

Direction and Stages of Redevelopment Policy in Seoul

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I. INTRODUCTION

1. Objectives of Research

Our Department of Urban and Regional Planning was engaged in a study of the urban renewal process in Seoul for over a year. In this article I will briefly review some of our conclusions and methodology. Before I begin I would like to make one or two points about urban renewal as it affects developing nations.

Urban renewal began in the United States in 1949. Renewal efforts have been pushed when cities have deteriorated or become ripe for different land uses or when traffic needs have created the need for arterial widenings and the removal of existing impediments to health or progress.

In the last decade interest in city planning has spread into the developing nations. This interest on planning has been accelerated by a growing awareness that population migration and industrialization have resulted in slums, insanitary conditions, congestion and traffic problems. The growing competition for space in or around the urban cores has added to a growing pressure on governmental power to regulate land uses and to acquire land for an expanding number of purposes now considered to be for the public benefit.

In adopting an urban renewal program, the policies and experiences of one country must be carefully construed in the context of that country's particular environment, its problems, its policies and experiences. In the U.S., for example, urban renewal is being undertaken in

cities which have been experiencing large vacancy rates and mass migration and of the central city to the suburbs. The vacancies left have made for less difficulty in evicting tenants than in countries experiencing rapid urbanization and heavy in-migrations into their cities.

There are two general ideas behind urban renewal. The first is slum clearance, getting rid of impediments to future growth. The second is the realization of the need for a comprehensive reordering of the city's physical patterns to insure that the city will be a functional and efficient machine for modern living.

One of the most sensitive political issues in urban renewal is the massive displacement of people and businesses. Other countries, including the United States, are trying to solve the problem through extensive housing projects designed to relocate those evicted into satisfactory accommodations.

Korea's situation is in many ways worse. Seoul has an extreme housing shortage. Not only slum lie, but intense overcrowding within slums as well as squatting are complication its living pattern. The public housing units added over the last few years have been largely offset by the continued in migration into Seoul from the countryside.

We did not take it to be our task to frame objectives or purposes for urban renewal.

Instead the objectives of this research were to estimate the land requirements and the available resources (land) in the Central Business District (CBD) in Seoul during the next 15 years and determine the gap between the requirements and the availability. Also, the total and yearly needs for redevelopment in the district, a task required of Seoul Special City, were quantitatively estimated in this research. The grounds on which these objectives are established is an assumption that city planning policy calls for altering the traditional pattern of land uses to meet new requirements generated by the growth of the whole city.

Since it may be regarded that the pattern of land uses in the city varies mostly according to the urbanized area's functional characteristics, it may be said that the central business district discharging the central functions of the city is the place where the land uses are at the highest degree of intensity(Note 1). Viewed from the point of view that the city functions are most economically and intensively carried on in the central business district, the effective redevelopment of the district would play the pivotal role in developing the whole city.

The significance of this research can be found in the fact that by estimating, through a quantitative model, the new land requirements to be generated by future city development and the excess and deficiency of land availability in the Central Business District, as well as

by determining quantitatively the need for redevelopment based on the gap between the requirements and existing availability, not only excessive investment can be prevented, but the quantitative anticipation of excessive intensity of uses can be made.

In this research, an assumption was made that the Central Business District chosen as the object area of this research, will continue to maintain its position as the single nucleus of highest intensity of land use in Seoul for at least fifteen years. However, if this research concludes that the land availability will be far short of the land requirements, or that an excessively large amount of funds will be necessary to fill the gap between the requirements and the availability, it will mean that it is necessary to consider the development of a second CBD or sub-CBD areas.

As the object area of this research, the Central Business District in Seoul was chosen. It is usual that the pattern of land uses in a central city with a single nucleus like Seoul, shows one place with the highest degree of intensity of land use. The farther from this central place the lower is the intensity of use. The intensity of land use means not the density of population per unit area, but rather the highest economical gains which can be attained by utilizing the unit area of land.

Keeping in mind the general nature of the Central Business District as mentioned above, this research marked out its object area of the CBD from the central area in Seoul, based on several criteria, such as the network of roads, status of land uses, land prices, boundary of Dong office administrative areas, geographical features, areas for specific uses designated in the city master plan and regional boundary (See Figure 1).

In any case of marking out the boundary of a CBD, its periphery poses a problem. Since the remoter from the center of the city a place is, the lower the intensity of land uses is, as was already mentioned, it will be impossible, in a strict sense, to mark out the CBD based only on the criterion of the pattern of land use.

In the modern metropolis, the network of roads generally divides zones of city activities. This is particularly the case in a city where motor vehicles constitute the main mode of transportation for city activities. According to the preliminary survey conducted for this research, the difference in the pattern of land uses is relatively clear in the center, particularly inside of and outside of the Inner Loop in Seoul. That is, the inside area has a higher rate of non-dwelling functions and the outside area has a considerably higher rate of residential land use (See Figure 2).

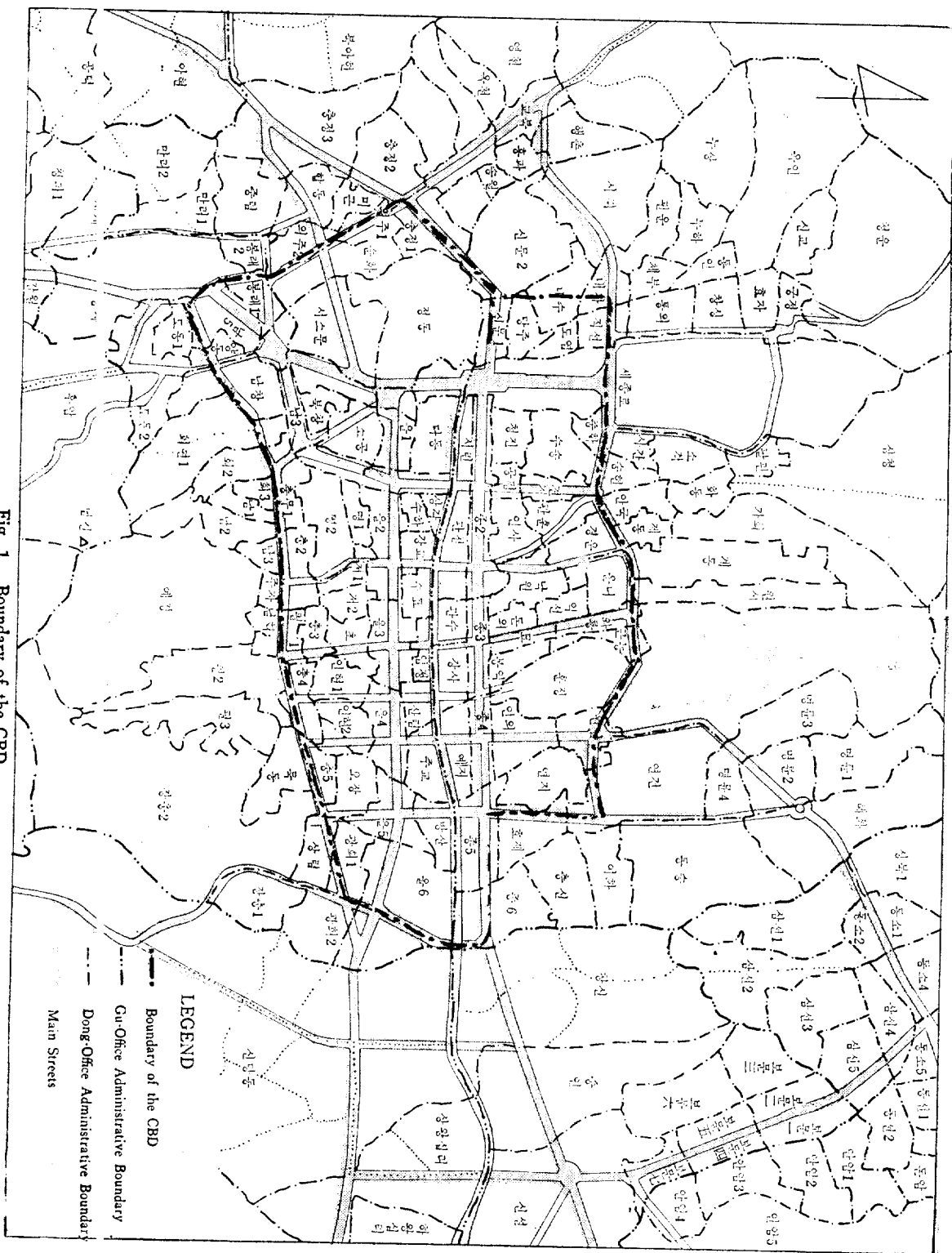


Fig. 1. Boundary of the CBD



Fig. 2.

