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DECENTRALIZATION OF SEOUL:
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CHAPTER ONE

INTRODUCTION

Urban growth has produced many social and environmental problems in urban areas. Complex urban problems continue to agglomerate until a city's growth is impaired, when growth no longer flows toward the city center, but out to suburban environs. The direction of metropolitan growth, in general, goes through the following four stages: (1) central city in-migration, hinterland out-migration; (2) central city out-migration,   suburban   growth dominance,   and   rural hinterland   out-migration;   (3) central city and older suburban   out-migration,   far suburban and exurban   in-migration; (4) metropolitan out-migration, exurban and rural in-migration.[1]

South Korea has experienced central city in-migration, accelerated by industrialization, since the 1960s.   The country's   five-year   economic   plans   have   emphasized industrialization and the expansion of foreign trade, over the last two decades, that has resulted in a concentration of industrial facilities in urban areas and fostered rural to urban migration.   The strong pull effect of urban areas has served to accelerate their polarized development.

As a result of the influx of population to the large cities, urban problems have been intensified. For example, more than one-fifth of Korea's population is concentrated in the capital city of Seoul. Seoul's increase in population since the 1960s has resulted in urban problems such as traffic jams, inadequate housing, inappropriate distribution of industrial and commercial facilities and pollution, as well as military vulnerability from attack by North Korea. These situations have led authorities to try the establishment of "new towns" as a means of resolving these urban problems. Thus, Seoul city authorities and central government officials chose Sungnam and Banweol as new town sites in 1968 and in 1977, respectively.

Statement of the Problem

Although several new towns have been built in Korea, there are very few studies in Korean and virtually nothing in Western languages on the relationship between decentralization and the development of new towns around Seoul. Moreover, there are few, if any, studies comparing new towns with each other and examining the success or failure of their development, particularly in Third World nations. In this regard, it has not been determined whether the goals of new town development have been achieved. Therefore, the problem of this research is to determine whether new town development has achieved the goal of

establishing independent new towns in the Seoul Metropolitan
Region.

Types and Functions of New Towns

The functions of new towns vary according to their
types. Previous researchers have classified new towns into
several types.

Gliege described three kinds of new towns as
independent new towns, satellite new towns, and new towns
in-town.[2] Alonso divided new towns into only two
categories: satellite and independent new towns.[3] He
indicated that new towns were "independent" if they could
employ their own residents, or were "satellite" if there
were a substantial amount of commuting to other centers. He
does not include growth centers in the new town category.
W.T. Watterson and R.S. Watterson divide new towns into four
groupings: satellite, add-on (additions to existing small
towns and cities capable of conversion to growth centers),
new towns in-town, and free-standing new towns.[4] Pressman
mentions independent new towns, satellite new towns, and
expanded new towns.[5]

Synthesizing the studies cited above, new towns can be
categorized as (1) independent new towns, (2) satellite new
towns, or (3) new towns in-town. A new town's type varies,
depending on its functions.

Independent New Towns

Independent new towns are geographicallly separated from metropolitan regions. As the term indicates, they are independent from the metropolis in employment opportunities and other socioeconomic activities.[6] The original intent of independent new towns was to absorb surplus metropolitan population and provide for self-sufficiency.[7] Self-sufficiency and balanced development remain the most important functions in establishing independent new towns.[8] Self-sufficiency implies independence along three main lines of development.

First, efforts are made to provide job opportunities for residents in the independent new towns, in order to minimize the number of people who must commute daily to a more distant workplace. In other words, the aim is to reduce the distance residents journey to work and assure economic viability by providing jobs within the independent new towns equal to the number of potential job seekers.[9] If the new town has an oversupply of job seekers without sufficient job opportunities or vice versa, there will be cross movement, with workers traveling to the outside for employment.[10] To create a balance between job opportunities and job seekers, the strategy for developing independent new towns emphasizes the establishment of industrial facilities to provide job opportunities.[11]

Second, efforts are undertaken to diversify industry in the new town, so that its employment structure will not be dominated by a single firm or type of employment. The reason for this is to prevent a catastrophe in employment if a dominant firm or industry experiences a slump or economic downturn. In such an instance, large-scale unemployment could produce lower wages and at the same time, residents who lost their jobs in the town would move to areas of higher employment and wages. A single dominant firm has a strong influence on socioeconomic environment that implies a class structure dominated by the social class represented by the workers in that firm.[12] Therefore, an emphasis on diversified industrial development is important for the establishment of new towns.

Finally, there are efforts to provide the urban facilities such as recreation and leisure centers, health and medical centers, schools, shopping centers, and housing necessary for self-sufficiency. These urban facilities enhance the quality of life in the new towns and promote the health and welfare of the residents.[13]

New Towns In-Town

New towns in-town are a concept based on the application of some new town principles to large already-existing metropolises.[14] The primary rationale for

the new towns in-town is an urgent need for an effective solution to the urban problems of large cities.[15]

The functions of new towns in-town are defined within two interrelated categories. The first is to enhance opportunities for disadvantaged people within the target area to live better lives. The term "disadvantaged people" encompasses individuals and families with incomes below the poverty level.[16] More and better jobs, improved public and private services, and improved housing and environment are needed to raise the living standards of disadvantaged people and such concerns point out the need for establishing new towns in-town.

The second category is related to a desire to induce or strengthen the processes of central city modernization and revitalization. Such a modernization and revitalization objective is essential for bringing the inherent vitality of a new town to the inner city. The inner city needs a powerful approach if it is to reverse the outflow of capital and create development linked to both resources and opportunity throughout the metropolitan region to support the development of a new town in-town. By these means the development of a new town in-town can prevent the flight of capital to the outside and encourage investment for inner city improvement.[17]

Satellite New Towns

Satellite new towns are located near a metropolis, and have some degree of self-sufficiency although they depend partly on the metropolis for job opportunities, economic activities and some of the amenities of urban life.[18] Satellite new towns have two dominant functions. One is development of housing, the other is development of mass transportation. To avoid urban congestion, particularly inadequate housing, urban development policy has been concerned with the development of the satellite new towns, emphasizing the availability of employment opportunities and services in such towns. In practice, however, the satellite new town usually functions as a bedroom or dormitory community, populated by particular social groups, with a predominantly middle-class population, a larger population at night than during the day, and young married or middle-aged workers.[19]

The development strategy for a satellite new town emphasizes mass transportation facilities such as railroads, buses and subway systems to and from an adjacent metropolis. The commuting pattern is simple and regular. The majority of commuters move toward the major central city on weekday mornings and move toward the satellite town in the evenings. Thus, the satellite new town is defined as a new urban settlement which is built within commuting distance of a

metropolitan orbit to provide housing for the growing population of the metropolis.[20]

Application of the New Town Concept

The modern new town movement originated in England in 1898 with the publication of <u>Garden Cities of Tomorrow</u> by E. Howard. At the beginning of this century, Howard built two new English towns, Letchworth and Welwyn, as examples of his "garden cities."[21] As the new town movement spread to other countries, such as France, Sweden, the United States, Canada, Australia, Japan, and Israel, new towns were constructed for regional development, decentralization, or other goals. These included the development of eight new towns around London;[22] five new towns in the Paris region;[23] satellite new towns around Stockholm;[24] the new town of Columbia located between Washington and Baltimore;[25] Reston, also located on the outskirts of Washington, D.C.;[26] and more than twenty new towns around Tokyo and Osaka.[27] These new towns have tried to absorb the "spillover" population and to provide adequate housing and economic base for residents moving from the metropolises to new towns. Their situation is similar to the Korean experience of trying to decentralize congested urban areas into detached new towns.

Study Area

The study area selected for this research is the new towns of Banweol and Sungnam in Korea (Figure 1.1). The city of Sungnam is located in the Seoul Metropolitan Region, 20 kilometers (12.5 miles) southeast of the center of Seoul. The Seoul Metropolitan Region includes the boundaries of Seoul and Kyonggi province. This area had a population of 13.3 million, which represented one-third of Korea's population in 1980, within an area of 11,677 square kilometers.[28] This area is the country's most important core region based on its agglomeration of political, social, economic, educational, and cultural functions.

The city of Sungnam has had several different names. In ancient times, it was called "Hansanju," which was changed to "Gwangju" in 918. The name, Gwangju, was used until 1973. Sungnam received special attention after its township office was established in 1946 and was considered to have developmental potential because, based on its location, it could accommodate a substantial population. When urban development began in 1968, Sungnam was a small village with a population of 6,000. Considering its location, the Seoul city government decided to construct a new town there. Since the urban development plan was initiated, the population of Sungnam has increased to more than 380,000. It is the eighth largest urban center in Korea.[29]
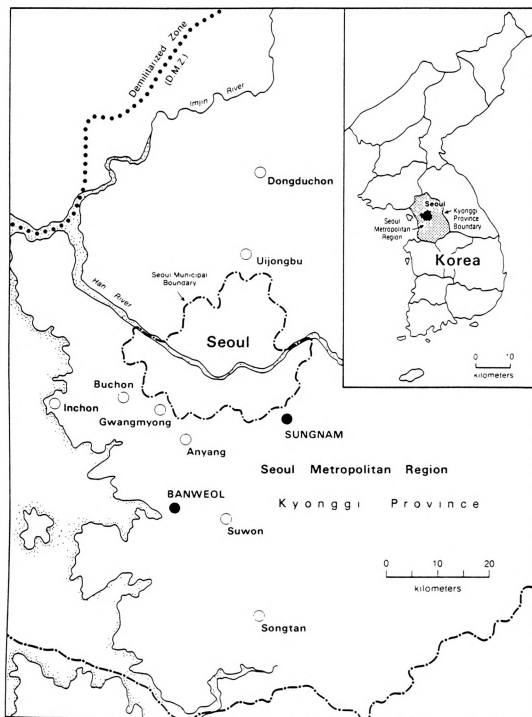
Figure 1.1 Location of Banweol, Sungnam, and Ten Cities
in the Seoul Metropolitan Region

Banweol is located in the southwestern part of the Seoul Metropolitan Region, approximately 35 kilometers (22 miles) from the center of Seoul. Banweol was a typical rural viallage and relatively isolated before urban development began in 1977. Historically, it had belonged to the city of Suwon since 1018. Suwon, the capital of Kyonggi province, is located 16 kilometers southeast of Banweol. In 1914, Hwasung township controlled Banweol, a situation that continued until plans were drawn up for urban development in 1977.[30]

These new towns, Sungnan and Banweol, are appropriate sites for this research for several reasons. First, both are located in the Seoul Metropolitan Region and the development projects have emphasized the establishment of both Sungnam and Banweol as independent new towns.[31] Other than these two, the only other new towns are two new towns in-town and a small satellite new town inside the Seoul metropolitan boundaries. This situation provides a good opportunity to study the roles of new towns in the Seoul Metropolitan Region. At the same time, the establishment of Sungnam and Banweol as new towns provides an opportunity to observe the relationships between new town development and urban decongestion.

Second, Sungnam and Banweol have different urban characteristics. Sungnam was the first trial new town near Seoul, while Banweol is one of the most recent new towns.

This situation provides an opportunity to compare urban development between an older new town and a more recent new town. It was expected that both similarities and differences in urban development policies, urban growth patterns, and economic bases would be found to exist between them.

Objectives of the Study

Part One

The first objective was to determine similar and dissimilar characteristics of the new towns of Sungnam and Banweol, as reflected by such factors as development policy, land use patterns, and inter-city linkages.

The establishment of a policy for community development is essential to provide a basis for decision-making for new town development, which is an important task. In Korea, this development policy is primarily influenced by political rather than private sector processes. In creating new town development plans, differing social situations over time have produced varying urban development policies. Thus, Sungnam and Banweol have different social and physical conditions, partially from being developed at different times. This investigator examined the differences in policy that have helped to shape the two towns.

Urban land use refers to the spatial distribution of city functions, including residential, industrial, and

commercial districts. Land use specialization, that is, land input for specified residential, commercial, industrial, greenbelt, and public uses, creates what are termed functional districts. The patterns of these functional districts, their characteristics, and densities were surveyed for each city. Differences in the use of land for residential, industrial, commercial, and public purposes over time and from city to city were anticipated because, as urban population increases, changes in land use in each city should occur. By reviewing urban land use and comparing land use in the older new town with that in the more recent new town, the internal structures of the two new towns and the changes of urban land uses were examined.

Linkages between new towns and other urban places are related to interactions between them. Therefore, these interactions are considered to be one reflection of the spatial structure between each new town and other cities. These interactions consist of telephone calls, newspaper circulation, retail trade contacts, passenger traffic, commuter flows, capital flows and other commerce back and forth between places. Movement of every sort creates spatial structure and, once established, such spatial arrangements influence subsequent movement. In order to gain a clear picture of the present spatial structures of the two new towns, it was necessary to explore and compare existing patterns of interactions between each town and

other urban places. This spatial structure was explored in an effort to predict the future of such relationships.

Part Two

The second objective of this research was to measure to what degree Sungnam and Banweol have achieved the goals of independent new towns. The most important goal of an independent new town is to create an economically and socially "self-sufficient and balanced community."[32] Self-sufficiency and balanced development are essential criteria of independence in new towns. The concept of balanced community sums up the basic requirement that new towns be composed of a variety of housing styles, land uses, employment bases, and socioeconomic classes.

This researcher examined four components of self-sufficiency and balance in the new towns. The first concern in balanced development is to ensure that the structure of employment is not dominated by a single firm. The rationale is to prevent large-scale unemployment resulting from shifts in the market position of the industry. A reasonably wide industrial distribution, therefore, is desirable in the development of independent new towns.[33]

The second component of self-sufficiency is an economic base that includes both "basic" and "nonbasic" activities. The "basic" elements in a city's economy include those firms producing for an external market, whereas the "nonbasic"

sector is primarily concerned with the needs of a city's own inhabitants, and includes production for the local market. Nonbasic activity is usually assumed to depend on basic activity.[34] In the context of economic base, then, the foundation of support for a city mainly comes from export activities.

The third concern is that new towns should achieve a reasonable balance between job opportunities and job seekers. This concept of balance in a new town provides that the level of population should be supported by a roughly equivalent level of potential employment. Relative balance between population and employment is a necessary condition for self-sufficiency. An imbalance means that a certain proportion of the working population must commute in-and-out of a town.

The final component of self-sufficiency for new towns is the provision of necessary urban services. An educational system, health care and recreational facilities, and open space are often mentioned as critical services for new town development.[35] Such facilities are major factors in residents' decisions to move to and remain in the new towns and they should be extensive enough to successfully compete with nearby urban centers in attracting and maintaining residents.

Methodology

Determining Different Characteristics of Urban Development

To meet the first objective of determining the similar and dissimilar characteristics of Sungnam and Banweol, three aspects of the new towns are investigated: development policies, land use patterns, and inter-city linkages.

Development Policies. In order to determine differences and similarities in the urban development policies which shaped Sungnam and Banweol, fifteen concerns of new town development were differentiated and examined. These components, for which data were available, were divided into three categories based on characteristics to explain various policy provisions: (1) political developmental issues--balanced development in the Seoul Metropolitan Region, establishment of independent new towns, the role of growth poles, and public versus private development of new towns; (2) site factors--availability of underdeveloped land, low land prices, good present transportation access, potential for transportation expansion, physical environment for new towns, and opportunity to preserve historical resources; and (3) socioeconomic aspects--relocation of residents from Seoul, relocation of industrial facilities from Seoul, solution of

squatter settlement problems in Seoul, housing development plans, and residents' participation in new town development.

Each of the fifteen components was found to be applicable to the development policies for Sungnam and/or Banweol.

To examine the development policies, data were collected from Report of Land Prices published by the Korea Appraisal Board (1968, 1977), Korea Statistical Yearbook (1968, 1977) Development Plan(s) in Sungnam (1976, 1980, 1983), Development Plan(s) in Banweol (1977, 1978), "Policy for Effective Development of Banweol (1980)" published by the Office of the Prime Minister, "Policy for Residents' Settlement and Investment in Banweol" (1982) published by the Office of Banweol Township, and History of Sungnam (1982).

Land Use Pattern. To determine the internal structures of the new towns, the distribution and density of residential, commercial, industrial, greenbelt, and open space districts were examined and compared for Sungnam and Banweol. Comparisons were drawn by calculating the percentage of total land area in each city devoted to the various land uses and the density of residential, commercial, industrial, greenbelt, and open space districts in each new town. Data were collected from Development Plan in Banweol (1978), History of Sungnam (1982), Banweol

Statistical Yearbook (1982), Development Plan in Sungnam (1983), and maps of land use.

Inter-City Linkages. To identify any differences in Sungnam's interactions with other urban centers and Banweol's interactions with other urban centers, the gravity model was used. The gravity model explains that interactions between two places are positively related to the masses of the two places and negatively related to the distance between them.[36] In this study, telephone call interactions were used to show whether or not Sungnam's interactions were more sensitive to population size and distance than those of Banweol.

Data were collected from the records of the Anyang Telephone Company and the Sungnam Telephone Company for 1983.

Measuring the Goal-Achievement of Sungnam and Banweol

The second objective of this research was to measure to what level Sungnam and Banweol have achieved the goals of self-sufficient and balanced development as independent new towns. The examination of self-sufficiency and balance considers four factors.

Lack of Dominance by a Single Firm or Type of Industry. The Gini Index allows an assessment of how many industries are represented in a town and how equal their

representation is. As such, it provided a useful measurement for the level of equality between two variables, numbers of industrial categories and employment in the industries in the new towns.

In this study, each Gini Index for Sungnam and Banweol was separately produced. The Gini Index of Sungnam, produced by using two variables such as the number of industrial categories (X) and cumulative share of employment (Y)[37] was compared with the corresponding index for Banweol over three periods between 1979 and 1983 because data for the three periods were available. The data were gathered from Sungnam Statistical Yearbook (1980, 1981), Industrial Status (1981, 1982, 1983), and Korea Industrial Directory (1982).

Economic Base. In order to investigate components of the economic base, the location quotient technique was used because it was quick and required little data.[38] The location quotient technique measures the concentration of an industry in a local area in comparison with national norms.[39]

In this research, the twelve industrial categories for which data were available were used to produce the location quotient, and comparisons were made between Sungnam and Banweol in food, textile and leather, lumber and furniture, printing and publishing, chemical and petroleum, nonmetallic mineral products, metallic mineral products, machinery,

medical care, public service, retail and wholesale, and
services. These data were collected from Korea Economic
Yearbook (1981), Banweol Statistical Yearbook (1982),
Development Plan in Sungnam (1983), and Korea Statistical
Yearbook (1983). On the basis of these data, the location
quotient for each industry in Sungnam and Banweol compared
and explained either export, import, or self-sufficient
function.

Balance Between Job Opportunities and Job Seekers. The
balance between job opportunities and job seekers, which
indicates relative self-sufficiency, was investigated by
comparing the number of local commuters who commuted within
the new towns, with the number of crossing commuters who
commuted in-and-out of the new towns. Commuters are people
who travel daily from their homes to their work places. The
ratio of local to crossing commuters is identified as an
"index of commuting independence."[40] It is a measure of the
extent to which a town is self-sufficient and balanced with
regard to journey-to-work. The higher the value of the
index the more self-sufficient and balanced the town.

