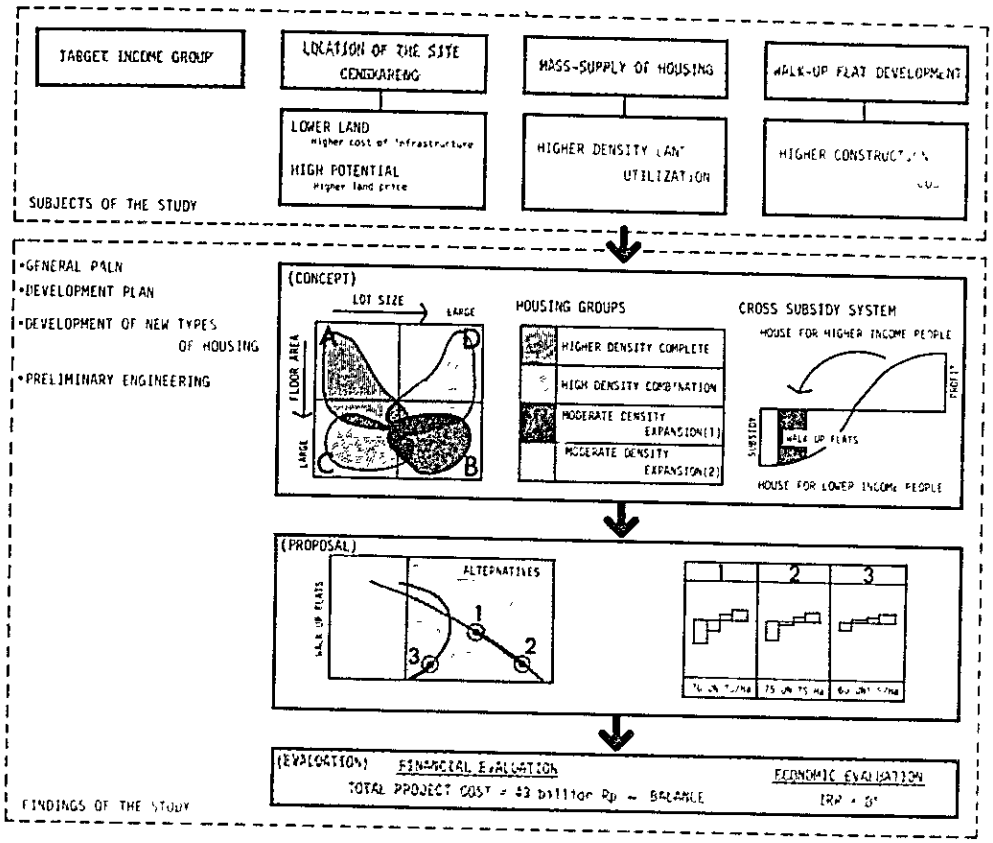
As stated above, this is a project which produces multiple

and versatile, direct, indirect, economic and social benefits. Then, by quantitatively estimating these benefits, the effects of this project shall be relatively evaluated. At this moment, however, the quantitative criteria or evaluating benefits of housing development projects, unlike that of such projects as road, port and air-port, is yet to be studied. And no institution has ever shown such a guideline. Therefore, the calculation made here has the meaning of a preliminary study for making criteria, and these quantitative benefits will be established as criteria through many housing development projects in the future.

Here, such quantitative evaluation shall be computed as a trial in terms of Internal Rate of Return (IRR). Then the computation has been made by adding the factor of the size of this project - mass construction - to the economic cost of this project obtained by deducting price contingency, wates of unskilled labour, taxes, insurance premiums and interests from the total project costs. On the other hand, the benefit is the economic value of the supplied housing, and it can be represented by the rent. Further, the empty lots for sale are sold at market prices, which can be regarded as an economic benefit.

If the IRR is computed from the above conditions, it is about 8%. This value is somewhat lower than 10% or more for road, port and other industry-connected projects. However, since this project also produces many social benefits which cannot be ascertained economically, this figure is considered to be appropriate.

FRAME WORK OF STUDY



2

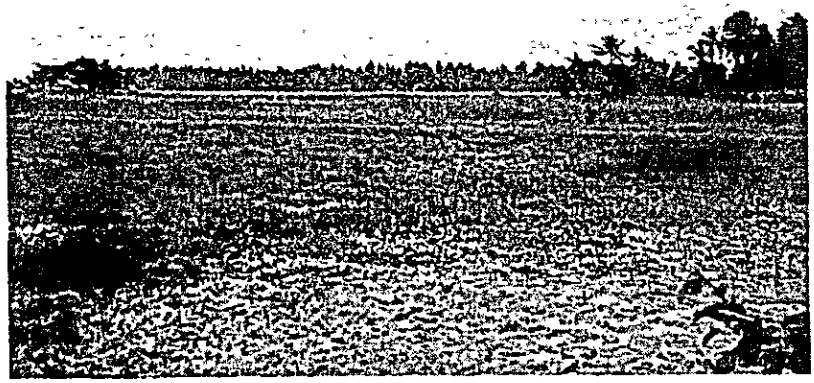
INTRODUCTION

2—1 INTRODUCTION

This is a Main Report of a preliminary study carried out in 1979-80 and a feasibility study in 1980-81 for a low cost housing development program at Cengkareng in DKI Jakarta.

To supplement this report, a technical report has been separately prepared. The technical report contains elaborate descriptions on the detailed technical aspects, as well as an analysis of the basic conditions for the formulation of a development program and the procedure required. Therefore, this provides a technical direction for a detailed design which is to be conducted at the following stage, and it is expected that it will serve as general information for the formulation of similar low cost housing development programs in the future.

Data on a topographical survey, a soil investigation and a socioeconomic survey have also been added at appendices.



General view of the site in CENGKARENG.

2—2 BACKGROUND

The development of an urban infrastructure and the supply of housing in large numbers are proclaimed as principal targets in the 3RD 5-YEAR NATIONAL DEVELOPMENT PLAN - REPELITA 111 (1979/80 - 1983/84).

Particularly in DKI Jakarta, there has been a continuously sharp rise in population in recent years, and residential areas have been developed and houses constructed thus far. But these endeavours have not been sufficient to meet the demand.

In the development of housing in DKI Jakarta, effort has been concentrated mainly in the southern area, which is higher in altitude and easier to develop. However, there is a limit even to the development of this area, and it has now become a major task to press forward with development of the seashore area, which is relatively close to the down town but which, as it happens to be a low and swampy area, is not blessed with favorable conditions for development, and little progress has been made towards urbanization.

Given this situation, the Cengkareng area (about 10 km west of the down town) where there has been progress in a land acquisition by the local government since the early 1970s, is regarded as the strategic point for development of a residential area, the purpose of which is to supply housing in large numbers and also to develop this lower land. Presumably, the method for development of this area could also be used in other areas.

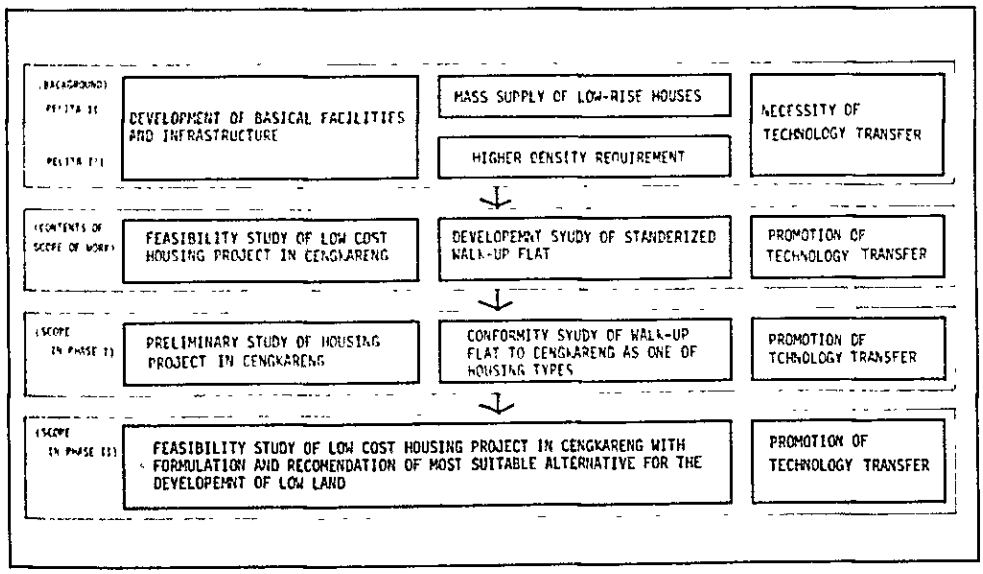
Of the 120,000 houses which are to be constructed by PERUM PERUMNAS (NATIONAL URBAN DEVELOPMENT CORPORATION) during the REPELITA 111, plans are afoot for the construction of 6,000 walk-up flats, some of which are to be erected in the Cengkareng area, in line with the policy of supplying houses in large numbers.

2—3 SCOPE OF WORK

In the Scope of Work, it is oriented to construct the walk-up flats which would allow the large number of houses and optimum utilization of land. Given this factor, the study team sees the necessity of shifting from the construction of low-rise housing (or duplex) of the suburban type, to that of housing of the urban type (walk-up flats or maisonettes) which will cope with the high density. Therefore, it might be said that the development of such a type of housing area differs from that of the Depok and Klender housing complexes developed thus far by PERUM PERUMNAS.

Another objective of this study is to explore the possibility of efficiently converting the lower land into a low cost housing estate. This signifies the necessity of studying how the cost of the infrastructure may be minimized while retaining a certain standard of environment and, at the same time, how to keep the selling price of the houses within an attractively low limit. Moreover, it might be said that the study of the latter method is associated with the development of high-density and urban type housing estates.

FIG. 2—3—1 OBJECTIVES OF THE STUDY



2—4 WORK FLOW

This study is designed to formulate plans for the development of a low cost housing of the urban type in a lower land in a manner somewhat different from the PERUM PERUMNAS housing developments of past. To eliminate the accumulation of eloborate studies on the final stages of development will be employed intermediate method.

In other words, rough solutions are worked out while work is proceeding, and the problems posed there are analyzed and reviewed from different points of view so that the direction of work may be adjusted to bring about a final achievement.

Even in this phase of the preliminary study(PHASE 1),the primary purpose is to make a study of the physical aspects, but the selling prices are hypothetically computed on a trial basis, and a comprehensive appraisal is made on the distribution of houses by degree of density and by type (walk-up flats, in particular) and on the status of persons to be accommodated in the flats, with a view to orienting the future course of work. Moreover, in a feasibility study, work on the socio-economic aspects is reinforced, the study extending to a financial and economic assessment being repeated.

The Project Areas in which a feasibility study is to be conducted are designated phase by phase. At the beginning, the feasibility study covers the entire planning area. But finally it is decided to accommodate 110 hectares, as subsequent surveys revealed that this range has the highest feasibility.

For the aim of progressing this feasibility study, the committees and working team are organized. Indonesian Steering Committee and Japanese Advisory Committee orien-

tate the progress of the study, and Japanese Study Team performs the work of the feasibility study and prepares the report in cooporation with Indonesian Counterparts.

FIG. 2－4－1 WORK FLOW

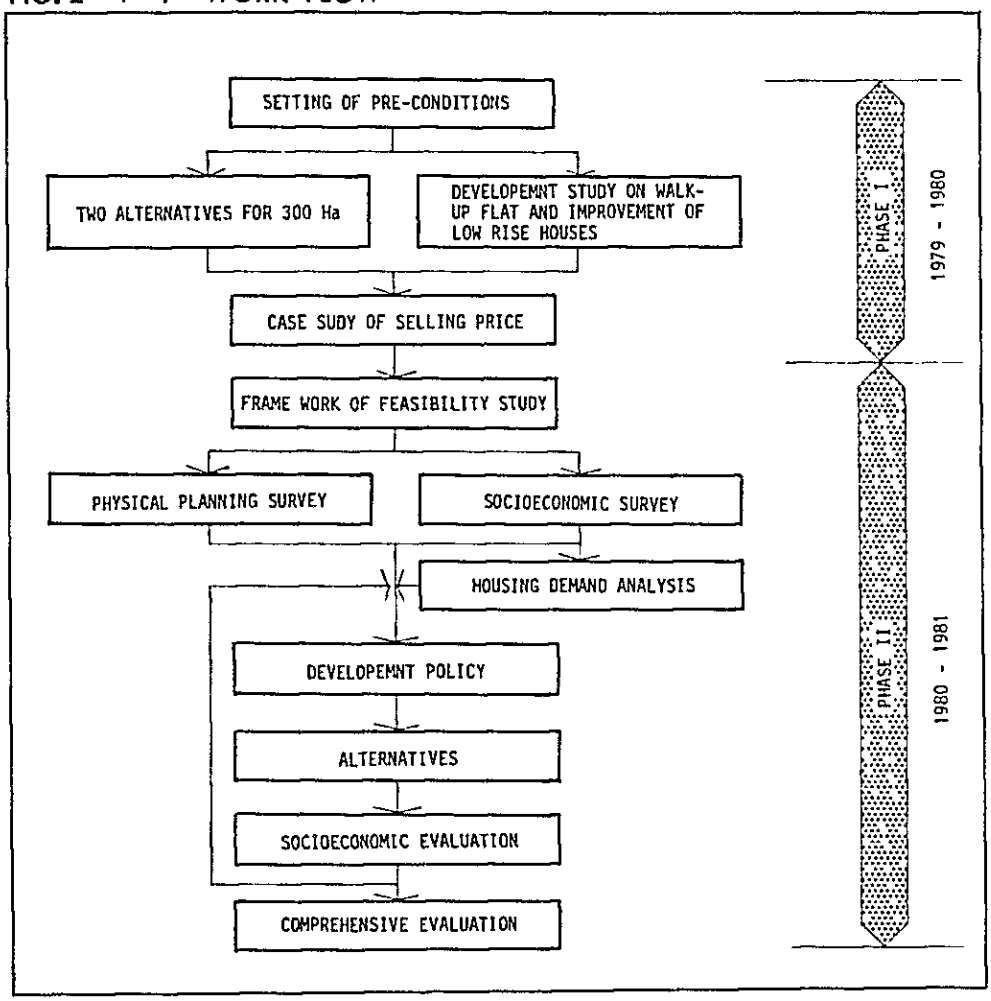


FIG. 2－4－2 SCHEDULE

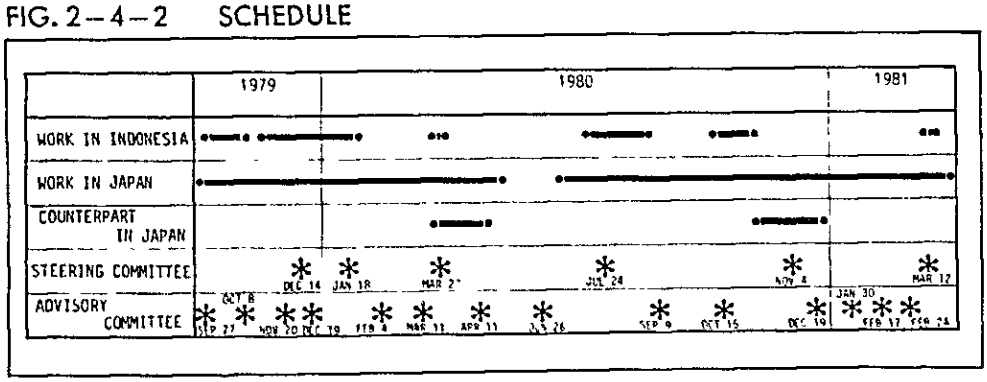
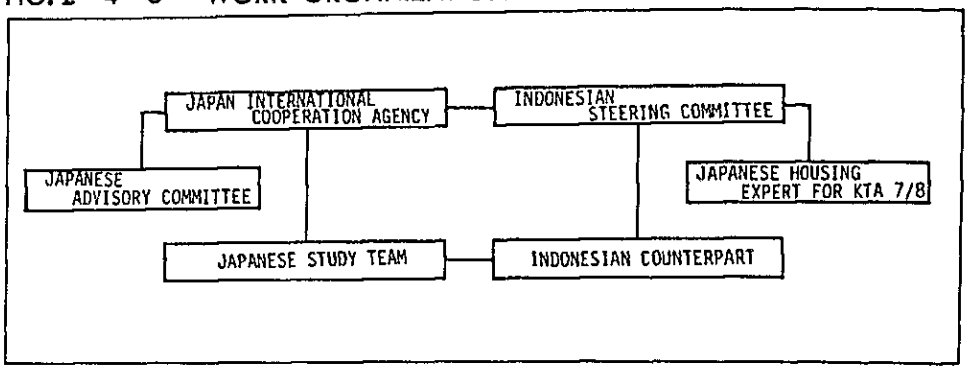


FIG. 2－4－3 WORK ORGANIZATION



INDONESIAN STEERING COMMITTEE

Ir. Radinal Moochtar	Dir. Jen. Cipta Karya
Ir. Suyono M. Sc.	Direktur Perumahan Rakyat
Ir. Susanto	Direktur Direktorat Tehnik Penyehatan
Ir. Soenarjono Danoedjo	Direktur Utama PERUM PERUMNAS
Ir. Suwarno Prawirasumantri	Direktur Perencanaan PERUM PERUMNAS
Ir Noer Saijidi M.K.	Direktur Pembanguman PERUM PERUMNAS
Ir. Herbowo	Ketua BAPPEDA D.K.I.
Ir. Iman Sunarjo	Ketua Team Perencanaan Perumahan D.K.I.

JAPANESE HOUSING EXPERT FOR KTA 7/8

Mr Shinsaku Kanetaki
Mr. Hajime Yokobori
Mr. Toshio Uetama
Mr. Hajime Obata

JAPANESE ADVISORY COMMITTEE

Mr.Soichiro Matsutani	Chairman Director, Housing Bureau, Ministry of Construction (MOC)
Mr.Shoichiro Umeno	Head, Housing Bureau, MOC
Mr.Nobuaki Ohkubo	Deputy Head, Urban Building Division, Housing Bureau, MOC
Mr.Yuji Ishiyama	Head, The first Earthquake Engineering Division, Building Research Institute, MOC
Mr.Toshio Ishiguro	Deputy Head, Tsukuba Academic New Town Developement Bureau, Japan Housing Corporation
Mr.Yasunori Yamanaka	Deputy Head, Housing Costruction Division, Housing Bureau, MOC
Mr.Tetsuo Numaoi	Deputy Head, Urban Building Division, Housing Bureau, MOC
Mr.Shunichi Hokura	Overseas Cooperation Officer, International Division, Planning Bureau, MOC
Mr.Hitonori Ono	Coordinator Social Development Cooperation Department, Japan International Cooperation Agency (JICA)
Mr.Toshio Ai	Ex-Coordinator

INDONESIAN COUNTERPART

Ir. Duddy Soegoto	Kepala Bagian Perencanaan Feasibility PERUM PERUMNAS
Ir. Rai Pratadaya	Ka. Ur. Pengarahan Perencanaan Lingkungan D.K.I.
Ir. Ny. Rosita Saputro	Kepala Distrik Perincanaan 1 Wilayah Jawa Barat.
Ir. Aziz Dahlan	Kasubag Kerjasama Luar Negeri PERUM PERUMNAS
Ir. Herry Purnomo	Staf Perencanaan Feasibility PERUM PERUMNAS
Ir. Paryatno Parno	Staf Perencanaan Feasibility PERUM PERUMNAS

JAPANESE STUDY TEAM

Mr.Jiro Suzuki	Leader Nihon Architects, Engineers & Consultants, Inc. (NAEC)
Mr.Hajime Sabo	Town Planner, NAEC
Mr.Masanori Onoe	Town Planner, NAEC
Mr.Shunji Kawada	Architect, NAEC
Mrs. Michiko Inagaki	Architect, NAEC
Mr.Shunran Takahashi	Structural Engineer, NAEC
Mr.Yutaka Saito	Mechanical Engineer, NAEC
Mr.Yasushi Miyazaki	Irrigation Engineer, NAEC
Mr.Ryoichi Kawasaki	Engineering Geologist, NAEC
Mr.Gen Fujiwara	Civil Engineer, NAEC
Mr.Mikio Tanemura	Civil Engineer, NAEC
Mr.Hiroya Yoshikawa	Environmental Scientist, NAEC
Mr.Motohide Nishio	Economist, NAEC
Mr.Takashi Inoue	Economist, NAEC

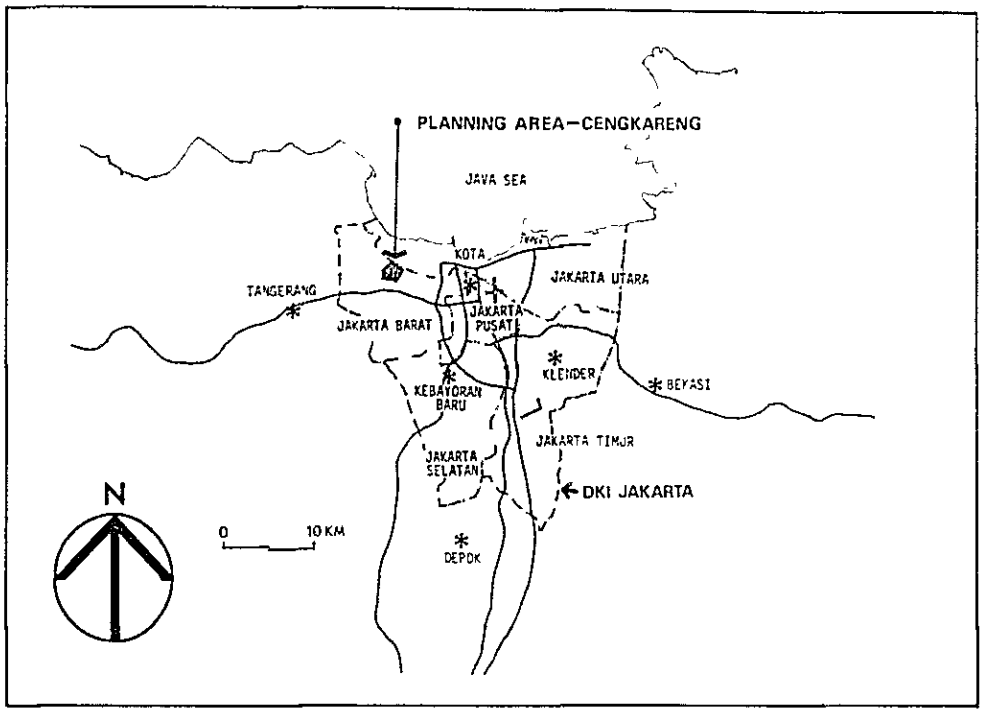
3

REGIONAL AND LOCAL SETTING

3—1 LOCATION AND SITE

The Planning Area is situated about 10 km west to the down town of Jakarta, about 12 km east of the city of Tangerang, and about 3 km from the coast running alongside the Java Sea.