Rate of the Number of Residential Buildings in each the Dongs in the CBD

Source: Report of the Survey on the Uses of Buildings in Seoul, Seoul Special City, 1967

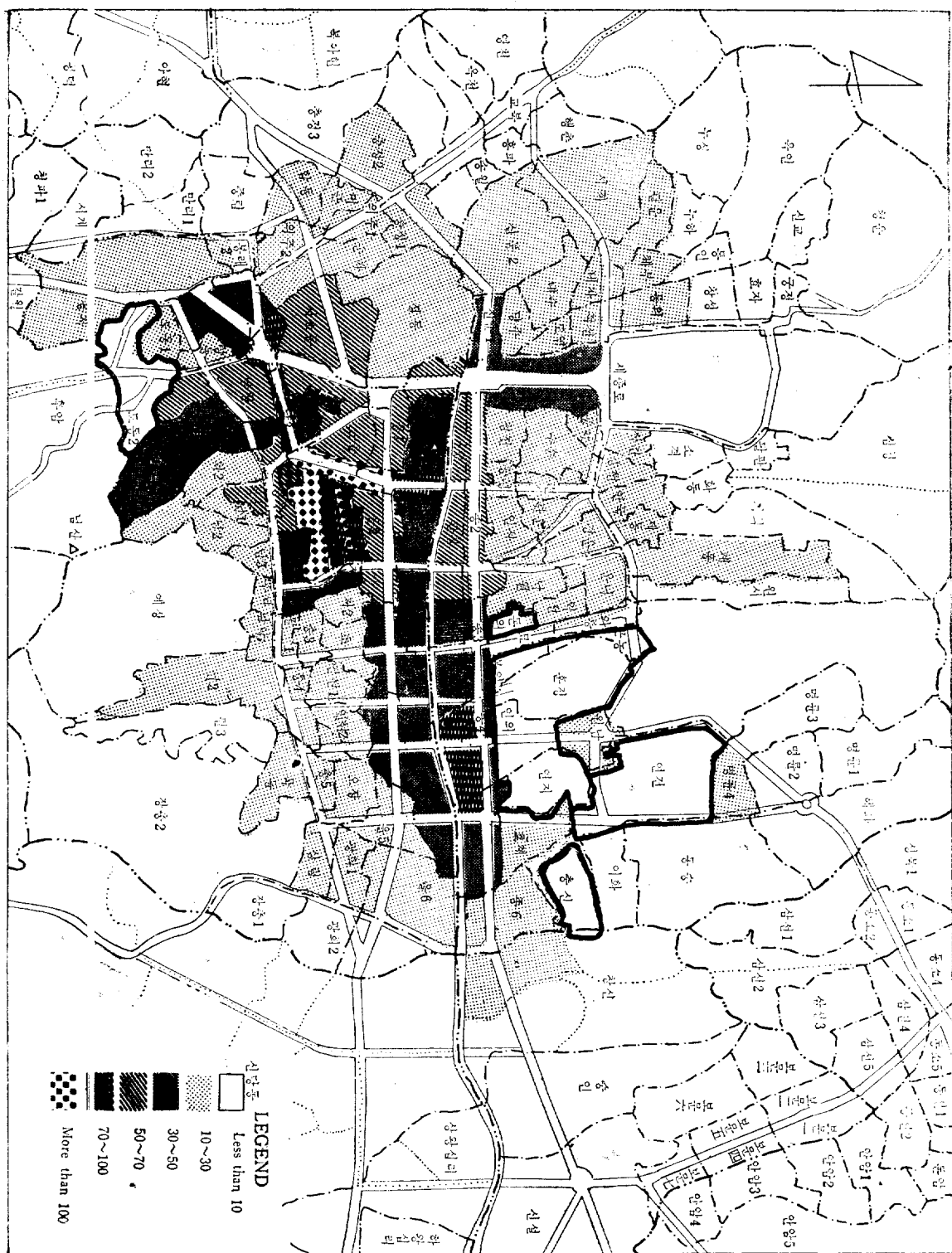


Fig. 3 Survey of Land Prices in the Central Area of Seoul (as June, 1968),
Source: National Land Prices Survey (1968), Korean Banking Association, pp.1~10

Land prices surveyed in both the Inner Loop and outside of it show that the price gap between the two areas has become larger over time(See Figure 3). In view of these facts, it can be said that in Seoul the pattern of land uses and land prices may well serve as a relatively useful criteria in marking out the area of CBD functions.

The existence of the street network in a close grid pattern inside the Inner Loop makes possible speedy communication among city functions, and may attract those activities which need the functions of rapid communication and transportation. Furthermore, the Central-Business District has literally become the functional center of the city system, since the Seoul network of transportation consists of a pattern of streets converging on the center.

There are two reasons for adopting the boundary of zones designated for specific use in the master plan as one of the criteria. In the first place, when a zone is designated for specific uses by laws and regulations which will be enforced, the designation will more or less give influence to the pattern of private land uses in the zone. In the second place, since the city master plan shows the basic direction of public investment to be made in the future, it will be useful in predicting the future pattern of the CBD.

Based on these four standards of judgement, the Central Business District in Seoul with a total area of 6,278,107 square meters was determined as the geographical range for our estimation of the land requirements and land availability in the future.

2. Establishment of the Period for Estimation (Target Year)

As the first step in estimating basic variables and implementing the redevelopment policy based on the estimated values, this research took the 15 years from 1971 to 1986. The reason why the year 1986 was taken as the target year is to make the year coincide with the target year of Seoul Special City's master plan. This not only makes convenient the mutual exchange of data, but also aims to correlate the results of this research with the policy making process for the development plan of the whole area of Seoul Special City to be carried out according to the city master plan. The change and development of the center of the city have an inseparable relation with the growth and development process of the whole city.

Another reason is that the period of 15 years represents nearly the maximum period for making a significant estimation from a technical point of view on various major variables to be adopted for the process of city development.

3. Definition of City Functions in the CBD

Based on this theoretical consideration, this research assumed that the central business district

in Seoul is the central place with the concentration of certain functions including (1) the commercial function: retail sale, wholesale, entertainment, etc. (2) the government managerial function, (3) private managerial function and (4) other transportation and communication function.

In this research the increased requirements of land uses area defined as the increase in the requirements of land uses for the CBD functions. Meantime, as long as the concentration of these functions in the CBD has been assumed, we also have to assume that functions other than these, for example, residential, will be gradually forced out from the district. In this sense, this research defined the land availability as including not only lots presently unoccupied but also lands which, although they are currently used for functions other than the CBD functions will probably be diverted to other uses in the future.

The gap between the land requirements and the land availability is defined in this research as the quantity of excess or deficiency shown by year between the requirements of land for the CBD functions, defined as above, and the land availability, which includes lots unoccupied in the present or in the future and areas being diverted from non-CBD functions which will be forced out from the district.

II. ESTIMATION OF LAND REQUIREMENTS

1. Establishment of Basic Model

The estimation of future land requirements in the central business district (CBD) is based on a basic assumption that the scale of CBD functions will be expanded as the population and economy of the metropolis grow. As the first task of this research a survey was conducted to determine the acreage being used to carry on the CBD functions. Then, we formulated a multiple regression equation by calculating and assessing the degree of correlation between the acreage and six independent variable. Finally, anticipated future values of the independent variables were substituted in the equation to estimate the future land requirements. The total floor area directly reflects the land requirements necessary for the expanded CBD functions. The six independent variables are national population, population in Seoul, gross national product (GNP), total income in Seoul, population engaged in economic activities in Seoul and population in tertiary industries in Seoul all of which are related to population increase and economic growth.

2. Survey for the Dependent Variable

To survey the total floor area of buildings used for the CBD functions, the dependent variable, the house ledgers, lost-house ledgers, non-taxable house ledger, and public building ledgers each Ku (district) Office were thoroughly referred to in order to find out the floor area in each lot number in the Central Business District. Then, all floor areas were summed up.