Data on employment in Banweol was gathered from
Industrial Status (1982) and data on crossing commuters was
collected from the three bus companies serving the town and
the Office of Banweol township. Only those going to and
from work were included as crossing commuters. Employment
data for Sungnam was obtained from Development Plan

in Sungnam (1983), and data on crossing commuters going to
and from work was gathered from the records of the Sungnam
city government.

  Level of Urban Services. Development plans emphasized
the dispersion of population from Seoul to the new towns.
Thus, in accordance with the plans, comparing each new town
with Seoul was appropriate for this study. In comparing
the level of urban services between each new town and Seoul,
the educational system, health and recreational facilities,
transportation facilities, and housing availability were
examined. If the new town had sufficient urban services and
facilities, there was that possibility of movement of
population from Seoul to the new towns.

  The data on the educational system was classified by
elementary, middle, and high schools. The ratio of
classrooms to the number of classes was compared for
Banweol, Sungnam, and Seoul. In Korea, each classroom of
students is held constant at 70 chairs. Therefore, a
school may have more classes than classrooms, and the ratio
shows any shortage of educational facilities in new towns.
Another ratio, that of the number of students that
matriculate to the next school level to the number of
students who graduate from the lower school level, was used
to explain educational opportunity. Education at the
elementary school level is compulsory, but education in

middle and high school, and college is not compulsory. In fact, opportunities to attend are limited.

Health and recreational facilities were compared for the new towns and Seoul. A number of people per recreational and medical facility were used. Recreational facilities include theaters, stadiums, billiard halls, and swimming pools. Medical facilities include hospitals, doctor's offices, dentists offices, and drugstores.

Transportation facilities were also surveyed in the new towns and in Seoul. In this research, only public transportation facilities such as buses and taxis were considered. Numbers of residents in the three places per bus and taxi were calculated and compared for Banweol, Sungnam, and Seoul.

Finally, housing availability was compared in the new towns and Seoul. Housing availability over a period of time was used to indicate self-sufficiency in residential facilities for the new towns. The ratio of the number of housing units to the number of households, increases in housing construction, and increases in population were compared to explain self-sufficiency in residential facilities.

The data on urban services was gathered from Seoul Statistical Yearbook (1979, 1982), records of the Office of Banweol township and the Sungnam city government, Banweol Statistical Yearbook (1980, 1981, 1982), Sungnam Statistical

Yearbook (1980, 1981, 1982), and Development Plan in Sungnam (1983).

Significance of the Study

This research was designed to determine variability in urban development between Sungnam and Banweol, and examine the goal-achievement for independent new towns in the Seoul Metropolitan Region. This is a first attempt to examine their goal-achievement using components such as lack of a single dominant industry, equivalence between job opportunities and job seekers, economic base for self-sufficiency, and the provision of sufficient urban services. This research can help urban planners and authorities in the establishment of further new towns in Korea. At the same time, it can provide a basis for further investigation of the success or failure of new town development.

Organization of the Study

This study consists of seven chapters. Chapter One provides an introduction to the research. It includes a simple review of literature about types and functions of new towns, and applications of the new town concept in several countries. Chapters Two, Three, and Four deal with determining different characteristics of urban development of the new towns. Chapter Two is about policies for new

town development of Sungnam and Banweol. To provide an overall perspective on these new towns, six other new towns were discussed. Then, fifteen policy provisions for development of Sungnam and Banweol were examined. Chapter Three deals with urban land use explaining internal structures of the two new towns, including distribution of land use, patterns of streets, and densities of land use. Chapter Four includes an examination of interactions between each new town and other urban centers. The examination of interactions shows the external spatial structure of the new towns.

In Chapters Five and Six, goal achievements of the new town development were measured. In Chapter Five, the level of diversified combination of industries, and the level of self-sufficient economic bases in the new towns were examined. Chapter Six provides measurements of the level of self-sufficiency and balanced development between job supply and job demand, and urban services and facilities. The concluding chapter includes a summary and implications for future research.

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CHAPTER TWO

DEVELOPMENT POLICIES FOR NEW TOWNS IN KOREA

Many larage cities in Korea have seen quantitative expansion of their population and urban functions since the 1960s, through industrialization of urban areas. Rapid growth of population and urban functions have presented urban problems similar to those Western countries have experienced. Since the 1960s, the development of Korean new towns has been undertaken for purposes of balancing development and alleviating, to some extent, the congestion of large cities. One of the chief advantages of new town development has been to produce improved urban environments through the accommodation of more dispersed population and industry.[1]

In this chapter, the development of new towns nationwide was surveyed. Then, the development policies for the new towns of Sungnam and Banweol were examined. Because of the location of Banweol and Sungnam in the Seoul Metropolitan Region (SMR), their development policies have been closely connected with the socioeconomic situation of the SMR, particularly the city of Seoul itself.

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The New Town Movmewnt in Korea

The new town movement in Korea has been based primarily on the country's five-year economic development plans which emphasize, at the same time, industrialization and urban decentralization. Major targets of the plans have been: (1) construction of heavy industry and chemical production facilities that further improve the nation's economic structure; (2) balanced development of such basic social facilities as electricity, transportation, storage, cargo handling, and communications; and (3) regional development through effective development of big river basins and the creation of industrial estates.[2]

The purposes of the Korean new towns can be divided into five categories: (1) decentralizing the urban functions of large cities; (2) establishing industrial parks as an aspect of economic development; (3) supplying needed housing for urban populations; (4) establishing growth poles for regional development; and (5) developing new towns for special purposes such as mining, administration, and trade. Accordingly, the development of industrial new towns has aimed at creating industrial parks and improving the nation's industrial base for the independence of employment. Emulating foreign countries' experiences in developing new towns, the policies of new town development in Korea have emphasized providing jobs and resettling urban residents in

new industrial environments. These new towns in Korea have important implications for export activity.

Ten new towns have been built in Korea since the 1960s (Table 2.1 and Figure 2.1). Most of these new towns, with the exception of Daedok and Gwachon, are industrial new towns or serve functions directly related to nearby industry (i.e., bedroom communities). Although Daedok is not discussed extensively here because it lacks an industrial focus, its development has some interesting implications. Development plans for the Daedok new town were formulated in 1973, with the purpose of building an academic community. Daedok has research and educational functions, but also has great potential for further development, based on its location. Situated in the middle of South Korea, Daeadok has advantages of being efficiently connected with other places and its close location to a water source, the Kum River. The middle reaches of the Kum river which runs through Daedok water relatively large plains areas scattered around the new town. For these reasons, if the Korean government moves the capital of Seoul, Daedok must be considered one of the prime candidates for a new national capital. The other non-industrial new town, Gwachon, will be discussed later.

The majority of the new towns in Korea, however, are consistent with the focus of this research on new towns. To provide an overall perspective on these new towns, the

development of Ulsan, Pohang, Gumi, Chanweon, Yeochon, and Donghae are discussed as background for the primary topic of this research, the development of Banweol as a major industrial new town and Sungnam as a primarily residential new town. That is, the development of Sungnam and Banweol must be viewed within the context of the new town movement of Korea as a whole. The experiences of other new towns in Korea provide a perspective from which to view Sungnam and Banweol.

Ulsan

Ulsan, which is located in Korea's southeastern coastal area, has been under development since 1962 as an industrial new town, in a development period that was anticipated to extend to 1981. Ulsan has a good location for port facilities near Busan, the largest port in Korea, and enjoys proximity to Japan for foreign trade. Ulsan existed as a township before its new industrial development started. In 1962, a development committee for Ulsan, made up of six government ministers and professional committee members,[3] began an effective execution of its development plan.

Ulsan has become the largest industrial center in Korea, especially for large-scale heavy industries. Large oil refinery facilities were built in Ulsan during the First Five-Year Economic Development Plan (1962-1966). Besides oil refining, a fertilizer plant, a thermal power plant, and

an integrated iron and steel mill were built, in addition to harbor facilities to accommodate huge oil tankers. At the same time, plans for the industrial new city of Ulsan were made. Ulsan has a large proportion, 22 percent of its 439.3 square kilometer area, devoted to industry: another 30.5 percent is occupied by residential districts, 4.0 percent by commercial districts, and 43.5 percent is devoted to open space.[4]

The city of Ulsan had rapid growth in population, from 8,500 when the development plan started to 418,000 in 1980 when it became the seventh largest city in Korea.[5] The rate of increase in population since the start of the development plan was 25 percent between 1960 and 1966, 8.9 percent from 1966 to 1970, 13.0 percent from 1972 to 1976, and 11.6 percent between 1976 and 1980.[6] These growth rates were very significant in comparison with the rates for other cities in Korea, which averaged 5.8 percent between 1960 and 1966 and 7.2 percent between 1966 and 1970.

The rapid growth of population in Ulsan has had some distinct characteristics. First, population growth has depended on migration to Ulsan because of its manufacturing growth, rather than on natural population increase. Migration to Ulsan, as the result of manufacturing growth, has reflected the dominance of the secondary sector in Ulsan's economic base. The composition of the city's economy in 1980, in terms of labor force, showed 11 percent

TABLE 2.1: Development of New Towns in Korea, by Population and Function

New Town	Starting	Ending	Planned Population	Population (1980)	Function
Ulsan	1962	1981	500,000	418,415	Refining Combinate
Pohang	1968	1987	300,000	206,346	Steel
Sungnam	1968	1986	250,000	388,202	Residential
Gumi	1969	1986	450,000	114,110	Electronic
Daedok	1973	1983	50,000	6,100	Acadaemic
Changweon	1974	1986	300,000	128,095	Defence indus.
Yeochon	1974	1986	100,000	18,000 (1979)	Refining Chemical
Banweol	1977	1986	200,000	31,551	Industrial
Gwachon	1979	1983	50,000	54,901 (1983)	Admin. resid.
Donghae	1980	1991	250,000	100,051	Growth pole

SOURCE: Data derived from the Economic Planning Board, The Korea Statistical Yearbook, 1981, p.23; and Development Plan in Pohang, Banweol, and Gwachon, A Study of Development Policies of New Towns: Analysis of Investment. Korea Research Institute for Human Settlement (KRIHS), 1980, pp. 37-61.
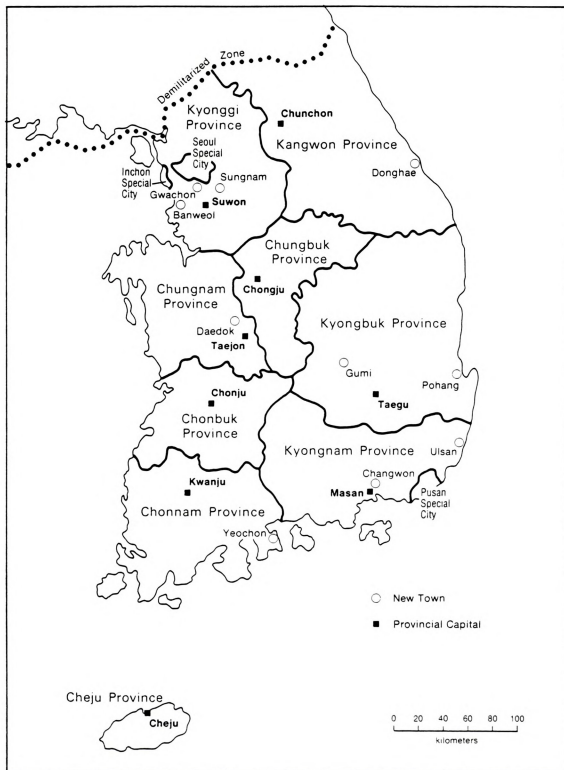
Figure 2.1 New Towns in Korea.

in the primary sector, 49 percent in the secondary sector, and 40 percent in the tertiary sector. In the secondary sector, employment in machinery manufacturing accounted for the largest proportion of 68 percent; employment in the chemical industry was the next largest with 18 percent.[7]

This composition arose from changes in the industrial structure from domination by oil refining and chemical production (1970-1976), to a preponderance of automobile manufacturing, construction, and shipbuilding (1976-1980). The first four years of development (1962-1965) saw a remarkable increase in the population of public service personnel and laborers, while construction workers were a major source of population expansion between 1970 and 1972. Shipbuilding and housing construction have stimulated population increases since 1976.[8]

The development of Ulsan is considered successful. The city now has a complete industrial complex with the largest refinery, shipbuilding, fertilizer, and automobile facilities in Korea. By 1981 its progressive industrial activity comprised a total of 330 industries in Ulsan, 262 industries that were in operation and 68 industries that were under construction.[9] At that time, there were no industries closed down for lack of work.

Pohang

In 1968, an industrial addition was built to the old port city of Pohang on the southeastern coastal stretch of

the Korean Peninsula. Pohang, which achieved city status in 1949, is considered in a good position to connect the inland area with the ocean. The city of Pohang was reorganized with an emphasis on industrial iron and steel facilities such as factories, inland creeks for providing water and raw materials, railroads, and related factories. The largest integrated iron and steel mill in Korea was built in Pohang with the support of the provisions made in the Second Five-Year Economic Development Plan. The Ministry of Construction planned for a population of 300,000, three times larger than that of 1968.[10]

The economic base of Pohang has been formed from its secondary sector. The development plan emphasized this sector, by allocating 10 percent of resources and efforts to the primary, 50 percent to the secondary, and 40 percent to the tertiary sector.[11] In addition to the integrated iron and steel mill, two industrial districts were constructed: the first Allied Industrial District was built in 1980 and the second was established in 1983. There are 43,275 employees in these industrial districts and the steel mill, nearly all of whom are residents of Pohang. Only 0.9 percent of the employees commute from outside.[12] Thus, Pohang has self-sufficient functions in employment and residential facilities. The development of Pohang was along the lines of the growth pole strategy rather than the new town strategy. According to Alonso, the growth pole concept

refers to the expansion of an existing center to bring it to sufficient size to afford the economies of scale and externalities needed for self-sustaining growth.[13]

Gumi

The city of Gumi has been in the process of development since 1969. Another industrial new town, Gumi is located inland, in the western part of Gyongsang Bukdo province. An intent of its development plan was decentralization of population and industries from big cities such as Seoul, Busan, and Daegu.[14]

One of the reasons why Gumi was chosen as an industrial new town site was its location on the vital railroad and expressway that connect the capital city, Seoul, with the ocean, through Busan, for foreign trade with Japan and the United States. In addition, water is convenient to the Gumi industrial district from the Nakdong River. Finally, low land prices in Gumi facilitated development of an industrial district. When the development plan started in 1969, the price of land per pyong (36 square feet) was only 300won ($1.39).[15]

Before development began, in 1968, the population of Gumi was 21,359. By 1977 the population had risen to 72,037, more than a three-fold increase. In 1981, the population of 114,110 represented an average annual increase of 12 percent from 1977 to 1981.[16] The major source of this

increase was in-migration from other places, rather than natural population growth.[17]

The industrial structure of Gumi has also changed since 1968. Employment in 1968 was 69.3 percent in the primary sector, 3.6 percent in the secondary sector, and 27.1 percent in the tertiary sector.[18] By 1977, employment percentages were 7.7 percent in the primary sector, 73.3 percent in the secondary, and 19.0 percent in the tertiary.[19] The secondary sector has significantly increased over time because the development policy has emphasized electronic industries, and Gumi is now the largest center for electronic industries in Korea. Based on its population increase, Gumi achieved city status (over 50,000 population) in 1978.

The increase of population shows potential for further urban growth in the new town. Gumi also has the potential to become an independent new town based on its location. It is a unique industrial new town, located inland and situated far from large cities such as Seoul, Busan, and Daegu. There are no cities on which Gumi depends for urban services. Another advantage is a strong economic base provided by the largest electronic industry in Korea.

Changwon

The development of Changwon started in 1974, to promote the growth of heavy industry and chemical production

specified in the Third Five-Year Economic Development Plan (1972-1976).[20] Changwon is located near the mid-point of the southern coast in Gyongsang Namdo province. It has a good location in an easily defensible basin surrounded by mountains. Changwon has been developed from scratch as a complete industrial new town with a strong military focus.

The basic directions for developing Changwon were derived from several strategies for reasonable land use and a comfortable city environment. First, the construction of urban facilities was emphasized. That is, the development plan required effective land use and convenient transportation networks within the city and between the city and other places. Second, a comfortable living environment was established, including a greenbelt, parks, and recreational centers, an adequate sewage system, and a housing supply sufficient for a comfortable living environment. Third, a plan for balanced urban land use was laid out, establishing a central business district (CBD) to support the demand for urban facilities by residents in the new town. The plan also emphasized a light industrial district and a convenient communications system. It also sought to improve social welfare; medical facilities were built and strategies were derived for protecting the living environment from pollution, fire, flood, and other natural disasters. Finally, educational facilities were built to[21] satisfy the demands of residents in the new town.

The development of the Changwon new town was to extend twelve years, from 1974 to 1986, in three stages: the planning stage (1974-1976), the construction stage (1977-1979), and the maturity stage (1980-1986). During the planning stage, the Industrial Sites and Water Resources Development Corporation, which is a public development agency, prepared 1,258 thousand pyong for industrial and residential sites in 1974, and 1,861 thousand pyong in 1976.

Industrial land use is dominant in the city, with 28.7 percent for residential use, 3.8 percent for commercial use, 47.7 percent for industrial use, and 20.1 percent of 184.1 square kilometers devoted to greenbelt.[22] Expansion of the new town has been considerable. Fifty-eight industries had entered the new town by 1976, when its population reached 44,000.[23] Although some newspapers and other communication facilities, financial agencies, and educational services were established, urban services could not completely meet the demand of residents in the new town. During the planning stage, many urban functions were furnished by the nearby cities of Masan and Jinhae. Until 1976, Changwon could not be considered an independent new town.

Under the provisions of the plan, during the construction stage (1977-1979), the central government tried to build the center of the new town, housing for residents, and urban service facilities such as banking, public health centers, transportation networks, recreation centers, and

educational facilities. Authorities invested 541 billion
won (69 million dollars) in the development of the new town.
During this stage, the population of the new town increased
from 55,000 in 1977 to 120,000 in 1979, a two-fold increase
in just two years. This increase was generated by
population movement from other places.