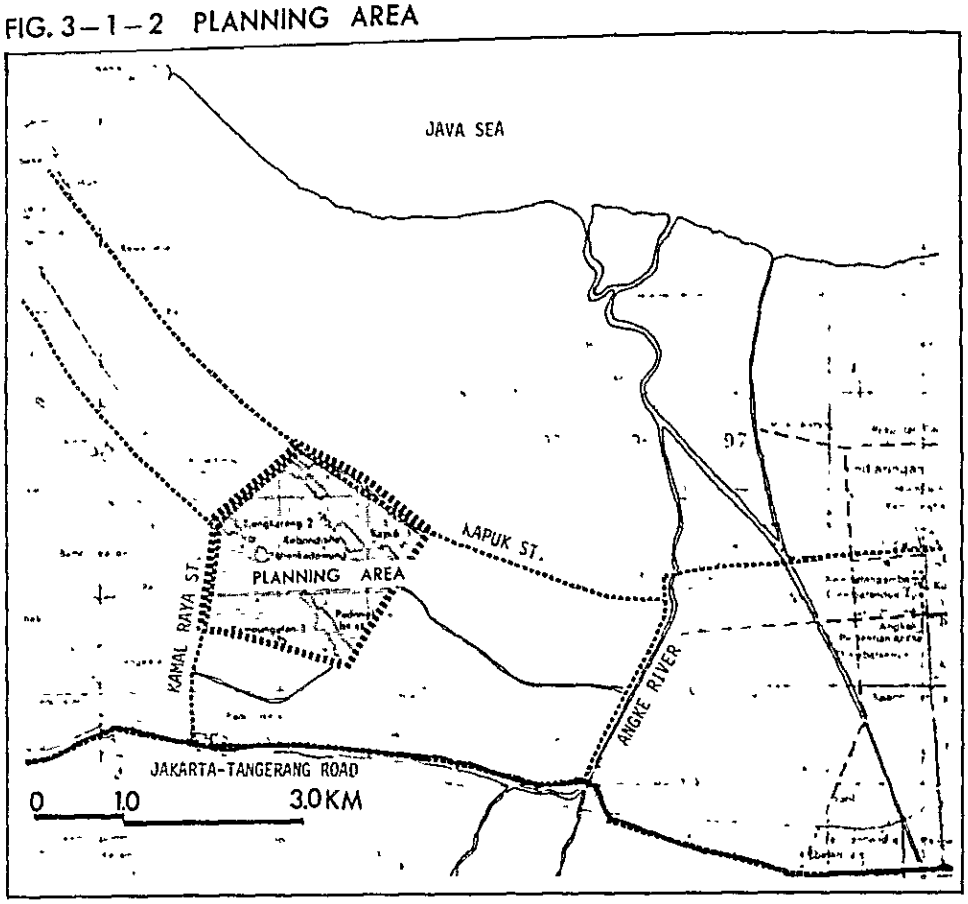
FIG. 3—1—1 LOCATION AND SITE



PLANNING AREA

The Planning Area is administratively situated in DKI Jakarta, the West Section of Jakarta (Kota Madya Jakarta Barat) and the town of Cengkareng (Kecamatan Cengkareng), stretching over the villages Cengkareng (Kelurahan Cengkareng) and Kapuk (Kelurahan Kapuk). The Planning Area measures 370 hectares, surrounded by main streets, such as the Kamal Raya and Kapuk St. , the existing village of Cengkareng, and the River Kapuk Muara. Within this area land use, the location of facilities, and a transportation system, will be oriented and, on the basis of this orientation, plans will be formulated for the 110-hectare project area.

FIG. 3-1-2 PLANNING AREA



PROJECT AREA

The area in which the project is to be carried out measures 110 hectares. This area is situated primarily among the paddy-fields between the villages of Cengkareng and Kapuk. In this paddy-field area, there has, up to now, been the highest degree of progress in the land acquisition making it possible to embark upon the project earlier than in any other area.

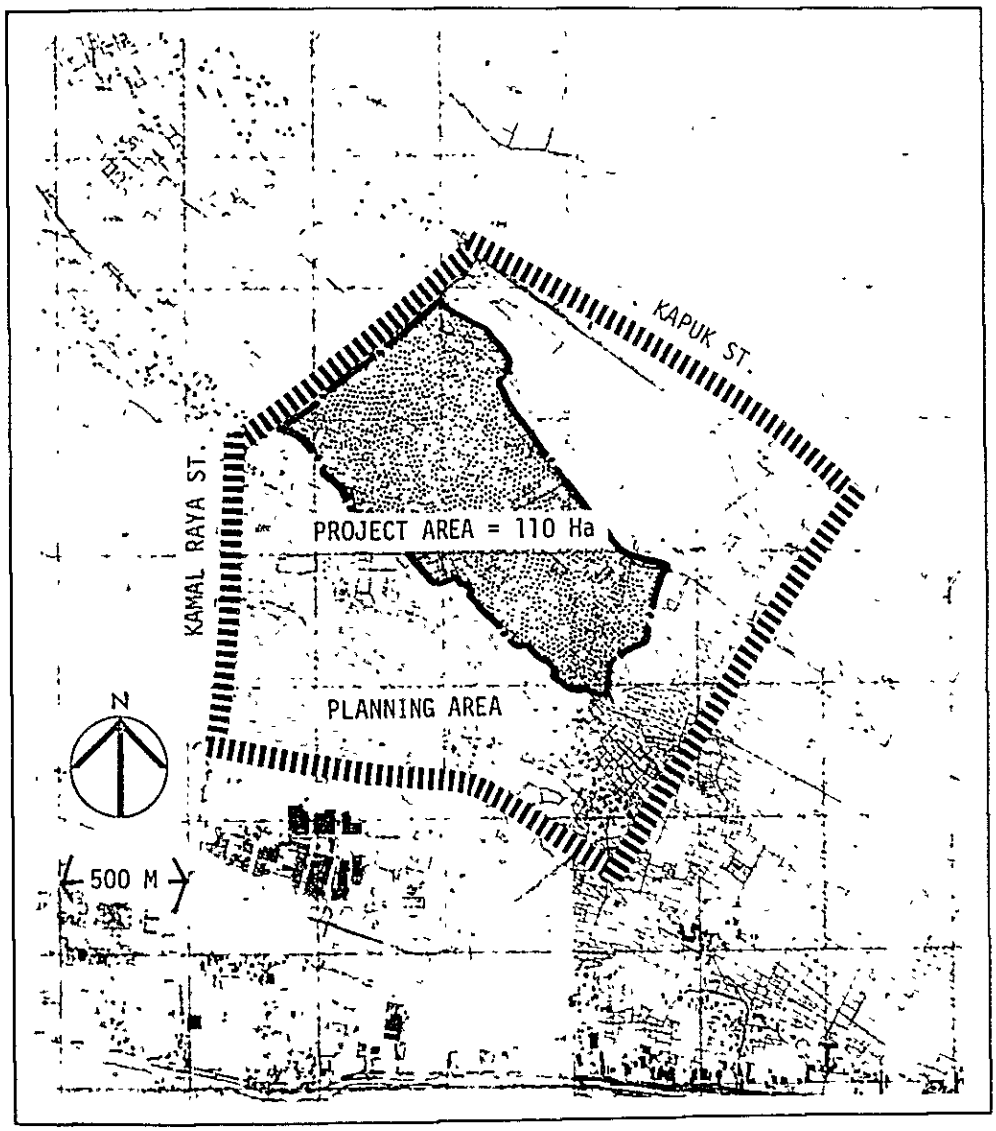
Therefore, the present feasibility study will be conducted on this area to compute the project cost, study alternative programs, and analyze the financial aspects.

In implementing this project, it is necessary, as a matter of course, to make a study for an area wider than the 370-hectares planning area. This step is indispensable, particularly in

respect to the infrastructure, including the drainage and the water supply, and to socioeconomic conditions, such as the pattern of demand for housing. This survey can be expanded, depending on the aim.

In respect to the 110-hectare project, too, it is conceivable that there may be some changes in the boundary during the implementation of the project. Alterations to meet these changes, will be made during the stage of a detailed design.

FIG. 3—1—3 PROJECT AREA



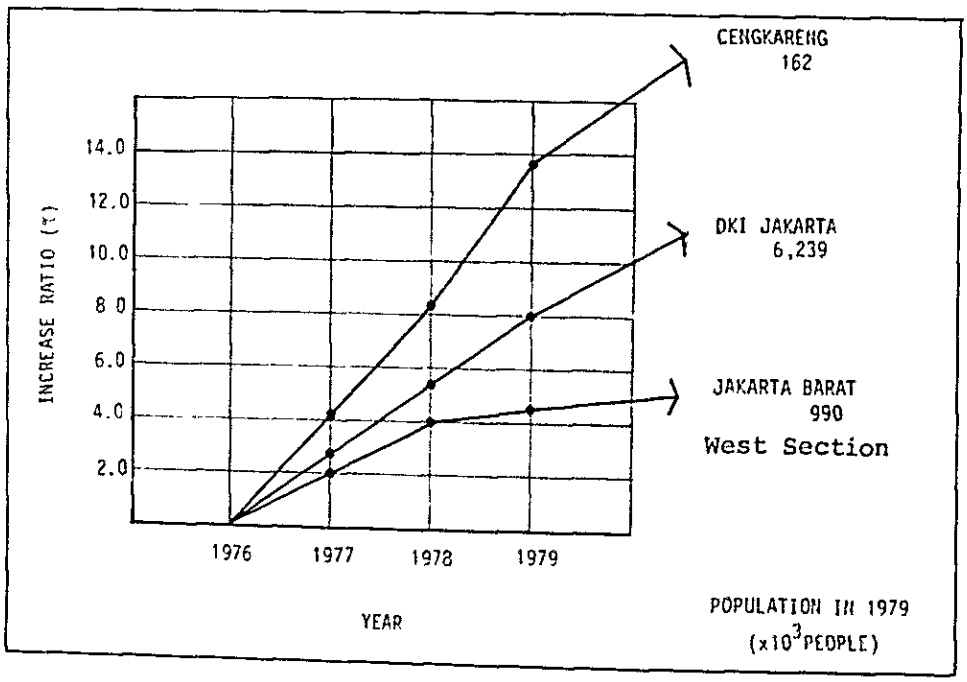
3—2 SOCIAL AND ECONOMICAL CHARACTERISTICS

POPULATION

The population of DKI Jakarta has increased at a rate of 3-4% a year in recent years, reaching about 5,300,000 in 1979. The total population of Jakarta's West Section and the town of Cengkareng, stood at about 990,000 and 160,000, respectively, in 1979.

One characteristic of Jakarta's population statistics is that the population of its built-up areas, such as the north and central, and south sections, has been on the gradual downturn, whereas the population of the suburban areas, such as the east and west sections, has increased at a conspicuous pace. Above all, there are unmistakable signs of an increase in the population of the town of Cengkareng. The population was up about 5% in 1979 from 1978. Should these signs persist, the population of Cengkareng in 10 years will rise by 50% to about 250,000.

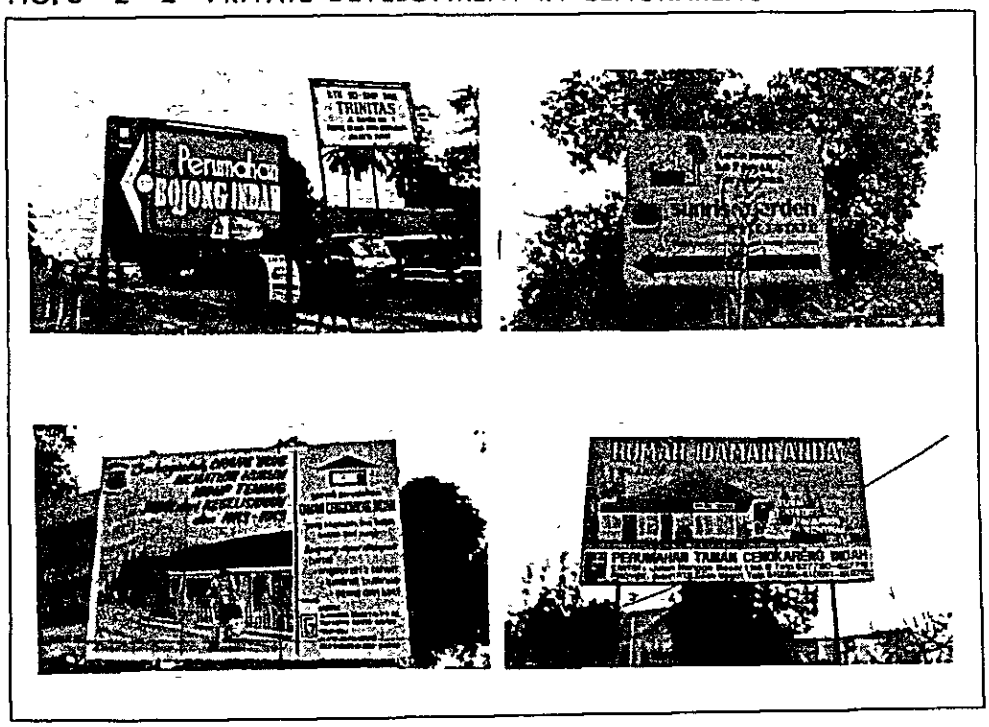
FIG. 3—2—1 POPULATION



On the other hand, the population density of Cengkareng stood at 2,657 persons/km^2 in 1979, ruoughly one-third of the average density of DKI Jakarta, which stood at 8,131 persons/km^2, and also that of west section, which was registered at 7,533 persons/km^2. Consequently, it might be said that there is room for a population increase.

Signs of any change in the number of members per house hold cannot be substantiated, as the statistical data now available very to a considerable extent, but the number is estimated to range from 5.5 to 6.0 members per house hold for DKI Jakarta at present. There are signs of a rise in the number. The reason is presumably ascribable to a rise in the population inflow and an increase in the number of persons living under the same roof. In supplying new houses in the future, estimating the number of members per house hold at 6.0 would probably be the most accurate figure.

FIG. 3—2—2 PRIVATE DEVELOPMENT IN CENGKARENG



INDUSTRY

A check of the employment of house hold heads in the town of Cengkareng indicates that 28.9% of them were engaged in agriculture in 1979. This percentage is by far higher than the 6.7% registered for DKI Jakarta and the 9.12% for the West section.

A check of the distribution of industry in DKI Jakarta reveals that the tendency is conspicuous for the number of places located eastward and southward of the down town, and this trend is particularly significant in the distribution of manufacturing industries. In the Cengkareng area, large modern factories and smaller industrial plants have been established along the Jakarta-Tangerang road and the Kapuk street. The main lines of industry are chemical, rubber, plastic, glass, electronics, electric appliances, ceramics, etc., suggesting that all of them are those of the inland industry type.

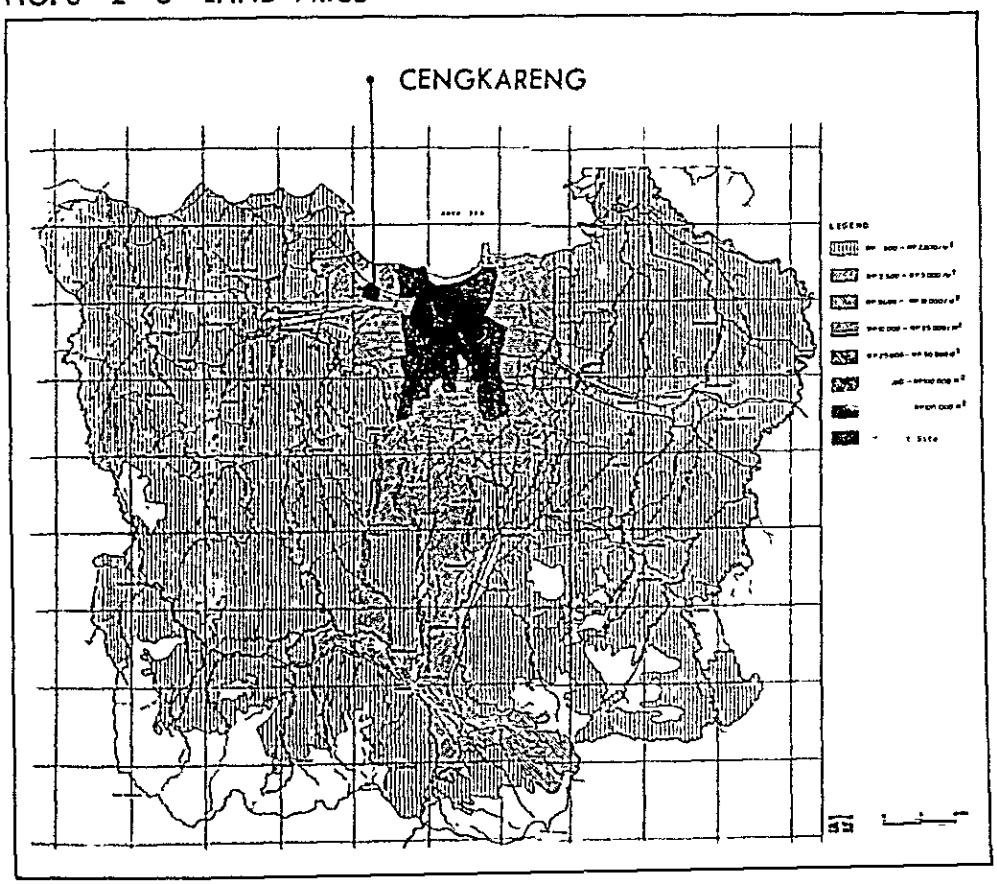
In view of such a population rise and the location of industry, as have been elucidated earlier, it is expected that there will appear signs of a shift from agriculture to industry and commerce and that there will be a rapid rise in the number of residents to be employed in the secondary and tertiary industries.

SIZE OF HOUSE AND LAND PRICES

In conjunction with the population rise in this area, new housing complexes, varying in scale, have been developed. The houses thus constructed are multifarious in type, but in most cases, the floor area is 50-150 m^2/unit and the lot size is 70-220 m^2/unit. The selling prices range from about Rp 9 million to Rp 20 million. This suggests that these houses are available for sale to costomers of higher financial standing than those for whom houses are provided by PERUM PERUMNAS.

The rise in land prices is due to the development of these housing sites. According to the Generalized Land Price Map, 1979, for JABOTABEK, the land price stands at Rp. 10,000-25,000/m^2 on the northern side of the Jakarta-Tangerang road. Persatudn Pengsaha Real Estate (April 20, 1976) says that the land price is Rp 12,643/m^2, including various expenses. Should this price be used as a guide, the land price in 1980 will be: 12,643 × 1.15^4 = Rp 22,113/m^2 on the assumption that the inflation rate remains at 15% a year. Assessed in terms of 1980 prices, after development of the infrastructure, the land price may reasonably be estimated to average Rp 20,000/m^2 for the project area covered by this program.

FIG. 3-2-3 LAND PRICE

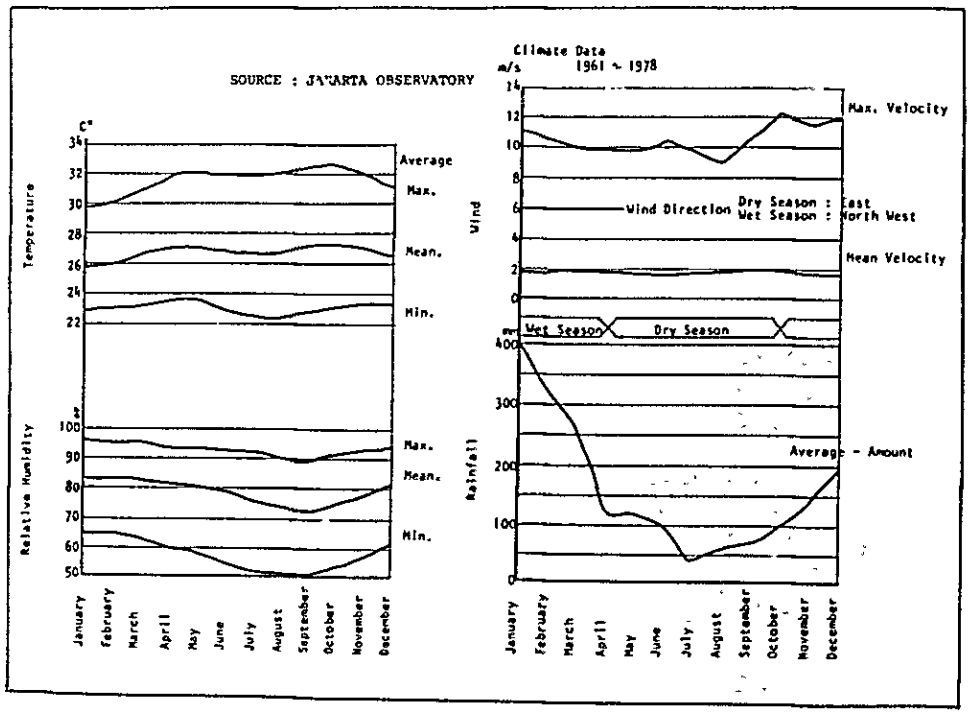


3—3 PHYSICAL CHARACTERISTICS

CLIMATE

The dry season in DKI Jakarta extends from April to October, and the rainy season from November to March. Even in the dry season, however, the precipitation averages about 90mm. The humidity averages 78%, suggesting that the area features a damp climate. The temperature is practically constant throughout the year, averaging 27°C. The wind velocity is insignificant, averaging 2 m/second. In most cases, the wind direction is east in the dry season and northwest in the rainy season.