A field survey would have required a large number of persons and much time. It was impossible to complete within the period assigned to this research. A survey based on building permit applications for new construction, and extension or reconditioning of existing buildings submitted to the competent offices, would have had to take account of the fact that there are a considerable number of buildings constructed illegally or without permission. Furthermore, it was almost impossible to survey matters such as the change of uses, because the City Hall or Ku office have kept only a part of the ledgers and other files concerned, and the applications have been classified not according to lot number but according to the number of the files.

A variety of house ledgers kept in the Ku Office classify the functions of buildings into about 30 categories. Taking account of the nature of this research and the convenience of investigation works, however, the functions were at first divided into two large categories: CBD functions and non-CBD functions. The functions were then sub-divided into seven codes as follow: Commerical functions; Dwelling functions; Commercial and dwelling functions; Educational and cultural functions; Industrial functions; Public and managerial functions; Palaces and unoccupied land.

In the survey of the total floor areas of buildings in the central business district, this research took the year 1959 as the base year and calculated the annual sum of the floor areas up to December 31, 1969.

According to the result of the floor area survey, the index number of the total floor areas of building in the central business district has been increased to 170 in 1969 from 100 in 1959, the base year. During the period, the floor areas for commercial functions had increased to 217 (Table 1). Commerical and dwelling functions combined into one grew to 421. The dwelling function had an almost negligible increase in the early years of the period and had begun to decrease after 1967.

It may be said that the fact that floor area of commercial CBD functions increased while the floor area of the non-commercial CBD functions decreased, supports the assumption already

Table. 1 Change of Floor Areas of Buildings by Function in the CBD (Unit: pyung)

Use Year	Code 1. Commercial				Code 2. Residential			Code 3. Comm-Resid			Code 4. Educational-Cultural		
	Floor	Rate (%)	Index		Floor	Rate (%)	Index	Floor	Rate (%)	Index	Floor	Rate (%)	Index
1959	381	622.32	0	100.0	255,026.93	0	100.0	5,608.58	0	100.0	46,129.82	0	100.0
1960	404	689.27	6.0	106.0	259,854.86	1.7	101.7	6,076.28	8.3	108.3	47,189.59	0.8	100.8
1961	441	497.64	9.1	115.7	263,172.62	1.5	103.2	6,394.55	5.2	114.0	48,757.37	3.3	104.1
1962	448	787.60	1.7	117.6	265,331.07	0.8	104.0	6,457.24	1.0	115.1	50,510.52	3.6	107.9
1963	465	129.49	3.6	121.9	267,851.30	0.9	105.0	7,000.28	8.4	124.8	51,981.42	2.9	111.0
1964	497	088.51	6.0	130.3	270,420.76	1.0	106.0	7,876.12	12.5	140.4	52,894.71	1.8	113.0
1965	544	354.12	9.5	142.6	274,613.86	1.6	107.7	9,215.96	17.0	164.3	56,520.69	6.9	120.7
1966	597	246.40	8.4	156.5	275,777.70	0.4	108.1	10,111.59	9.7	180.3	59,698.35	5.6	127.5
1967	647	176.97	8.4	196.6	277,277.40	0.5	108.7	11,871.44	17.4	211.7	61,846.38	3.6	132.1
1968	721	981.49	11.6	189.2	274,926.38	-0.8	107.8	20,312.83	70.1	362.2	66,885.41	8.1	142.8
1969	829	359.31	14.9	217.3	273,741.66	-0.4	107.3	23,630.26	16.4	421.3	72,044.23	7.7	153.8
Average Rate		7.92				0.72			16.60			4.43	

Use year	Code 5. Industrial			Code 6. Public-Managerial			Code 7. Parks-Open			Grand Total			
	Floor	Rate (%)	Index	Floor	Rate (%)	Index	Floor	Rate (%)	Index	Floor	Rate (%)	Index	
1959	14	721.46	0	100.0	48,891.79	0	100.0	2,168.80	0	100.0	754,969.70	0	100.0
1960	16	579.00	12.6	112.6	49,648.18	1.5	101.5	2,168.80	0	100.0	785,605.98	4.1	104.1
1961	17	999.27	8.6	122.3	53,190.64	7.1	108.8	2,168.80	0	100.0	833,179.88	6.1	110.4
1962	19	455.93	8.1	132.2	50,584.02	-4.9	103.5	2,168.80	0	100.0	844,187.18	1.3	111.8
1963	20	280.60	4.2	137.8	51,974.45	2.7	106.3	2,168.80	0	100.0	866,175.29	2.6	114.7
1964	22	162.02	9.3	150.5	52,560.80	1.1	107.5	2,168.80	0	100.0	905,162.48	4.5	119.9
1965	23	673.52	6.8	160.8	53,477.98	1.7	109.4	2,168.80	0	100.0	963,911.74	6.5	127.7
1966	25	899.21	9.4	175.9	54,291.87	1.5	111.0	2,168.80	0	100.0	1,025,190.73	6.4	135.8
1967	27	055.38	4.5	183.8	51,920.28	-4.4	106.2	2,168.80	0	100.0	1,085,339.55	5.9	143.8
1968	27	883.24	3.1	189.4	52,355.26	0.8	107.1	2,168.80	0	100.0	1,165,613.22	7.4	154.4
1969	28	865.32	3.5	196.1	53,771.47	2.7	110.0	2,168.80	0	100.0	1,283,583.96	10.1	170.0
Average Rate		7.01				0.98			0			5.49	

presented here, that the CBD functions will be expanded with population increase and with economic growth.

This research included the floor area for the commercial function (code 1), commercial and dwelling function (code 3), and public and managerial function (code 6) under the category of CBD functions. No argument will be needed on the commercial function and the public and managerial function, because they belong to the CBD functions as defined in the early description. However, there must be some reason proffered for including the commercial and

dwelling function with the CBD functions. It is true that the floor space under code 3 is used for both commercial and dwelling functions. But it may be argued that the dwelling function is being utilized less than the commercial function in the central business district because the commercial function has been rapidly increasing while the dwelling function has begun to decrease in the district.

The total floor space of buildings for CBD functions, the dependent variable was found to be increasing at an average annual rate of 7.66.

Table 2. Land Requirements for CBD Functions in The Future

Year	Estimated Area (pyung)	Estimated Area (m ²)	Yearly Amount of Increase	Growth Rate (%)	Cumulative Amount of Increase
1969	892,643.1	2,945,722			
1970	952,143.6	3,142,074	196,352	6.67	196,352
1971	,007,958.1	3,326,262	184,188	5.86	380,540
1972	,076,472.3	3,552,359	226,097	6.80	606,637
1973	,144,111.6	3,775,568	223,210	6.28	829,847
1974	,213,029.0	4,002,996	227,427	6.02	1,057,274
1975	,287,449.2	4,248,582	245,587	6.14	1,302,861
1976	,361,656.3	4,493,466	244,883	5.76	1,547,744
1977	,446,229.6	4,772,558	279,092	6.21	1,826,836
1978	,532,735.5	5,058,027	285,469	5.98	2,112,305
1979	,619,179.4	5,343,292	285,265	5.64	2,397,570
1980	,702,613.8	5,618,626	275,334	5.15	2,672,094
1981	,783,408.0	5,885,246	266,621	4.75	2,939,525
1982	,864,936.3	6,154,290	269,043	4.57	3,208,568
1983	,941,830.7	6,408,041	253,752	4.12	3,462,320
1984	2,011,804.4	6,628,955	230,913	3.60	3,693,233
1985	2,073,528.6	6,842,644	203,690	3.07	3,896,923
1986	2,121,632.3	7,001,387	158,742	2.32	4,055,665
Average				5.14	

3. Establishment of Independent Variables.

In collecting data on the six independent variables presented as the indicators of population and economic growth, namely, the national population, population in Seoul, gross national product, total income in Seoul, population engaged in economic activities in Seoul and population in the tertiary industries in Seoul, consideration was made of the possibility of procuring the data. 1961 to 1968 were the years for which the data were available.