Finally, during the maturity stage (1980-1986), the
urban development plan has continued. Authorities
anticipate a total investment of 505 billion won (641
million dollars) in urban development in the Changwon new
town during this stage.[24] Based on the rapid growth of its
population, Changwon achieved city status in 1980, when the
population was 128,000.[25] It is anticipated that the
population will exceed 200,000 by 1986.[26]

Yeochon

Yeochon has been under development as an industrial
center since 1974. The purpose for this new town is to
develop the country's heavy industry and chemical
production potential, based on refining, petrochemicals,
and a thermal power plant. Yeochon is situated at the mid-
point of the southern coastal area along the Korean
Peninsula, where it connects the inland with the ocean. The
population in 1981 was 44,952 an increase of 5.2 percent
from 1974. This increase was relatively small in comparison
with the population of other industrial new towns, i.e.,

Ulsan (11.3 percent), Changwon (26.6 percent), and Gumi
(13.5 percent).[27]

Land use is predominantly industrial, with 56.6 percent
of the land for industrial uses, 21.7 percent for
residential, 1.3 percent for commercial, and 20.4 percent
for open space. Area per house is at least 150 pyong, which
is large in comparison with Seoul, which has about 30 pyong
per house. This large housing area will be the foundation
of a comfortable environment in the industrial new town.
Private investment is more than half of total investment,
primarily in electrical and heating equipment, private
schools, and residential facilities.[28]

Yeochon currently has problems in its urban
development, however, because urban services and facilities
are insufficient for the residents. Development of urban
services and facilities has lagged behind the industrial
sector and engineers and managerial staff moving in from
large cities have suffered from a lack of urban services and
facilities. This has been the main reason for out-migration
from Yeochon, which exceeded in-migration at the end of the
1970s.[29]

Donghae

Donghae is located in the coastal area of Kangwon
province and has the best mineral resources in Korea.
Although the province includes 19 percent of the nation's

total land area, its population is only 7 percent of the total national population. Recently, residents of this province have moved out at a rate of 50,000 per year, because of the province's isolation and lack of urban services and facilities. Because the province has lagged in development, the Korean government designated the city of Donghae as a growth pole for the 1980s. Donghae is a new town combining Mukho township with Bukpyong township. Its development program accents two strategies. One is to develop an industrial district based on the mineral resources; the other is to equip port facilities serving its coastal location.[30]

The land parcels are predominantly used for residential and industrial purposes, with eight percent of land used for commercial purposes, 55 percent for industrial and residential purposes, and 37 percent reserved for open space. A population of 250,000 is planned by 1991, from a base of 100,051 in 1981.[31] Investment by the private sector is 117.2 billion ($150 million), or 61 percent of total investment.

The development of Donghae is significant for several reasons. First, it will contribute to the balanced development of land nationally. Because industrial and urban services have been concentrated in the Seoul Metropolitan Region and the southeastern coastal area,

Kangwon province has been neglected. Development of Donghae will help to remedy this situation.

Second, Donghae's location allows expanded fishing activities in the Sea of Japan, which is the largest fishing ground for Korea. Development of the port facilities can help to stimulate the fishing industry. The establishment of Donghae will also be helpful in the exploitation of other natural resources such as coal, iron ore, limestone, and hydraulic power.

Finally, establishment of Donghae has slowed the exodus of population and capital. In other words, it has the essentials for regional development as a growth pole in a long-term strategy.

New Town Development in the Seoul Metropolitan Region

The new town movement takes on special importance in the Seoul Metropolitan Region (SMR), where new town development is an effort to overcome severe urban congestion. The solution to this urban congestion is a major issue in Korea today. Combined with several associated issues, it has generated new town development as a way of overcoming several problems.

First, many people have concentrated in Seoul. In an area of 627 square kilometers, 0.6 percent of the total area of South Korea, lives a population of more than 8,367,000 or

22.3 percent of the nation's total population. Population
density was 13,836 by 1981.[32] Seoul is over crowded with
people moving in from other places.

A second problem is related to the imbalances in
regional development of Korea. The rapidly growing primary
city of Seoul causes disadvantages to other places. Seoul
is a classic example of a primate city, in that its rapid
growth is an obstacle for medium and smaller size cities
that must grow to provide service functions to surrounding
rural areas. Problems are caused for medium and smaller
size cities when people leave them for the primate city,
thus creating unbalanced growth and regional inequality.
This is exactly the situation in South Korea.

Third, population movement from rural to urban areas
causes similar capital movement. This capital is essential
for developing rural communities and its outflow causes
their decline, preventing rural areas from modernizing.

Finally, a special problem peculiar just to Seoul is
the location of the capital city very close to the
Demilitarized Zone (DMA) which divides Korea in South Korea
and North Korea. Seoul is situated only 20 miles away from
the DMZ. The concentration of population and central
government agencies in Seoul makes the city extremely
vulnerable to military attack by North Korea and presents
substantial threat to national security.

These problems have motivated authorities to develop new towns in Korea since the 1960s. The establishment of such new towns is one method of reducing these problems in the Seoul Metropolitan Region.

Policies of New Town Development in Sungnam and Banweol

The new towns that have been built so far in the SMR are Sungnam, Banweol, and Gwachon. Gwachon is a typical bedroom community, as well as an administrative new town that has been developed outside the border of Seoul since 1979. Gwachon belongs administratively to Gyonggi province and its development has been based on the strategy of dispersing Seoul's population by moving the secondary government buildings and Seoul's large recreation park away from Seoul.[33] For that reason, the secondary government buildings were built to accommodate several ministries, such as the Ministries of Government Administration, Agriculture and Fisheries, and Construction. The structure of land use of the new town shows the dominance of residential uses. The land parcels are 73 percent residential, 6 percent commercial and office, and 21 percent open space. The planned population was 50,000.[34] The population of Gwachon was 54,901 in 1983 because adequate apartment space was provided. Thus, since it is considered a satellite new town for the purpose of providing only adequate residential

facilities, Gwachon was not an appropriate case for this study.

Development policies for the new towns of Sungnam and Banweol can be discussed in three major categories: political development issues, site factors, and socioeconomic aspects. In the discussion below, Banweol policies are compared with those of Sungnam.

Political Development Issues

In this section the basic and large scale strategies for new town construction were surveyed in relation to political development issues. Several issues, such as balanced development in the SMR, establishment of independent new towns, the role of growth poles, and public versus private sector roles in development were analyzed.

Balanced Development in the SMR. There are ten cities in the SMR: Seoul, Inchon, Suwon, Sungnam, Ujongbu, Anyang, Buchon, Gwangmyong, Songtan, and Dongduchon (Figure 1.1). These cities are fairly large as shown in Table 2.2. Seoul and Inchon have more than eight million and one million population, respectively.

The growth of city populations in the SMR has been greater than in the rural areas of the SMR, as shown in Table 2.3. City proportions have increasingly expanded over time. For example, the population of Seoul in 1980 was 3.5 times its 1960 population. The population of other cities in 1980 was 4.8 times that of 1960. Urban population in the SMR

TABLE 2.2: Population of Cities in the SMR (1981)

City	Population
Seoul	8,676,000
Inchon	1,142,000
Suwon	324,000
Sungnam	388,000
Ujongbu	135,000
Anyang	259,000
Buchon	246,000
Gwangmyong	154,000
Songtan	63,000
Dongduchon	60,000
Total	11,447,000

SOURCE: The Ministry of Home Affairs, <u>Municipal Yearbook of Korea</u>, 1982, p.194.

TABLE 2.3: Population Growth in the SMR

Year	Seoul	Other Cities	Rural Areas	SMR	% of Popula. in Cities
1960	2,445	492	2,257	5,194	56.6
1966	3,803	731	2,371	6,905	65.7
1970	5,525	908	2,450	8,883	72.4
1975	6,889	1,649	2,391	10,929	78.1
1980	8,518	2,380	2,444	13,342	81.7

SOURCE: Korea Statistical Yearbook, 1967, 1971, 1976, and 1981.

increased from 56.6 percent of the total to 81.7 percent by 1980. However, the population of rural areas in 1980 was only 1.1 times that in 1960. These data show that there has been severely unbalanced development between city and rural areas in the metropolitan region.

In addition, the concentration of headquarters of enterprises, revealed in Table 2.4, shows that Seoul had more than two-thirds of Korea's business headquarters in 1980. This unbalanced concentration of population and industries could be one of the major reasons of unequal development between cities and rural areas in the SMR. Kown[35] explains intra-regional inequality in the SMR as follows:

> The capital region shows a share distribution between Seoul and countryside. Most of the counties in Gyonggi province, except the ones near Seoul, have in fact lost population. The functional dominance of Seoul must be diminished by creating a more complex polycentric metropolitan region.

The intra-regional inequality in terms of the unbalanced spatial structure in the SMR is a significant problem in regional development and the reason that development policy began to emphasize building new towns for more balanced development in the SMR.[36] In this regard, the establishment of Sungnam and Banweol new towns in rural areas has been one method of balancing development in the SMR.

TABLE 2.4:   Concentration of Headquarters of Enterprises
             in Seoul and the SMR

(Investment Unit: million won)

Investment	10-100		100-1,000		1,000 10,000		More than 10,000	
Place	#	Ratio	#	Ratio	#	Ratio	#	Ratio
Nation	1,564	100	1,169	100	441	100	45	100
SMR	1,216	78	927	79	363	82	39	87
Seoul	1,042	67	772	66	325	74	36	80

Source: The Rearrangement Plan in the SMR (1982-1991),
          1981, p.17.

Establishment of Independent New Towns.   One of the
purposes of establishing new towns is to make new towns
independent in terms of employment, living facilities, and
urban services.   The independent new town should be self-
sufficient.   In Banweol and Sungnam, development policies
                                        37
have clearly emphasized self-sufficiency,   in Banweol based
on the industrial sector, and for Sungnam to achieve self-
sufficiency in the long run.

Role of Growth Poles.   The strategy of growth poles
comes from studies by Perroux (1955), Myrdal (1957),
Hirschman (1958), and others.   The concept is related to
regional development.   If private or public sectors invest
in an existing small town or city which has lagged behind

its region in development, that town or city will become the growth pole. "Backwash" or "polarization" and "spread" effects or "trickle-down" effects are basic concepts of the growth pole strategy.[38] "Backwash" refers to the population, money, and raw materials that flow from surrounding areas to the growth pole, whereas "spread" explains the subsequent movement of modern technology, investment, information and population from the growth pole to surrounding areas.

The development strategy for Banweol is to build it into a growth pole for the development of the southwestern part of the SMR.[39] The development strategy for Sungnam, however, does not adopt the growth pole strategy partly because Sungnam is located too near Seoul to be an independent growth pole. At a distance of only 20 kilometers, the socioeconomic and cultural influences from Seoul on Sungnam are significant.

Public versus Private Sector Development. Development planning for new towns in Korea has been carried out by the public sector.[40] In the case of Banweol, the public sector has completely dominated planning for the basic structures of the new town. Agencies such as the Ministries of Construction, Treasury, Home Affairs, Education, and Communication, the government of Gyonggi province, the Office of Korean National Railroads, the Korean Electric Company, and the Industrial Sites and Water Resources

Development Corporation have taken direct roles in the new town development. Other ministries and governmental agencies such as the Economic Planning Board, the Ministry of Commerce, and the Korean Housing Corporation have also supported the development plan.[41]

In the case of Sungnam, the Seoul city government and the government of Gyonggi province were the main public sector planners. The Seoul city government was responsible for setting land prices and the boundaries of the new town area, controlling the sale and subdivision of land, cutting the forest, controlling housing construction, distributing housing sites to residents who wanted to live in the new town, taking care of security problems, and establishing public facilities.[42] The Gyonggi province has dealt with administrative affairs because Sungnam is in its jurisdiction.[43] Thus, the development of the new towns was based on different levels of governments, local governments for Sungnam and the central government for Banweol.

Site Factors

Among the site factors favoring the existing locations of Sungnam and Banweol were the availability of considerable undeveloped land, low land prices, good physical environment, good access to present transportation, potential for transportation expansion, and opportunity to preserve historical resources.

Availability of Undeveloped Land.   The site for an
independent new town needs undeveloped or redeveloped land.
For a completely new town, from the bottom up, a large site
is necessary.

When the development of Sungnam started in 1968,
Sungnam was a small village.   The population was only 6,000
but has now expanded to more than 380,000 which is 64 times
that of 1968. [44]   In 1968, the economic base of Sungnam was
dominated by the primary sector which provided 89   percent
of total employment compared with the secondary sector
employment of 0.6 percent and tertiary sector employment of
10.4 percent.   These proportions show that Sungnam was a
typical rural village with little industrial and service
activities.

In contrast, the population of Banweol in 1977 when its
development started was 16,500. Now, its population is more
than 50,000 which is three times the 1977 figure.   Banweol
was then a typical village without urban services.   The
economic base of Banweol in 1976 consisted of primary sector
employment of 72.7 percent of total employment, secondary
sector   employment of 5.1 percent, and tertiary sector
employment of 22.2 percent. [45]   Thus, Banweol was also an
undeveloped area dominated by primary sector employment
before its development began.

Low Land Prices.   The price of land is a major factor
in new town establishment.   The low land price can be

advantageous to all kinds of new towns such as independent new towns, new towns in-town, and satellite new towns. When the development plan of Sungnam started in 1968, land prices in Gyonggi province were as shown in Table 2.5. Residential land prices are used in this study because those land price data were available in contrast to some other land prices. Usually, the land prices of residential areas in Korea are divided into three categories, high, middle, and low. In this study, high and low land prices were used for convenient comparison among townships and cities. In 1968, the high price of land per <u>pyong</u> (36 square feet) in Sungnam was 1,000 <u>won</u>. The highest land price per <u>pyong</u>, 14,474, was in Anyang township, while the lowest land price per <u>pyong</u>, 153 <u>won</u>, was in Janghowon township. Thus, average land price was 3,440 <u>won</u> which was 3.4 times Sungnam's land price. The lowest land price in Sungnam in 1968 was 700 <u>won</u> per <u>pyong</u> which was lower than the average land price of all townships, 951 <u>won</u>. Low land price in Sungnam was one of the major factors for selecting it as a new town site.

In the case of Banweol, its residential land prices were compared with other townships in Gyonggi province in 1978 (Table 2.6). The figure for Banweol is for 1977.

In Table 2.6, the land prices in Banweol were among the lowest ones. The average land prices were 50,428 <u>won</u> (high) and 18,874 <u>won</u> (low). The land price in Banweol was significantly lower, in comparison with the average land

TABLE 2.5: Land Price of Residential Area by Township in Gyonggi Province (Sungnam, 1968)

Unit: <u>won</u>

Place	Residential Area	
	High (price per <u>pyong</u>	Low (price per <u>pyong</u>
Inchon	9,175	3,075
Suwon	5,743	1,575
Ujongbu	7,136	573
Dongduchon	587	75
Yoju	717	137
Ichon	782	115
Janghowon	153	79
Ansung	1,046	657
Pyongtak	2,620	290
Songtan	708	190
Osan	580	302
Anyang	14,474	4,605
SUNGNAM	1,000	700
Average	3,440.0	951.0

NOTE: (1) One dollar corresponded to 400 <u>won</u> in 1968 and 780 <u>won</u> in 1983.
(2) The land price per <u>pyong</u> in Sungnam was 1,000 <u>won</u> in 1968. One <u>pyong</u> equals 36 square feet. The land price per square foot in Sungnam was $0.07 in 1968.

SOURCE: Korea Appraisal Board, <u>Land Price Report</u>, 1968.

TABLE 2.6: Land Price of Residential Area by Township in
            Gyonggi Province (Banweol, 1978)

| | Residential Area | |
Place	High (price per pyong)	Low (price per pyong)
Inchon	94,667	58,462
Buchon	63,000	23,333
Anyang	120,000	55,833
Suwon	88,478	47,567
Sungnam	91,250	23,750
Ujongbu	39,250	11,938
Osan	14,850	6,525
Songtan	22,833	3,917
Pyongtak	49,400	13,700
Ansung	44,846	15,615
Osung	40,000	11,000
Dongduchon	9,000	4,091
Peangsung	35,000	8,500
Unhyon	5,000	1,500
Gwangtan	4,000	2,000
Munsan	32,500	3,000
Gumchon	30,000	7,000
Junae	7,000	2,500
Sindo	23,333	6,333
Guri	150,000	66,667
Syhung	140,000	40,000
BANWEOL	5,000	2,000
Average	50,428	18,874

Source: The Citizen National Bank, Land Price Report,
         1978.

price. Therefore, low land prices may be considered important factors for selecting Banweol as a new town site.

Physical Environment of New Towns. The physical environment is also an important element to consider in new town development. Sungnam is located on a small plain with Gumdan Mt. (542 m) located to the east, and Chonggae Mt. (618 m) to the west.[46] A small river called the Tan river runs between the two mountains. The plain supplies sites for urban facilities and farm land, so that the small plain and adjacent low hilly areas represent a relatively good site for constructing a new town.

Banweol is located on a fairly large plain in the southwestern coastal area of Gyonggi province. There are small mountains scattered throughout the plain, at the end of Gwangju Mountain Range that stretches from east to west. The average height of land in Banweol is less than 100 meters above sea level. The proportions of land according to height are as follows: less than 10 meters (33.3 percent); 10-50 meters (56.3 percent), 50-100 meters (9 percent); 100-150 meters (1.2 percent), and more than 150 meters (0.2 percent).[47] The proportion of land between 10 and 50 meters is more than half the total area of Banweol. The relatively low flat plain can be regarded as a good physical site for new town construction.

Good Present and Potential Transportation Access. Distribution of transportation networks should be considered

a factor in developing new towns. Good location and relatively low transportation costs are essential in building new towns.

Sungnam has road transportation by bus, taxi, and other automobiles. Main roads connect Sungnam with Seoul, Suwon, Gwangju, and the southern part of the Korean peninsula. The Gyongbu Freeway runs through the western part of Sungnam's area. These roads contribute to transportation for Sungnam's residents. There were 2,314 bus trips carrying 146,000 residents between Sungnam and Seoul per day in 1983. According to the construction plan, by 1986, there will be a subway line between Seoul and Sungnam.[48] When this subway is constructed, residents of Sungnam will have even more convenient mass transportation facilities between Seoul and Sungnam. Thus, Sungnam is fairly well located for land transportation.

Banweol has two kinds of transportation systems, road and railway. Main roads connect Banweol with Suwon, Inchon, and Anyang. There are no roads which directly connect Seoul with Banweol, but they are connected through Anyang by road. By bus, there were 547 round trips carrying 13,600 passengers per day between Banweol and other places in 1983.[49] The railroad called Suin Line runs through Banweol between Suwon and Inchon. There were four trains per day from Banweol to Suwon and Inchon in 1983, transporting about

250 passengers per day. Thus, Banweol is also in a relatively good location for transportation.

Products for foreign trade are carried from Banweol to Inchon which is the second largest port in Korea. Banweol does not presently have port facilities but facilities can be built in its coastal location. As a result, Banweol has the potential to establish sea-going transportation.

Opportunity to Preserve Historical Resources. In contrast to Sungnam, the development policy for Banweol has emphasized preservation of historical remains in the new town area. That is, the development plans have been designed to preserve the graveyards of the late scholars, Yik Lee and Young-Shin Choi. Historical parks are to be located at these sites.[50] This policy for preserving historical resources will contribute to formation of a better recreational and cultural environment. No plans have been made for similar preservation of historic resources in Sungnam.

Socioeconomic Aspects

Socioeconomic factors are closely related to development of new towns. These factors have influenced authorities to consider new town construction in Sungnam and Banweol. Housing shortage, squatter settlements, urban crowding and indusrial pollution are serious urban problems

that are expected to be alleviated in Seoul, to some extent, by the outward movement of people and industry to new towns.

Relocation of Residents from Seoul and Housing Development. The increase of population in the 1960s and the 1970s caused housing shortages in Seoul. Table 2.7 shows the rate of housing shortage in Seoul in 1966 reached its highest point and then decreased. The rate slightly decreased again in 1978.

TABLE 2.7: Housing Shortages in Seoul

Year	Households	Existing Dwellings	Shortage	% Shortage
1966	724,043	361,948	-------	50.0
1970	1,097,432	600,367	497,065	45.3
1978	1,609,121	892,084	717,037	44.6

SOURCE: Seoul Statistical Yearbook, 1980 and 1982. Rearrangement Plan of Population in SMR (1982-1991), Korea Research Institute for Human Settlements, 1981, p. 42.