FIG. 3—3—1 CLIMATE DATA-DKI JAKARTA



TOPOGRAPHY

DKI Jakarta consists of a stretch of hills(Mountanious Region), more than 150 metres above sea level, along the upper course of the Ciliwung River; a terrace(Upper Coastal Region), 5 to 150 m above sea level;

and an alluvial plain(Coastal Region), less than 5 m or so above sea level. The project area at Cengkareng is situated on this alluvial plain. Micro-topographically, this area may roughly be classified into the following two forms.

1) Coastal Ridge (containing villages and palm plantations), 3.5-5.5m above sea level.
2) Lower Land(used as paddy-fields), 2.0-4.0m above sea level.

The area to the north of this planning area is less than 2m above sea level in most parts, consisting of a low and swampy area unfitted to rice cultivation. It is used for fish ponds.

FIG. 3—3—2 TOPOGRAPHY

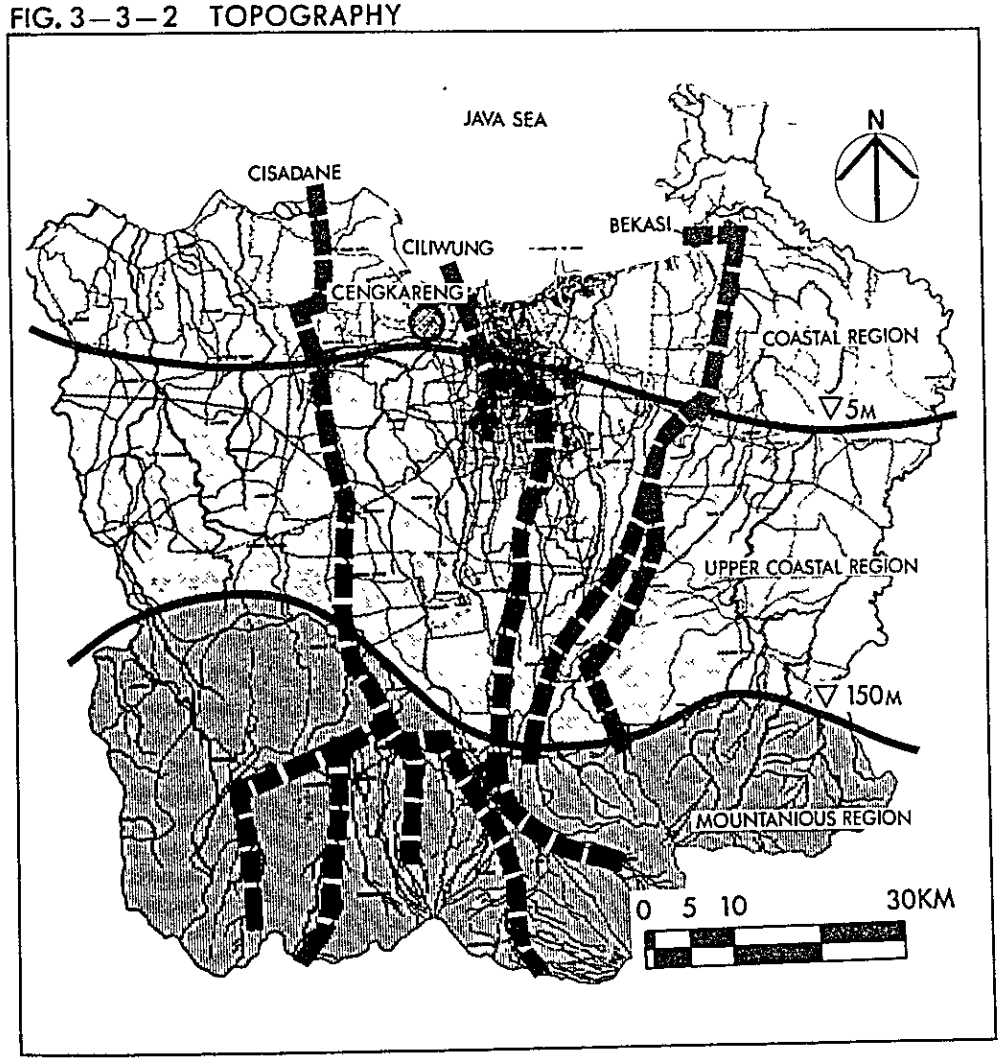
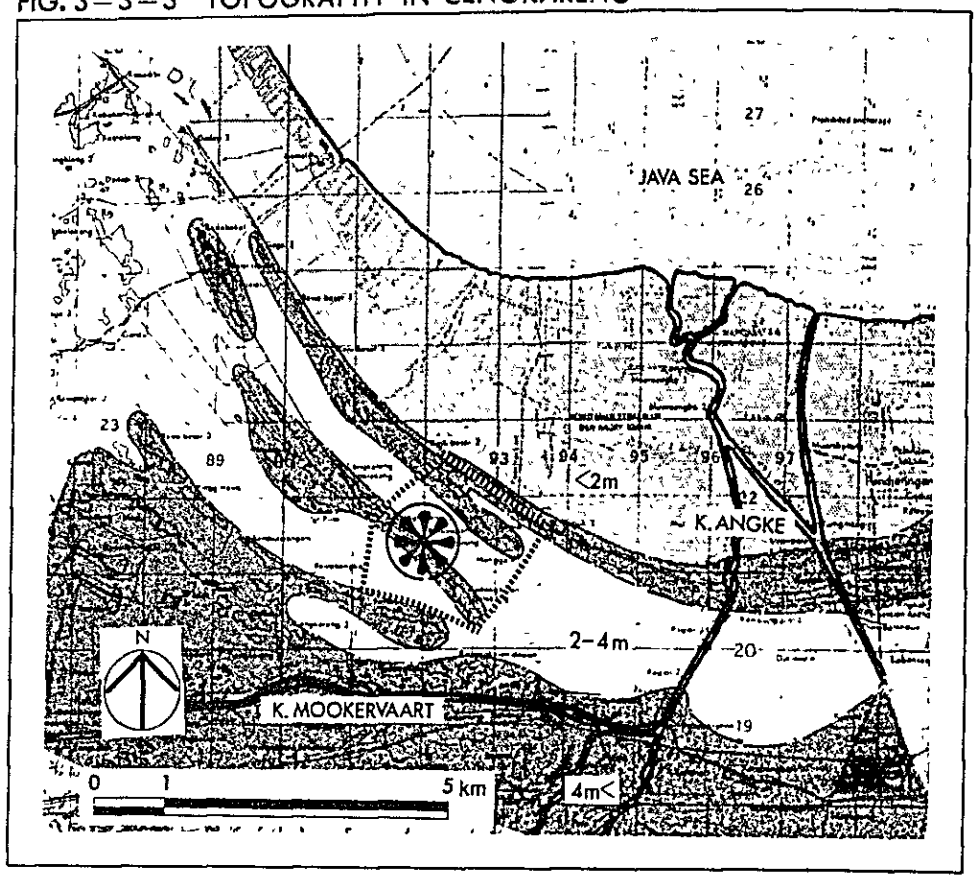


FIG. 3－3－3 TOPOGRAPHY IN CENGKARENG



GEOLOGY

Geologically, the alluvial plain, less than 5m or so above sea level, in which the project area is situated, consists primarily of volcanic deposits and rocks. The upper layer (to a depth of 9-15m from the surface) is primarily made up of alluvium, high in viscosity but low in the bearing strength of the ground.

In micro-topographical classification, the coastal terrace, high above sea level, is made up of a layer of fine sand, high in water permeability.

FIG. 3－3－4 GEOLOGICAL MAP

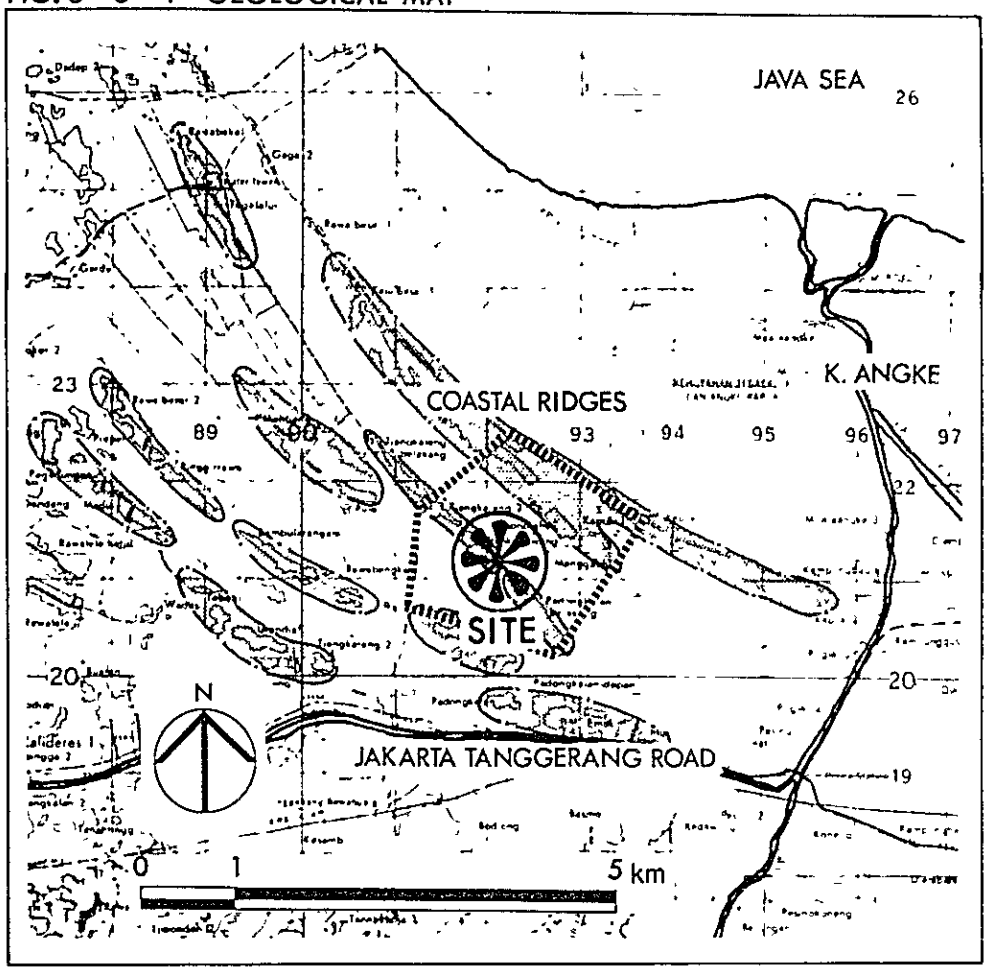
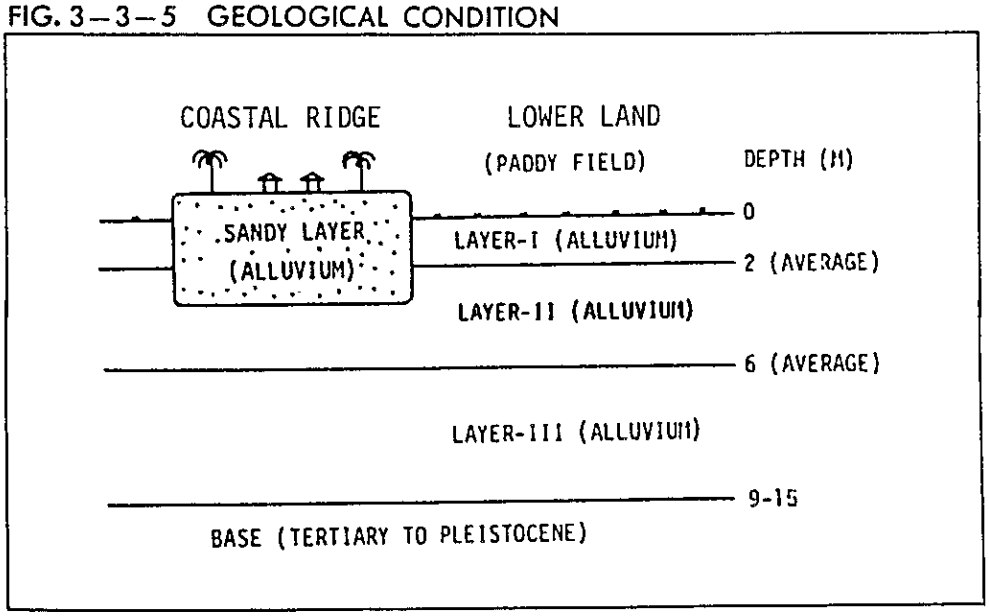


FIG. 3－3－5 GEOLOGICAL CONDITION



GROUND WATER

The underground water level extends from 0.5 to 1.0m under the ground. This level is as high as the paddy fields, suggesting that the level is significantly high.

SOIL MECHANICAL CONDITION

The computed permissible stress of the alluvial clay, which have a direct influence on the foundation used for buildings, is estimated at about 8 t/m^2 at a depth of 30cm from the surface, indicating that the stress is adequate to sustain one- or two-storied housing.

Also, the distension and contraction of the alluvial clay and laterite is significantly small, suggesting that special consideration is little required in the designing of buildings' structures.

FIG. 3－3－6 SOIL CONDITION

Item \ Layer	Layer-I	Layer-II	Layer-III
N-Value	2-6	3-7	8-21
Weight percent of SAND (%)	90	50	15
Water content (%)	55	58	60
Liquid limit (%)	110	70	94
Unit weight (t/m^3)	1.75	1.60	1.60
Cohesion (t/m^2)	3.0	3.5	3.2
Angle of internal friction	10°	10°	10°
Preloading (t/m^2)	6.2	23	32
Compression index	0.4	0.6	0.4

LAND USE AND FACILITIES DISTRIBUTION

In Jakarta, the development of housing has evolved in a southern direction. It is only 10km or so from the down town to the Cengkareng area, but many farms are still distributed in the Cengkareng area, which is situated outside the sphere of Jakarta's activity. In recent years, however, there have appeared signs of a sprawl even in this area, and the disorderly conversion of farmlands adjacent to arterial roads into housing sites is conspicuous.

The Planning Area covers an area of 370 hectares, and one third of this area is villages account for about 130 hectares and the rest is taken up by paddy-fields. One third of the villages is almost entirely made up of agricultural households, and the population density is small.

Few community facilities which cover the greater part of the town of Cengkareng are available in the Planning Area, and most of them are concentrated on the Kamal Raya street near the Jakarta-Tangerang road. The facilities are not large enough to cope with a future population increase, and there is a need to develop these community facilities in parallel with the construction of new housing.

FIG. 3—3—7 EXISTING LAND USE

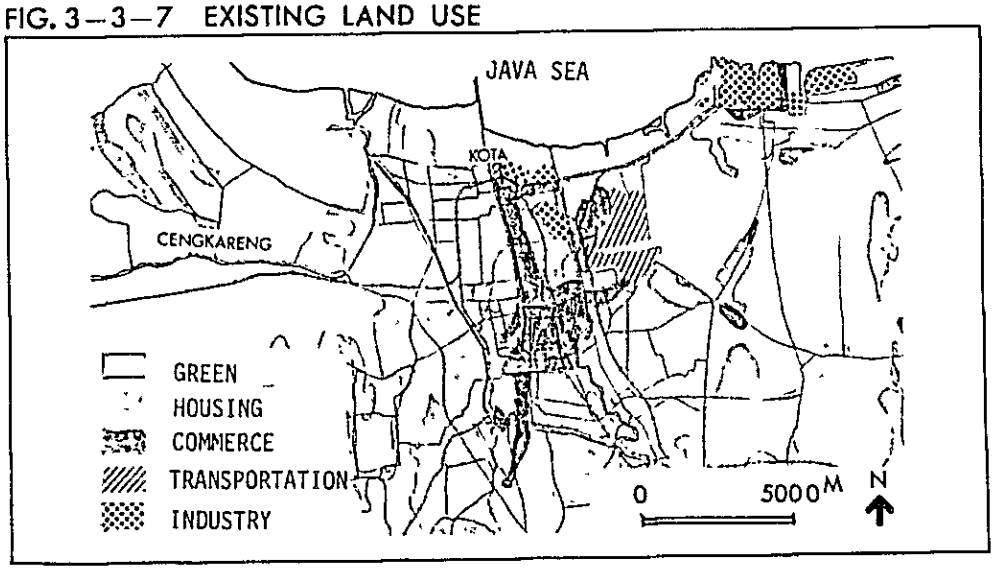


FIG. 3-3-8 LAND USE IN CENGKARENG

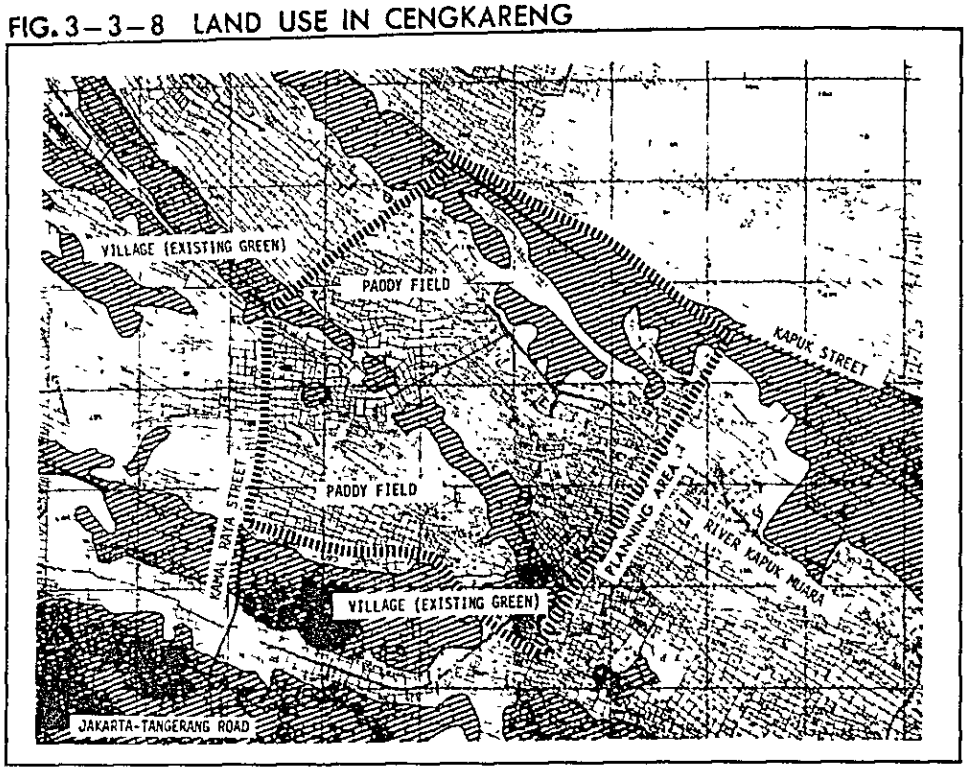
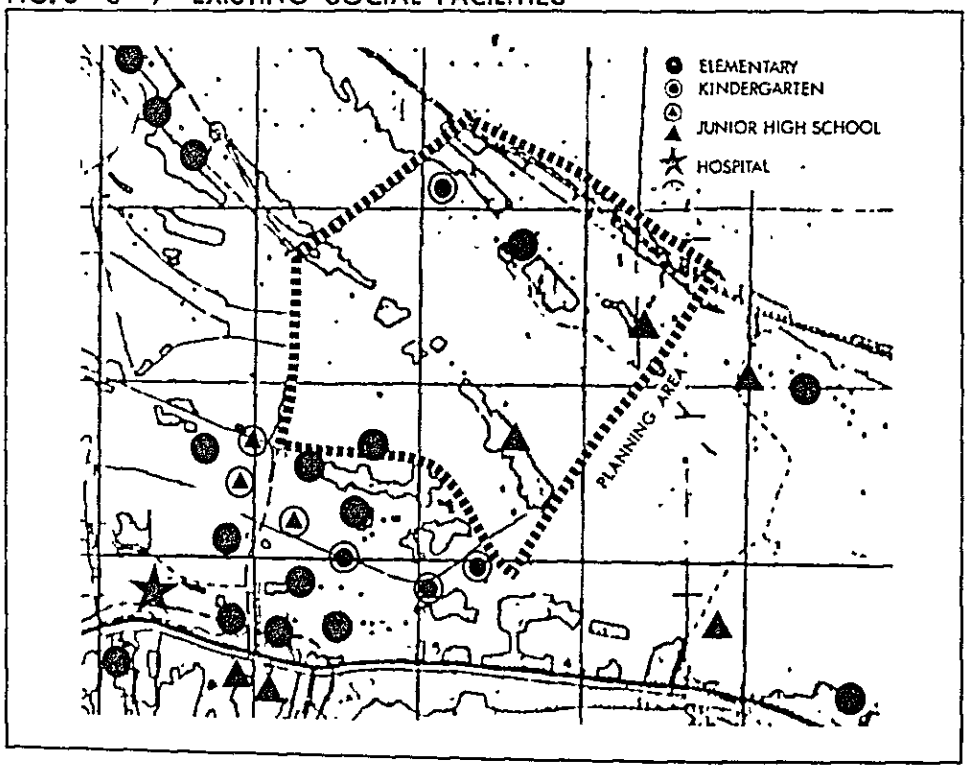


FIG. 3-3-9 EXISTING SOCIAL FACILITIES



TRANSPORTATION

Essentially, the network of arterial roads in DKI Jakarta is both ring and radial. The Kamal Raya Street which will become the Outer Ring Road in the future penetrates through the western border of the Planning Area, and the Jakarta-Tangerang road which is one of the radial roads runs at a point about 1.5km south of the Planning Area.