Reviewing the increasing trend of the independent variables during the period from the base year of 1961 (index number 100) to 1968, all independent variables, excluding total income

in Seoul exhibited a similarity to the dependent variable. The total floor space for CBD function: had an index number of 158.6 by 1968. In 1968 the population in tertiary industries registered an index number of 155.1, national population 119.6, population in Seoul 168.5, gross national products 183.7 and population engaged in economic activities in Seoul 193. Only total income in Seoul showed a substantially higher rate of increase with an index number of 430.8 registered in 1968.

It can be inferred from this that the independent variables already presented have a considerable degree of correlation with the dependent variable, the total floor space of buildings for the CBD functions. With regards to this correlation, this research assumed that the dependent variable had a linear relation with each of the independent variables, and calculated the dependent variable had a linear relation with each of the independent variables, and calculated the simple correlation coefficient of each independent variable. The results range from a minimum of 8.96435957 E-01 to a maximum of 9.94744556 E-01.

Such high degrees of correlation may be said to prove the appropriateness of the independent variables chosen. In other words, it is demonstrated that the independent variables could be established for the multiple regression equation by which the floor space of buildings for CBD functions in the future may be calculated. At the same time, it proves the appropriateness of the basic assumption, that the expansion of the CBD functions is caused by population increase and economic growth.

4. Formulation of the Basic Equation

The value of 9.99150130 E-01, the multiple correlation coefficient, calculated from the linear relation between the independent variables and the dependent variable, shows nearly perfect correlation and proves the appropriateness of the independent variables established. The standard error was calculated as 1.2807573 and the squared standard error as 1.64020717.

From the linear relation with the independent variables, the basic equation to estimate the floor spaces of buildings for the CBD functions in the future is expressed as follows:

$$Y = -359,118.851 + 0.377454815X_1 - 0.435532505X_2 - 58.4203934X_3 + 601.633531X_4 + 42.802196X_5 + 0.0664352791X_6$$

Where:

Y: Total floor spaces of buildings for CBD functions

X₁: Population in tertiary industries in Seoul

X₂: Population engaged in economic activities in Seoul

X₃: Gross national product (GNP)

X₄: Total income in Seoul

X₅: National population

X₆: Population in Seoul

5. Estimation of Independent variables

Independent variables values (1969-1986) were calculated on a two phase approach. The first phase (1969-1976), using current trends and extending them via different mathematical models. The second phase assumed that in the 1977-1986 period the Integrated National Land Development Plan would be applied. This would basically alter the developmental patterns.

6. Assessment of Values of the Dependent Variable

Having calculated the values of land requirements for the CBD functions in the future by substituting each of the estimated values for the independent variables for X's in the basic equation, this research had found that the average annual rate of increase in land requirements, which was 7.36 percent during the period from 1959 to 1969, will be 5.14 percent from 1969 to 1986.

Table 3. Amount of Land Used For Non-CBD Functions in the CBD in Seoul

Items	Area(m ²)	Percentage (%)
Area of the CBD	6,278,107	100.0
Land Availability	1,595,156	25.41
Residential	1,205,756	19.21
School	316,320	5.04
Industrial	73,080	1.16

Note; Are Being Used For Colleges and Universities, Private Educational Institutes and Kindergartens were Excluded From the Items Listed Above.

The years up to 1976 will see the dependent variable have an average annual increase rate of about 6 percent, because change in each independent variable is assumed to continue the current trend. Beginning from 1977, however, the rate of increase will be gradually lowered, since each independent variable was estimated taking account of the effects of the National Land Development Plan which are expected to be effective after 1977.

III. ESTIMATION OF LAND AVAILABILITY

1. Assumptions About and Survey of Land Availability

"Land availability" means here those lands which have been used for non-CBD functions

but might be diverted to CBD uses in the future in the Central Business District of Seoul, the object area this research.

In term of uses, various buildings in the Central Business District in Seoul can be classified into sever categories: (1) dwelling, (3) commercial and dwelling, (4) educational and cultural, (5) industrial, (6) public and managerial and (7) palaces and open space. Buildings with residential industrial and educational functions could be regarded as non-CBD functions. That is to say, we may regard sites with these uses as lands which may be diverted in the future to CBD functions.

Although we generally lump all educational functions together, it is undoubtedly true that the various kinds of schools, ranging from primary schools to universities to private educational institutes, each have their own peculiar relationship with the CBD functions. The primary schools and the middle and high schools can be included in the non-CBD functions. The primary, middle and high schools, because of the trend a reduction in the dwelling function and the school district system of compulsory education, have a high probability of moving to the outskirts of the Central Business District. The rise in land prices in the CBD and the traffic mess, will also work to force relocation of schools. The university and private educational institutes are excluded from the non-CBD functions, taking account of their operational peculiarity.

The palaces and the open spaces could be reasonably included in the non-CBD functions, but they are excluded from the land availability list. Our survey revealed that the area of open space negligible. It was assumed that the ancient palaces and parks will permanently keep their standing as recreational and cultural centers within the Central Business District.

Thus, the dwelling lots, school sites (primary, middle and high schools), and the factory sites were included in the land availability list and surveyed to calculate their area.

A. Survey of Land for the Dwelling Function

Since the net acreage of buildings used for residential purposes had already been calculated at the time of the survey of the total floor space of buildings in the CBD. The total area of land for dwelling purpose could be computed if we could obtain the average floor ratio of residential uses in the district. To compute the floor ratio, all Dongs in the CBD were taken as the universe, a sample was drawn from this universe. Then, calculation was made on the floor ratio of each sample Dong. The average of all sample Dong was assumed to be the average for the universe.

The average value of the area covered by buildings for the dwelling function, calculated in the 12 Dongs chosen, was 57.14 percent, very near to the percentage computed by Seoul Special City for its plan for redevelopment districts.

Using this rate of 57.14 percent, the area of land used for the dwelling function was calculated (table 3).

B. School Sites Survey

The objects of the school sites survey were primary schools, middle and high schools and the universities in the Central Business District. The kindergarten site was negligible because its area was very small. The private educational institutes were excluded from this survey, because we regarded them as a commercial function rather than as a non-CBD function.

In the process of the survey, all schools in the Central Business District were at first listed, then, a survey was made of each school to calculate the acreage of its site, referring to the data kept in the Seoul City Education Committee (table 3).

C. Factory Site Survey

The survey on the total floor space of buildings in the Central Business District conducted in the preceding chapter revealed that the floor space of factories is 13,065.92 pyungs. Applying the rate of factory floor space of 59 percent for all sites, we get a total of 22,145.46 pyungs (73,080 square meters) as the amount used for factories.

In order to calculate the rate of floor space in the factory area, a survey was made in 50 factories in the vicinity of Samgak Dong and Chukyo Dong.

The survey on the land availability for the CBS functions turned out percentages of 19.21 percent for the dwelling function, 5.04 percent for the school sites and 1.16 percent for the factory sites. It can be said, therefore, that the largest source of land availability for the expanding CBD functions is the land now used for the dwelling functions.

Among the three kinds of lands with non-CBD functions, it is meaningless to estimate for two kinds of lands, factory and school sites, the possibility of their being diverted to uses for CBD function, because that possibility will be largely dependent upon the policy factor. When necessary in the future, the public sector (government) will be able to divert such lands to CBD uses with relative ease. In short, both kinds of land used for non-CBD functions may be regarded as a kind of reserve resource (land) strongly subject to the variable of public policy.

On the other hand, it is regarded that the land for the dwelling function can be gradually diverted to CBD functions in conformity with the trend of its being forced out from the

Central Business District. Although the trend will be accelerated or delayed according to the policy and intervention of the public sector, it is certain that the trend will act in correlation with the total progress of social, economic or environmental change.

The assumption that the dwelling function will be ultimately forced out from the Central Business District is based on, not only the theory on the general trend of city development, but also on the actual trend shown in the past ten years in Seoul.

As was mentioned earlier, the modern metropolis generally has one or two, or more nuclei discharging the central services function. Though the scale of the central district is decided according to the scale and functional complexity of the city, it is usual that the degree of intensity of the use of land in the nuclear district becomes heightened as the scale of the city is enlarged and its CBD functions expand. This expansion is caused by the increase in the demand for the central services, supplied to all parts of the city from the nuclear district.

The most typical example of the direct expenses caused by the addition of locational value to a district may be the taxes imposed on the land. Besides this, various social expenses caused by traffic congestion and the increased demand for various city services must also be borne.