These housing shortages stimulated dispersion of population from Seoul. Therefore, the development policies for Sungnam and Banweol have emphasized attracting residents from Seoul to the new towns through the provision of housing.[51] An adequate supply of housing in the new towns is a major goal in achieving self-sufficiency.

<u>Solution of Squatter Settlements in Seoul.</u>   By   the
1960s the squatter problem in Seoul had reached great
proportions because of the lack of housing. Solution of the
problem became a political issue in the election of both the
president and the national congress in 1967.[52] The
locations of the squatter settlements in Seoul were
influenced by cheap public transportation determining the
distribution   of   the   settlements.   Dominant   squatter
settlements in Seoul were widely distributed over hilly
areas, public open spaces near railroads and the small
Chonggaechon river.

In   1967,   the Seoul city government prepared   a
comprehensive plan for clearing the squatter housing that
advocated developing a new town to relocate the squatters.
At that time, 233,535 of Seoul's 649,290 total housholds
lived in 136,650 dwellings in the squatter areas, the
population was 1,270,000 of Seoul's 3,800,000 total
population.   The comprehensive plan emphasized overcoming
the problems of 76,650 squatter houses by establishing a new
town, removal of 14,000 of the squatter houses by building
multi-storied apartments on the land where the squatter
houses were located, and rehabilitating 46,000 squatter
homes by repairing them.[53]   The Seoul city government
decided on the new town site in Sungnam for relocating Seoul
squatters in 1968 and the movement of squatters lasted for
three years from 1969 to 1971.   During these three years,

41,596 squatters moved from Seoul to Sungnam.[54] Thus, Sungnam was part of the solution to the squatter resettlement problem, but Banweol was not. This was probably because squatter resettlement was not a serious problem later, since squatter settlements in Seoul had been almost cleared out by the end of the 1970s. Therefore, the plan for the Banweol new town did not need to include squatter resettlement.

   Relocation of Industrial Facilities from Seoul. Just as population became concentrated in Seoul, industrial facilities were agglomerated in the same place. Seoul accounted for 33.9 percent of the country's manufacturing in 1970, 30.5 percent in 1975, and 25.7 percent in 1978.[55] With more than one-fourth of the country's manufacturing carried on in Seoul, the headquarters of industries were concentrated heavily in that area as shown in Table 2.4. As mentioned previously, the Seoul area is 0.6 percent of the nation and the Seoul population in 1980 was 22.3 percent of the national total. In comparison with the area, the proportion of industrial headquarters, more than two-thirds, is even more disproportionate. The industrial concentration caused a pollution problem in Seoul. To help overcome this, the development policy for Banweol emphasized the relocation of industries which produced severe pollution, and the industries which were inappropriately located, such as those in residential and commercial areas in Seoul.[56] Accordingly,

210 or 79.4 percent of the 265 industries in Banweol by 1982 had moved to the new town from Seoul.[57] In this regard, the policy to move polluting and inappropriately located industries from Seoul to Banweol can be regarded as successful. On the other hand, the development policy for Sungnam did not emphasize relocation of industries from Seoul.

Residents' Participation in New Town Development. The development of the Sungnam new town presented serious problems in that residents of the new town opposed the plans of the development authorities. When the relocation of residents from Seoul to Sungnam in the late 1960s was announced, an incident later called the August Tenth Riot broke out among the residents in 1970. There were several reasons for it. First, speculation in real estate caused land prices to rise in the first stage of the development. Since the Seoul city government advertised the Sungnam new town development extensively, realtors and other sales agents immediately gathered in Sungnam. Realtors sold the same 20 pyong residential sites which the authorities assigned to new households moving in from Seoul, several times over. Fluctuations in land prices were erratic with realtors and sales agents controlling land prices. Whenever they sold or resold a site, the land price went up at a premium so that the price of each parcel of land became several times its original price. At the premium prices,

more than half the squatters moving in from Seoul sold their residential sites to realtors or sales agents at a profit and then left Sungnam for other places. Some who sold their assigned sites could not return to Seoul because they were unable to buy expensive Seoul land with the profits they made from selling the Sungnam sites. They were wandering around Sungnam and other residents who wanted to live in Sungnam had to pay higher land prices later. This situation resulted in the demonstration that preceded the August Tenth Riot in 1970. The Seoul city government executed a measure, prohibiting the reselling of residential sites in 1970.[58]

Another reason for the riot was that the Seoul city government ordered residents of the new town to immediately pay a lump-sum price for assigned residential sites. Few residents were able to pay this quickly because a majority of them were squatters. Administration of this policy stimulated some residents to riot and others were angered by insufficient urban services and facilities for residents in the new town. The dissatisfaction with prices, facilities and management accumulated until the residents finally rioted against the authorities.[59]

In contrast, the development processes in Banweol have proceeded with cooperation between development authorities and residents in the new town. According to Yun-Kil Jo, Chief of the Planning Department in the Office of Banweol township, there have never been any serious difficulties

in obtaining residential and industrial sites from native
residents.[60]

Summary

The development policies for Sungnam and Banweol were divided into three categories of political development issues, site factors, and socioeconomic aspects, based on characteristics of each to explain various policy provisions. Each category had several detailed subsections.

The first category of political development issues, which included four subsections, was more applicable to the development policies for Banweol than those for Sungnam. All four subsections, balanced development in the SMR, establishment of independent new towns, role of growth poles, and public sectors for development, were applicable to the development policies of Banweol, while three of them, balanced development in the SMR, establishment of independent new towns, and public sectors for development, were adopted for the development policies in Sungnam.

The second category related to site factors for developing new towns, included six subsections: availability of undeveloped land, low land prices, physical environment of new towns, good present transportation access, potential for transportation expansion, and opportunity to preserve historical resources. All these six subsections were

employed in the development policies of Banweol, whereas only one subsection, the opportunity to preserve historical resources, had some marginal applicability to the development policies of Sungnam.

The third category dealt with socioeconomic aspects and consisted of five subsections concerning relationships between socioeconomic problems in Seoul and the need for new towns. These five subsections were: relocation of residents from Seoul, housing development plans, solution of squatter settlements in Seoul, relocation of industrial facilities from Seoul, and residents' participation. Of these, one subsection, the solution of squatter settlements in Seoul, was marginally relevant to the development policies of Banweol, while two subsections, the relocation of industrial facilities from Seoul and residents' participation, were somewhat related to the development policies of Sungnam.

In their entirety, the detailed subsections were more applicable to the development policies for Banweol, which is a more recent new town, than those of Sungnam, an older new town. In other words, Sungnam developed in a relatively more spontaneous or unplanned way than did Bandwol. However, a necessarily qualitative examination of development policies is obviously subject to varying interpretations by different observers.

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CHAPTER THREE

URBAN LAND USE PATTERNS IN SUNGNAM AND BANWEOL

A city is a mosaic of parcels of land which reflect its
internal structure, based on the apportionment and
distribution of land. There are regularities in the
patterns and spatial distributions of land uses in the city.
Based on functions of utilization, the land can be
classified into several categories that are important in
understanding the city's spatial structure. The
classification of land use should bear some relationship to
land development and should be applicable and adaptable to
any city. A general land use classification system involves
identifying the dominant functions at the particular
location. Thus, functional categories such as residential,
commercial, industrial and open space help to standardize
and make comparable such classifications.[1] In this study,
functional land uses are categoried as residential,
commercial, industrial, greenbelt and open space.

Land available for use in cities is derived from two
sources. The first source is the existing developed urban
land. In this situation, previous urban development has
determined the major land use patterns, and management

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options are limited. The urban land is used intensively for various purposes, especially in central areas of the city with many people per unit area. The second source is to develop new urban land in the rural fringe or beyond. There, new urban development sets the major land use pattern based on physical and social environmental features. Management options are relatively flexible within the development strategy.² Land use in independent new towns are consistent with the second case rather than the first case because independent new towns require extensive continuous land parcels for newly developed communities.

The distribution of land parcels shows patterns of land use characteristics in a city. Thus, land use patterns in rural areas have been changed to those of urban areas. Farm land has been transformed into urban parcels with industrial, commercial, and residential facilities. Residential land uses incorporate all housing activities, including individual household units, group living accommodations, and mobile home parks. The proportion of land use for residential purposes averages 32 percent of the total city area in American cities, and 27 percent of the total city area in Seoul.³ Commercial and industrial land uses normally occupy small proportions of the city area. Commercial uses tend to dominate the pattern of spatial organization in a city. Commercial districts are, in general, concentrated in the center of a city for the

convenience of businesses and sometimes appear as clusters of high-rise buildings. Meanwhile, industrial districts with manufacturing activities are often located either in residential districts in naturally grown cities, or some distance from residential districts in planned cities because of the threat of air and water pollution from factories.

One important aspect of urban land use is the proportion of land devoted to residential, commercial, industrial, open space and greenbelt purposes. The respective percentages of the total city used for these purposes represent characteristics of distribution of urban land use.

There are several types of urban street patterns. The basic patterns are a grid or rectangular system, a radial system, and an irregular system. The grid pattern is the most common pattern, in old cities as well as newly developed cities. The radial pattern has the appearance of a spider web with a radial distribution of main streets and a concentric arrangement around a central nucleus. The irregular pattern is a street arrangement without any regular order in terms of directions and street width. Many cities have irregular street patterns in some part of the city or a mix of two or more patterns.

Land use density in a city concerns the degree to which land is occupied by the users. Different densities exist

for functional land uses such as residential, commercial, and industrial that vary chronologically and spatially. Often a city incorporates more area to accommodate increased population, which results in increased or decreased densities. Sometimes, an area of the city is used more intensively for each use, resulting in increased land use densities. When an area of a city is expanded, available stocks of vacant land within the city are converted to functional uses.[4] Residential and commercial areas in a city contain higher densities of occupants per unit area than industrial areas. Thus, functional land use tends to differentiate densities.

There are several ways to calculate land use density. First, the total population of a functional district can be divided by the area of the functional district.[5] For example, when the population of residential districts in a city is divided by the area of the residential districts, numbers of residents who live in the district per unit area can be derived.

Second, respective areas of functional land use can be divided by the total population of the city.[6] In this case, amount of land per capita is considered and residential, commercial, or industrial area per capita can be calculated. The amount of land used for any urban purpose is related to the number of people in the city.

Third, the number of employees of a chosen type can be divided by the land area devoted to this type of employment.[7] Residential densities are based on the population of a city and amount of land available for residential use. Industrial and commercial densities are based on respective amounts of employment and the land use for these purposes. For example, the number of employees in manufacturing factories is divided by the land area used by manufacturing facilities.

Finally, the functional area of a chosen type is divided by the unit population to derive functional area per unit population.[8] For example, if 1,000 residents are regarded as a unit population, the functional area per 1,000 population can be calculated to estimate the density of each of them. This study adopted the last method for comparing densities of functional land uses between Sungnam and Banweol, because data for this method were available and areas of the functional districts per unit population could be expected to be moderate, not too large or small.

Urban Land Use Patterns in Sungnam

For characterizing patterns of urban land use in Sungnam, distribution of functional land use, patterns of street distribution, and land use densities are considered in this section.

Distribution of Land Use in Sungnam

The management of urban development affairs for Sungnam was transferred from the Seoul city government to the government of Gyonggi province in 1971 because Sungnam belongs to Gyonggi province. Prior to 1971, the Seoul city government was responsible for managing development in Sungnam while Gyonggi province officials dealt only with administrative affairs for Sungnam residents. Through the transfer of responsibility for urban development, a two-chamber system was changed into a single-chamber system under the jurisdiction of Gyonggi province. Since 1971, Gyonggi province officials have dealt with both administrative affairs and urban development programs for Sungnam. As soon as Gyonggi province took jurisdiction over development, the authorities prepared a Three-Year Investment Plan extending from September of 1971 to September of 1973.[9] This short-term plan emphasized investment in sewage systems, roads, and public sanitary facilities.

Another plan for land use in 1972 was a part of the first comprehensive plan for urban development promulgated by Gyonggi province. This comprehensive plan was a large-scale urban development program with several goals: (1) to induce middle-class residents to move into Sungnam; (2) to provide sufficient job opportunities; (3) to build industrial facilities for a self-sufficient new town; and

(4) to encourage self-help efforts. In addition, the plan divided urban land into the four functional districts of residential, commercial, industrial, and open space. The proportions of each district are shown in Table 3.1 and Figure 3.1. The proportion allocated for residential district, 20 percent of the total city area, was very large compared with proportions allocated in the plans for 1976 and 1978. The large allocation for residential district was determined by the authority based on the initial dominant residential function intended for the city as well as the governments over zealous plans for urban development. Urban facilities were planned in Sungnam for 500,000 population. This overambitious plan later had to be downsized because of urban problems such as inadequate distribution of residential facilities, traffic jams, and the lack of job opportunities. For example, prior to 1975 squatter settlements totaling 3,000 houses were scatterd in unauthorized sites throughout the city.[10]

The Sungnam city government thus reconsidered its urban development plan after Sungnam achieved city status in 1973. It then issued a comprehensive revised plan for urban development of the city in 1976, which is still in use to guide present urban development. The rearrangement plan set the following goals: (1) to build urban facilities for 250,000 population; (2) to prevent farm land within the city from urbanization; (3) to adjust functional land uses; (4)

N

Gyongbu

Yan River

Freeway

0 1 2 3
kilometers

Residential
Commerical
Industrial
Greenbelt
Open Space
Park
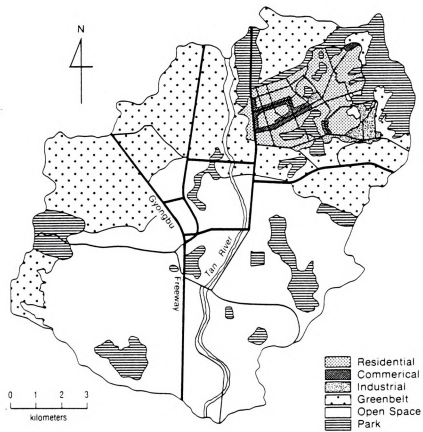
Figure 3.1 Distribution of Land Use in Sungnam.

to prevent expansion of present built-up area; (5) to expand industrial districts for job opportunities for its residents; (6) to restrict in-migration; (7) to clear squatter settlements and to build apartments and tenement houses for squatters; and (8) to expand streets and to adjust transportation systems. One characteristic of land use in Sungnam is a larger proportion of greenbelt and open space. Farm land is included in the greenbelt and open space area (Figure 3.1). This situation has continued from the beginning of the new town development, based on the emphasis of the development policy on providing a large proportion of open space, which is an important factor in adopting the idea of a garden city. In adjusting the functional land use, which is one of the goals of the revised plan, land use development in the city was intended[11] to fulfill the following objectives:

(1) to develop urban land according to transportation networks.

(2) to preserve a greenbelt area.

(3) to protect the city environment from pollution through preserving sufficient open space.

(4) to develop land use in accordance with the industrial structures of the city.

(5) to achieve a harmonious land use distribution.

The plan divided Sungnam's urban land into residential districts, commercial districts, industrial districts, a

greenbelt, and open space. There is a difference in meaning between greenbelt and open space in this study. A greenbelt is a restricted area to prevent expansion of the built-up area. By contrast, open space refers to land within the urban area that is not developed to usual types of urban development.[12] Public land uses are normally dominated by parks, airports, cemetaries, and deliberately vacant tracts of land. The proportion of open space area increases with distance from the center of a city.

The land use plan in the city was slightly changed in 1978 because the area of Sungnam was expanded from 132.588 square kilometers to 145.798 square kilometers. The revised plan of 1976 was not substantially changed, only the proportions of functional land uses were changed. The portion of built-up area which consists of residential, commercial, and industrial districts was not different from that of 1976, but the portions of a greenbelt and open space were altered as shown in Table 3.1.

Thus, the land use plans in Sungnam were set in 1972, and revised in 1976 and 1978 based on urban development plans. Proportions of functional land use changed slightly during those years, but open space had a remarkably large proportion under each plan. More than half of the total city area is devoted to open space and greenbelt also has a large proportion. Proportions of residential, commercial, and industrial districts are relatively small: only 6.4

percent of the total city area for residential, 0.7 percent for commercial, and 1.2 percent for industrial purposes. The area for residential districts in 1978 was exactly the same as in 1976, but the proportion of residential districts slightly decreased over time. Percentages of commercial and industrial districts, and open space also decreased but the proportion of greenbelt increased. This was in accord with the policy to prevent the expansion of the present developed area within the city. As shown in the revised plan for 1976, the Sungnam city government overemphasized limiting the present built-up area to 250,000 residents (in 1981 the population of Sungnam was over 380,000, 130,000 more people than planned). The dominant reason for limiting the developed area was that Sungnam did not have a strong enough economic base to provide job opportunities for all its residents although three industrial districts provide job opportunities to some of the residents.[13] The jobs which the three industrial districts provided for about 31,000 employees in 1981 were not sufficient for the 125,000 potential workers in the city.[14]

According to the land development plan, the proportions of functional land uses have changed. In Table 3.1, the area of the built-up districts has maintained the same proportion of land since 1976. These residential, commercial, and industrial districts have been inflexible, whereas those of greenbelt and open space have been

flexible over time. This was also due to the policy limiting urban expansion.