The main access roads available to this area at present, include the Jakarta-Tangerang road, the Kamal Raya street, and Kapuk street, in the northernmost section. Plans are afoot for an upgrading of Kapuk street as a substitute route for the New Cengkareng International Airport. At the present time there has been no progress toward urbanization of the Planning Area and its periphery, and access to the Planning Area is hampered, because the above access roads are not wide enough and the Kamal Raya street runs through a market. Therefore, these existing access roads need to be improved in conjunction with the housing development. Moreover, after the improvement of the access roads, this area will turn into an area with a by far higher accessibility than other areas.

FIG. 3—3—10 TRANSPORTATION NETWORKS EXISTING

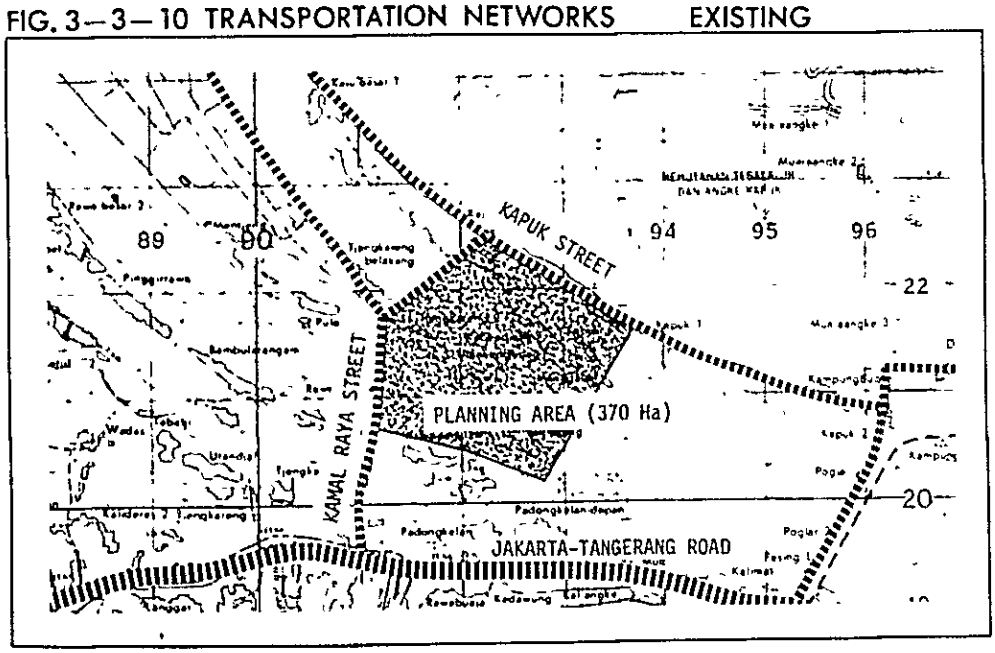
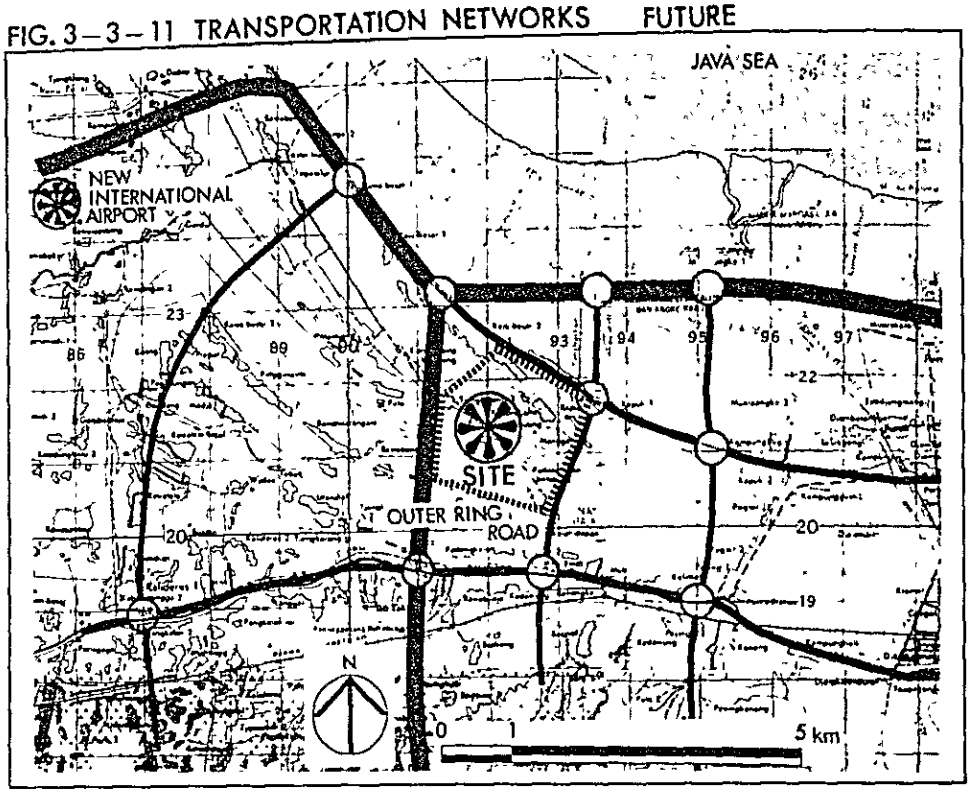


FIG. 3－3－11 TRANSPORTATION NETWORKS FUTURE



DRAINAGE

The planning area is situated in a basin on the left side of the Ahgke River and its tributary, the Mookervaart River. From the Angke River, the Kapuk Muara River extends to merge into the Kapuk Kamal River. The Planning Area is situated in the 570-hectare basin of the Kapuk Kamal River.

Existing drainage is in an undeveloped state, the discharge speed of the existing drainage often is reduced to zero, or an adverse current makes its appearance, as back water emerges, due to an occasional torrential downpour in the upper basin of the Angke River or an occasional high tide. With such a poor drainage system, the lower parts of the Planning Area are often inundated.

Given this situation, plans were drawn up for the draining of the Angke's upper basin, and the construction of a 100-meter-

wide flood-control channel in Cengkareng was started in 1980, expecting to be completed in March, 1983.

In parallel with this flood-control channel program, plans have been under study for the construction of new drainage system at Macro, to augment the existing drainage system in conjunction with the flood-control channel program. A study for improvement of the draining of the lower left basin of the Angke River is also under way.

For the Macro drainage, which will have the greatest impact on the housing development program, a system of pumping water into a flood control channel, a system of siphoning it into the Angke River, and other systems have been studied, but in the final analysis, it was decided to adopt a system of discharging it directly into the Java Sea. This system has been adopted in consideration of the technical, maintenance and control aspects.

FIG. 3-3-12 EXISTING DRAINAGE SYSTEM

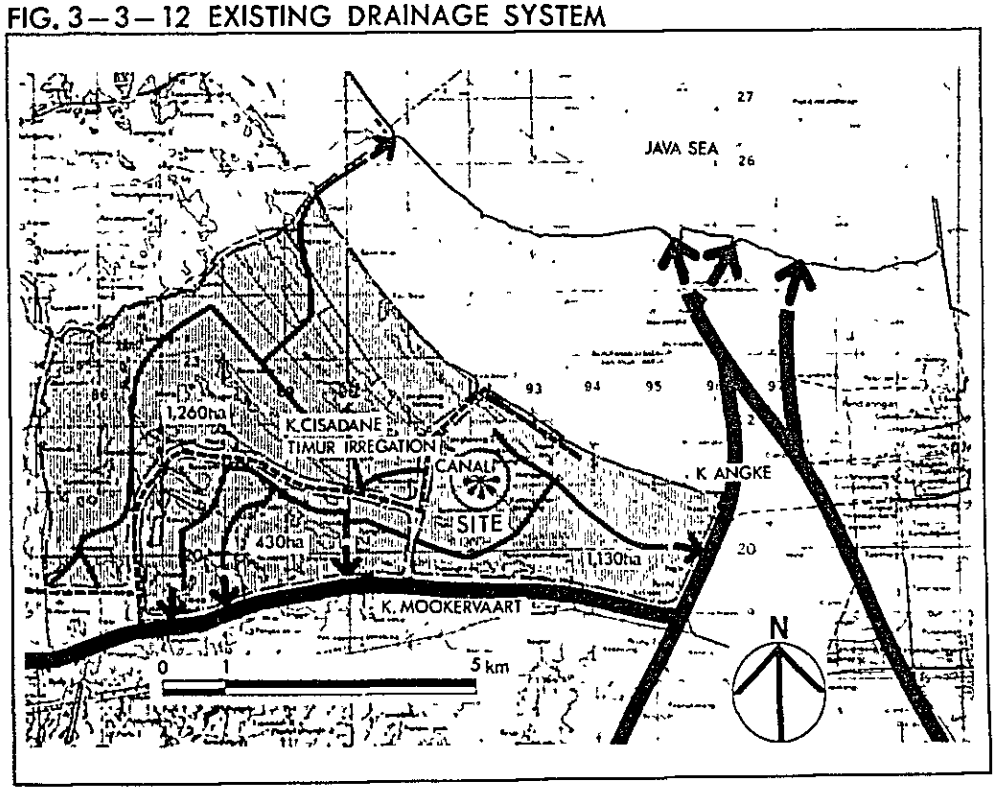
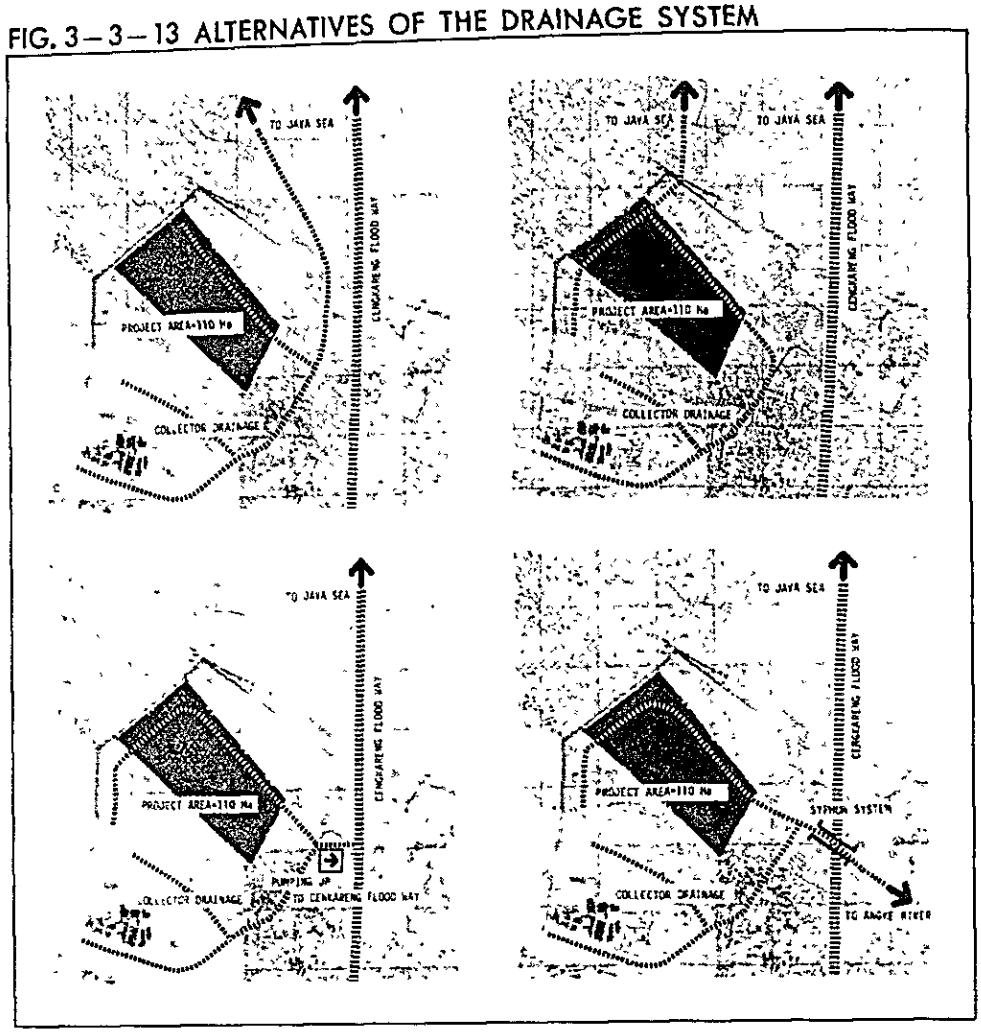


FIG. 3 – 3 – 13 ALTERNATIVES OF THE DRAINAGE SYSTEM

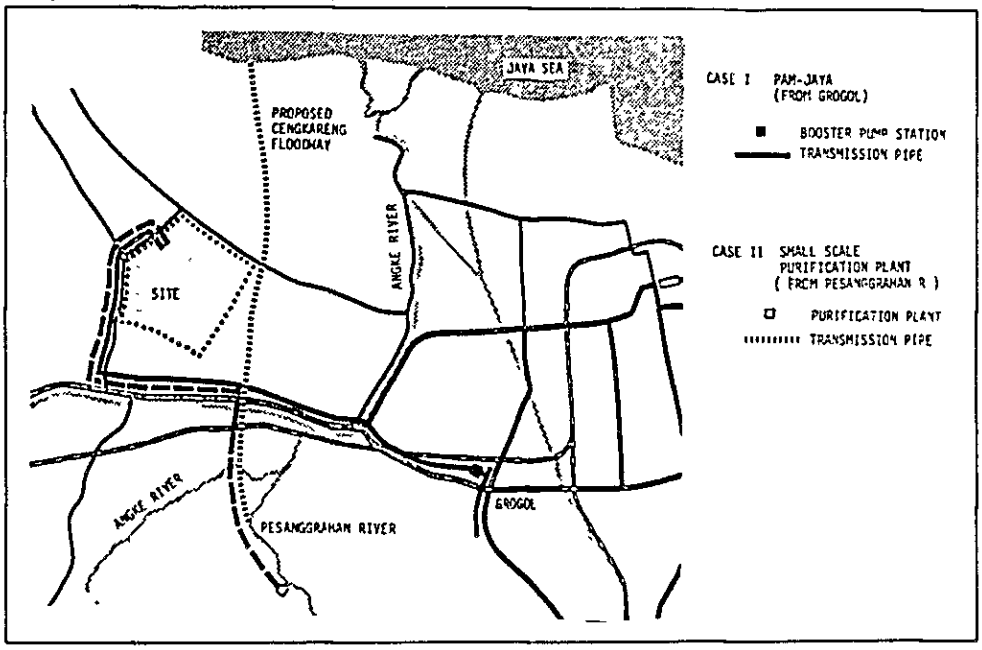


WATER SUPPLY

The PAM-Jaya, the water supply service for DKI Jakarta, has a capacity of 5,300 ℓ/second, being capable of catering to half of the city's total population. As water is not supplied to communities on the left bank of the Angke River, the Planning Area and its periphery are looking for sources of water through wells, rivers and irrigation channels. The water supply program of DKI Jakarta envisages the supplying of water from Grogol, with an 800mm pipe laid along the Jakarta-Tangerang road, by the year 1990.

As the completion of this program does not coincide with the time when this program is put into force, the possibility was explored of seeking water sources from wells and nearby rivers. Eventually, as confirmed by the Steering Committee on November 4, 1980, it was decided to request PAM-Jaya to install a booster pump at Grogol, capable of providing a pressurized water service for this project.

FIG. 3—3—14 WATER SOURCE



OTHER INFRASTRUCTURES

At present, no sewage treatment plants are available in DKI Jakarta. Sewage is dumped into rivers leading to the Java Sea or percolated underground via septic tanks and cesspools. Plans are afoot for the realization of a sewage treatment plant for DKI Jakarta in the near future, but this plan does not encompass the Planning Area. Therefore, there is a need to study and adopt a sewage treatment system which will be of use to this program.

Garbage disposal in DKI Jakarta is conducted by the Cleaning Bureau. Garbage boxes are installed in each neighbourhood and garbage is collected and transported to disposal plants by truck. However, the service is so inadequate that much garbage is dumpted at vacant lots and into rivers. Garbage disposal under this program will be based on a same system to that operated by DKI Jakarta Cleaning Bureau.

Electric power is supplied by PLN at 220/380 V for households, but PLN's supplying capacity is inadequate. At present no electric power is being supplied to the Planning Area by PLN, and oil lamps and self-generating facilities are in use. However, plans call for the completion of 20 KV distribution lines along Kamal Raya and Kapuk streets, and PLN has guaranteed to supply electric power to this area.

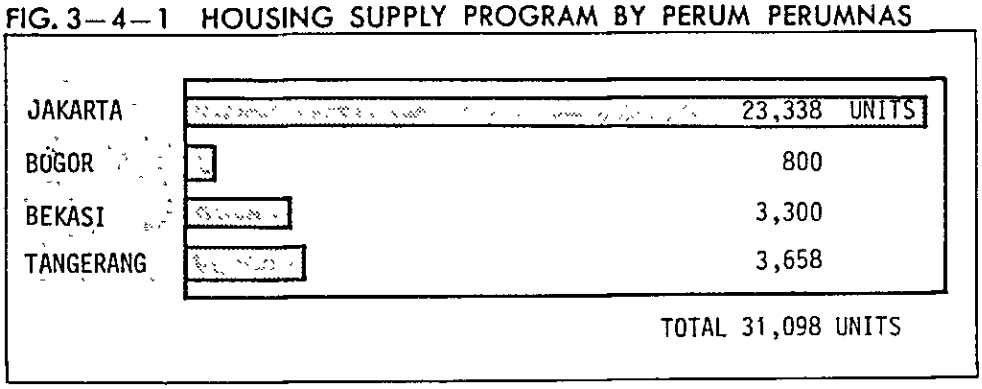
CENGKARENG FLOOD WAY is under construction.
(PHOTO:March,1981)

3—4 RELATED PROGRAM

HOUSING SUPPLY PROGRAM

Under the 3RD 5-YEAR NATIONAL DEVELOPMENT PLAN - REPELITA 111 (1979/80 - 1983/84), it is estimated that the national population will register a rise of 15 million, making it necessary to construct an additional 3 million houses. It is estimated that 600,000 of these houses will be required for the cities, and PERUM PERUMNAS plans to construct 20% of them, or 120,000 houses, about 30,000 of which, or a quarter of the national total, are scheduled to be constructed in the region of JABOTABEK (DKI Jakarta, Bogor City, Tangerang City and Bekasi City). If it is assumed that 7,000 houses or so will be reserved for the Cengkareng district, this figure will be equivalent to a little more than 20% of the number of houses that PERUM PERUMNAS plans to build in the JABOTABEK area, suggesting that this project will be of much significance in strategic terms.

FIG. 3—4—1 HOUSING SUPPLY PROGRAM BY PERUM PERUMNAS

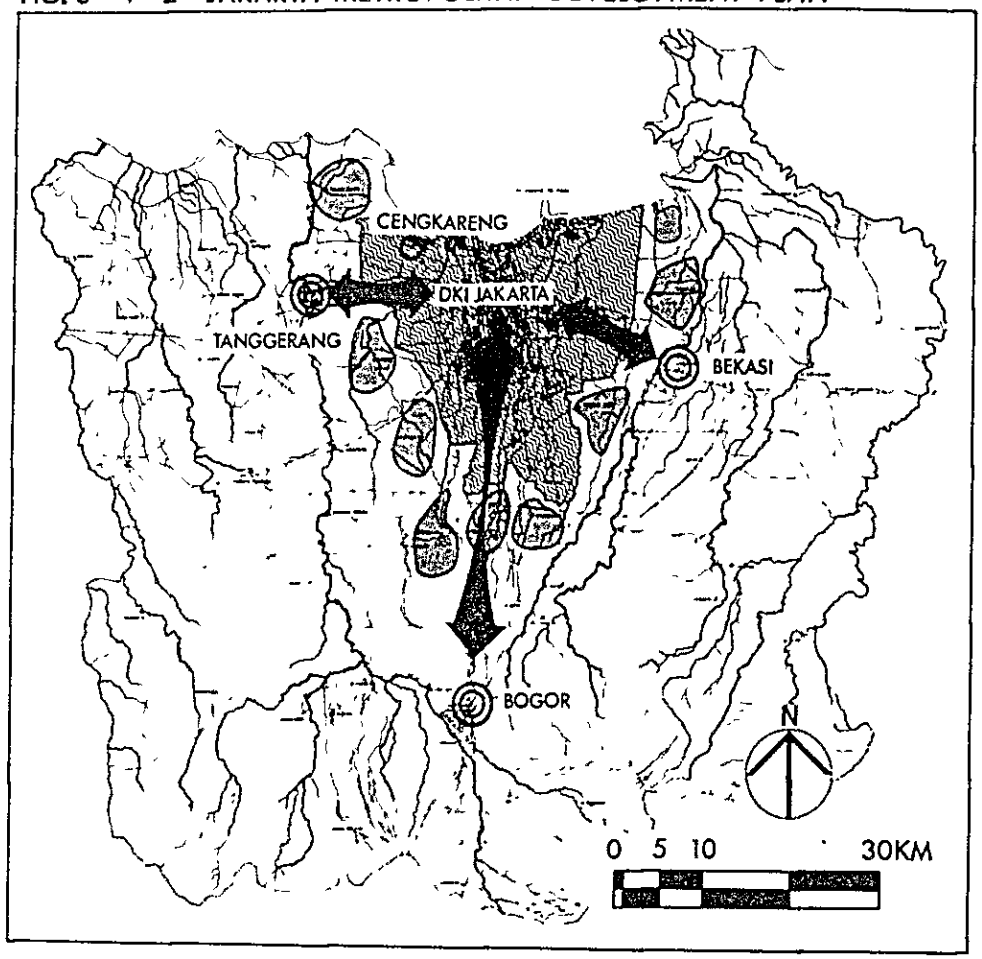


JABOTABEK'S CONCEPT

The concept of JABOTABEK, with DKI Jakarta serving as its core, is designed to alleviate the high density of Jakarta's built-up area and disperse some of its functions to peripheral core cities. Situated along the "corridor" between the core city

of Tangerang and the down town of Jakarta, the Cengkareng area will presumably be an important pivot, not only for its ability to provide housing, but also for its commercial and industrial functions.