Through this process, functions such as the dwelling function, unable to pay for the added costs of the location are forced out from the Central Business District. The land formerly occupied by the residential function will be diverted to uses which bring more economic return.

2. Tendency For Forcing the Dwelling Function From the CBD

In Seoul, the tendency toward forcing the dwelling function from the Central Business District has been continuing for the past ten years. Giving the year of 1961 the index number of 100, total population in Seoul has increased year after year and reached to 177.3 in 1968. However, Chongrogu and Chunggu, occupying most of the area of the Central Business District began to have a decrease after 1963 and had an index number of 86.8 in 1968, with a tendency for more decrease in the future. Let us examine in detail the tendency toward forcing out the dwelling function from the CBD.

(a) The rate of increase for the CBD functions is lower than that for forcing out the dwelling function from the CBD. According to a survey on the floor space of buildings in the CBD for the period from 1959 to 1969, the total floor space of buildings for the CBD func-

(1) F. Stuart Chapin, Jr., *Urban Land Use Planning*, 2nd. ed., Univ. of Illinois Press, Urbana, 1965, pp.15-17.

tions was increased by an annual rate of 7.66 percent, but the former 0.72 percent per year.

(b) During the above period for the survey, the CBD functions showed an increasing rate of more than five percent from the beginning, but the dwelling function which had been increasing at an annual rate of 1 percent up 1967 began thereafter to be forced out from the CBD.

Table 4 Trend of Land Area Used For Commercial, Residential, and Combined Commercial-Residential Uses in Seoul, CBD.

Year	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Use											
Commercial	100.0	106.0	115.7	117.6	121.9	130.3	142.6	156.5	169.6	189.2	217.3
Residential	100.0	101.7	103.2	104.0	105.0	106.0	107.7	108.1	108.7	107.8	107.3
Com-Res	100.0	108.3	114.0	115.1	124.8	140.4	164.3	180.3	211.7	362.2	421.3

(c) In spite of the rapid increase of the CBD functions, the dwelling function has not been totally forced out, but the combined use for commerce and dwelling has been rapidly increased. It is attributable to the undevelopment of market distribution systems in Seoul; the great weight of private service industry occupied in the tertiary industries; the frequency of human contacts caused by family and geographical location; the narrow roads; etc.

3. Estimation of Values of the Tendency for Forcing out the Dwelling Function

It is assumed that the tendency toward forcing out the dwelling function from the Central Business District will be going on hereafter at a more rapid speed than that of the past ten years, because of the weakened rate of rising land prices, the gradual improvement of the distribution and marketing structure, the expansion of the secondary industries and the service functions, and others. Under this assumption, estimation was made using quadratic equation of the amount of yearly increments of the land availability, generated by the diversion of the dwelling function to the CBD functions. This equation predicted a rate of decrease varying from -1.30 in 1970 to -11.09 in 1986. The average rate of decrease was -4.78.4.

4. Estimation of Land Availability

Since the land requirements will be increased as the functions of the Central Business District expand, much land will be required to be available. For the land requirements in the future, the land available will be composed of the land for the dwelling function, the school

(4) Cited from pp. 69-88, "Estimates on Population in Seoul Special City During 1967-1990" by Seoul Special City, in 1966.

sites (only primary, middle and high schools) and factory sites.

Calculation shows that the total of the land left as the dwelling function is forced out, as the school sites and the factory sites 389,400 square meters in 1968 and will be 454,276 square meters in 1986.

The land availability generated by the diversion of the school sites and factory sites is impossible to estimate on a year-by-year basis, since the diversion of the sites will be mostly decided according to the policy of the public sector. Thus, the area of the sites available is simply added to each year's total area of the land availability.

Summing the school and factory sites and the land generated from forcing out the dwelling function it is concluded that the land availability in 1986 will be about 17 percent of the area of the Central Business District.

Table 4. Area of Land Availability by Year.

(Unit: m²)

Year	School (1)	Industrial(2)	Residential(3)	(4) Cumulative Decrease in Residential Land	(1) + (2) + (3) = (5)	(1) + (2) + (4) = (6)
1969	316,320	73,080			389,400	389,400
1970	"	"	15,599	15,599	404,999	404,999
1971	"	"	18,679	34,278	408,079	423,678
1972	"	"	21,757	56,035	411,157	445,435
1973	"	"	24,839	80,874	414,239	470,274
1974	"	"	27,917	108,791	417,317	498,191
1975	"	"	30,998	139,789	420,398	529,189
1976	"	"	34,077	173,866	423,477	563,266
1977	"	"	37,158	211,024	426,558	600,424
1978	"	"	40,238	251,262	429,638	640,662
1979	"	"	43,317	294,579	432,717	683,979
1980	"	"	46,396	340,975	435,799	730,375
1981	"	"	49,477	390,452	438,377	779,852
1982	"	"	52,557	443,009	441,957	832,409
1983	"	"	55,715	498,724	445,115	888,124
1984	"	"	58,637	557,361	448,037	946,761
1985	"	"	61,797	619,158	451,197	1,008,558
1986	"	"	64,879	684,034	454,276	1,073,434

IV. POSSIBILITY OF BUILDING HIGHER

This chapter aims to estimate the limit of accommodating buildings in the Central Business District under an assumption that the existing legal and administrative systems and the current economic conditions will be continued.

Two measures for the redevelopment of the Central Business District to meet the expected expansion of land requirements in the district will be presented. The first measure would be to accelerate the forcing out of the dwelling function from the CBD and divert the land left to CBD uses. Next is the measure to encourage the construction of high buildings.

Viewed from the standpoint of redevelopment policy, the significance of computing the maximum marginal value is that the policy of redeveloping the Central Business District for new CBD functions should be decided taking account of the possibility of the construction of higher buildings up to the limit computed in terms of economy of all the land resources in Seoul.

1. Legal Constraints on the Tendency Toward Constructing Higher Buildings

Under the existing laws and regulations, the constraints to higher buildings may be considered from two sides: the regulation on construction sites within the Central Business District and regulation on the height of individual buildings. These two aspects were simultaneously surveyed, because the existing Law of Construction and Regulations delineates the location of construction sites in connection with the function and structure of the individual buildings.

A. Regulation by zoning

According to a survey made as part of this research, most areas of the Central Business District, the object area of this research, have been designated as commercial areas in accordance with the Construction Law and the city master plan. In addition, all roadside areas of the trunk line in the Central Business District have been designated as so-called "linear fire prevention areas". Because the CBD has been determined as the land for specific uses and also for commerce and fire-prevention, the Central Business District has been permitted to have higher buildings than any other district in Seoul under the existing laws and regulations. In other words, this district has been allowed up to the maximum limit legally permissible under the existing laws and regulations.

B. Regulation on the Height of Building

Under the Revised Construction Law to be enforced from 1970, the height of a building is regulated by the rate of building volume (Article 40) and the width of road in front of the buildings, besides the regulation on the site itself. In view of these maximum heights of buildings permitted under the existing laws and regulations, buildings along the east-west trunk (35 to 45 meters wide) in the Central Business District could be heightened to at least 11 stories and those along the south-north trunk (25 to 35 meters wide) to about 10 stories, if

the present width of the trunk roads is maintained in the future⁽⁵⁾

According to our survey of the floor space of buildings in the CBD, the average height of building in the CBD in 1969 was 2.25 stories. If the roads in the Central Business District in Seoul are expanded to 25-40 meters wide and the orderly gridiron-shape of block system is adopted, it is possible theoretically that the average height of buildings can be heightened by four to five times in comparison with the present average.

2. Administrative Constraints to High Buildings

There are two main administrative constraints to the construction of high buildings. One is how much investment the public sector would have to make from its own resources for the construction of high buildings. The other is what kinds of and how many restrictions or conveniences the public sector would provide for the effort of the private sector for construction.

This research is going to diagnose these two possibilities under the present reality, however, the diagnosis will suggest only a general prospect, because no master plan for developing the city including the Central Business District in Seoul has been established. In addition a master plan, if established, would probably not represent the basic policy of the public sector for city development and the distribution of resources.