Patterns of Streets in Sungnam

The built-up area of Sungnam is situated in its northeastern region of small hilly areas and plains. The area of a plain connected with the bottom of a mountain has been considered as a good site for settlement in Korea, because of adequate elevation to prevent flooding, and living variety with the plain and the mountain. The built-up area of Sungnam is also located in that area (Figure 3.1). Topographical conditions are an important factor in determining the street patterns. The streets are densely laid out in a predominant grid system (Figure 3.2). The grid systems are aligned along major streets within the urban developed area, with the grid patterns divided into several sections located between small hills. These grids include residential, commercial, and industrial districts, with the residential districts having a more compact grid pattern than the other functional districts. The commercial district grids have wide streets. The long streets stretch from west to east, while short streets run from north to south consistent with topographical conditions.
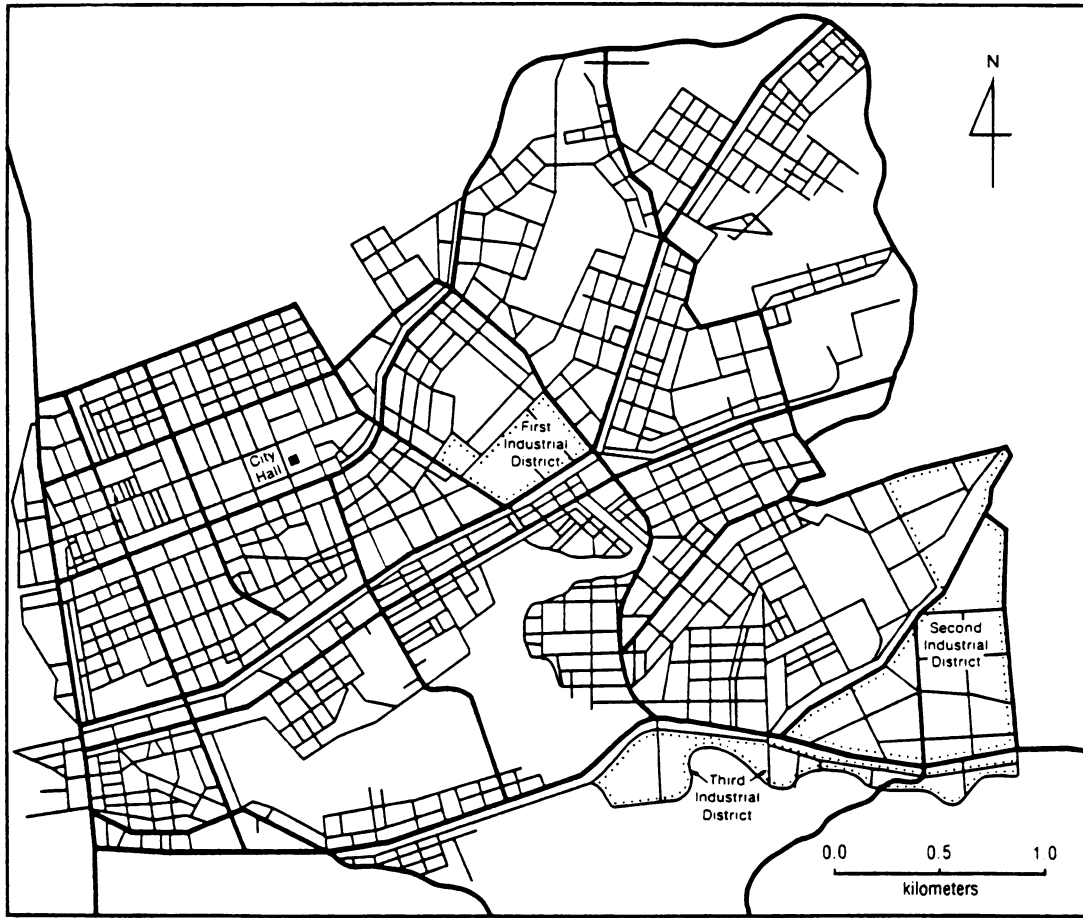
Figure 3.2 Patterns of Street Distribution in Sungnam.

Densities of Land Use in Sungnam

The city of Sungnam was planned for 250,000 people. With a population in 1981 of more than 380,000, the distribution of population was far denser than expected. Planned population density in Sungnam was 1,886 people per square kilometer, while actual population densities (using total land area) were 200 persons per square kilometer in 1968, 2,019 in 1975, and 2,739 in 1981.[15] Thus, the population density in 1981 was 24 times that of 1968. These figures are misleading, however, because 92.5 percent of the land area of Sungnam consists of greenbelt and open space. Taking only the urban developed area which consists of residential, commercial, and industrial districts within the city, produced a high population density of 35,407 persons per square kilometer for 1981. The development policy for Sungnam, which is aimed at maintaining only the present developed area and prohibiting further population growth, results in the very high population density. Population growth in the city has resulted from in-migration. Sungnam has served as an intermediate stop for people who move from the southern rural areas of the Korean peninsula with plans to eventually live in Seoul.[16] If there are job opportunities in Seoul for these people, there will be a general tendency for these people to move on to Seoul. More than 63 percent of Sungnam's residents came from these areas.[17]

In accordance with the proportions of the functional land uses in Sungnam, open space had the largest area per 1,000 population, and the greenbelt area had the second largest (Table 3.2). Industrial districts have the smallest area. There was a significant difference between functional areas per 1,000 population. Open space area per 1,000 population was 89 times larger than the commercial area. These differences were based on the policy limiting urban expansion.

Urban Land Use Patterns in Banweol

This section deals with the distribution of functional land uses, patterns of streets, and densities of land use in Banweol in characterizing patterns of urban land use.

Distribution of Land Use in Banweol

The land use plan for Banweol was first proposed in 1977, and modified in 1979 and 1982. The development plan included a large land area set aside for industrial activities. The plan is as follows:[18]

(1) to develop urban services and facilities to accommodate a population of 200,000 by 1986.

(2) to set up three nuclei residential districts, an industrial district, and a central business district (CBD).

(3)   to develop the industrial district, taking into consideration pollution and land reclamation along the coast line.

(4)   to build streets in hexagonal patterns.

(5)   to provide residential facilities based on three nuclei districts.

(6)   to divide the development period into three stages: the first stage (1977-80) to accommodate 140,000 people; the second stage (1981-83), 182,000 people; and the third stage (1984-86), 200,000 people.

(7)   to construct a two-part transportation network, one part for passengers and the other for goods.

The areas of residential, commercial, industrial and open space retained almost the same proportions over time (Table 3.1). The last modification, in 1982, was the addition of a greenbelt area that expanded the area of the new town from 57.8 square kilometers to 72.6 square kilometers. In comparison with Sungnam, Banweol's residential, commercial, and industrial districts have larger proportions. Banweol is an industrial new town based on the dominance of manufacturing, so a large proportion of land in Banweol (11.4 percent: 8.2 km^2) was set aside for industrial uses compared with the proportion of industrial areas in Sungnam (1.1 percent: 1.6 km^2). Among the built-up area (residential, commercial, and industrial), the

TABLE 3.1: Distribution of Functional Land Use in Sungnam and Banweol

| | Sungnam | | | | | | Banweol | | | | | |
| | 1972 | | 1976 | | 1978 | | 1977 | | 1979 | | 1982 | |
	Area (Km²)	Per-cent	Area (Km²)	Per-cent	Area (Km²)	Per-cent	Area (Km²)	Per-cent	Area (Km²)	Per-cent	Area (Km²)	Per-cent
Residential	38.451	28.9	8.488	6.4	8.488	5.8	15.729	27.2	15.613	27.0	15.60	21.5
Commercial	1.326	1.0	0.876	0.7	0.876	0.6	1.674	2.9	1.674	2.9	1.70	2.3
Industrial	3.978	3.0	1.600	1.2	1.600	1.1	8.195	14.2	8.121	14.1	8.20	11.4
Greenbelt	----	----	47.680	36.0	54.800	37.6	----	----	----	----	14.75	20.3
Open Space	88.833	67.1	73.944	55.7	80.034	54.9	32.202	55.7	32.392	56.0	32.30	44.5
Total	132.588	100.0	132.588	100.0	145.798	100.0	57.800	100.0	57.800	100.0	72.55	100.0

SOURCE: The Sungnam City Government, The Rearrangement Plan for Urban Development in Sungnam, 1976, p. 75. History of Sungnam, 1982, p. 343. The Development Plan in Sungnam, 1983, p. 53. The Ministry of Construction, The Development Plan in Banweol, 1977, p. 12. The Korean Research Institute for Human Settlements, A Study of Strategies for New Town Development, 1982, p. 42. The Office of Banweol Township, Banweol Statistical Yearbook, 1982, p. 13.

proportion occupied by the industrial district in Banweol (32.1 percent) was more than twice that in Sungnam (14.6 percent).

The industrial district was planned in consideration of seasonal wind directions and topographical conditions in order to minimize air and water pollution. Prevailing winds come from the southeast in the summer and from the northwest in the winter. As a result of the location of the residential districts as well as CBD, exposure to wind borne pollution in these areas has been minimized. On the other hand, topographical conditions have influenced the sites for manufacturing. The industrial district is situated along the coast line. This coastal location has advantages for getting rid of water pollution produced by factories through treatment plants for dirty and poisoned water that were built in the coastal area.

Besides the industrial district, three nuclei are also part of urban development in Banweol (Figure 3.3). The nuclei are considered second-order centers, following the first-order center, the CBD, within the new town. A nucleus is one community unit which has several zones (neighborhood units) which are the smallest units in urban development in Banweol (Figure 3.4). These small zones are regarded as third order units in terms of function. There are 17 small zones which are in accord with the lowest administrative unit in Banweol, the dong. The population of dongs depend
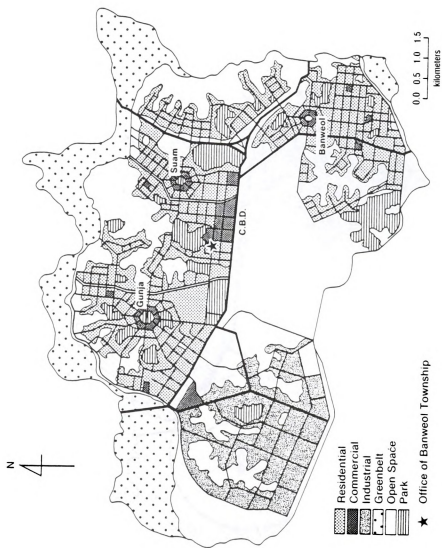
Figure 3.3   Distribution of Land Use and Street Patterns
            in Banweol.

Figure 3.3 Distribution of Land Use and Street Patterns in Banweol.

Residential
Commercial
Industrial
Greenbelt
Open Space
Park
★ Office of Banweol Township

C.B.D.

Suam
Gunja
Banweol

N

0.0 0.5 1.0 1.5
kilometers
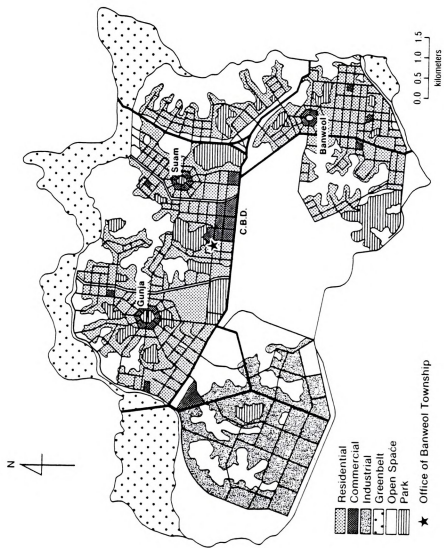
upon city size.   Large cities have more populous <u>dongs</u> than

small cities.   For example, the population of a <u>dong</u> in

Seoul was 21,240, whereas one in the city of Gumi was 4,924

in 1979.[19]   Compared with the American census tract, the

<u>dong</u> generally has more residents and less area.   In Banweol

there are 18 <u>dongs</u>,   17 <u>dongs</u> in the three nuclei districts

and one <u>dong</u> in the industrial district.   According to the

development   plan,   each   small   zone   is   based   on   the

distribution of one elementary school.   Each small zone has

an elementary school which is the focal point of the   zone.

The average population of the zones is 12,188   and   their

average   area   is   1.02   square   kilometers.   Population

density   is 11.949 per square kilometer.   The proportion of

the small zone area,   34.2 percent,   is used for public

purposes.   However,   these   zones   do   not   have   a

socioeconomically   self-sufficient   function.   They   lack

sufficient   urban   facilities   such   as   shops,   offices,

recreational   centers,   and   health   centers.   They   have

dominant residential and educational facilities.[20]

The   development   plan   differentiates   population

densities among the three nuclei. First, the Gunja district

which is the northwestern nucleus, was designated as a high

population density district, 13,287 persons per square

kilometer.   The location of the Gunja district near the

industrial district was designed for a high population

density district.   The Gunja district has some advantages

for residents who are related to industrial activities, because the development plan aimed at providing living facilities in the Gunja district for workers of the industrial district. The area of the Gunja district is 5.7 square kilometers which consists of residential area (3.2 square kilometers), educational, commercial, and recreational area (0.5 square kilometers), and public land use area (2.0 square kilometers). Thus, more than a half of the Gunja area has been used for residential purpose. The proportion of land for public use in the Gunja district, 35.4 percent, is the largest among the three nuclei districts. The land for public use includes streets, parks, and green tracts of land. The area per capita is 0.075 square kilometers, which is the smallest figure among the three nuclei districts. The planned population in the Gunja district is 75,600. According to the development plan, each nucleus district is self-sufficient in urban services and facilities: religious, educational, health and recreational, administrative, public welfare, and commercial facilities.[21] The Gunja district is the most active in urban development because of its location near the industrial district. Employees in the industrial sector live mostly in the Gunja residential districts. The Gunja district has six small zones scattered around the central part of the nucleus.

The Suam district, which is the northeastern nucleus, was designated a medium population density area, with 11,196 persons per square kilometer. The Suam district is located nearest the CBD and fairly close to the industrial district. Therefore, the development plan designated the Suam district as a residential area for employees in the CBD. This district has the highest hills in Banweol and a fairly large plain. These topographical conditions have caused the medium population density of the Suam district. The area of the Suam district, 5.2 square kilometers, consists of residential area, 2.8 square kilometers, commercial, recreational, and educational area, 0.6 square kilometer, and public land use area, 1.8 square kilometers. More than a half of the Suam district is used for residential purposes. The portion of the public land is about one-third of the area of the Suam district. The area per capita is 0.09 square kilometers, the largest proportion among the three nuclei districts. Planned population of the district is 58,400. The Suam district has five small zones but the district has not yet been actively developed.

The Banweol district is the southeastern nucleus. The name of the Banweol district originated from the name of the Banweol township which existed before the development plan started. "Banweol" is the name of the new town, whereas "Banweol district" is the name of a specific residential nucleus. The Banweol district was originally designated as

a low population density area of 10,644 persons per square kilometer in 1977 because this district is isolated from the industrial district and the CBD. But the development plan changed the Banweol district from a low population density area to a medium population density area in 1978, in consideration of new academic and research institutes. At the same time, the development authorities planned to accommodate middle-class residents in the Banweol district, which is a suburban residential area. The area of the Banweol district is 6.5 square kilometers which represents the largest area among the three nuclei districts. This district consists of residential area of 3.8 square kilometers, educational, commercial and recreational area of 0.6 square kilometers and public land use area of 2.1 square kilometers. Residential districts occupy more than a half of the Banweol district. The proportion of the residential area is the largest among the three nuclei districts. The proportion of land for public use and the area per capita are similar to the other nuclei districts. The planned population of the district is 73,200. The Banweol district has six small zones. However, this district has not yet been fully developed either. The facilities in this district so far are academic and research agencies, such as the Branch School of Hanyang University and the Ocean Study Institute.[22]

Pattern of Streets in Banweol

Banweol has a relatively balanced pattern of land use with three nuclei to the northwest, northeast, and southeast, an industrial district to the west, and the CBD in the central part of the new town. The urban land use of Banweol reveals a mixed pattern. Each nucleus has three concentric hexagonal street patterns, small, medium, and large (Figure 3.3). These hexagons produce radial-concentric patterns. The hexagonal patterns are based on two dominant features. First, the development plan intended to build three nuclei for complete living units with self-sufficient functions. The hexagonal pattern can easily contribute to making up a complete living unit with urban facilities scattered around a central nucleus. Moreover, residents who live in the outer part of the hexagonal pattern can easily reach the focal point of the pattern.[23]

Second, topographical conditions were considered in setting up the hexagonal patterns. Three hexagonal patterns are located in plains situated between small hills. The development authorities planned to locate these three hexagonal patterns in the central part of each of three districts, Gunja, Suam, and Banweol. Sizes of hexagons differ according to scales of the plains. For example, the length of one side of the largest hexagon in the Gunja district, 0.537 kilometers, is the largest among the three

disricts, that in the Suam district, 0.417 kilometers, is
the second largest and that in the Banweol district, 0.364
kilometers, is the smallest.

Besides the radial-concentric system, a grid pattern
has been adopted for the CBD, the industrial district, and
areas surrounding the nuclei. Consistent with topographical
conditions, the grid patterns are scattered between small
hills. The grid patterns in residential districts are much
denser than those of the industrial district because house
sites are smaller than factory sites.

Densities of land Use in Banweol

In contrast with Sungnam, Banweol's actual population
is much smaller than planned. According to the development
plan, the population of Banweol was to be 44,100 in 1980,
and 137,600 in 1983.[24] However, its actual population in
1980 was 31,551 and in 1983 it was only 51,442.[25] As a
result of this smaller population, the amount of land per
1,000 population is much greater than expected. In
addition, respective areas of residential (0.301 km^2),
commercial (0.033 km^2), and industrial district (0.158
km^2), per 1,000 population in Banweol are larger than those
of residential (0.022 km^2), commercial (0.002 km^2), and
industrial district (0.004 km^2) in Sungnam in Table 3.2.
Also, respective areas of greenbelt (0.285 km^2) and open
space (0.623 km^2) per 1,000 population in Banweol are larger

than those of greenbelt (0.141 km^2) and open space (0.206 km^2) in Sungnam in Table 3.2. These discrepancies between Banweol and Sungnam and primarily based on population sizes and development policies. Banweol's population is less than planned, which means larger than intended amounts of functional land per unit population in Banweol. In contrast, Sungnam has a larger population than planned, which means smaller than intended amounts of functional land per unit population. At the same time, the development policy for Sungnam which limits urban expansion reinforces the limit on functional land per unit population, particularly in residential, commercial, and industrial districts.

As in Sungnam, the growth of population in Banweol has been based on in-migration. The number of population moving into Banweol in 1982 were 15,585. Of this number, 36.7 percent were from Seoul, 9.8 percent from the three major cities of Busan, Daegu, and Inchon, 36.5 percent from Gyonggi province, and 17.0 percent from eight other provinces.[26] Thus, major sources of in-migration are Seoul and Gyonggi province which are near Banweol.

Summary

Consistent with the previous discussion, several aspects of urban land use differentiate Banweol and Sunganm, based on their different physical and social situations and

TABLE 3.2:   Areas of Functional Districts per 1,000 Persons
             (1982)

District	Area per 1,000 persons in Sungnam	Area per 1,000 persons in Banweol
Residential	0.022 km^2	0.301km^2
Commercial	0.002	0.033
Industrial	0.004	0.158
Greenbelt	0.141	0.285
Open Space	0.206	0.623

SOURCE: Calculated by author

development policies. First, their densities of functional land use are different. All functional areas per unit population in Sungnam are smaller than Banweol's, partly because of Sungnam's surplus population.

There are two dominant reasons for Sungnam's surplus population. One is that Sungnam has had in-migration from southern Korea of migrants who eventually want to find jobs in Seoul. Another reason is that the city has had a strong supported urban development policy to retain and avoid enlarging the presently developed area within the city. Significantly small proportions of residential, commercial, and industrial districts, in comparison with areas of open space and greenbelt, have contributed to the higher population density in Sungnam. On the other hand, the reason for a smaller population in Banweol than planned is that Banweol has received fewer migrants from Seoul than expected. Only one-third of Banweol's in-migration comes from Seoul.

Second, the greenbelt and open space in Sungnam are given more weight in the urban development plan, whereas industrial land uses in Banweol are emphasized. That is, the proportion of the industrial district in Banweol, 11.4 percent of the total new town area, is larger than in Sungnam (1.1 percent), whereas the proportions of a greenbelt and open space in Sungnam (92.5 percent) are larger than in Banweol (64.8 percent).

Third, the development policy for Banweol has emphasized expansion of the developed area within the new town, whereas that of Sungnam has stressed limiting the presently developed area within the city. This discrepancy arises from different social situations, as well as different development policies between the older new town, Sungnam, and the more recent new town, Banweol. Sungnam which has enough population and fairly well developed urban services and facilities has restricted its urban expansion, while Banweol is still constructing urban facilities.