FIG. 3-4-2 JAKARTA METROPOLITAN DEVELOPMENT PLAN



DKI JAKARTA MASTER PLAN

The concept of JABOTABEK is definitely pictured in a master plan for DKI Jakarta, in terms of a transportation networks and land use. It is conceived that commercial, industrial, and administrative functions, may be located along ring and radial roads. Plans are also afoot for the location of industrial and commercial facilities along the Kapuk street and Harbour Road, which are local arteries.

The area hemmed in by these local arteries is scheduled to be developed as a housing area, whereas the area facing the Java Sea is scheduled to be developed as a housing and recreational zone.

At a place about 7 km to the west of this area, Cengkareng Airport, a new international airport, is scheduled to be opened in 1984.

FIG. 3—4—3 DKI JAKARTA MASTER PLAN (1)

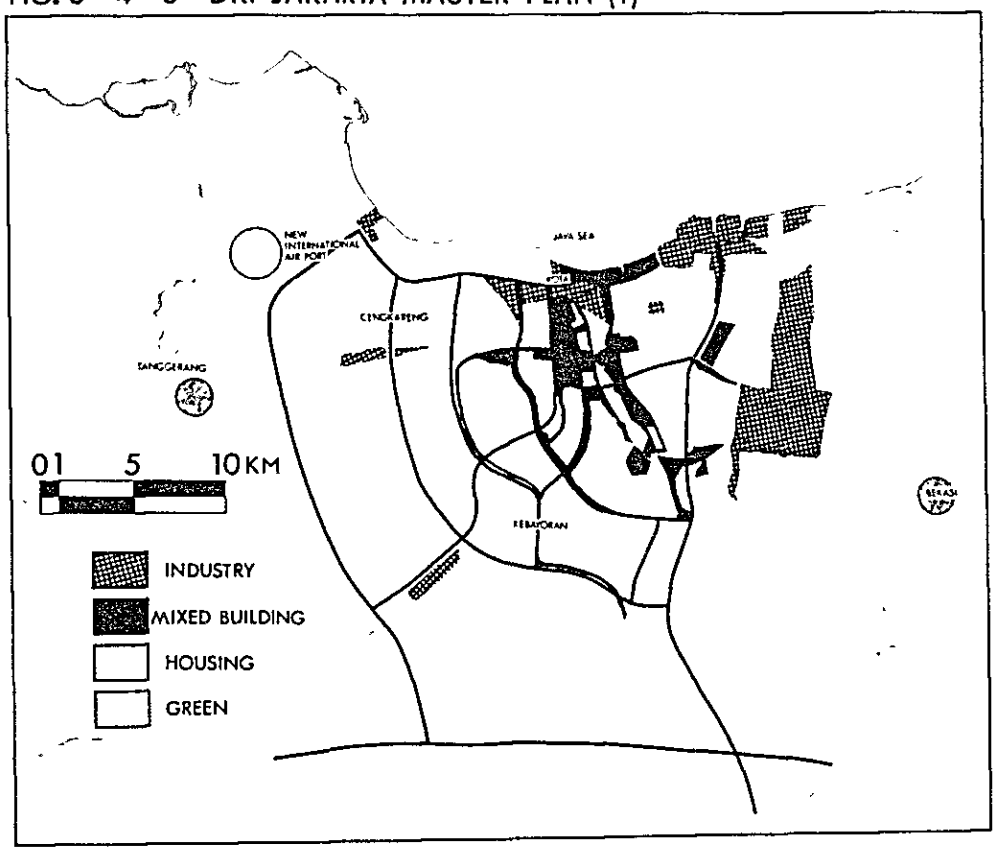
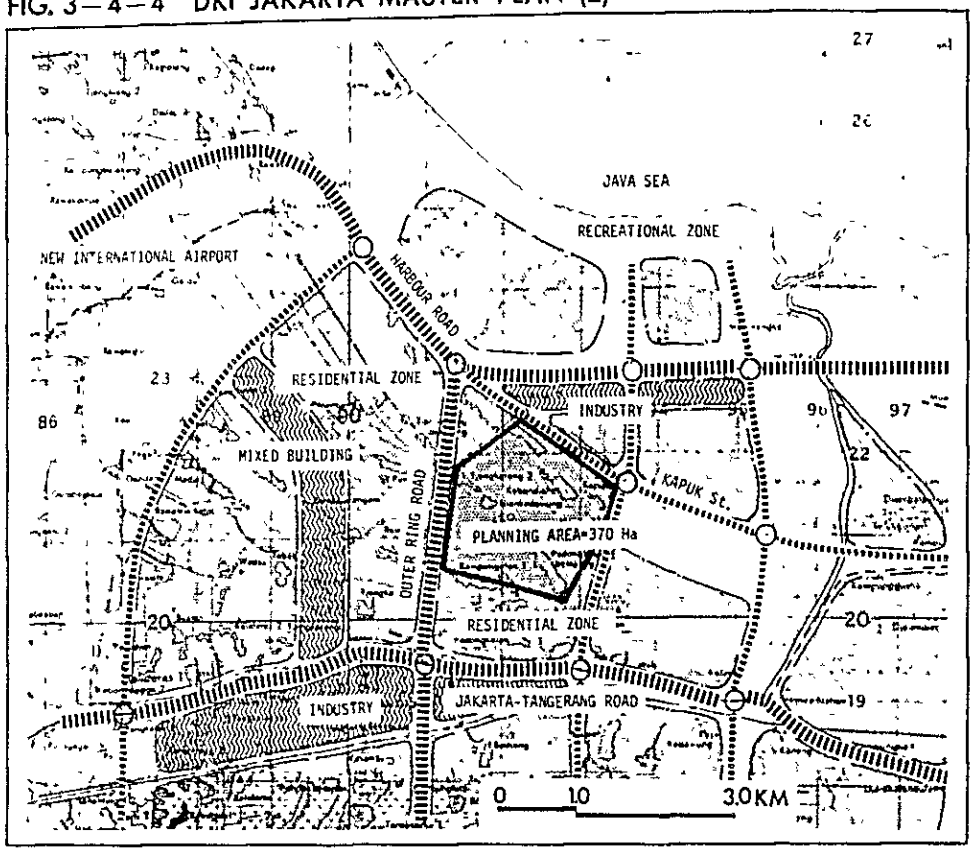


FIG. 3－4－4 DKI JAKARTA MASTER PLAN (2)



This Kamal Raya St. will be widened and utilized for the OUTER RING ROAD.

3—5 SIGNIFICANCE OF THE PROGRAM

It is expected that there will be increasingly strong needs for the accumulation of population and the location of industry in the Cengkareng area and that, if comprehensive systematic projects are not carried out, there will be a continuous unsightly without the redevelopment of the infrastructure and there will appear disorderly built-up areas, as has happened in the past. Moreover, these moves of urbanization are accelerated when major projects are initiated, such as Cengkareng International Airport, a new Harbour Road, an Outer Ring Road, the Cengkareng Flood Way, etc.

This low cost housing development program, encompassing the highly potential Cengkareng area, will have a great effect in terms of the large area of space employed, the massive absorption of population, and the infrastructure being kept at a fixed level, and the community facilities provided. Also, because this is regarded as a priority scheme, this project assumes much significance.

Therefore, this may be described as a strategic area development project to satisfy the requirements of Jakarta, entailing the development of a lower land and the supply of housing in large numbers, and an attempt at harmonized development of the Cengkareng area.

4

HOUSING DEMAND AND TARGET INCOME GROUP

4—1 SHORTAGE AND DEMAND

SHORTAGE

In view of a rise in the flow of population into DKI Jakarta, there is an acute shortage of housing. As a result, as of 1977 more than a quarter of a total of 930,000 households in DKI Jakarta were forced to adopt a system in which one family lives with other under the same roof, and there is a shortage of about 150,000 houses. The number of households has increased at 2.5% a year, and it is estimated that this percentage will stand as it is for the time being. If the rise in the number of houses to be constructed by private enterprises is estimated at 1.5%, the shortage will further increase, reaching about 300,000 in 1984.

When accommodation is rated by type of dwelling, such as rental houses, it follows that dwellings of the type in which one family lives with another under the same roof, account for upwards of 20%. This suggests that the shortage of housing is consistently prevalent, not only among house owners with relatively high incomes, but also among tenants with low incomes.

FIG. 4—1—1 SHORTAGE IN DKI JAKARTA

(UNITS)

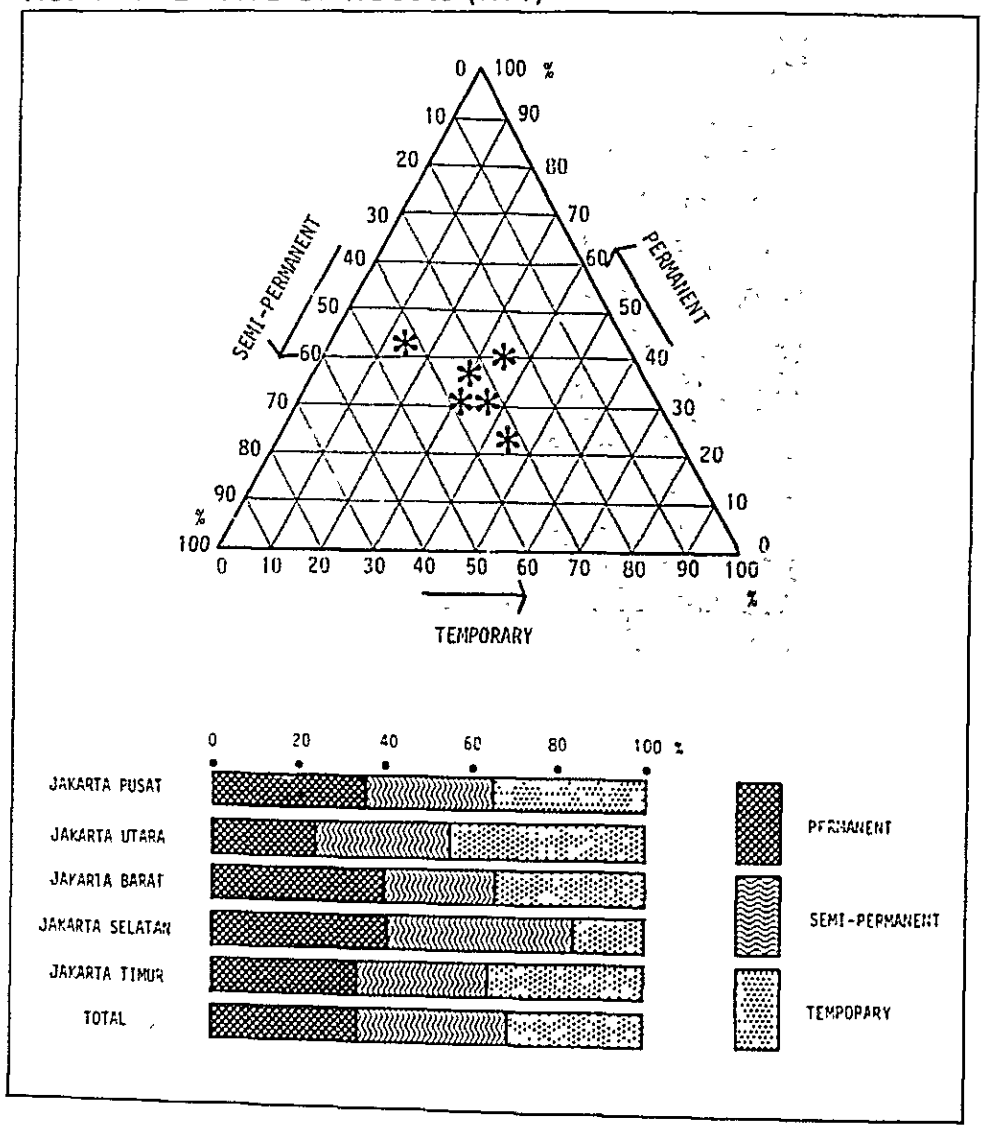
STATUS (Housing Status)	Number of Households Who Live in One Living House				(Total)
	1	2	3	4	
Rent House	71,712	9,180	5,184	5,616	91,692
Contract House	140,940	18,900	13,176	32,616	205,632
Duty House	17,820	1,188	648	1,944	21,600
Non Payable House	30,240	12,312	7,992	10,584	61,128
Own House	436,968	47,952	26,892	41,688	553,500
JUMLAH (Total)	697,680	89,532	53,892	92,448	933,552

SHORTAGE = 933,552-(697,680+89,532/2+53,892/3+92,448/4) = 150,030

DEMAND

By 1984, or the year when the 3RD 5-YEAR NATIONAL DEVELOPMENT PLAN - REPELITA III is due for completion, there will still be a shortage of 300,000 houses in DKI Jakarta. A check on the number of existing houses reveals that of a total of 780,000 units in DKI Jakarta, temporary houses account for 30%, or about 250,000. As it is conceivable that some percentage of these temporary houses will have to be repalced by new ones, or vacated for repair, it is estimated that the actual demand will reach 300,000 houses.

FIG. 4—1—2 TYPE OF HOUSES (1979)

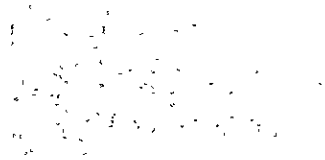


Consequently, the total housing demand is significantly large and of great variety, such as, those for families newly flowing into the city, for those living with others under the same roof, for those moving from temporary houses to others, for those with a high income, and for those of low income. This signifies the fact that the demand for not only low cost housing, but also for various types of houses is great, and coincides with the possibility of many different types of houses being in strong demand, whether they be constructed by governmental or nongovernmental enterprises.

DEVELOPMENT PROGRAM OF PERUM PERUMNAS

Under the 3RD 5-YEAR NATIONAL DEVELOPMENT PLAN - REPELITA III, PERUM PERUMNAS plans to construct about 23,000 houses, accounting for 30% of a total of about 70,000 houses which private enterprises plan to build in DKI Jakarta.

On the other hand, if 7,000 houses or so are to be constructed in the 110-hectare project area under this program, it follows that this figure will be equivalent to 10% of the houses which are scheduled to be newly built by private enterprises in DKI Jakarta, indicating that this project will be quite instrumental in making up for the shrotage of housing. Accordingly, further studies will be necessary in order to guarantee the building of as many houses as possible.



4—2 HOUSING POLICY AND TARGET INCOME GROUP

SUPPLY METHOD BY PERUM PERUMNAS

PERUM PERUMNAS is an entity for supplying houses under Government policy, and is self-supporting. With loans advanced by the governmental banks such as BTN, PERUM PERUMNAS constructs and sells houses. The accounts for each project are settled, so that a cross-subsidy method is employed for each project. It supplies houses to people of high income, and lots to commercial entrepreneurs, the profits thus gained subsidizing the construction of houses for the main target income group of PERUM PERUMNAS. In this way, receipts and payments are balanced.

The banks such as BTN which sustains the construction and selling of houses by PERUM PERUMNAS, advances loans to PERUM PERUMNAS for development of the infrastructure and the construction of houses. Basically, BTN purchases the houses after lapse of two years from occupancy, and for this purchase, the occupants in turn will pay back the due over a span of 20 years.

(NOTE) In this Cengkareng project, BTN purchses the houses at the same time when the occupants are fixed.

TARGET INCOME GROUP

The system of supplying houses commensurate with the income of households is one of the principal housing measures. In principle, PERUM PERUMNAS supplies low cost housing to the income people of 20-80 percentile. The supply of housing to the lower income people is as a direct result of the Ministry of Public Works (Cipta Karya) project and other autonomous entities. For the higher income people, houses are supplied by private developers.

In respect to the formulation of income people, the distribution of incomes in 1980 and 1984 has been estimated on the basis of distribution of monthly income per household in DKI Jakarta in 1976, with an increase rate of 15% per year, on a monthly basis.

In the above income distribution, it is estimated that the monthly incomes at percentiles of 20 to 80 would be Rp 32,000-110,000 in 1980 and Rp 57,000-191,000 in 1984.

FIG. 4-2-1 INCOME DISTRIBUTION

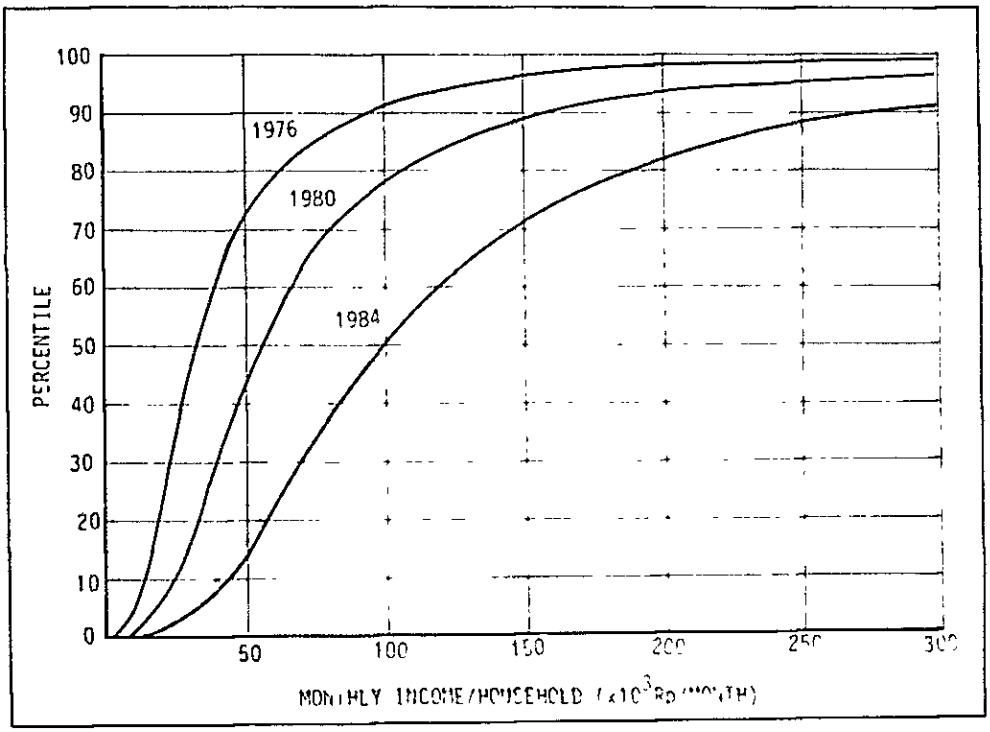


FIG. 4-2-2 HOUSING SUPPLY SYSTEM AND INCOME GROUP

GROUP	PERCENTILE	MONTHLY INCOME	HOUSING TO BE SUPPLIED
FLEXIBLE LOWEST	0 - 20th	-30,000 Rp	SITE &SERVICES
LOWEST			
LOW	20 - 70th	-65,000 Rp	
MEDIUM	70 - 90th	-110,000 Rp	LOW COST HOUSING
MEDIUM HIGH	90 - 98th	-180,000 Rp	MEDIUM COST HOUSING
HIGHEST	98 -100th	180,000-Rp	HIGH COST HOUSING

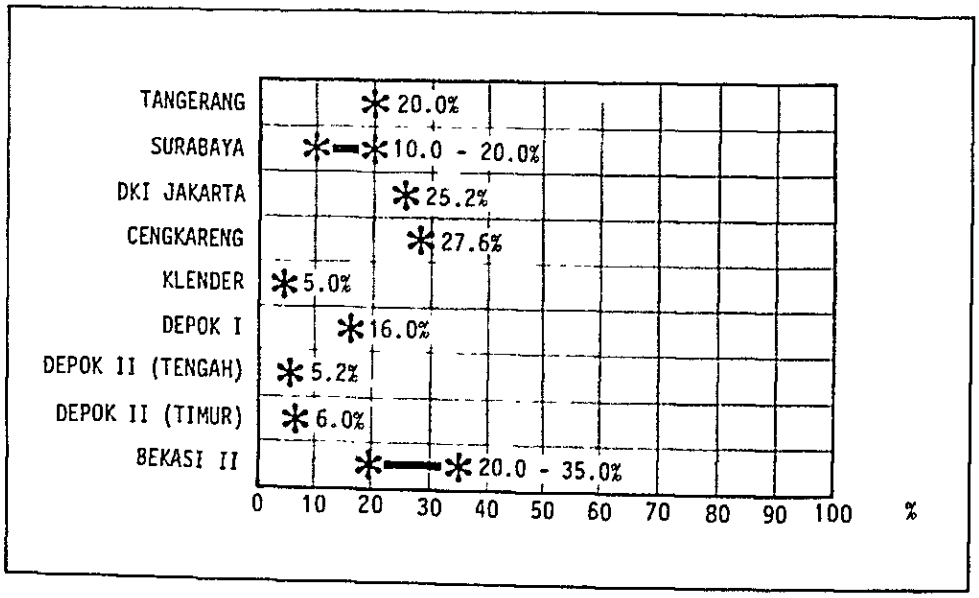
4—3 AFFORDABILITY

EXPENDITURE FOR HOUSES AND AMOUNTS OF REPAYMENT

DKI Jakarta in 1976, house expedniture at an average of Rp 14,000 per month accounted for 25% of the normal monthly income of Rp 55,400. The Tangerang New Housing Survey (CONCAR Plan, 1976) estimated the house expenditure at 20% of the monthly average income of Rp 42,500. According to a household interview conducted by the Study Team in the Cengkareng area and the Depok I housing complex, the average rate of expenses for houses stood at 27.6% and 22.3%, respectively.