In general, the city development projects made by the public sector in the past 20 years have placed their emphasis more on the periphery than the heart of the city. The probable reason is that the development projects are more difficult to plan and implement in the heart of the city than on the periphery partly because the projects in the mid-town area need an excessively large amount of expenditure including compensation, and partly because the city functions are more complex in the center of the city.

Of the two administrative constraints stated above, it will be more important to explore what kinds of intervention the public sector could make to guide the private sector toward the construction of high buildings and what would be the effect of such subsidies or restrictions on the Central Business District.

The administrative constraints to the private sector's effort could be assessed from two

(5) According to the provisions in the latter half of Clause 1, Article 49 of the Construction Law, which states that the rate of volume may be at maximum doubled in other districts, and taking account of the fact that areas along the Sejong-ro and Taepyong-ro which have a width of 100 meters are not included in the provisions, it is actually possible for the city of Seoul to exceed the height of more than 25 stories at maximum.

aspects. One is how to determine the conditions for the location of high buildings in the CBD, and the other is how much and how effectively the high buildings could be regulated in terms of their structure.

A. Intervention by the Private Sector

In utilizing the land for high buildings in the Central Business District of the metropolis, the most important locational consideration is to secure a network of roads with adequate width, since they serve not only as links among several activities with a high intensity of land use but also provide necessary open space.

With regard to this consideration, the center of Seoul City is unfavorable for higher intensities of land use. Compared with the average rate of 30 to 40 percent which the road area commands of the total area in cities in the economically advanced countries, the rate of road area, even in the center of Seoul was recorded as only 22.67 percent in 1969.

The prospect for the future up to 1986 does not seem bright. Even if Seoul City's plan to construct a subway is completed within ten years and it passes through the Central Business District, there is no prospect for any improvement of the current congestion of traffic and communications in the district, without expanding the present network of roads to counter the increasing tendency for automobiles on the streets in Seoul. In order to construct high buildings, therefore, it is necessary to automobiles on the streets in Seoul. In order to construct high buildings, therefore, it is necessary to readjust the network of roads and secure the land for transportation facilities.

The network of roads in the center of Seoul City is characterized by numerous zigzagging narrow paths. These paths not only make difficult access for modern means of transportation, but also make impossible a high intensity of land use on the network of trunk lines. To make all land available in the CBD for the functions of the CBD, the paths should be rearranged into a gridiron network of roads with a width of more than 25 meters.

According to a survey made for this research, roads in the CBD more than 25 meters-wide make up about 75 percent of the total area of roads. The remaining 25 percent is made up of narrow paths. Applying the rate of road area of 22.78 percent to the total acreage of the Central Business District, 6.278 square kilometers, we find that the acreage of roads in the district is only 0.941 square kilometers.

To extend the width of road to the scale in a metropolis in the economically advanced countries, to a rate of 35 percent, it will be necessary to secure 1.255 square kilometers of

land for the use of road, and invest approximately 3,100 million won at the price level of 1970. Taking account of the fact that this amount does not include the expense of sewage facilities and compensation for land in the center of Seoul, the actual amount of expenses will be more than twice this amount.

According to this calculation, an annual average of more than 600 million won should be invested for road building in the center of Seoul City in the next ten years. The records on Seoul City's investment for road building shows, however, that the annual average amount has been on the level of only tens of millions of won in the past, except for the 1,200 million won spent in 1967, the highest total. Even the 1,200 million won in 1967 was mostly invested in the periphery to extend and recondition roads. Considering this fact, it is assumed that the rate of investment in the center of the city will be a relatively small percentage.

After having viewed the administrative constraints which would limit the construction of high buildings we must conclude that the maximum limit on the height of buildings permitted legally in the Central Business District in Seoul is unlikely to be realized within the next 15 years.

In view of these administrative constraints, it is difficult to estimate with much degree of accuracy the height of buildings likely to be realized in the future. Nonetheless, if we assume that the distribution of resources for city development by the public sector in Seoul will be made equally to the expansion and improvement of roads in the periphery and the development of the CBD, and if we agree that the consolidation and expansion of the road system constitutes the fundamental condition determining possible sites for constructing high buildings in the center of the city, then the average height of buildings in the CBD would be doubled within the next 15 years.

Another administrative constraint effecting the private sector's effort to construct high building is the regulations on the structure of individual buildings. On this aspect, it will be difficult to make a scientific estimation on the trend in the future, but a prediction on the general trend could be made based of the trend in the past.

In examining the effectiveness of the regulations in 1969, we found that out of 610 buildings of more than five-stories constructed with a permit from Seoul Special City, 154 buildings, or about 25 percent of the total deviated from the regulations while only two buildings, were ordered to be removed.

These violations were committed mostly to heighten or enlarge buildings. We frankly

criticize the fact that the administrative actions on these violations taken in advance or afterward have been very ineffective.

It is very difficult to estimate the long-term trend of violation activities, but it seems that the situation will not be improved during the next five or ten years in view of the current trend of financial and administrative ability of Seoul Special City.

As long as the pressure from the private sector for high buildings is continued, it is anticipated that the existing laws and their accompanying administrative regulations will be eased. The system of regulating the rate of volume, recently adopted in place of the system of limiting the absolute height of buildings, with the revision of the Construction Law, may be said to represent measures taken in compliance with the pressure for high buildings from the private sector, and constitute a good example supporting the above mentioned prospect.

Under these prospects, it is presumed that the administrative regulations on the structure of high buildings will not be very effective upon the private sector's efforts for high buildings, at least within the period chosen for this research.

B. Intervention by Public Sector

It will be rare that groups of high buildings will be constructed in the Central Business District by the direct investment of the public sector. It is possible, however, that a city redevelopment project may be carried out in a special area of the district. However, any independent redevelopment project will be very unlikely, because of the excessive expense for constructing the necessary infrastructure. It will not be wrong to say, therefore, that direct investment for construction by the public sector will have an almost negligible influence over the construction of buildings by the private sector in the Central Business District.

In concluding the discussion on the administrative constraints to the construction of high buildings in the Central Business District in Seoul, it may be said that the most fundamental and influential factor is on what criterion and how much the investment of the public sector will be earmarked to construct the infrastructure including roads in the Central Business District. Even if the maximum rate of investment is made, the practical effect of the investment in higher buildings will be to heighten them to an average of four to five stories, about twice the present average height in the district.

3. Prospect for Economic Constraints

The above prospect for the legal and administrative constraints was made paying attention to the expectation the structure of the market economy itself in the private sector will make

a change in favor of using land for high buildings in the Central Business District in Seoul. If the change in the structure of the market economy itself is regarded as the internal condition for high buildings, the administrative and legal systems, as considered above, may be regarded as the external conditions.

It may be said that the economic constraints to the construction of high buildings in the Central Business District were already macroanalytically clarified in estimating the land requirements for the Business District were already macroanalytically clarified in estimating the land requirements for the CBD functions. That is to say, in Central Business District, the CBD functions will continue to expand until at least 15 years hence. This is one of the fundamental assumptions in this research.

In terms of land uses, it is indicated that the trend toward higher intensity of land uses will be possible for the CBD functions. To estimate whether or not individual enterprises will construct high buildings in the Central Business District, some variables other than the change of land requirements should be examined. The purpose of such an analysis would be to discover within the framework of estimating the total development, the correlations among variables involved in each enterprise's decision to invest in the construction of high buildings. In other words, we want to describe the trend toward high buildings in more detail.

In the first place, the increased rate of annual income from such buildings will rapidly increase the construction of high buildings. The increased rate of annual incomes from the building means the rate of annual increase of economic gains earned from enterprising activities making use of the building. Assuming that the existing CBD in Seoul will continue to develop as the single nucleus of the city, it is clear that the demand for the CBD functions will continue to increase with economic growth and population increase in Seoul and the whole country. It can be easily anticipated that the economic gains from the land use in the district will be increased as the effective demand for the district expands.

In the second place, under this trend, the price per unit will continue to rise in the district. It will thus pay to use land more intensively by building higher.

The progress of architectural technology is another factor for accelerating the tendency toward higher buildings. The progress reduces the construction expenses.