Finally, patterns of street distribution are remarkably different between Banweol and Sungnam. Banweol has a dominant radial-concentric urban pattern as well as grid patterns. It also has balanced urban development with three radial-concentric nuclei, the industrial district, and the CBD. In contrast, the urban pattern of Sungnam is an overall grid system and Sungnam would be regarded as a nucleus city. Their respective urban patterns are basically consistent with their topographical conditions as well as the direction of their urban development plans.

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CHAPTER FOUR

DIFFERENT CHARACTERISTICS OF INTERACTIONS
BETWEEN SUNGNAM AND BANWEOL

This chapter deals with spatial interactions between
the two new towns, Sungnam and Banweol, and other places in
Korea. Spatial interactions generally include migration,
visits between people, journeys to work and shopping, mail
flow and telephone calls, because all these occur over
distance. That is, people, goods, and information move from
one place to another. The spatial interaction in this study
represents the external structure of the new towns. For
measuring degrees of spatial interaction, the gravity model
is considered a useful empirical technique by using data on
a population variable and a distance variable.[1] Through
examining spatial interactions between each new town and
other urban centers using the gravity model, the following
questions can be answered in this research.

1. Is the population variable or the distance vari-
   ble more effective in spatial interaction?

2. Why does more or less spatial interaction occur
   between the new towns and other places than can
   be expected.

The concept of the gravity model is simply that
interactions between two places are positively related to

the masses of the two places and negatively related to the distance between them.[2] That is,

$$I_{ij} = k \frac{M_i \; M_j}{D_{ij}^{\;c}} \qquad (4.1)$$

where, I = interactions between place i and place j

      M = population at i

      m = population at j

      D = distance between i and j

      k and c = parameters

In general, population was used as the measure of mass. The exponents of M_i and M_j in equation 4.1 are unity. However, for precise estimation of the role of the variables, we can allow the exponents to take different values. Replacing the exponents with a symbol representing a number of unknown size, the gravity model becomes:

$$I_{ij} = k \frac{M_i^{\;a} \; M_j^{\;b}}{D_{ij}^{\;c}} \qquad (4.2)$$

In the telephone call problem, one of the masses always represents the population of the new town. For every observation, it is a constants which can be included in the constant, k. Therefore, a simplifed expression of the model is:

$$I_{ij} = k \frac{M_j^{\;b}}{D_{ij}^{\;c}} \qquad (4.3)$$

By taking the logarithm of each side of equation (4.3), a multiple regression equation is produced as:

$$\text{Log } I_{ij} = \text{Log } k + b \text{ Log } M_j - c \text{ Log } D_{ij} \qquad (4.4)$$

The parameters, k, b and c, control of the relationships between variables, I, M and D.

In this research, two multiple regression equations for Banweol and Sungnam were produced using telephone calls between Banweol and eighty-seven other places, and between Sungnam and fifty-one other places. These eighty-seven and fifty-one places were urban centers for which telephone call data with Banweol and Sungnam, respectively, in June, 1983, were available for analysis. Parameters, k, b and c, in the two equations were then compared.

In general, business calls are positively associated with the market function which is related to population size, whereas for personal calls distance is a more important consideration. Banweol is dominated by broad market functions consistent with its industrial role, whereas Sungnam is dominated by a residential function which tends to generate personal interactions. Based on these situations, the hypothesis can be expressed as:

> Interactions with Banweol are more sensitive to the population sizes of other urban centers than those with Sungnam, whereas the interactions with Banweol are less sensitive to the distance between the new town and other urban centers than those of Sungnam. In other words, the value of the parameter (b) for Banweol is larger than that for Sungnam, whereas the value of the parameter (c) for Banweol is smaller than that for Sungnam.

Analysis of Interactions between Sungnam and Other Urban Centers

Estimating Parameters in the Gravity Model for Sungnam

Interactions between Sungnam and fifty-one other urban centers were measured by data on telephone calls in 1983. The number of places for measuring these interactions was based on data available from the Sungnam Telephone Company. The average number of telephone calls per day was used for the interaction model. Using data on telephone calls, population, and distance, the resulting multiple regression equation is expressed as:

$$\text{Log } I_{Si} = 0.845 + 0.495 \text{ Log } P_i - 0.853 \text{ Log } D_{Si} \quad (4.5)$$
$$\qquad\quad (2.876) \quad (7.627) \qquad\quad (-8.533)$$

Values in parantheses are t-value. The constant of a_S, 0.845, is an index of the average propensity of the fifty-one places to interact with Sungnam by telephone. This constant has two meaningful characteristics. First, it includes the value of the variable of Sungnam's population, P_S. That is, P_S is a constant in the model because Sungnam's population is always the same in each comparison and it is included in the constant, a_S. Therefore, if Sungnam has a large population, the constant has a large value, whereas if Sungnam has a small population, the value of the constant is small. Second, the constant, a_S, makes

the overall equation proportional to the rate characteristics of the phenomena in the model. When both monthly and daily data are used, the population and the distance variables remain the same but the magnitude of interactions will differ according to monthly or daily data. The constant, a_{3_S}, is used to adjust for differences in magnitude.

Interactions between Sungnam and other urban centers vary directly with the number of people who live in the other places. As the size of population increases, the number of interactions also increases. If the interaction sharply increases in relation to the size of population in other places the value of b_S is generally large. In contrast, if the size of population has only a minor effect on interaction, the value of b_S is relatively small. When every unit of $\text{Log } P_i$ increases, $\text{Log } I_{Si}$ rises by b_S, 0.495 in the equation.

The effect of distance is opposite from that of population. As one unit of $\text{Log } D_{Si}$ increases, the value of $\text{Log } I_{Si}$ decreases by c_S. If the value of c_S is large, the number of interactions sharply decreases with distance between Sungnam and other urban centers. That is, a larger distance exponent represents a larger effect of distance decay. But if the value of c_S is small, the effect of distance represents a correspondingly small obstacle to interaction. In equation 4.5, when one unit of $\text{Log } D_{Si}$

increases, the value of $\text{Log } I_{Si}$ drops by 0.853. The value of c_S in the equation is a relatively small one which is less than unity. Empirically, estimates of c_S coefficient have ranged between 1.5 and 2.5 according to White and Woods,[4] between 1.3 and 1.8 according to Hammer and Ikle,[5] and 2 was the estimate of Krueckeberg and Silver,[6] and Rugg.[7] A distance exponent of 2 has generally been used.

The value of the coefficient of determination, R^2, is 0.653 in Table 4.1. The coefficient of determination represents the proportion of variation in telephone interaction explained by population and distance. This means that the gravity equation accounts for 65.3 percent of the variation in the telephone call data explained by population and distance data. This figure indicates a substantially large explanation of variation based on the classification of association by Poister.[8]

TABLE 4.1: R^2, Beta Weight, and F-Value for Sungnam to Explain Variation, Standardized Regression Coefficient, and Significance, Respectively.

| R2 | Beta Weight | | F-Value |
	Population	Distance	
0.653	0.728	−0.815	45.237

In explaining significance of the multiple regression equation (4.5), the F-test is used, while the t-test is used for expressing the significance of partial regression coefficients. In the case of Sungnam, the critical F-value, 2.80, is much smaller than the 45.237 F-value produced at the 0.05 significance level. This result rejects the null hypothesis (H_o) that partial regression coefficients are identical $(b_S = c_S = 0)$, and then accepts the alternative hypothesis (H_1) that partial regression coefficients are not identical $(b_S \neq c_S \neq 0)$. This means that the equation is significant in multiple regression.

The t-values of independent variables, population and distance, are 7.627 and -8.533 respectively in equation 4.5. The critical t-value, 1.678, is smaller than the t-value of population, 7.627 and the absolute t-value of the distance, 8.534, at the 0.05 significance level. In this case, the one-tailed t-test is used because the direction of values can be determined. The relationship between interaction and population size is positive, while that between interaction and distance is negative. The result of the t-test rejects the null hypothesis that there are no relationships between population size and telephone call interactions, and between amount of distance and telephone call interactions. Instead, the results accepts the alternative hypothesis that there are relationships between each independent variable and the dependent variable.

It is then necessary to show which partial regression coefficient has more relative importance in contributing to the dependent variable: telephone call interactions. The value of c_s, 0.853, is larger than that of b_s, 0.495 in the equation 4.5. In this case, it is difficult to indicate the relative importance of each independent variable with only the value of partial regression coefficients, b_s and c_s. To determine the relative importance, the standardized regression coefficients, beta weight, can be used. In Table 4.1 the absolute values of beta weight for population and disance are 0.728 and 0.815, respectively. That is, when the standard deviation of population changes by one unit, the standard deviation of telephone call interactions changes by 0.728. Also, when the standard deviation of distance changes by one unit, the standard deviation of telephone call interaction changes by 0.815 units. Therefore, the beta weight of distance affects telephone call interactions more than population size. This results means that, in the case of Sungnam, the partial regression coefficient of D_{Si}, a distance function, is more sensitive to $\text{Log } I_{Si}$ than that of $\text{Log } P_i$, a population size function.

Interpreting Residuals for Sungnam's Case

A residual is defined as the difference between the value of observed interaction (OI) and that of expected interation (EI)[9].

In other words, the residual is produced by subtracting the value of expected Log EI_{Si} from that of observed Log OI_{Si}. So, the residual can have negative value or positive value. With these positive and negative residuals, a map of residuals can be drawn to show how the variation in the transformed data that is not explained by the gravity model is distributed among fifty-one places. In the case of Sungnam, the gravity model accounts for 65.3 percent of variation in telephone call data; 34.7 percent of variation remains unaccounted for (Table 4.1). The map of residuals explains the 34.7 percent residual variation (Figure 4.1). The positive residual represents the value of observed interactions larger than expected, whereas the negative residual indicates that the value of observed interactions less than expected. In the case of Sungnam, the other places are classified into five categories according to the intervals of residual value shown in Figure 4.1: three positive and two negative residuals.

Positive Residuals. Places with positive residuals are concentrated in three regions in the southwestern part of the country, the Seoul Metropolitan Region, and the southeastern region of the country. Only places with many more or less telephone calls than expected were analyzed.

The southwestern region includes Kwangju, Chonju, and Taejon as points of much more telephone traffic than expected. The region consists of Chonnam, Chonbuk, and
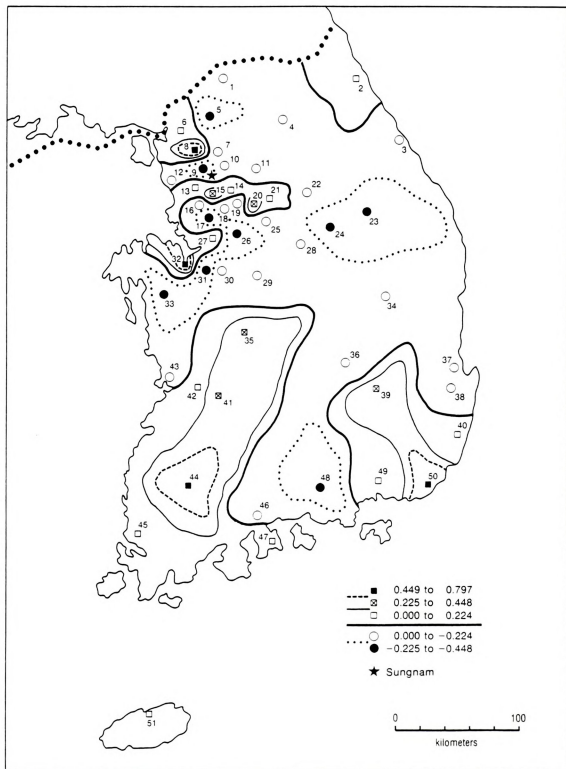
Figure 4.1   Location of Places Based on Residuals (Sungnam).

TABLE 4.2: Fifty-One Places Corresponding with Sungnam

Number	Place	Number	Place
1	Chorwon	26	Ansong
2	Sokcho	27	Pyongtaek
3	Kangnung	28	Chungju
4	Chunchon	29	Chongju
5	Dongduchon	30	Chonan
6	Munsan	31	Onyang
7	Uijongbu	32	Sinjang
8	Bundang	33	Hongsong
9	Seoul	34	Andong
10	Kurye	35	Taejon
11	Yangpyeong	36	Gumi
12	Inchon	37	Pohang
13	Anyang	38	Kyongju
14	Gwangju	39	Taegu
15	Pangyo	40	Ulsan
16	Suwon	41	Chonju
17	Osan	42	Iri
18	Yongin	43	Kunsan
19	Konjiam	44	Kwangju
20	Ichon	45	Mokpo
21	Yoju	46	Sunchon
22	Wonju	47	Yosu
23	Yongwol	48	Chinju
24	Chechon	49	Mason
25	Janghowon	50	Pusan
		51	Cheju

Chungnam provinces. The greater than expected number of telephone calls from Sungnam to these cities may be based on personal calls, because this region is the source of a considerable proportion of the migration into Sungnam, to be exact, 35.6 percent of Sungnam's residents. [10] Kwangju has much greater telephone frequencies than expected. It is the site of government in Chonnam province and is situated far from Sungnam, but its greater than expected telephone interactions may be based on strong personal relationships because Chonnam province is the second leading place of origin of Sungnam's residents, accounting for 14.4 percent, out of the nine provinces and two municipalities of Seoul and Pusan. It is widely known that a large portion of Sungnam residents originate from Chonnam and Chonbuk provinces. [11] Chonju and Taejon are provincial capitals of Chonbuk province and Chungnam province, respectively, and have much greater than expected telephone interaction with Sungnam. Personal telephone calls may explain the larger than expected frequency of telephone calls. Chonbuk province is the source of 10.9 percent of Sungnam's residents and Chungnam province is the source of 10.5 percent of Sungnam's residents, representing the third and fourth most important provinces of origin. [12]

The Seoul Metropolitan Region includes four places of large positive residuals: Bundang, Sinjang, Pangyo and Ichon. These places are concentrated around Sungnam and

their telephone traffic with Sungnam may be closely related to personal rather than business activities since they have no particular commercial or industrial base. The greater than expected frequency of telephone calls may be related to the fact that the largest portion of Sungnam's residents originated from Gyonggi province or the close proximity of these places to Sungnam. The shorter the distance in Korea, the lower the cost of long distance calls. Close proximity between Bundang and Sungnam could be one reason for an extremely large number of telephone calls. Since Bundang has no dominant business and industrial facilities, administrative functions, or cultural facilities, strong personal relationships between residents of the two places are likely to explain the frequency of calls. Pangyo and Ichon were also in contact with Sungnam more frequently than predicted and are also in close proximity so that short distances may have facilitated low rates and increased calling from Sungnam. In terms of personal relationships, the very close proximity between those towns and Sungnam may generate more interpersonal calls than otherwise predicted.

Finally, the southeastern region includes Pusan and Taegu where telephone interaction with Sungnam was greater than estimated. A larger number of calls between Sungnam and Pusan than estimated is probably due to business rather than personal calls. Pusan is the origin of only a small

portion of Sungnam residents, 1.3 percent, but, based on its proximity to Japan, it has the largest port for foreign trade in Korea and exports manufactured products from Sungnam. In 1980, sixty-nine industries in Sungnam exported textile, chemical, machinery, electronic, and electrical products worth $212,059,000.[13] Raw materials used in Sungnam can also be imported through Pusan. These exporting and importing activities could be a major source of the more frequent than estimated calls from Sungnam to Pusan. Taegu is the provincial capital of Gyongbuk province and more calls than estimated could also be related to business activities. Taegu is famous for spinning and raw silk manufacturing in Korea. These textile manufacturing activities, connected with textile industries in Sungnam, could be a source of the greater than expected frequency of calls.

Negative Residuals. Places of negative residuals are scattered in the Seoul Metropolitan Region and Kangwon province. The Seoul Metropolitan Region contains six places of much fewer calls than expected: Seoul, Dongduchon, Osan, Ansong, Onyang, and Hongsong. There are various reasons that may explain the fewer calls than expected. Seoul's fewer than expected calls may result from the large number of Sungnam residents making trips between Sungnam and Seoul. In 1983, about 46,000 residents of Sungnam a day made round trips between Sungnam and Seoul.[14] These residents are not

likely to use long distance telephone from Sungnam to Seoul because they have the ability to visit Seoul in person and are likely to make any necessary local calls while they are in Seoul. For example, daily commuters can use public phones or telephones at their work place in Seoul to call Seoul residents. Osan and Dongduchon also have fewer calls than expected. Osan and Dongduchon are military cities which have army bases, which could be a reason for fewer personal calls from Sungnam. In order words, Sungnam's personal calls are not likely to have large effect on the military cities. Hongsong, Ansong, and Onyang are located in rural areas which are relatively isolated. This isolated location may result in fewer calls from Sungnam to them than predicted.

Kangwon province which is situated in the central eastern part of Korea, has many places of negative residuals. The province is more isolated than others because of several large mountain ranges. Particularly, Chechon and Yongwol have many fewer calls from Sungnam than expected. These places are both relatively isolated and have military bases which may result in fewer calls than expected. Another place which is isolated in the southern coast area, Chinju, also has fewer calls than predicted. That area is the origin of a very small portion of Sungnam residents. [15] Furthermore, Chinju is a center of a rural area

located far from Sungnam which may result in fewer calls from Sungnam to Chinju than predicted.

Analysis of Interactions between Banweol and Other Places

Estimating Parameters in the Gravity Model for Banweol

The data on telephone calls from Banweol to eighty-seven places were used for the interaction model. These eighty-seven places are all the places with which Banweol corresponds every day. Using the average number of calls a day, the resulting multiple regression equation is expressed as:

$$\text{Log } I_{Bj} = -1.440 + 0.665 \text{ Log } P_j - 0.539 D_{Bj} \qquad (4.6)$$
$$(-4.600) \quad (12.520) \qquad (-6.136)$$

In the equation 4.6, values in parantheses are t-values, and the constant a_B has a negative value of -1.440. The constant, a_B, includes the value of Banweol's population variable, P_B. P_B is a constant in the gravity model because Banweol's population remains the same in each of eighty-seven comparisons. The negative value of the constant indicates a very small value based on the small population of Banweol.

Size of population is directly related to the frequency of telephone call interactions. If one unit of Log P_j increases, the value of Log I_{Bj} increases by b_B or 0.665 units. In comparison with Sungnam's equation (4.5), the value of b_B in Banweol's equation (0.665) is larger than

that of Sungnam (0.495). This indicates that the population variable in the Banweol equation (4.6) is more sensitive to the interaction variable of telephone calls than that in the Sungnam equation (4.5).

According to the estimation of each multiple regression equation for Banweol and Sungnam, the original hypothesis that the partial coefficient of Banweol (b_B) is larger than that of Sungnam (b_S) was supported. In this study, population sizes of other places were more sensitive to interactions of the industrial base than interactions of the residential base.