The rate of expenses for houses differs, depending on the income, and it would be misleading to set the monthly repayment rate at a fixed amount. Here, the rate is set at 25% of the monthly income of an occupant at the time of occupancy. This rate will be relatively reduced in reverse proportion to a rise in monthly income after occupancy, and it is therefore conceivable that the rate is not so much a burden for people in the low income people.

FIG. 4—3—1 EXPENDITURE FOR HOUSES



AFFORDABILITY AND REPAYMENT SYSTEM

It has been a standard practice for the residents of low cost housing supplied by PERUM PERUMNAS to repay the money to the BTN in fixed repayment system.

However, there have been sharp rises in the selling price of houses due to rapid increases in land and construction costs, thereby bringing about gaps between prices and income of the target income group.

Therefore, although the amount of repayment at the time of purchase is set at 25%, it becomes necessary to adopt a gradual repayment system whereby the amount of repayment will be increased through every year in proportion increases in the income of the resident. The incomes of residents in DKI Jakarta have increased at a rate of 15% or so in recent years. Here, the increase ratios of a gradual repayment are set at 5 and 7.5%

and a gradual repayment system will be adopted, and a study will also be conducted on a fixed repayment system in installments.

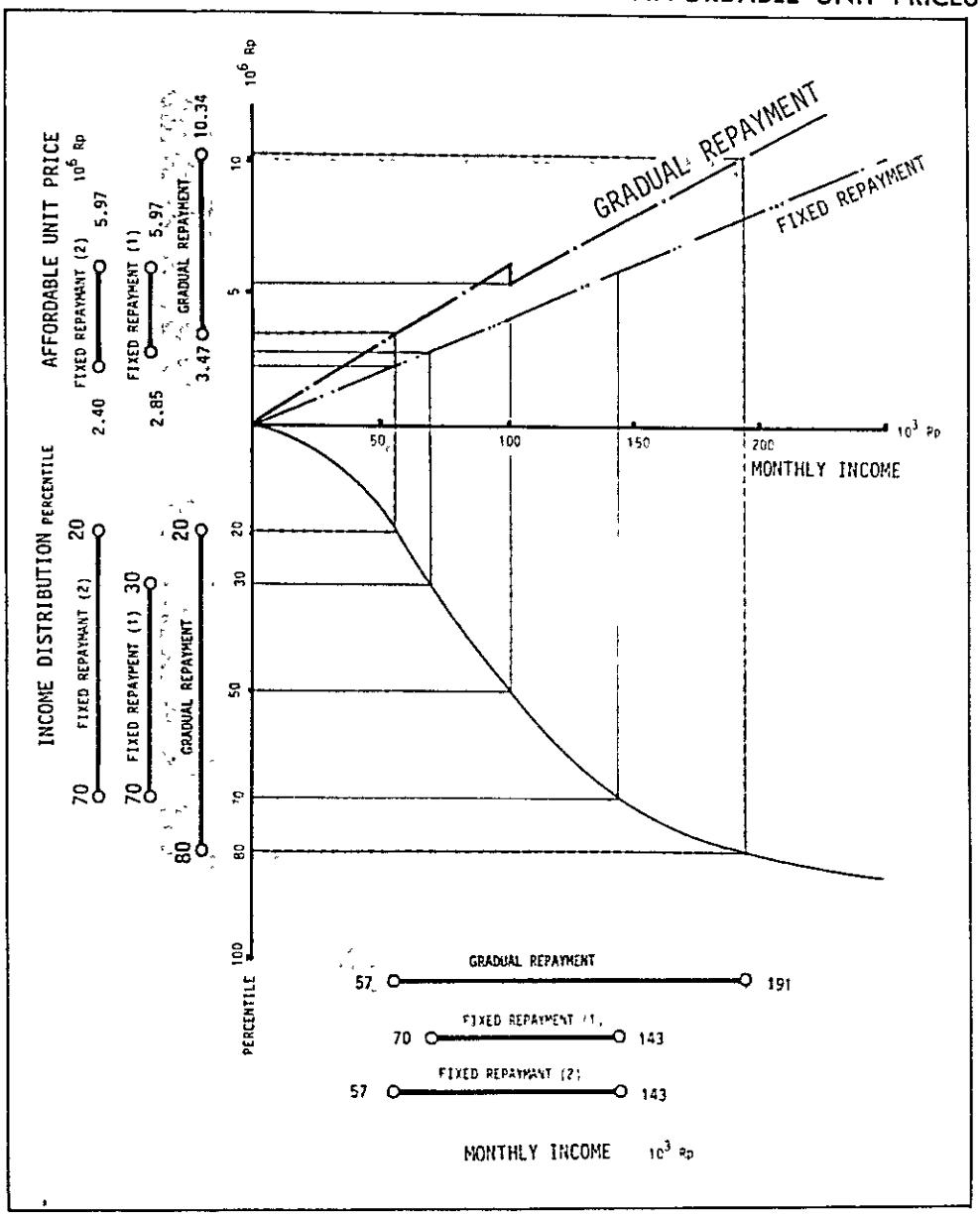
FIG. 4—3—2 REPAYMENT SYSTEM

	GRADUAL		FIXED
TARGET GROUP (PERCENTILE)	20 - 50	50 - 80	20 (30) - 70
1.DOWN PAYMENT (%)	5	10	5
2.INTEREST (%/YEAR)	5	9	5
3.TERM (YEAR)	20	20	20
4.GRADUAL RATIO (%/YEAR)	5	7.5	0

According to BTN's criteria on repaying debts in fixed repayment system, the down payment is set at 5%, the interest rate is 5%, and the repayment period is 20 years, for prices less than the criteria house selling price of Rp 2,500,000. For prices higher than the standard price, the down payment

is set at 10%, the interest rate 5% and the repayment period is 20 years. The affordability will be Rp 2,400,000 to Rp 5,970,000 in 1984 according to this criteria, with the scope of the target income group set at 20 to 70 percentiles. On the other hand, the gradual repayment system is a new trial system. With the scope of the target income group set at 20-80 percentiles, the loan conditions will be divided into two at the 50 percentile. In other words, the down payment is set at 5%, the interest rate 5% and the repayment term 20 years for percentiles less than 50 percentile, and for larger than 50 percentile, the down payment is set at 10%, the interest rate 9% and the repayment term at 20 years, in computing the affordability. Here, the gradual amount of repayment each year is set at 5% for those less than and 7.5% for those larger than 50 percentile. In this situation, the affordability will range from Rp 3,470,000 to Rp.10,340,000 in 1984.

FIG. 4—3—3 TARGET INCOME GROUP AND AFFORDABLE UNIT PRICES



4—4 HOUSING TYPE AND MONTHLY INCOME

FLOOR AREA OF HOUSES

A check of the correlations between the size of housing at the Depok I, II and Bekasi housing complexes reveals the existence of considerable gaps, but the tendency is practically consistent. In other words, it is common that the floor area is about 35 m^2/house for the income people of Rp 50,000/month, and 60 m^2/house for those of Rp 100,000/month.

Due to the high rise in selling prices in recent years, there have been signs of a drop in floor area, particularly at the Depok II housing complex. Even some of the people of Rp 100,000/month choose to purchase a house with a floor area of only 35m^2.

FIG. 4—4—1 FLOOR AREA OF HOUSES

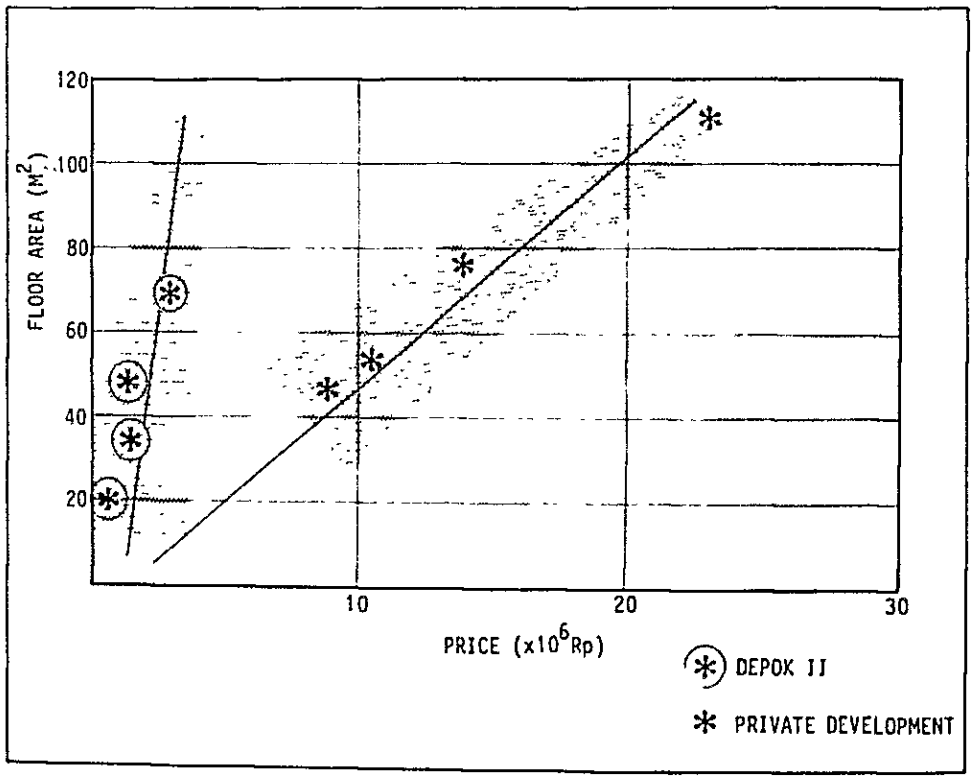
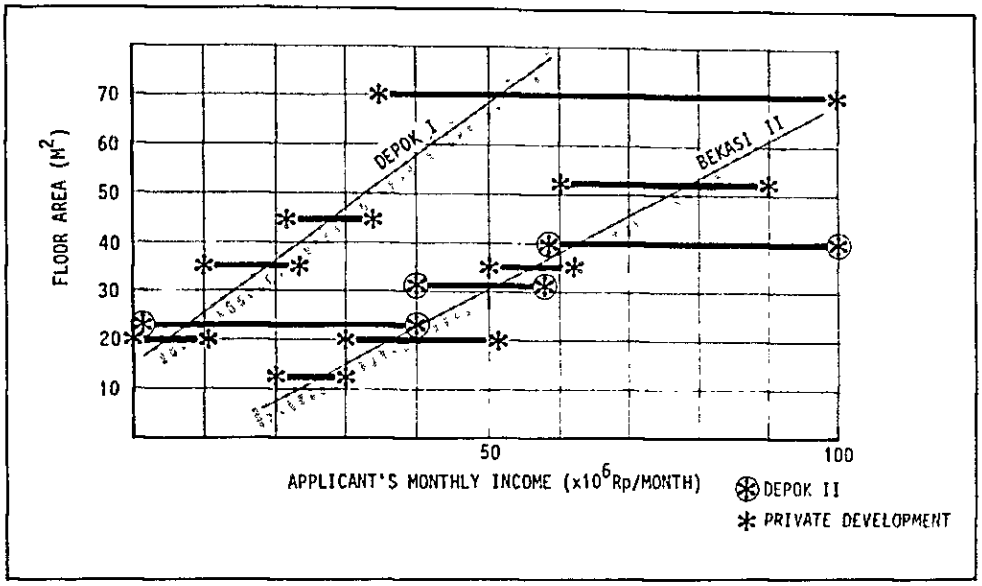


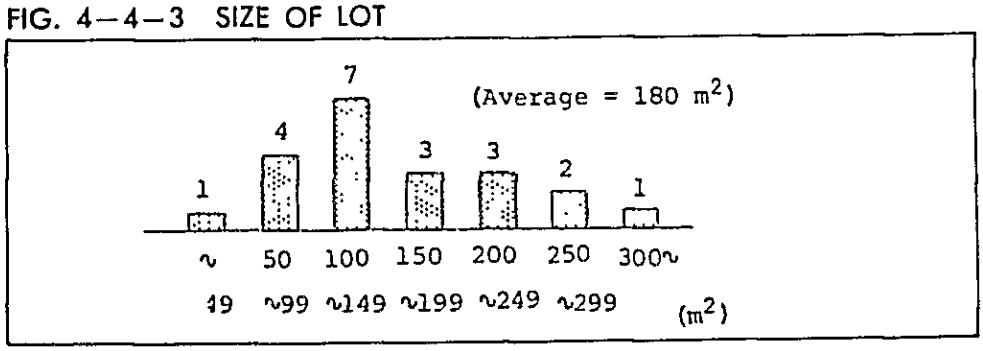
FIG. 4—4—2 HOUSING TYPE AND MONTHLY INCOME



SIZE OF LOT

The empty lot for house supplied by PERUM PERUMNAS have thus far ranged from 200 to 400 m^2/houses in scale. Housing Empty lot for sale by private developers in DKI Jakarta average 180 m^2/unit in scale, where as those in the Cengkareng area average 150 m^2/unit. There are signs that the scale of housing sites will drop due to high rises in land price and development cost, and to a relative drop in income. It is conceivable that an average lot size of 150 m^2 or so will be regarded as reasonable, in terms of affordability and marketability, but this adoption of smaller housing units will result in a lowering of the standard of the environment.

FIG. 4—4—3 SIZE OF LOT



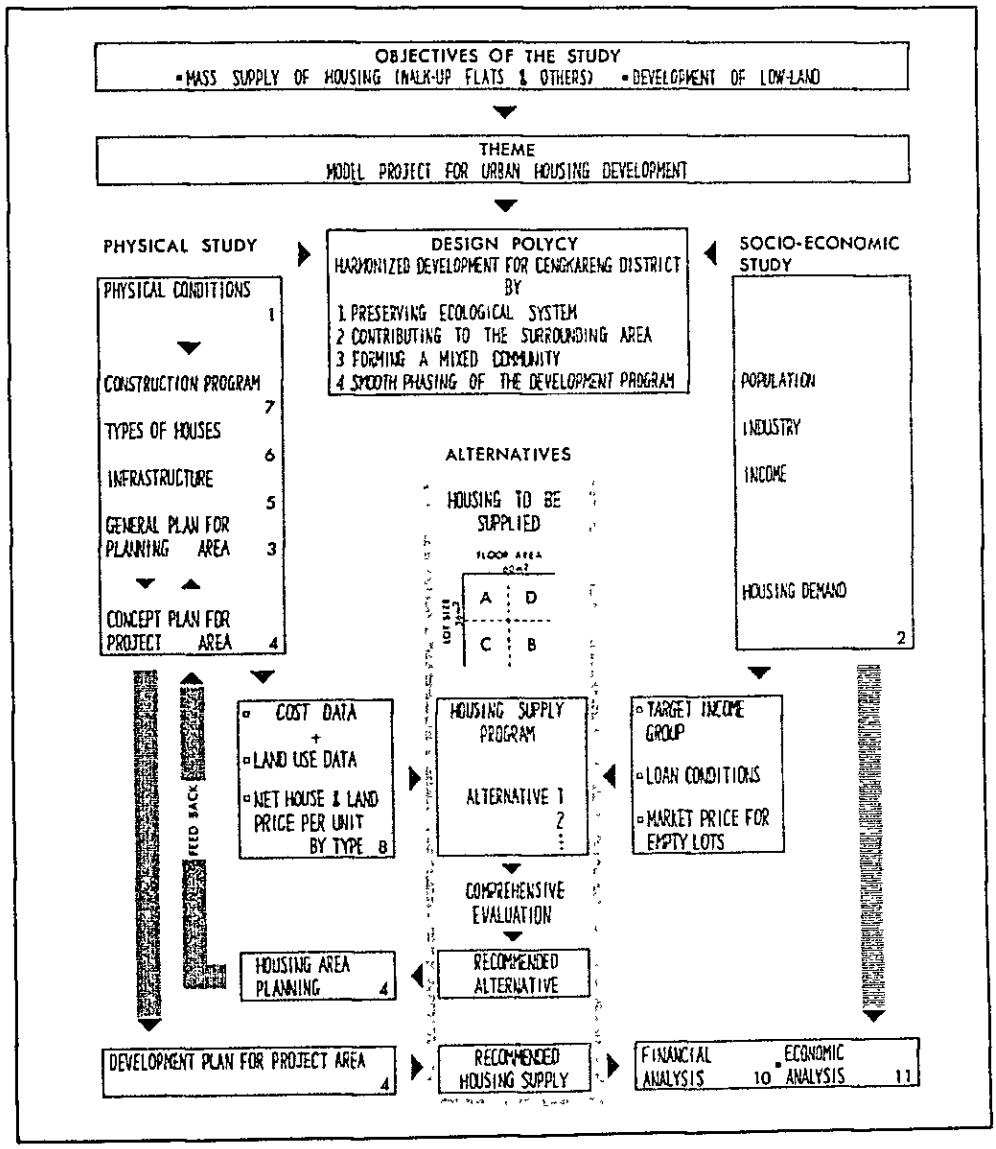
5

DEVELOPMENT POLICY

5—1 POLICY AND FRAME WORK OF STUDY

In view of call for a mass supply of the housing and the characteristics of being a lower and swampy area, the development of housing of the high density urban type is an imminent task. Moreover, this program can be regarded as a supportive, large-scale area development project for the highly potential Cengkareng district. And also a strategic and comprehensive model project for a harmonious development of this district.

FIG. 5—1—1 FRAME WORK OF STUDY



5—2 POLICY FOR PHYSICAL PLANNING

HIGH DENSITY AND MASS SUPPLY

In view of the high potentiality of the Cengkareng area, an intensifying housing demand and costly development in a lower land, it is necessary to supply houses in large numbers and develop high-density housing. For this purpose, it is necessary to develop new types of housing simultaneously with the development of walk-up flats.

INFRASTRUCTURE ADEQUATE FOR DAILY LIFE

As the project area is in a lower land with swamps, great care must be taken in developing this portion so as to attain a level of environment equal to that of the housing complexes having been developed by PERUM PERUMNAS. As there is a marked sprawl in this area, urbanization tends to make progress without the development of an infrastructure, thus creating a poor urban environment. Under this program therefore, it is necessary to develop the kind of infrastructure which will serve as a model for the development of its periphery and other similar areas.

COMPREHENSIVE DEVELOPMENT

One of the principal purposes of this program is to supply houses in large numbers to help persons in acute need of housing, and this program is also the comprehensive urban development project in Cengkareng. Therefore, attempts should be made to develop community facilities in a systematic manner and, in view of the high potentialities of this area, to introduce functions other than those related to housing, commercial and industrial functions. These various functions will provide job opportunities, not only for the occupants of low cost housing, but also residents living in the periphery, with the consequence that the outlays for commutation may be

presumably reduced, with their abodes located close to their places of work. This will also contribute to alleviate the concentration of job opportunities in the down town.

MIXED COMMUNITY

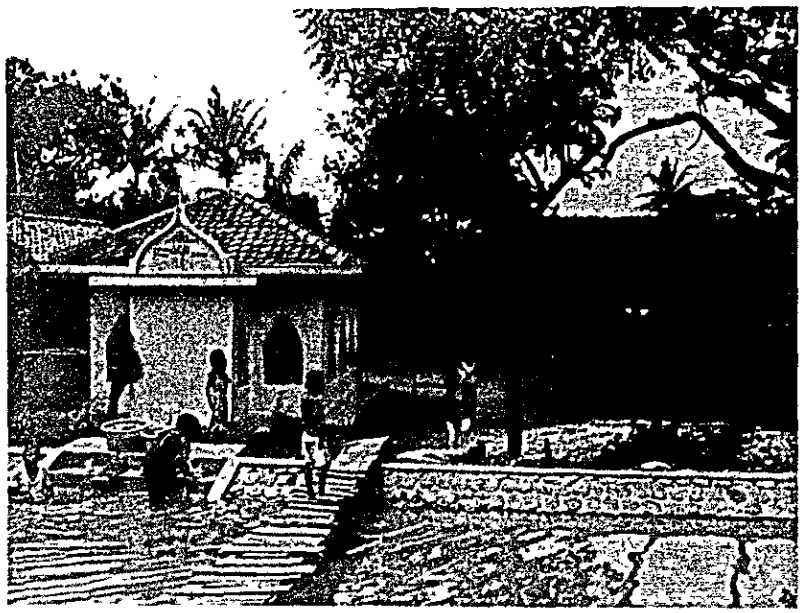
Under this program, attempts will be made to form a mixed community with a variety of occupations, ages, and incomes. The supply of empty lots to the people of high incomes, or to those engaged in home industries, is conceivable, as well as the supply of the regular type of low cost housing. And also the empty lots and low cost housing need to be provided for the farmers who live in the existing villages in the Planning Area and will be forced to move after urban development in Cengkareng.