Although advanced architectural technology does not necessarily reduce the expenses for constructing high buildings, the successive reduction of construction expenses per unit of space

in the upper floors will be possible, if the building has enough stories. Finally, to anticipate the place in Seoul where the above tendency of higher building will be realized most favorably, it may be a good idea to rely on William Alonso's hypothesis. According to Alonso's equation on the equilibrium of locations, the decision on the location of the land to be used for commercial business is a function of (1) the effective distance from the mid-town, (2) the locational access to potential consumers, and (3) external conditions of such production, services, advertisements and others to attract potential consumers.

Compared to other districts, the existing Central Business District in Seoul is absolutely superior to any others as long as the factor of (1) is concerned, since it is a mid-town area which has existed for a long period. On the factor of (2), the district makes possible the broadest access to potential consumers, since it is located at the center of the network of radial streets and beltline avenues. In terms of various external conditions supporting city functions (3), it is clear that the district is under favorable conditions in comparison to other districts, since it is discharging the central function of transportation and communication. Taking account of these relatively superior conditions of the Central Business District in Seoul, we cannot but say that this district, the object area of this research, has the highest probability for the tendency of higher buildings in terms of economic constraints, as long as the entire city structure is maintained, as this research has assumed.

V. CONCLUSION.

1. Significance in Terms of Total Quantity

As stated before, in the Central Business District in Seoul established as the object area of this research, the land requirements will be expanded by 5.14 percent annually due to the growth of the CBD functions, while the land availability for the CBD functions will be decreased by 4.78 percent annually when taking into consideration the trend of forcing out of the dwelling function. The land availability means that the land used by the non-CBD functions will be gradually diverted to use for the CBD functions.

In the Central Business District with an area of 6.3 square kilometers, the total floor space of buildings needed for the CBD functions will have reached to about 7.001 square kilometers in the target year of this research (1986). This means that, if the total area of the Central Business District is used by only single-story buildings, it could not accommodate all CBD functions in the target year, even including the land for non-CBD functions such as roads,

parks, houses and schools.

To obtain more practical numerical values, the following operations were performed on the values of the land requirements and the land availability as estimated in the preceding chapters. First, the requirements for public facility land to be increased with the growth of the CBD functions were computed by step. The acreage of open space and school sites were added to this. The sum was regarded as the land for external economic facilities needed as the CBD functions grow. Secondly, the remainder of land used for the dwelling function, other than that which will have been forced out according to the tendency as already estimated, was estimated by year. Finally, these values were subtracted from the total acreage of the CBD. The remainder was multiplied by a certain rate of building floorage. The product was regarded as the total acreage of building construction available by year for the CBD functions.

Taking account of the present rate of 22.67 percent of the CBD land used for road area,

Table 6. Total Area of Land Availability

(Unit: m²)

Year	(1)	(2)	(3) = (1) + (2)	(4) = CBD Area - (3)	(5)
1969	1,735,784	1,204,232	2,940,016	3,338,091	2,002,855
1970	"	1,188,633	2,924,417	3,353,690	2,012,214
1971	"	1,169,954	2,905,738	3,372,369	2,023,421
1972	1,882,064	1,148,197	3,030,261	3,247,846	1,948,708
1973	"	1,123,358	3,005,422	3,272,687	1,963,612
1974	"	1,095,441	2,977,505	3,300,604	1,980,362
1975	"	1,064,443	2,946,507	3,331,602	1,998,961
1976	"	1,030,366	2,912,430	3,365,679	2,019,407
1977	2,195,969	993,208	3,189,177	3,088,932	1,853,359
1978	"	952,970	3,148,939	3,129,170	1,877,502
1979	"	909,653	3,105,622	3,172,487	1,903,452
1980	"	863,257	3,059,226	3,218,883	1,931,330
1981	"	813,780	3,009,749	3,268,360	1,961,016
1982	2,509,874	761,223	3,271,097	3,007,010	1,804,206
1983	"	705,508	3,215,382	3,062,725	1,816,035
1984	"	646,871	3,156,745	3,121,362	1,872,817
1985	"	585,074	3,094,948	3,183,159	1,909,895
1986	"	520,198	3,030,072	3,248,035	1,948,821

Note: (1); Includes road area, ancient palaces, parks, and colleges.

(2); Includes residential area remaining in the CBD.

(3); Means total area not available for the CBD function

(4); Total Land Availability for CBD function in the CBD.

(5); Means net area available for CBD functions in the CBD.

Assuming that the ground floor area ratio of the total lot area is 3 to 5, the amount of land which will be available for buildings is as is listed in column 5.

the road area to be added in the future, and the area for parking lost needed as the total floor space of buildings (parking area for one automobile per 500 square feet of total floor space will be needed). The rate of land for public facilities was estimated to increase from the present rate of 22.67 percent to 25 percent in 1972-1976; 30 percent in 1977-1981; and 35 percent in 1982-1986.

The total area of land availability was calculated by subtracting the sum of the public facility land, open spaces, sites of universities and the remainder of land for the dwelling function from the total acreage of the Central Business District.

According to our calculations, it is anticipated that the land for the CBD functions will be balanced between its requirements and availability in 1976, as long as the current trend of forcing out the non-CBD functions continues. The provision of land for public facilities and the present tendency for higher (present rate of volume is 225 percent) are also assumed.

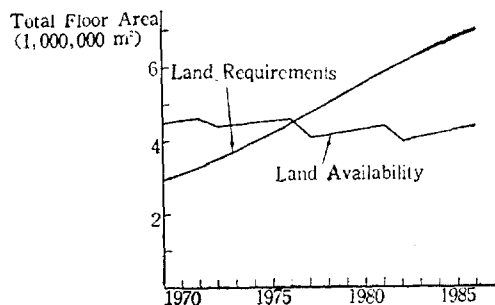


Fig. 1. Relation Between the Requirements and Availability of Land in Case of Assuming that the Present Average Height of Buildings Persists (2.25 Storeys)

In view of the city redevelopment policy in the Central Business District, the balance between the requirements and the availability in 1976 means that in the district the overall land requirements for the CBD functions could be spontaneously met until 1976. The rate of road area can increase to 25 percent, the rate of building floor space may be 60 percent and the present rate of volume of 225 percent for high buildings is assumed. We can assume this will be the case because of the fact that land for CBD functions will be generated as the dwelling function is forced out from the district.

2. Relation Between Land Requirements and Availability after 1977

While the increase in land requirements could be met by 1976 with the current tendency for constructing higher buildings and forcing out the dwelling function, after 1976 there will

be a new stage necessary in city redevelopment policy. In other words, the period up to 1976 should be a period in which to prepare for the development which will occur after 1976.

Beginning from 1977, the land requirements for the CBD functions can not be met with the current rate of the tendency for higher buildings and the forcing out of non-CBD functions. While the total floor area available in those years will not be increased from the fixed level of 4 to 4.5 million square meters, the land requirements in 1977 will be increased from 4,771,000 square meters to 7,000,000 square meters, bringing an increasingly larger gap between them.

It is necessary, therefore, to promote active redevelopment projects in the Central Business District in Seoul in the years after 1977 to meet the growing demand for CBD functions. Viewed from the range of this research, two alternatives for the redevelopment projects could be considered. One is to accelerate the construction of higher buildings than at the present level, so as to raise the average height of buildings. The other is to accelerate the rate of forcing out the dwelling function from the CBD beyond the spontaneous level. It will be necessary to either select one out of these two alternatives or attempt some combination of the two.

By accelerating the rate of forcing out the dwelling function and maintaining the current pace of constructing higher buildings, it is assumed that all dwelling functions could be forced out from the Central Business District. It is estimated that all land requirements can be met up to 1980

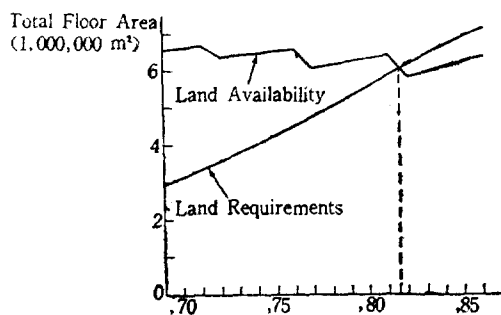


Fig. 5. Relation between the Requirements and Availability of Land in Case of Forcing out the Residential Function

On the other hand, by maintaining the current rate of forcing out the dwelling function and by encouraging the construction of high buildings so as to raise the average height by one story after 1977, the land requirements could be met up to 1981.