Meanwhile, the effect of distance was opposite to that of population size in the gravity model. With the increase of distance, interactions decreased. In equation 4.6, the partial regression coefficient of distance, c_B, has a value of 0.539, so that if one unit of Log D_{Bj} increases, the value of Log I_{Bj} decreases by 0.539. The value of c_B (0.539) is less than unity and relatively small, which means that the effect of distance is a minor barrier to telephone call interactions. Moreover, compared with Sungnam, the value of c_B in the Banweol equation of 0.539 is smaller than the c_S of 0.853 in the Sungnam equation. This means that the distance effect of Sungnam is more sensitive in interactions than that of Banweol. This result supports the original hypothesis that the value of the partial coefficient in the Sungnam equation, c_S, is larger than that

in the Banweol equation, c_B. As a result, the population size function of Banweol with its industrial base is more sensitive to telephone call interactions than that of Sungnam with its residential base, whereas the distance function of Sungnam is more sensitive to telephone call interactions than that of Banweol.

The coefficient of determination, R^2, is 0.694 in Table 4.3. This indicates that the gravity model equation (4.6) accounts for 69.4 percent of the variation in the telphone call data explained by population and distance data. This is a substantially large explanation.

TABLE 4.3: R^2, Beta Weight, and F-Value for Banweol to Explain Variation, Standardized Regression Co-efficient, and Significance, Respectively.

| R2 | Beta Weight | | F-value |
	Population	Distance	
0.694	0.755	-0.370	95.427

To explain the significance of equation 4.6, the F-test was used. The F-value, 95.427, was found to be larger than the critical F-value, 2.71 at the 0.05 significance level. According to this result, the null hypothesis that partial coefficients are identical ($b_B = c_B = 0$) was rejected. Instead, the result accepted the alternative hypothesis that partial coefficients are not identical ($b_B \neq C_B \neq 0$), that the multiple regression equation (4.6) is significant.

One-tailed t-test was used for explaining the significance of the relationship between each independent variable and the dependent variable because it allows for determination of the direction of relationship. Given that the size of population is positively related to interactions, while the amount of distance is negatively related to interactions, the t-value of population, 12.520, and absolute t-value of distance, 6.136, were found to be larger than the critical t-value of 1.670 at the 0.05 significance level. This result rejected the null hypothesis that no relationship exists between population size and telephone calls, and between distance and telephone calls. The alternative hypothesis that there are relationships between each independent variable and the dependent variable was accepted.

Interpreting Residuals in Banweol's Case

A map of residuals can show how variation in the transformed data, that was not explained by the gravity model, is distributed among eighty-seven places. The multiple regression equation 4.6 explained 69.4 percent of the variation, while 30.6 percent of the variation in the telephone call data remained unexplained (Table 4.3). The map of residuals accounts for the unexplained 30.6 percent of variation. In Figure 4.2, eighty-seven places are classified into five categories based on intervals of
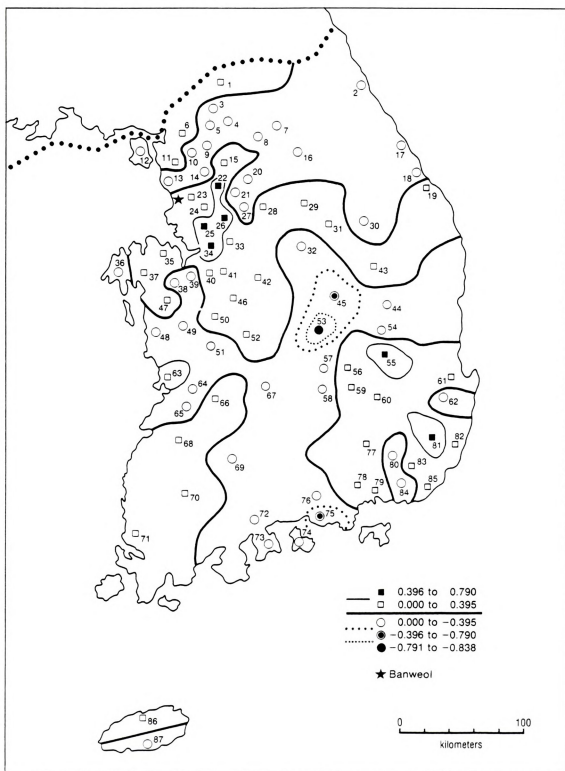
Figure 4.2   Location of Places Based on Residuals (Banweol).

TABLE 4.4: Places Corresponding with Banweol

Number	Place	Number	Place
1	Chorwon	45	Chomchon
2	Sokcho	46	Chochiwon
3	Chongok	47	Hongsong
4	Pochon	48	Daechon
5	Dongduchon	49	Chongyang
6	Munsan	50	Gongju
7	Chunchon	51	Nonsan
8	Gapyong	52	Taejon
9	Uijongbu	53	Sangju
10	Wondang	54	Uisong
11	Kimpo	55	Kumsong
12	Ganghwa	56	Gumi
13	Inchon	57	Kimchon
14	Seoul	58	Daeya
15	Kurye	59	Yegwan
16	Hongchon	60	Taegu
17	Kangnung	61	Pohang
18	Donghae	62	Gyongju
19	Samchok	63	Kunsan
20	Yangpyeong	64	Iri
21	Gwangju	65	Kimje
22	Sungnam	66	Chonju
23	Anyang	67	Muju
24	Suwon	68	Chongup
25	Osan	69	Namwon
26	Yongin	70	Kwangju
27	Ichon	71	Mokpo
28	Yoju	72	Sunchon
29	Wonju	73	Yosu
30	Yongwol	74	Namhae
31	Chechon	75	Samchonpo
32	Chungju	76	Chinju
33	Ansong	77	Changryong
34	Pyongtaek	78	Haman
35	Dangjin	79	Masan
36	Taean	80	Milyang
37	Sosan	81	Eonyang
38	Yesan	82	Ulsan
39	Sinjang	83	Yangsan
40	Onyang	84	Kimhae
41	Chonan	85	Pusan
42	Chongju	86	Cheju
43	Yongju	87	Sogwipo
44	Andong		

residual value: two categories of positive residuals and three categories of negative residuals.

Positive Residuals. Places of much greater positive residuals are concentrated in the Seoul Metropolitan Region and the southeastern part of the country. The Seoul Metropolitan Region includes Osan, Pyongtaek, Yongin, and Sungnam that experience greater than expected calls from Banweol. These locations are near Banweol and several rationale may explain the greater than expected telephone traffic. Osan and Pyongtaek have army bases, and are located relatively near Banweol. These military functions and close location may explain the reason for more calls than expected. The dominant industrial function of Banweol produces a large amount of correspondence with military cities unlike Sungnam whose residential function decreases such interaction. Yongin is famous for such tourist attractions as a Natural Farm and a Folk Village, as well as for spinning industries. These tourist facilities may require food and manufacturing products from Banweol that result in frequent telephone interaction. Meanwhile, although Sungnam has a dominant residential function, it also has three industrial districts which may require more calls from Banweol to Sungnam than would otherwise be expected.

The southeastern part of the country contains Kumsong and Eonyang as places with high positive residuals

indicating greater than expected telephone interactions with Banweol. Kumsong produces mineral resources such as graphite and gold and is located on the Jungang railroad line connecting Seoul and Kyongju. Eonyang produces iron ore and is located on the Gyongbu freeway connecting Seoul and Pusan. These mineral resources and convenient facilities for transporting them may result in more calls than would otherwise be expected.

Negative Residuals. Three places receiving much fewer calls than predicted were Sangju, Chomchon, and Samchonpo. Sangju and Chomchon are rural centers located in isolated basins and have no particular industrial functions. The lack of industrial base and the physical condition could result in fewer calls from Banweol than would otherwise be predicted. Another place, Samchonpo, is situated in the southern coastal area of the country far from Banweol and also has no strong industrial base. Although Samchonpo is one of the most important fishing ports in Korea, fish and other marine products are seldom sent from Samchonpo to Banweol because of the long distance. The absence of an industrial base and the long distance largely explain the relative lack of calls from Banweol to Samchonpo.

Summary

Through examination of the multiple regression equations for Sungnam and Banweol, several detailed findings can be summarized.

First, the result of comparisons of the partial coefficients for population and distance between Sungnam and Banweol supported the hypothesis that the population size function of Banweol affects telephone interactions more than that of Sungnam, while the distance function of Banweol has contributed less to the interactions than that of Sungnam. This result can be related to the observation that business calls based on Banweol's industrial dominance correspond with market volume which is related to population size, whereas personal calls based on Sungnam's residential dominance significantly correspond with distance.

Second, when the data on telephone calls were used in the gravity model, the distance exponents in both Banweol's and Sungnam's equations were less than unity. Considering that many studies of migration, shopping trips, and intercity travel flows have placed the distance exponent at about 2, the exponents for Banweol and Sungnam were relatively small. This result indicates that when data on telephone calls are used, distance decay may be regarded as a minor barrier.

Third, regional origins of households could be closely related to personal interactions by telephone. A dominant example was the frequency of telephone calls between Sungnam and the Kwangju area, which was the origin of a large portion of Sungnam's residents.

Fourth, mineral resources and convenient transportation facilities were shown to be closely related to interactions with the industrial new town. Examples were the greater than expected frequency of calls between Banweol and Kumsong, and between Banweol and Eonyang.

Fifth, military cities were seen to be more closely related to the industrial new town than the residential new town. There were many more calls between the industrial new town and military cities than expected, whereas there were fewer calls between the residential new town and the military cities Osan and Pyongtaek.

Finally, interactions by telephone calls were found to be more closely related to functions of the new towns. That is, the number of telephone calls were based more on the industrial or residential function of the new town.

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CHAPTER FIVE

MEASUREMENTS OF GOAL ACHIEVEMENT IN
SUNGNAM AND BANWEOL: INDUSTRIAL
DIVESIFICATION AND ECONOMIC BASES

This   chapter   reports some aspects of the   goal
achievement of the new towns of Sungnam and Banweol.   As
mentioned previously, the most important goal of new towns
is to establish self-sufficient and balanced development in
employment and living conditions. This chapter concentrates
on   an   examination of self-sufficiency   and   balanced
development in the economic structure of the two new towns,
Sungnam and Banweol.   In examining this goal achievement,
two   catgories   are   considered: (1)   industrial
diversification, and (2) basic and non-basic activities of
the new towns.   The industrial diversification within the
new towns represents the internal structure of industrial
composition, whereas basic and non-basic activities relate
to the external structure, as well as the   internal
structure, of the economic bases of the new towns.

Some Aspects of Industrial Diversification in the New Towns

One   goal of new town development is   industrial
diversification in terms of categories of industries and

employment in the industries.   Gratton states the goal of
new town development as:[1]

> A diversified industrial structure is a major
> policy objective of the new town programme...
> New towns should be self-contained and balanced
> communities for working and living. Such balance
> can only be achieved through a diversified
> industrial structure.

Only the manufacturing sector is dealt with in
examining the degree of industrial diversification in this
study.   The degree of industrial diversification indicates
the degree of inequality of distribution between industrial
categories and employment.

The idea of a diversified industrial structure for
community development has been supported by many studies,
such as those by Rodgers, Conkling, Clemente and Sturgis,
Parr, Conroy, and Taylor.[2]

For explaining the industrial diversification based on
industrial categories and employment, the Gini index is
useful.[3]   The Gini index represents the degree of inequality
of distribution between industrial categories and the number
of employees of the industries in the new towns, based on
the Lorenz curve shown in Figure 5.1.[4]   The closer the
Lorenz curve comes to the diagonal, the more even the spread
of employment over the industrial categories.   The Gini
index measures the area between the diagonal of perfect
equality and the Lorenz Curve. That is, it is defined as
the ratio A/A+B, and ranges from 0 to 100.   Zero means
perfect   equality   of   distribution   (Industrial

Cumulative share of
total employment (Y)

Diagonal

A

Lorenz Curve

B
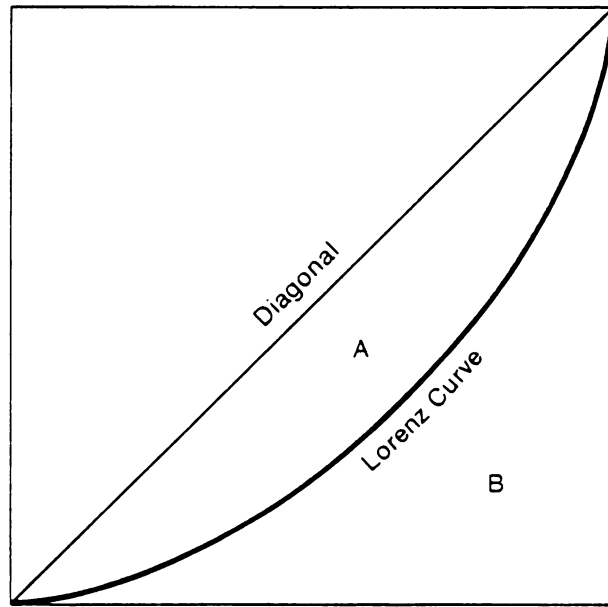
Cumulative share of numbers
of industrial categories (X)

Figure 5.1   Lorenz Curve.

diversification) and one hundred means perfect indquality (domination by a single firm).

The Gini index (G) can be calculated by using the following equation:[5]

$$G = 100 \left[\frac{\frac{1}{2} - \frac{1}{2} \sum_{i=1}^{k} X_i \left(\sum_{j=1}^{i-1} Y_j + \sum_{j=1}^{i} Y_j \right)}{\frac{1}{2}} \right] \qquad (5.1)$$

where, X_i = unit of categories of industries in a town

Y_i = cumulative share of employment

Y_j = length of parallel lines of trapezoids formed by plotting the adjacent cumulative Y values as functions of their corresponding cumulative X values.

Poister suggested general categories of associations between two variables from 0 to 100.[6] The categories of the criteria are as follows: (a) 0: no association; (b) 1-9: negligible; (c) 10-29: low; (d) 30-49: moderate; (e) 50-69: substantial; (f) 70-99: very strong; and (g) 100: perfect asociation. This researcher adopted Poister's criteria for explaining the Gini index in this study.

In general, the larger the size of a population in a city, the more diversified its industry. This is based on many studies which mentioned the city of the larger population has more industrial diversification.[7] The population of Sungnam is about eight times that of Banweol. In accordance with this situation the following hypothesis regarding industrial diversity states:

> The degree of industrial diversification in
> Sungnam is larger than that of Banweol.

In order to examine this hypothesis, degree of
diversification of industries in Sungma and Banweol were
studied using the Gini indexes.

Industrial Diversification in Sungnam

Industries in Sungnam were concentrated in three small
industrial districts in the city (Figure 3.2). These
industries were generally light industries. Data on
industrial categories and employees of the industries in
1979, 1980, and 1982 were used for producing the Gini
indexes. These industries were classified into fifty-five
categories (three digit industrial categories) in Table 5.1
according to the U.S. Standard Industrial Classification
(SIC) code of 1979.

The Gini indexes in 1979, 1980 and 1982 are shown in
Table 5.2 and the Lorenz curves are shown in Figure 5.2.
These Gini indexes and Lorenz curves were produced by using
the data on employment for each industrial category, which
were ranked from smallest employment to largest employment.[8]
The percentage data are cumulative. Each industrial
category has the same proportion, whereas employment in each
industrial category has a different proportion based on the
number of employees in each cateogory.

The value of the Gini index for 1979 was the largest, 56.834, whereas that of 1982 was the smallest, 54.666. These values were relatively large in explaining the inequality of industrial distribution. According to the criteria for association between two variables from 0 to 100 by Poister,[9] degrees of industrial diversification in Sungnam in 1979, 1980 and 1982 were moderate. This means that the composition of industries in Sungnam was not highly diversified. However, the value of the Gini indexes decreased slightly over the period between 1979 and 1982. There were few changes in distribution of industrial categories and employment.

In 1979, 147 firms in Sungnam had a total of 34,116 employees. In comparison with the number of firms and employees in Banweol, the average number of employees in each firm in Sungnam, 220, was much larger than that of Banweol at 68. Based on the two digit industrial classification, food, textile, primary metals, and electric and electronic products industries had large numbers of employees, more than 3,000, respectively. Based on the three digit industrial classification, bakery, knitting, footwear, nonferrous rolling, and communication equipment industries had large numbers of employees, respectively. This situation indicated that consumer goods, such as bakery, knitting and footwear products, were dominant among Sungnam's industries in 1979, based on Sungnam's large

TABLE 5.1: Industrial Categories in Sungnam

Industrial Category (2 digits)	Industrial Category (3 digits)	1979			1980			1982		
		No. of Firms	No. of Employees	Sub Total	No. of Firms	No. of Employees	Sub Total	No. of Firms	No. of Employees	Sub Total
Food (20)	Bakery	5	3,044		4	2,764		4	2,939	
	Beverages	2	140	3,290	2	131	3,003	2	105	3,153
	Misc. Foods	1	106		1	108		1	109	
Textile (22)	Weaving, cotton	3	628		3	751		3	856	
	Weaving, synthetics	2	86	3,433	2	141	3,662	3	221	3,943
	Knitting	10	2,303		10	2,409		11	2,627	
	Misc. textiles	1	416		1	361		2	239	
Apparel/ other textile (23)	Men's suits	1	521		1	543		1	542	
	Women's wear	1	339		1	335		1	350	
	Fur goods	3	370	2,420	3	427	2,829	3	540	3,342
	Misc. apparel	3	505		3	511		5	715	
	Misc. fabricated products	3	685		4	1,013		6	1,195	
Lumber/wood (24)	Plywood	1	54	54	2	269	269	2	133	133
Furniture (25)	Household	7	1,530	1,530	7	1,670	1,670	6	1,200	1,200
Paper (26)	Misc. paper	3	442	442	3	379	411	4	446	499
	Building paper				1	32		1	53	
Printing (27)	Books	1	513	949	1	500	1,105	1	548	874
	Commercial	4	436		4	605		2	326	
Chemical (28)	Inorganic				1	28		1	128	
	Plastic/Synthetics	7	975		7	672		8	728	
	Drugs	5	447	1,540	6	703	1,599	6	898	1,988
	Paints	1	81		2	159		2	159	
	Misc. Chemicals	2	37		2	37		2	75	
Petroleum (29)	Misc. Petroleum	1	28	28						
Rubber (30)	Tires	2	1,298		3	1,202		2	1,188	
	Reclaimed	2	129	1,898	2	124	1,796	3	572	2,219
	Fabricated	2	471		2	470		2	459	
Leather (31)	Footwear	5	3,557	4,485	4	2,508	3,470	4	3,675	4,548
	Gloves	3	928		3	962		3	873	

TABLE 5.1: Industrial Categories in Sungnam - Continued

Industrial Category (2 digits)	Industrial Category (3 digits)	1979			1980			1982		
		No. of Firms	No. of Employees	Sub-Total	No. of Firms	No. of Employees	Sub-Total	No. of Firms	No. of Employees	Sub-Total
Primary Metal (33)	Basic Steel	6	341		7	342		7	368	
	Iron Foundry	1	51		1	51				
	Nonferrous roll.	4	2,616	3,055	4	2,212	2,663	3	2,131	2,540
	Misc. metal	2	47		3	58		2	41	
Fabricated metal (34)	Plumbing/Heating	1	292		2	357		2	241	
	Screw/bolt	1	254	546	1	180	537	1	219	460
Machinery (35)	Farm machinery	2	362		1	81		1	75	
	metal working	1	114		1	52		1	127	
	Office machine	2	627		2	469		3	752	
	Misc. Machinery	6	592	1,695	4	370	972	4	371	1,325
Electric/ electronic (36)	Electric apparatus	6	631		7	841		6	965	
	Household appliacnes	1	20		2	28		1	50	
	Electric lighting				2	134		2	70	
	Radio/TV	4	312		3	360		4	365	
	Communication	3	3,951		3	3,304		3	3,366	
	Electronic Component	1	90		4	273		5	587	
	Misc. electrical	4	615	5,619	5	511	5,451	5	759	6,162
Transporta- tion (37)	Motor vehicle	3	194		4	277		5	303	
	Railroad	1	236	430	1	236	513	1	236	539
Instruments (38)	Optical	2	264		2	341		2	235	
	Medical	2	248		3	310		3	410	
	Photographic	6	414		4	373		4	337	
	Watches	2	1,022		3	1,502		2	1,371	
	Toy-7 sporting	2	411	1,948	2	305	2,526	2	225	2,353
Misc. Manu- facture (39)	pen/pencils	3	343	754	4	446	751	4	677	958
	Misc. manufactures							1	56	
Total		147	34,116	34,116	160	33,227	33,227	165	36,236	36,236

Sources: The Sungnam City Government, Sungnam Statistical Yearbook, 1980, pp. 180-93, and 1981, pp.162-73. The Control Office of Korea Industrial Estates, Korea Industrial Directory, 1982, pp. 229-54.

population. Meanwhile, plywood, miscellaneous chemicals, petroleum, iron foundries, miscellaneous metals, and household appliance industries, had very small numbers of employees. Most of these industries generally manufacture producer goods. Therefore, Sungnam was found to be dominant in the manufacture of consumer rather than producer goods.