GREEN AXSES

The belts of trees widely spreading in areas adjacent to the Planning Area are maintained, on the basis of a balance between the ecosystem and man's life. Therefore, even in the process in which the entire Planning Area is to be converted into an area of urban activity, it will be made a fundamental policy to conserve the belts of trees and turn them into green axses and thus develop a network of green tracts of land.

As these belts of trees will survive, on the basis of the ecological features of nature, their conservation will be far less costly than the development, maintenance and control, of new belts of trees, so much so that their effective tuilization constitutes an essential part of this program. And also the channels are utilized for a community activity with combinning the green axses.

GREEN AXSIS
Typical view of the existing green which will be conserved and utilized for the urban function.



Channel is utilized for the daily life in the existing village, Cengkareng.

STAGE DEVELOPMENT

Under this program, 110 hectares of the 370-hectare Planning Area is designated as the primary project area for the time being. This decision is made with due consideration given to the purchase of land, easier draining of rainwater, accessibility to existing roads, and evolution to the second development project, as indicated at the follwing figure. The above conditions are also taken into consideration in selection of the following stages of development, and at the second stage, a development will be carried out at the village of Cengkareng and finally the existing village of Kapuk will be added to the project area.

During execution of the project, the programs for roads, drainages, and other facilities, may have to be changed, depending on progress in the purchase of land, time of implementing infrastructure and change of social needs. Therefore, it is necessary to come out with a flexible response.

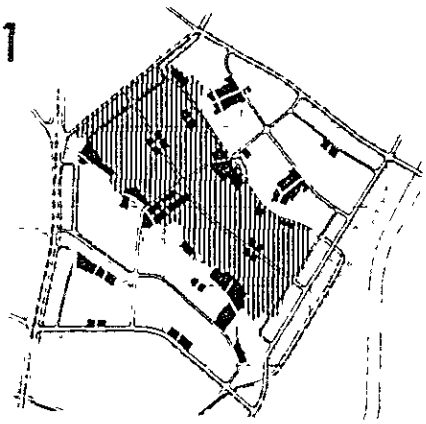
Before completion of the entire Planning Area, there may be many cases in which the living environment of occupants is not improved. Here, attempts will be made to boost the living environment in each phase of the project, as it is believed that these attempts will contribute to the enhancement of the image of the living environment of the Cengkareng area and make it possible for future development projects of a higher level.

An infrastructure for an area of 110 hectares is to be developed, but there is a need to give consideration to the development of an infrastructure for 370 hectares. Rainwaterdrains are to be developed primarily for 370 hectares, and plans are to be formulated for 110 hectares for the time being. As for the sewage treatment, the 370-hectare area will be divided into two in alignment with treatment plants and pumping facilities, and one of the two sub-areas will be incorporated in the project.

The supply of water will be planned for 110 hectares and the system will be converted to another system after expansion of a housing development.

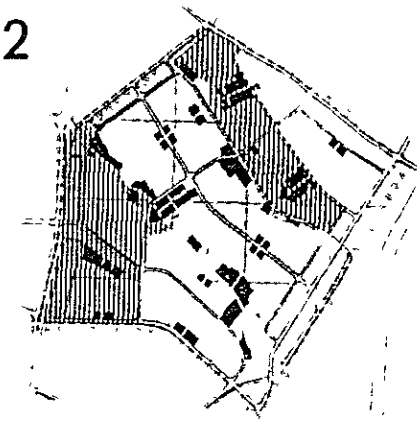
FIG. 5–2–1 STAGE DEVELOPMENT

1



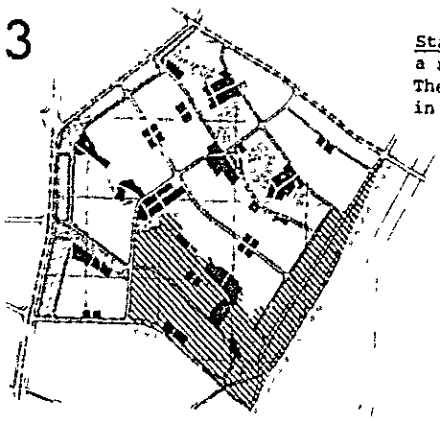
Stage 1 will be in the central sector of 110 Ha including a part of the town centre. It will produce several neighbouhood units along a primary road, to be constructed of Kamal Raya St.. This will create a balanced residential area, despite it being the first stage, and the roads and buildings will be laied out in such a way that will not hinder future expansion. It will be assumed that the collector drainage will be installed prior to this project. The sector in which this first stage will take palce will be known as the "Project Area".

2



Stage 2 will develop a 20 Ha, east of the Project Area and the town centre extending southwards, making a total of around 40 Ha. Later in this stage, the east side of the Project Area will be developed along the collector drainage. With this, all the areas along the Kamal Raya St. will have been developed.

3



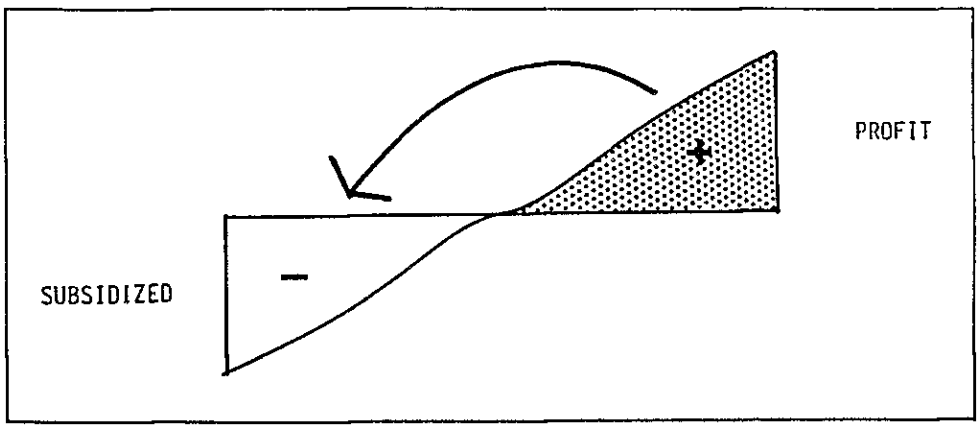
Stage 3 will take place at the same time as a road is constructed by the local government. The collector drainage will also be completed in this stage.

5—3 POLICY FOR HOUSING SUPPLY

SYSTEM OF CROSS SUBSIDY

Under this program, the target income group will be selected from among those with income people ranging from 20 to 80 percentiles in income distribution. To facilitate the supply of low cost housing, it is necessary to provide subsidies. In other words, by constructing houses for people with income people higher than those of the occupants of low cost housing, or by establishing commercial area for sale at the prevailing market prices, the profits thus gained will be reverted to the construction of low cost housing. This will make it possible to raise the standard of low cost housing and facilitate the purchase of houses for the target income people.

FIG. 5—3—1 SYSTEM OF CROSS SUBSIDY



HOUSE WITH GARDEN

Under the existing housing supply system, it has been a practice to supply to people with a less affordability "core" housing with a floor area of $20m^2$ or so, plus the bare necessities for living and, for those with a higher affordability, completed housing with a bigger floor area.

For the "core" housing, too, it has been a practice to provide the occupants with relatively greater lot, so that they may

extend their houses by themseleves in order to raise their standard of living.
These measures are exceedingly effective when the costs related to land are relatively low and population density can be kept at an moderate level.

However, when land prices are on the rise, the value of the "lot" becomes relatively higher than that of the "building". In other words, it becomes exceedingly difficult to have access to a tract of land, itself, making it more of a luxury than the house, in a way. Moreover, when there are calls for an increase in density in an urban development program, it is improper to supply smaller units on the premise that they can be expanded later, in attempts to retain a certain environmental level by reducing the size of the housing lots.

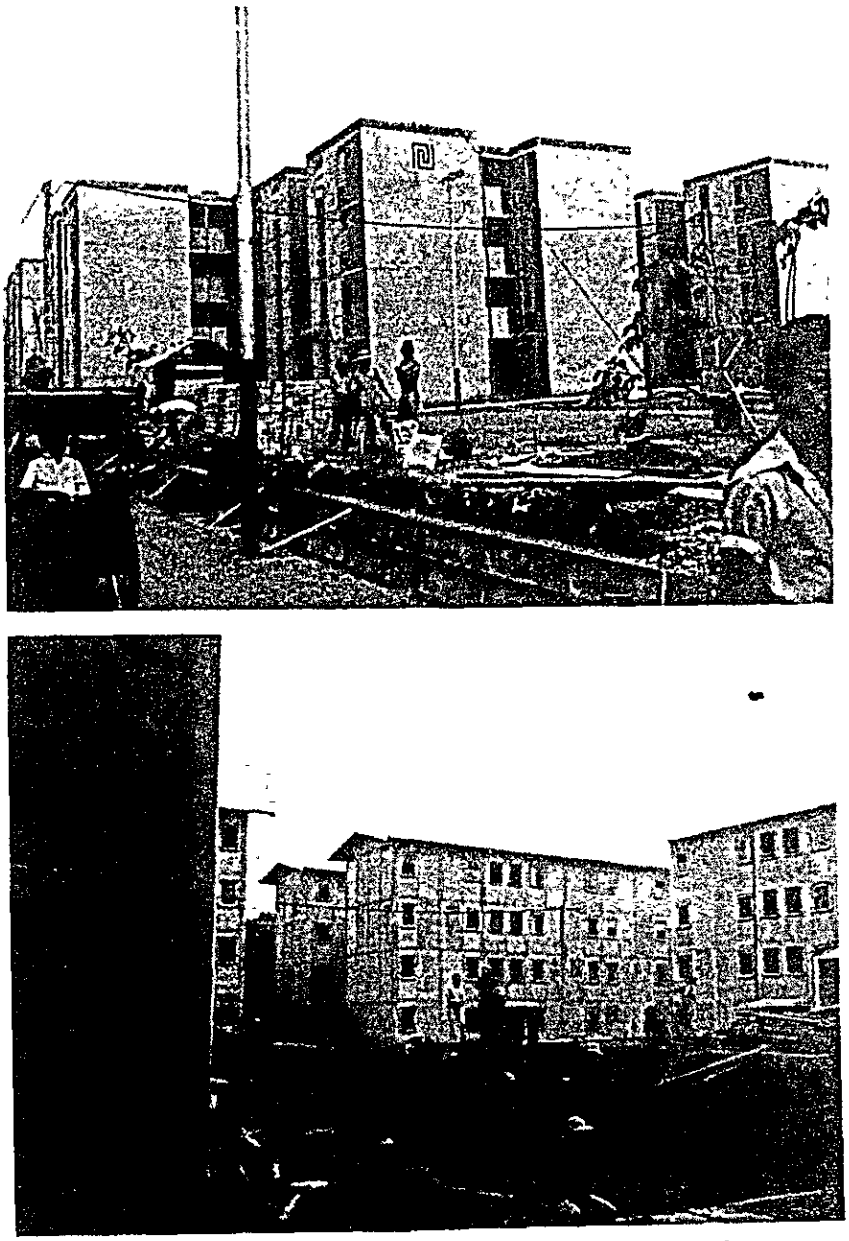
Aside from the handling of walk-up flats, it becomes advisable to provide people of lower income with houses closer to the complete ones, and those of higher income with houses which may be radily expanded in future; and to refrain from providing the occupants of low cost housing with new housing sites.

WALK-UP FLAT

No walk-up flats have ever been completed by PERUM PERUMNAS. Some have been completed by other developers, but their number is actually very few. At this juncture, therefore, the demand for walk-up flats and the views of prospective occupants have yet to be clarified.

When the walk-up flat is compared with a maisonette, a two-storied flat, in terms of identical floor area, it is difficult to say which is better. This is because the walk-up flat has some minus factors, such as that it does not have any garden and that it cannot be expanded in the future, although it features a large number of plus factors.

In respect to walk-up flats under this program, therefore, their number is related to density, target income group, and other factors, and an attempt will be made to identify the correlation of the supply of walk-up flats with these factors, in a physical aspect. The supply of walk-up flats will be incorporated as an important factor in the preparation of alternatives.



The walk-up flats by PERUM PERUMNAS at Tanah Abang, located at the centre of Jakarta.

6

CONCEPT PLAN

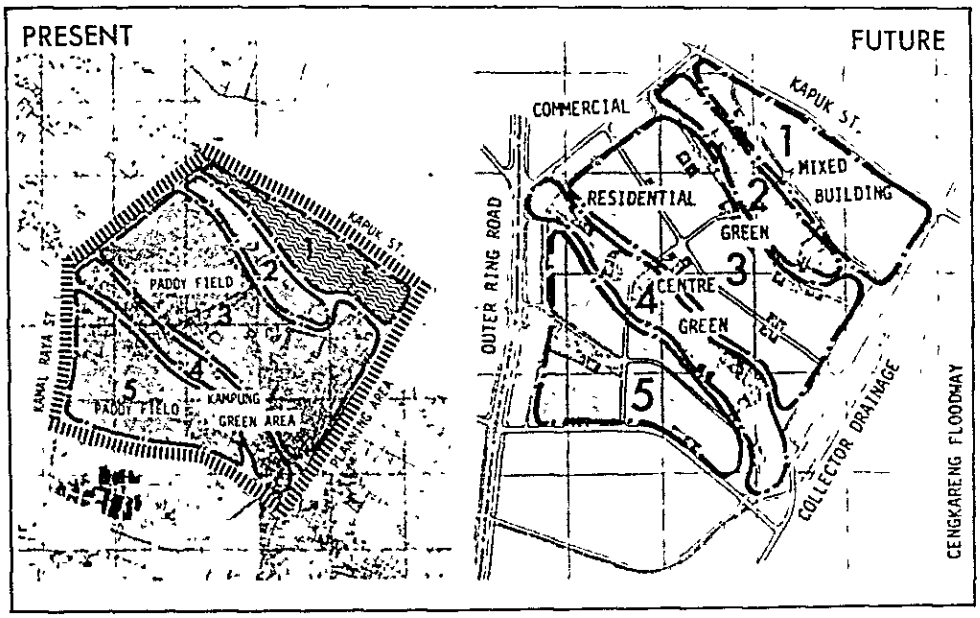
6—1 GENERAL PLAN

A general plan has been designed for the Planning Area, which measures 370 hectares in area. On the basis of this plan, a development program will be formulated for one area of 110 hectares.

LAND USE

From the standpoint of land use at present, the 370 hectare Planning Area is roughly divided into five zones. Even in this present classification of land use, the natural and social conditions are evidently different from one zone to another. Plans for land utilization will be formulated with this in mind.

FIG. 6—1—1 LAND USE—PRESENT AND FUTURE



In Zone No. 1, villages and small industrial plants already exist, and it is expected that an improvement of the Kapuk street will further accelerate urbanization. Therefore, attempts will be made to induce smaller commercial and industrial

facilities, houses, etc., in a systematic manner, for the development of a well-balanced town.

Zone No. 2 and 4 are belts of trees with a low density of villages, and attempts will be made to make use of them as "green axis" for urban purposes. As the general plan is designed to give encouragement to the potentiality for commerce and industry, and to supply houses in large numbers, there are calls for land use of the urban type having a relatively high density. Given this factor, these green belts will turn out to be valuable assets for places of community and recreational activities, and as scenic spots. And then, these zones will constitute the backbone for the development of the whole Planning Area.

Most of Zone No. 3 and 5 are made up of paddy-fields at present. The greatest degree of progress has been made here, in a land acquisition for the development of housing sites. Consequently, the development of these two zones will evolve primarily around housing, commerce, industry, and other urban functions. For this purpose, commercial and business functions to cater to a relatively wider areas, will be distributed along peripheral arterial roads to which accessibility from the periphery is relatively high. By so doing, it will be possible to check the flow of inter-regional traffic into these areas, and to assure a favorable living environment. Also, this distribution may flexibly respond to the demand for commercial facilities.

The existing population of the Planning Area is estimated at 20,000 persons. According to the Guide Plan of DKI Jakarta, the average population density stands at 200 - 300 people/hectare. On the basis of this figure, the population density will be set at 400 people/hectare in the new housing areas, 300 people/hectare in the areas for the induction of facilities, and 30 people/hectare in the commercial area.

Typical view in zone 1, 2 and 4. There are plenty green and lower density communities.

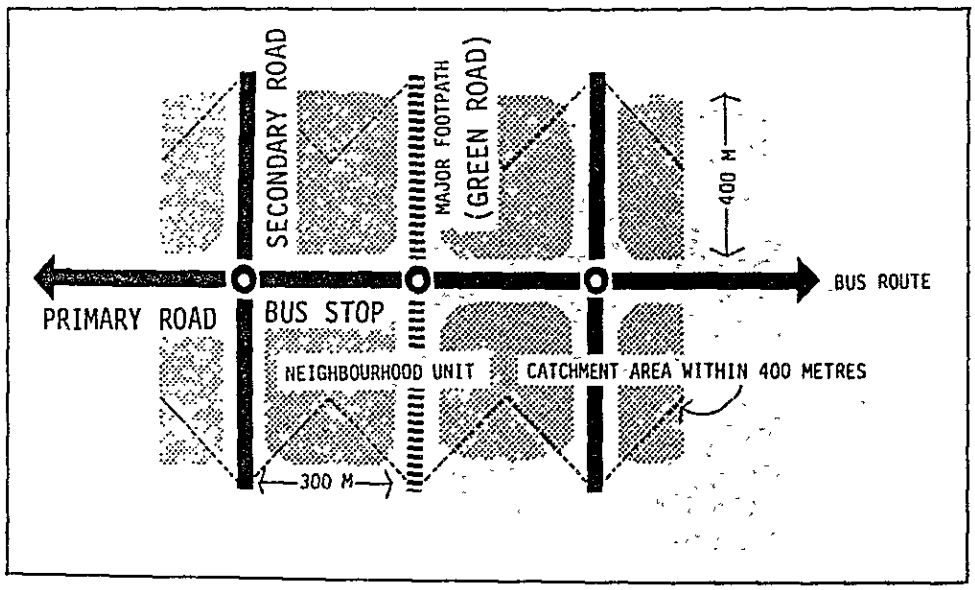
Typical view of the paddy fields in Cengkareng. Most of the paddy fields are well maintained.

TRANSPORTATION SYSTEM

The Planning Area will be externally surrounded by existing and planned arterial roads. The main access roads leading to the Planning Area from these peripheral roads will serve as principal bus routes, with a view to development of a road system, the backbone of which is these access roads.

In proportion, as highly dense built-up areas are formed in future, the public transportation system will become all the more important. Particularly in the residential areas, bus services, the most realistic means of transportation will become a main system. For this reason, the whole road network for the Cengkareng area will be so arranged that these bus routes may serve as the primary roads. It is assumed here that the walking distance to a bus stop from within the housing area is 400m, and it will be necessary to build secondary roads at an interval of about 600m, as a model.

FIG. 6-1-2 SYSTEM MODEL



The Planning Area is shaped like a regular square, roughly 2km on all sides, so much so that there will arise a need for

two secondary roads, which will cross each other at right angles. Model A is a typical presentation. However, this Planning Area is divided into three large zones by "green axis," making it necessary to prepare a primary road for each zone. It is desirable that the number of primary roads be reduced in terms of planning and project. Therefore, it has been decided to prepare three secondary roads from east to west, and one north to south in order to accomplish the initial objective.

The backbone of the pedestrian way system is made of "green axis" and "green roads" which link one "green axis" with another. This system is the most essential network in sustaining the daily life of this area. It also constitutes the main routes for pedestrians, cyclists and Becas. Moreover, these "green roads" will be effectively linked to the bus routes, the principal means of transport for trips to and from districts outside this area. Therefore, it will turn out to be an organic transportation system.