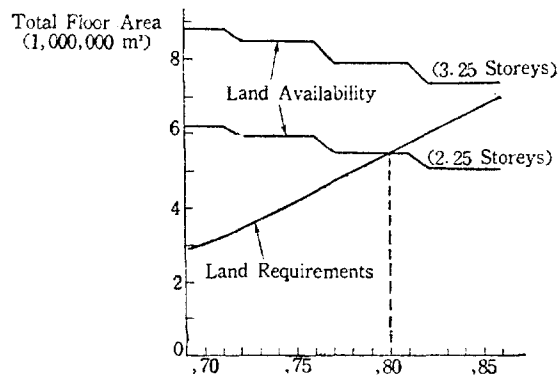


Fig. 13. Relation between the Requirements and Availability of Land in Case of Accelerating the Tendency of Constructing Higher Buildings (3.25 Storeys)

If the non-CBD functions other than the dwelling function, that is, all sites of primary schools, middle and high schools, which total 316,320 square meters, are diverted to the CBD functions, in combination with the two alternatives mentioned in the preceding paragraph, namely, accelerating the rate of forcing out of the dwelling function while at the same time raising the average height of buildings, the land requirements could be fully met until the target year of 1986 (See Figure 13). If the rate of high buildings is not accelerated in accordance with the above measure, no big difference will be seen, since the area of the sites of primary middle and high schools represents a very small value in comparison with the total areas.

3. Meaning in Terms of Redevelopment Policy

The relations between the land requirements and the land availability as described above are summarized as follows:

(1) In the Central Business District in Seoul with an area of 6.278 square kilometers, the land requirements for the CBD functions could be met until 1976, if the current spontaneous rates of forcing out the dwelling function, of securing open space and of the tendency toward higher buildings are maintained. This is possible at a time when the rate of road area will be increased from the present rate of 22.67 percent to 25 percent.

(2) During the period after 1977, the imbalance between the requirements and the availability of the land could be overcome by (A) accelerating the tendency of forcing out the dwelling function; (B) quickening the tendency toward higher buildings beyond the current pace; (C) or combining these measures.

(3) Of the above two alternatives of A and B, the increased land requirements could be met until 1980 by A and until 1981 by B.

For the general city development policy by Seoul Special City, the above relation of requirements and availability may be said to have the following meanings.

(1) Under any city redevelopment policy to accommodate the increase in CBD functions in Seoul during the period up to 1986, comparison and assessment should be made on the expenses and effectiveness of each of the above alternatives. Among the development policies planned and devised by Seoul Special City to meet the increase, the development of a second CBD or of subcenters might be possibilities. In view of the relationship between the requirements and the availability of the land for the existing CBD functions as estimated in the development stages described in this research, the plan for developing a new center of the city with a scale and performance similar to that of the existing CBD functions will be an appropriate policy only when it is assured that the plan will be able to produce the same amount of benefits but with fewer expenses in terms of the economy of land uses. The development of a sub-CBD will be the same case. It is another nature of the problem, however, when a neighborhood residential district is planned for redevelopment and its dwelling function is assumed to take a secondary place to that of the Central Business District Functions.

In establishing the plan for developing the Central Business District in the future, the most important criterion for assessing its effectiveness will be the transportation access to the central district from all directions. If the entire network of roads in Seoul is not faced with a big change in the future, it can be stated that the existing Central Business District is situated in an area with the most favorable transportation access.

In this area, however, the quantity of traffic will be greatly increased in the years ahead, because of increasingly expanding land requirements. The increased traffic congestion might hinder transportation access. In this case also, the expense required for relieving the congestion will not be comparable to the expense necessary in order to create a new transportation access in a new center of the city.

(2) In developing the existing center of the city as the Central Business District according to the fundamental assumptions of this research, the values showing the relationship between requirements and availability of land by stages of development should constitute the fundamental criteria in deciding redevelopment policies.

In the first stage from 1971 to 1977, the land requirements for the expanding CBD functions will be met, as has already been revealed, by maintaining the current level of forcing out the dwelling function and the present average height of buildings. That is, it is

clarified in his research that the direction and of the policy for redeveloping the center of the city during the first period will be preparatory to the second stage.

In preparation for providing for the excess of the land requirements for CBD functions over the land availability in the second stage, it is clarified in this research that the direction of the policy for redeveloping the center of the city during the first period will be preparatory to the second stage. In preparation for providing for the excess of the land requirements for CBD functions over the land availability in the second stage, it will be necessary in the first stage to undertake some measure, such as increasing the percentage of road area, and accelerating the tendency of forcing out the dwelling function. The latter could be pushed forward by constructing adequate housing in the outlying areas, and devising conditions for the construction of higher buildings.

According to the estimation of this research, the rate of road area should be increased to at least 25 percent during the first stage (1971-6), and 30 percent before the beginning of the second stage (1977-81). The maximum height in the CBD permitted by laws and regulations is about three times the present average height of buildings in the district (See Chapter 4). In case the maximum height will be realized, the rate of public facility land (roads, parking-areas, etc.) should be increased to about 40 percent, the same level as in the metropolitan areas in the economically advanced countries. According to the land requirement for the CBD functions as estimated for fifteen years hence, however, it will not be necessary for the average height of buildings in the district to increase to twice the present level. We can thus predict that in the target year the CBD functions will be performed without hinderance if the rate of public facility land has increased to about 35 percent. It goes without saying that the computation of road ratio should be based, not only on the tendency toward higher buildings, but also on the total quantity of traffic flows. But the above values are presented here with in the objectives and scale of this research.

In the Central Business District in Seoul, the land used for the dwelling function occupies a relatively small percentage of the total area. However, a considerably large quantity is occupied by the combined uses of dwelling and commerce, or business. It will be necessary to attempt the elimination this phenomena for the effective performance of the CBD functions in the center of Seoul.

To accelerate the tendency of forcing out the dwelling function from the central district, not only transportation access to the center for the dwelling function forced out should be

made easy. In fact, other city development projects, and it may be said that the transportation access to the central district from the periphery has been relatively convenient.

As another measure to accelerate the tendency of forcing out the dwelling function from the CBD, the burden of expenses imposed on the dwelling function in the district should be increased. For example, consideration could be made of raising the taxation rate on dwelling sites in the central district, or tightening regulations on the areas designated for specific uses.

(3) It was already stated that in the second stage from 1977 to 1981 the land requirements for the CBD functions will gradually exceed the land availability. Theoretically, possible alternatives for furnishing land to meet the land requirements as estimated are as follows: (a) complete elimination of the dwelling function from the CBD, and (b) acceleration of the tendency toward higher buildings up to an average height of 3.5 stories.

Since alternative (a) has a very weak feasibility, the combined policy of implementing both alternatives should eventually be enforced after taking sites in outer areas, raising the taxation rates for land used as the dwelling function, and tightening the regulation on areas designated for specific uses, etc.

In addition, the sites being used for primary, middle and high schools, and non-CBD functions other than the residential, will be gradually diverted to CBD functions during the period from 1969 to 1986.

In estimating the amount of land availability, this research concluded that, in the target year of 1986, the average height of buildings in the Central Business District in Seoul should have reached to about 3.5 stories; land presently used for non-CBD functions other than the dwelling function, namely the sites of primary, middle and high schools should have been totally diverted to CBD uses and the tendency for forcing out the dwelling function should have been maintained at the present level. We can predict that the average height of 3.5 stories can possibly be realized considering the existing legal and administrative constraints. Viewed from the point of view of environmental investment, a sufficient rate of road area and an effective network of roads provided by the public sector will accelerate the tendency toward higher building. At the current rate, the tendency toward forcing out the dwelling function will be continued in the third stage as in the first and second stages. The sites of primary, middle and high schools will begin to be diverted to the CBD functions immediately after the first stage, and the sites in all will be situated in areas at least five kilometers from the center of the city by the target year of 1986.

The above values estimated in three stages on the relation of the requirements for and availability of land and the alternatives presented for them indicate that, in the Central Business District in Seoul, the process of redevelopment in terms of the requirements for and availability of land could be well managed until 1986, by adjusting the variables of only the rate of forcing out the dwelling function (annual average of 4.78 percent), construction of high buildings, increase of the average height and diversion of the sites of primary, middle and high schools.