(NOTE) Beca = public tricycle

FIG. 6-1-3 MODEL NET WORKS

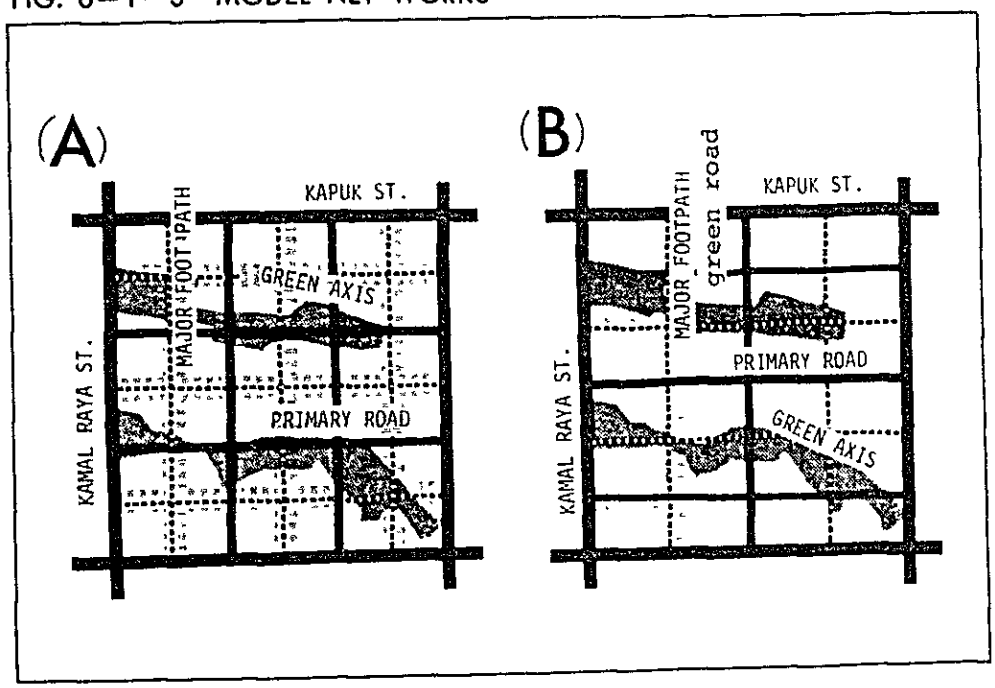
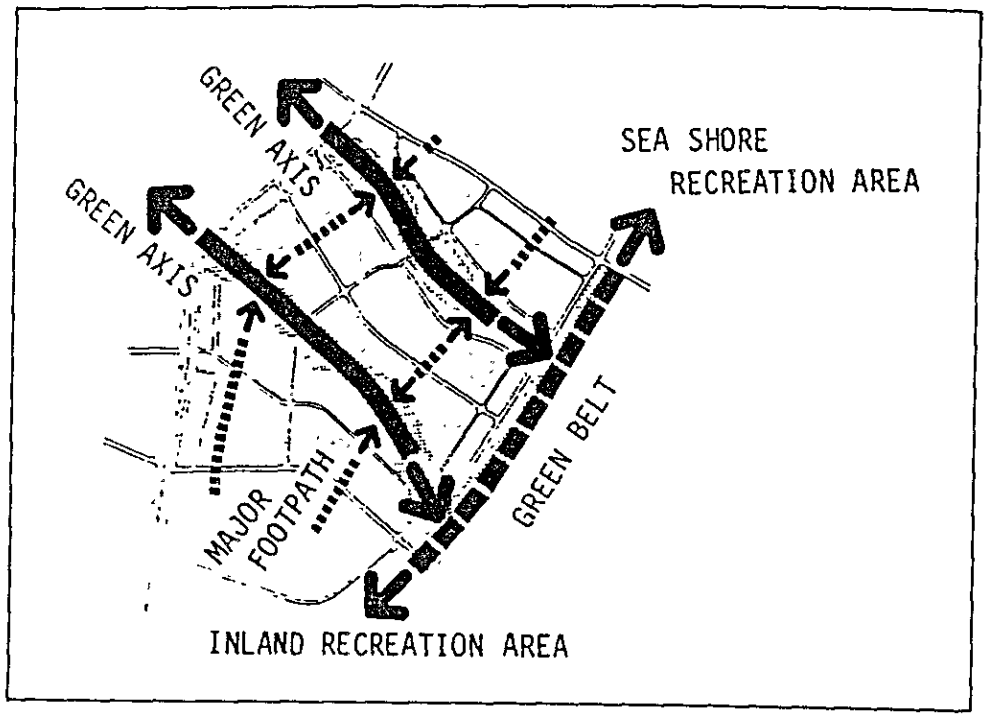


FIG. 6-1-4 GREEN AXES AND PEDESTRCAN WAYS



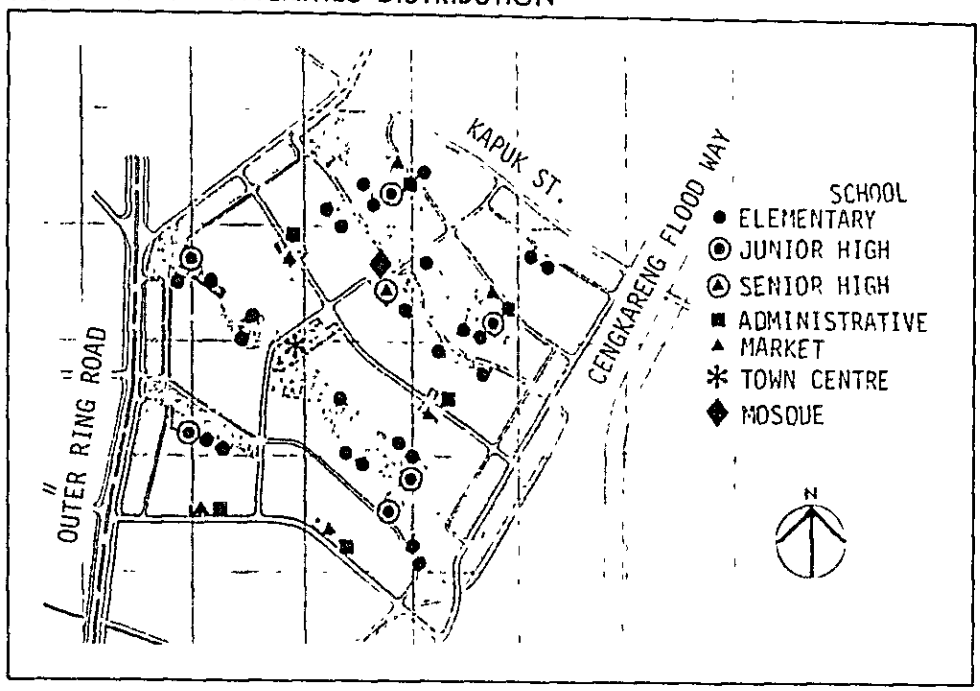
COMMUNITY FACILITIES LAYOUT

On the basis of the standards set forth by DKI Jakarta and PERUM PERUMNAS, the planned communities will have a population of 3,600. When it is assumed that the population density will be 350 people/hectare, it will follow that a single planning unit covers an area of 10 hectares. Therefore, if the space set aside for the commercial area, town centre, rivers, and primary roads, etc., is deducted from that of the Planning Area measuring 360 hectares in space, roughly 300 hectares will be available for housing sites, making it possible to form about 30 unit communities. The basic community as referred to here, serves as the basic unit for the distribution of community facilities and, at the same time, as the basic unit for the phased implementation of the project.

The community facilities will be constructed near the "green axis" for effective utilization of land and attempts will

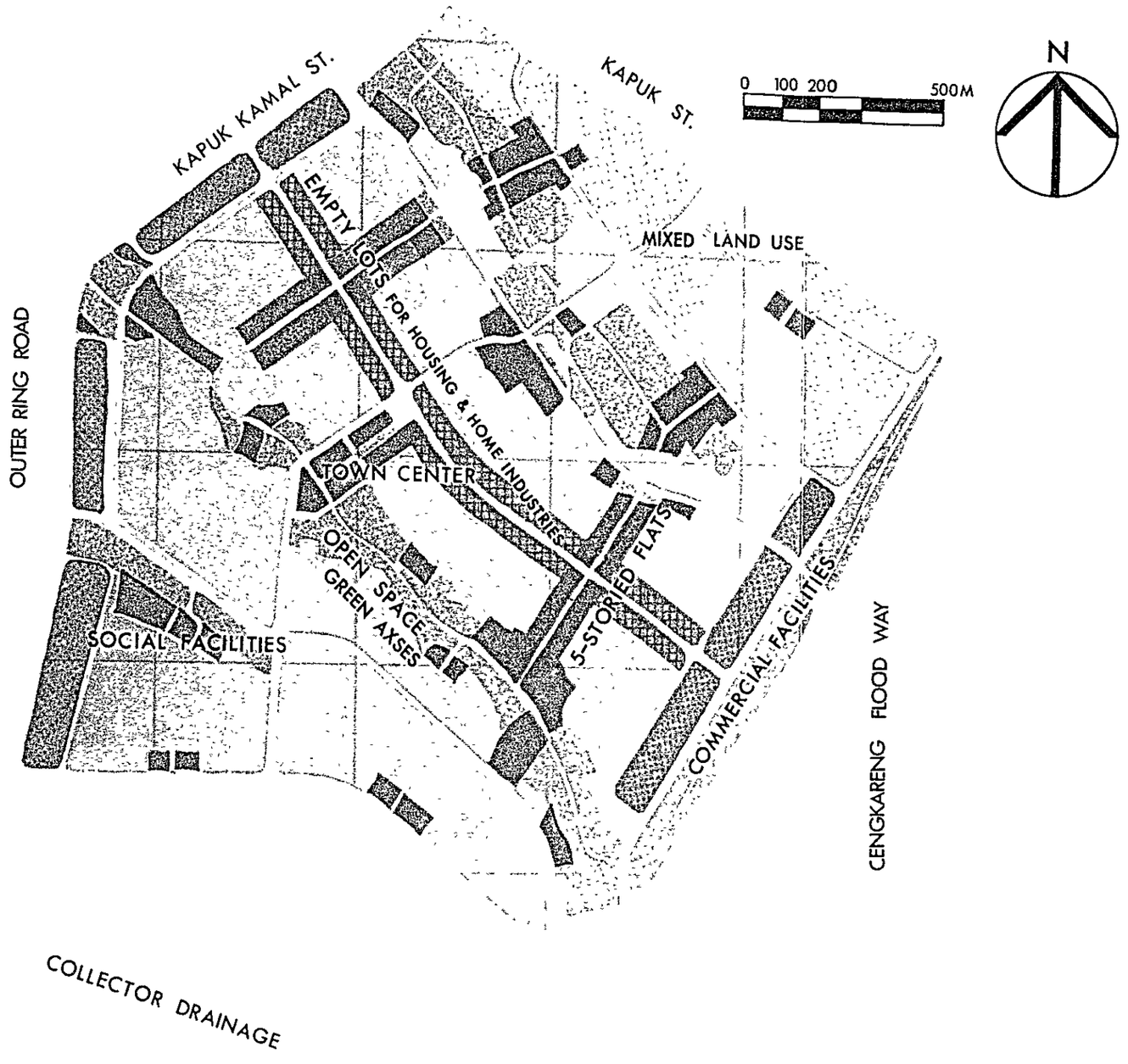
be made to make positive use of the "green axis" in close association with the inhabited areas.

FIG. 6-1-5 FACILITIES DISTRIBUTION



When the development of the whole Planning Area is completed, there will emerge a huge community having a population of upwards of 100,000. For this reason, there will be a need to install a community centre which will serve as the core of community activity. Here, a town centre will be constructed, practically at the centre of the Planning Area, or a place which is included in the initial Project Area and is close to the "green axis", for inter-regional community activities. For the time being, this centre will cater to the 370-hectare Planning Area but, it is taken into account that the centre may have to cope with a rise in future demand.

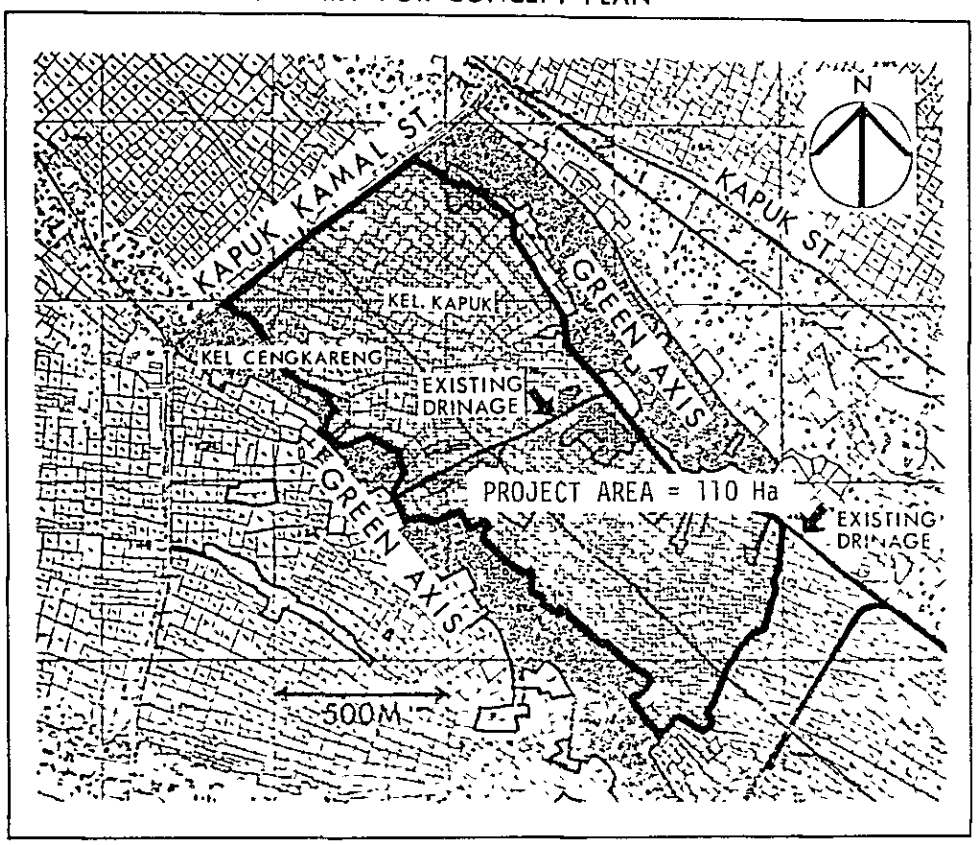
FIG. 6—1—6 GENERAL PLAN



6—2 CONCEPT PLAN

The concept plan is designed for the 110-hectare Project Area. The computation of the project cost, preparation of substitute programmes and financial analysis, are made on the basis of this plan.

FIG. 6—2—1 BOUNDARY FOR CONCEPT PLAN



URBAN TYPE HOUSING

One of the themes of this program is to work for a highly dense development, in order to supply houses in large numbers. A proposal is made for the development of urban type housing sites which differ from the ones developed by PERUM PERUMNAS.

As concrete measures, there is a need to work for a reduction of lot size, and an adoption of row houses, in addition to the

two - five storied walk-up, and maisonette.

Under this programme, the lot size which is most closely correlated to the density will be basically set at 40 m^2/unit for walk-up flats, 50 m^2/unit for two-storied flats and 60 m^2/unit for maisonette, by taking into consideration Jakarta by-laws. Here, the floor area will be basically 36 m^2/unit, and the net capacity will be 90%, 72% and 60%, respectively. Now that the conventional mean value by PERUM PERUMNAS stands at less than 50%, it is evident that the types proposed here is of the high density type. Lot sizes of the high density type are compared in terms of housing area units, with the conventional housing complexes and existing residential areas at the following figure.

A check of the conditions after an expansion of the houses reveals that the building-to-land ratio is practically the same, both for the high-density and conventional types, and lower than that of the existing residential areas. Consequently, as much open space is maintained as in the case of the conventional housing complexes, even for the high-density type, so that it might be said that the environmental standards are paractically the same in terms of functions.

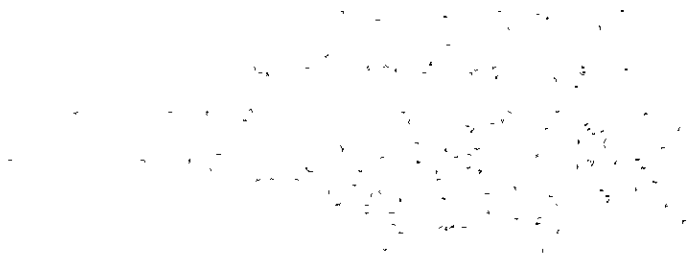
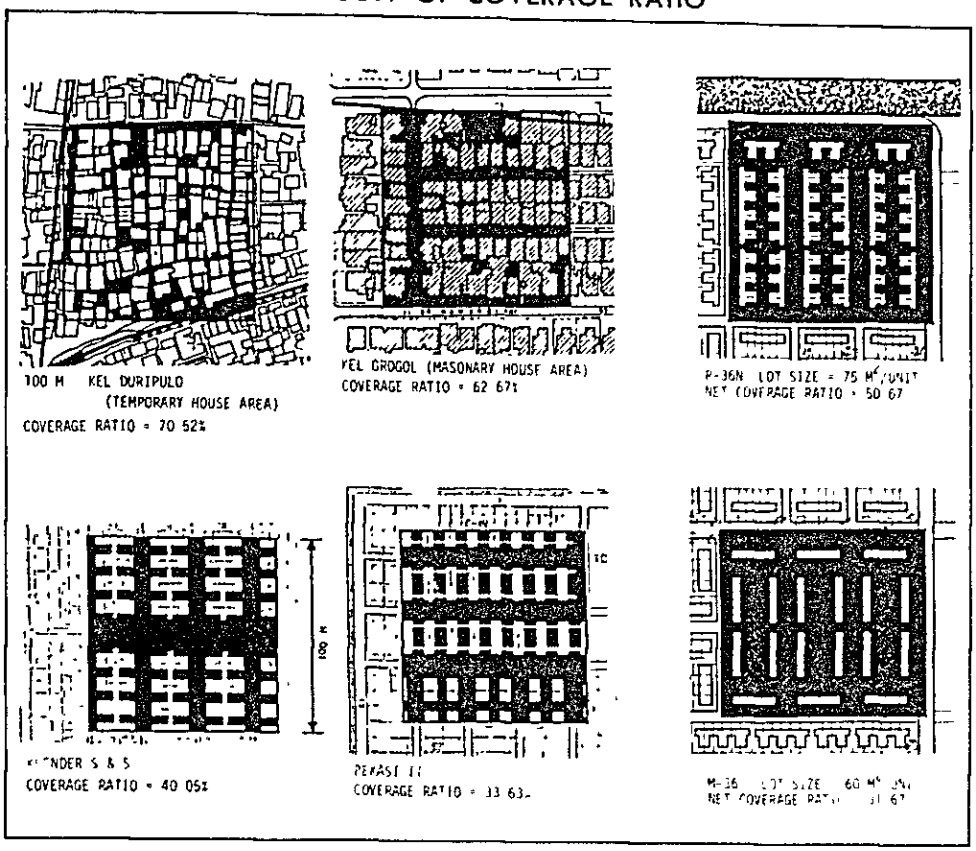


FIG. 6—2—2 COMPARISON OF COVERAGE RATIO



URBAN STRUCTURE

"Green axis" and drainage are major factors which organize the structure of the Project Area. Under this programme, parks, playgrounds, schools, and other facilities, will be distributed near them, and put to effective use in relation to community activities. These green belts have a space structure heretrogeneous to that of the highly dense residential areas, and serve as an important factor in bringing about changes in an otherwise monotonous urban space.

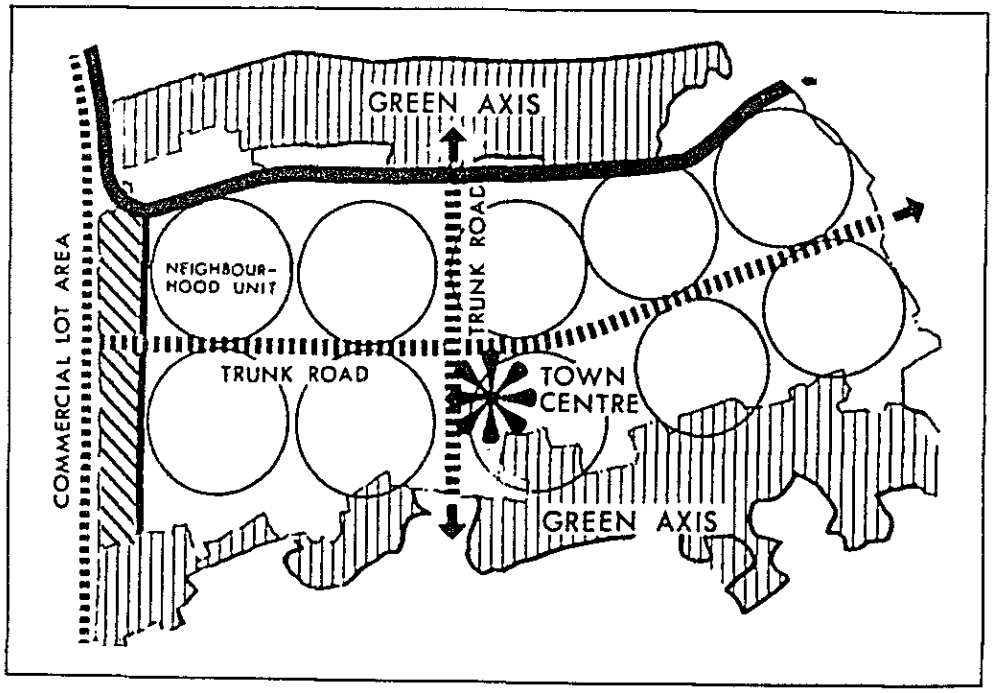
For highly dense built-up areas, not only orderly urban structure and safety are required, but also, utility and a comfortable life. Here, the housing areas are almost evenly divided by the primary road , which will run through the centre of the

Project Area, "green roads" which will link the two "green axis" running perpendicular to the primary road , drainage and the transportation. In terms of space, the area around the point at which a primary road and a "green road" cross each other, walk-up flats will be distributed in a concentrated manner to have the structure come more visibly to the force.

In order to expand the Project Area and develop the Planning Area in line with the general plan, there is a need to add flexibility to this programme. As one method to achieve this purpose, the secondary road, which is to penetrate the Planning Area almost north to south, will resemble a loop-road, and consideration is given to possible changes in the configuration of the road, depending on the land acquisition.

This programme is designed to develop a community of the complex type, incorporating a wide variety of dwellings. The social needs are to be satisfied by developing the empty lots for high-income people, or landed dwellings of the

FIG. 6—2—3 STRUCTURE PLAN



maisonette type, along the automobile access roads, and by distributing dwellings for low-income people in other areas.

LAND USE

Land use is determined for the 110-hectare Project Area in accordance with PERUM PERUMNAS guidelines. Here, the number of houses is hypothesized at 7,000. Educational and other facilities which are directly correlated to the population scale, will include an open space, a playground, and other facilities, as one set. At the same time, the number of elementary schools will be made larger than the standard, so as to respond flexibly to a rise in population.

As a result, the productive area for housing, commerce and others, in the Project Area, accounts for roughly 60%, whereas the remaining 40% will be set aside for public facilities. Although this programme is designed to supply dwellings in large numbers, it might be said that adequate space for public facilities is set aside to satisfy the living functions of inhabitants to the full degree and to maintain a certain level of environment.

FIG. 6—2—4 LAND USE