TABLE 5.2: Gini Indexes in Sungnam

Index	1979	1980	1982
Gini	56.834	55.117	54.666

. In 1980, 160 firms in Sungnam employed a total of 33,227 persons. Although the number of firms increased in 1980, the number of employees decreased compared to 1979. The average number of employees of each firm in 1980 was smaller than in 1979. This was perhaps due to the serious economic recession at that time. Characteristics of composition of industries in 1980 were very similar to those of 1979. Bakery, knitting, footwear, nonferrous rolling, and communication equipment industries had larger numbers of employees, whereas miscellaneous chemicals, iron foundries, miscellaneous metals, metal working, and household applicance industries had small numbers of employees in 1980.

Cumulative Percent
of Employment
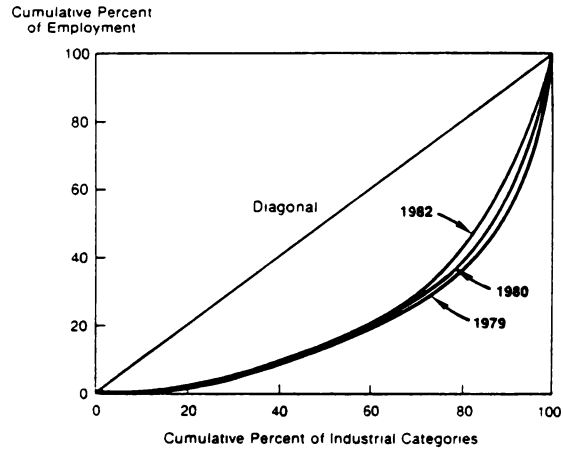
Figure 5.2   Lorenz Curves Showing Industrial
Diversification in Sungnam

Cumulative Percent
of Employment
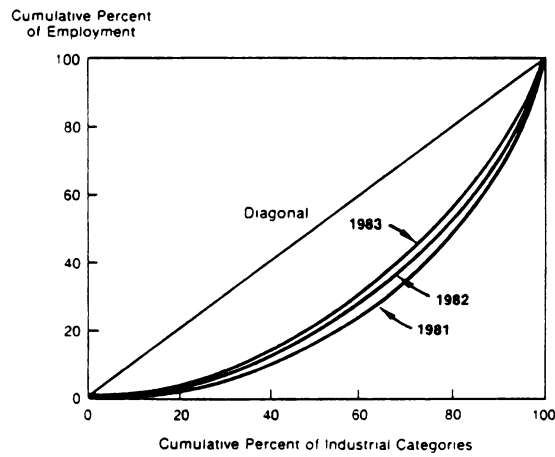
Figure 5.3   Lorenz Curves Showing Industrial
Diversification in Banweol

Cumulative Percent
of Employment
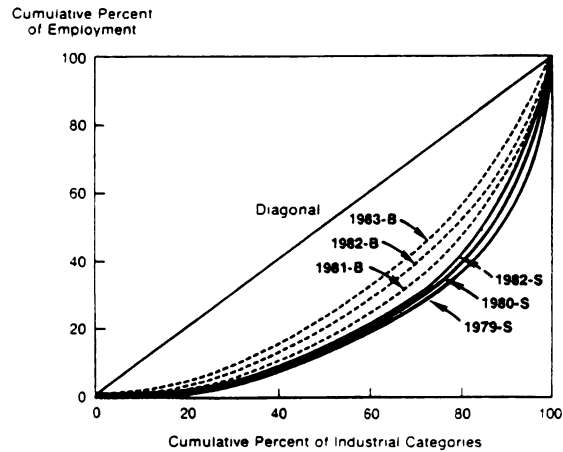
Figure 5.4   Comparison of Industrial Diversification
between Sungnam and Banweol

In 1982, 165 firms in Sungnam had 36,236 employees. The number of firms and employees slightly increased in 1982 over 1980 and industrial distribution was the most diversified in 1982, according to the Gini index. The larger the size of the population in Sungnam, the more diversified its industry over time. The respective sizes of industrial categories, as to employment, were very similar to those of 1979 and 1980. That is, Sungnam was dominant in industries producing consumer goods, rather than producer goods.

Industrial Diversification in Banweol

All manufacturing firms in Banweol were concentrated in one industrial district. That industrial district has mainly light industries. Data on industrial categories and employees who worked in the industrial district in Banweol in 1981, 1982, and 1983, which were available for this study, were used for producing the Gini indexes. These industries were classified into sixty categories (three digit industrial categories) in Table 5.3 based on the SIC code of 1979.

The Gini indexes for Banweol in 1981, 1982, and 1983 are shown in Table 5.4 and Figure 5.3. Degrees of industrial diversification in Banweol were substantial based on the criteria by Poister. Values of the Gini indexes for Banweol were smaller than those for Sungnam. This means that

TABLE 5.3: Industrial Categories in Banweol

Industrial Category (2 digits)	Industrial Category (3 digits)	1981 No. of Firms	1981 No. of Employees	1981 Sub-Total	1982 No. of Firms	1982 No. of Employees	1982 Sub-Total	1983 No. of Firms	1983 No. of Employees	1983 Sub-Total
Food (20)	Dairy				1	37	63	1	37	179
	Fruit				1	13		1	15	
	Fats/oils				1	13		2	89	
	Misc. foods							3	38	
Textiles (22)	Weaving, cotton	4	176	867	4	270	1,245	4	268	1,867
	Weaving, synthetics	2	93		5	403		6	473	
	Knitting	3	153		3	283		3	291	
	Thread	3	309					4	496	
	Misc. textile	2	136		5	289		4	339	
Apparel/other textiles(23)	Fur	1	45	536	1	144	647	1	146	642
	Misc. apparel	1	45		3	220		4	216	
	Misc. fabricated products	4	446		3	283		3	280	
Lumber/wood (24)	plywood	1	56	56	2	332	332	2	319	319
Furniture(25)	Misc. furniture							3	161	161
Paper (26)	Misc. converted	2	121	308	2	87	530	2	85	541
	Paperboard	2	187		5	333		5	349	
	Building paper				1	110		1	107	
Printing(27)	Misc. printing	2	240	240	3	399	399	3	401	401
Chemical (28)	Inorganic	3	221	940	4	286	2,243	5	330	2,403
	Plastic/synthetics	5	225		7	354		6	287	
	Drugs	2	136		5	316		8	420	
	Soap/cleaners	2	24		4	86		6	155	
	Industrial Organic				4	182		7	181	
	Misc. chemical	12	334		19	1,019		20	1,030	
Petroleum(29)	Refining	1	44	44	2	101	101	2	104	104
Rubber (30)	Rubber/plastic	1	15	851	1	12	910	1	17	983
	Hose/belt	4	213		3	203		4	235	
	Misc. plastics	10	623		10	695		10	731	
Leather(31)	Finishing	2	99	607	3	232	728	4	275	708
	Handbags	1	508		2	496		2	433	
Clay/glass (32)	Clay	1	21	53	2	62	349	1	47	253
	Pottery	1	32		2	28		2	30	
	Misc. products				3	259		5	176	

TABLE 5.3: Industrial Categories in Banweol - Continued

Industrial Category (2 digits)	Industrial Category (3 digits)	1981			1982			1983		
		No. of Firms	No. of Employees	Sub-Total	No. of Firms	No. of Employees	Sub-Total	No. of Firms	No. of Employees	Sub-Total
Primary metal (33)	Basic steel	11	602		10	465		10	373	
	Nonferrous metal	5	137		4	117		5	202	
	Nonferrous rolling	7	417	1,865	7	482	1,688	8	520	1,716
	Nonferrous foundry	8	616		9	456		6	398	
	Misc. products	4	93		5	168		5	243	
Fabricated metal (34)	Hand Tools	2	137		2	146		3	232	
	Plumbing/heating	6	389	790	6	442	885	6	428	1,035
	Screw/bolts	3	264		4	297		5	375	
	Construction	4	298		7	508		7	480	
Machinery (35)	Metal working	1	36		1	63		1	58	
	General	5	223		5	163		5	154	
	Office machine	4	338	1,504	3	268	1,744	4	607	1,992
	Refrigeration	1	70		2	82		3	196	
	Misc. machine	7	539		9	660		6	497	
Electric/electronic (36)	Distributing	4	349		4	369		4	353	
	Apparatus	6	775		6	671		5	678	
	Household appliances	6	243		5	284		4	228	
	Lighting/wiring	3	2,019	3,824	3	223	1,943	4	341	2,141
	Radio/tv	2	117		1	27		2	70	
	Electronic components	5	257		6	288		5	258	
	Misc. electrical	1	64		1	81		2	213	
Transportation (37)	Motor vehicles	17	1,338		16	1,668		15	1,612	
	Ship repairing	1	184	1,681	1	195	2,172	1	194	2,222
	Railroad equipment	2	63		3	230		3	323	
	Motorcycle/bike	1	96		1	79		1	93	
Instrument (38)					2	142	142	2	142	142
Misc. Manufacturing (19)									98	98
Total		188	12,178	12,178	232	15,979	15,979	258	17,927	17,927

SOURCE: The Office of the Banweol Industrial District, Industrial Status, 1981, pp. 12-41; 1982, pp. 8-51 and 1983, pp. 8-51.

industries in Banweol were more diversified than those of Sungnam. This result did not support the hypothesis that the degree of industrial diversification in Sungnam is greater than that of Banweol. Even though the size of population in Banweol was one-eighth that of Sungnam, the composition of industries in Banweol was more diversified than that of Sungnam. Thus, the tendency for larger cities to have more diversified industry (manufacturing) was not supported by the experience of these new towns in the Seoul Metropolitan Region. Sungnam had larger differences between the number of employees in respective industrial categories than Banweol. For example, the five smallest industrial categories in terms of number of employees in Sungnam in 1982 had 41, 50, 53, 56 and 70 employees each, respectively, whereas the five largest industrial categories in terms of number of employees had 3,675, 3,366, 2,939, 2,627, and 2,131 employees each, respectively. In contrast, Banweol had smaller differences in numbers of employees between industrial categories than Sungnam. For instance, the five smallest industrial categories in Banweol in 1982 had 12, 13, 27, 28 and 62 employees each, respectively, while the five largest industrial categories had 1,668, 1,019, 695, 660, and 508 employees each, respectively. Banweol had a larger number of firms than Sungnam, but differences in employment among industrial categories in Banweol were smaller than those in Sungnam. These characteristics

reflected different degrees of industrial diversification between Sungnam and Banweol. In other words, industries in

TABLE 5.4: Gini Indexes in Banweol

Index	1981	1982	1983
Gini	46.907	43.992	40.870

Banweol were more diversified than those of Sungnam. The Gini indexes for Banweol decreased over the period from 1981 to 1983 indicating that the degree of industrial diversification in Banweol gradually increased over that time.

In 1981, 188 firms in Banweol employed 12,178 workers. Distribution of employment in Banweol was much different from that of Sungnam. In contrast to Sungnam's dominance in manufacturing consumer goods, Banweol was dominant in manufacturing producer goods such as primary metals, machinery, electric and electronic products, and transportation equipment. Each of these industrial categories had more than one hundred employees. According to the three digit industrial classification, vehicle equipment, electrical industrial apparatus, nonferrous foundries, and basic steel products had the largest number of employees in comparison with other industrial categories

in Banweol. In contrast, the industrial categories of textiles, soaps and cleaners, pottery, and miscellaneous clay and glass products had considerably smaller numbers of employees. Banweol did not have any food and instrument products industries in 1982.

The number of firms in Banweol increased from 188 in 1981 to 232 in 1982. These 232 firms in Banweol employed 15,979 persons. In 1982, the industrial categories of chemicals, primary metals, machinery, electric and electronic products, and transportation equipment had large numbers of employees in comparison with other industrial categories in Banweol. The number of employees in chemical products and transportation equipment increased especially remarkably over time. According to the three digit industrial classification, the category of vehicle equipment was the most dominant in number of employees in Banweol. This could be due to an emphasis on car-exports by the government.

In 1983, 258 firms in Banweol had 17,927 employees. In comparison with Sungnam, the number of firms in Banweol was much larger but the total number of employees was much smaller than in Sungnam. Likewise, the average number of employees of each firm in Banweol was 68, much fewer than the 220 in Sungnam or a ratio of 3.4. The distribution of industries in Banweol in 1983 was the most diversified. The larger the population grew in Banweol, the more diversified

its industry became over time. In contrast to the slight increase of industrial diversification in Sungnam, the increase of industrial diversification in Banweol was rapid and became larger each year. The rapid industrial diversification may have been based on the development policy for Banweol, which emphasized moving small size industries from Seoul to Banweol. The majority of industries in Banweol were more evenly distributed with the average firm size smaller in number of employees than Sungnam in 1983. As mentioned previously, this situation causes diversification of industries in Banweol. On the other hand, the characteristics of the distribution of industrial categories in 1983 were similar to those in 1981 and 1982. That is, Banweol remained dominant in the manufacture of producer goods rather than consumer goods in 1983.

Urban Economic Bases in the New Towns

The economic base model classifies a region's economic activity into basic and non-basic activities. "Basic" means the economic activities for export from an urban center to other places in response to external demand, whereas the "non-basic" represents local economic activities in response to internal demands of the urban center. To measure the economic activities, the location quotient technique is used because it is quick and requires little data.[10]

The location quotient (LQ) is the ratio of an industry's share of the economic activity of an urban center to that industry's share of the national economy.[11] That is, the location quotient can be expressed as:

$$LQ = \frac{E_{ir}}{E_r} \Big/ \frac{E_{in}}{E_n} \qquad (5.2)$$

where, LQ = location quotient

E_{ir} = employment in industry i in town j

E_r = total employment in town j

E_{in} = employment in industry i in the nation

E_n = total employment in the nation.

Leigh identifies economic activities based on the value of the location quotient as:[12]

Activities, with location quotients above unity, are also basic economic activities, providing goods and services surplus to local demand, exporting them to external markets and channelling income into the local economy... Activities (with location quotients below one) are assumed to be satisfying less than the total local demands for the goods and services they produce (imports fill the gap).

Norcliffe explains the implications of economic activity in terms of a region's self-sufficiency.[13]

It is generally assumed that a location quotient of unity indicates that a region is exactly self-sufficient. A value below one indicates net imports, while an amount above unity represents production surplus to local needs that is exported.

Thus, the value of the location quotient above unity represents export activity (basic activity), whereas that below unity indicates local consumption or import activity (non-basic activity). A location quotient at unity indicates self-sufficiency in the town.

In addition, local activity is assumed to depend on export activity and to be proportional to it.[14] For example, total activity (T) consists basic activity (B) and non-basic activity (N). The resulting simple equation[15] can be expressd as:

$$T = B + N \hspace{3cm} (5.3)$$

$$N = a.B \hspace{3cm} (5.4)$$

$$T = (1 + a)\ B \hspace{2.5cm} (5.5)$$

In equation 5.5, the term, 1+a, is referred to as an economic base multiplier which measures the total impact of a unit of export activity. The basic activity (B_{ti}) of a town's employment (E_{ti}) in industry (i) can be calculated by using the following equation.[16]

$$B_{ti} = \left[1 - (1/LQ_{ti}) \right] E_{ti}, \text{ for } LQ_{ti} > 1 \hspace{1cm} (5.6)$$

Based on equation 5.6, the basic activity can be calculated.
Non-basic activity can then be produced by using equation
5.3. With the basic activity and the non-basic activity,
the multiplier can be derived using equation 5.4 and used to
anticipate future total activity in the town based on the
equation 5.5.

Using the location quotient technique, the economic
bases of the two new towns, Sungnam and Banweol, were
examined in order to determine their self-sufficiency.

Economic Activities in Sungnam
Based on Location Quotients

For producing values of location quotients for Sungnam,
available data on employment in twelve sectors of the
economy in 1982 were used (Table 5.5). According to the
calculations of location quotients using equation 5.2, ten
out of twelve industrial categories have location
quotients above unity, and two categories have values below
unity. Of these ten categories, only the chemical and
petroleum category has the value, 1.01, which is almost
unity. So, this can be regarded as an industry which has a
self-sufficient function. Nine categories are considered
industries which have location location above unity. Of
these nine categories, seven are manufacturing activities
which have export functions. The consumer goods include
food, textile and leather, lumber and furniture, printing

TABLE 5.5: Location Quotients (LQ) in the New Towns

Industrial Categories	Nation		Sungnam				Banweol			
	No. of Employees	Propor-tion	No. of Employees	Propor-tion	LQ	Employees for Basic Activity	No. of Employees	Propor-tion	LQ	Employees for Basic Activity
Food	172,462	.0121	3,153	.0288	2.40	1,839	63	.0031	.26	---
Textile/leather	653,600	.0453	11,833	.1081	2.39	6,882	2,620	.1285	2.84	1,698
Lumber/furniture	65,827	.0046	1,333	.0122	2.65	830	332	.0163	3.54	238
Printing/publishing	90,929	.0063	874	.0080	1.27	186	399	.0196	3.11	271
Chemical/petroleum	261,649	.0181	1,988	.0182	1.01	20	2,344	.1150	6.35	1,975
Nonmetallic mineral	92,453	.0064	2,219	.0203	3.17	1,519	1,252	.0614	9.59	1,121
Metallic mineral	87,799	.0061	2,540	.0232	3.80	1,872	1,688	.0828	13.57	1,563
Machinery	543,968	.0377	10,839	.0990	2.63	6,718	6,744	.3308	8.77	5,975
Medical care	196,429	.0136	439	.0040	.29	---	14	.0007	.05	---
Public service	647,851	.0449	3,052	.0279	.62	---	249	.0122	.27	---
Retail/wholesale	1,118,934	.0776	16,610	.1517	1.96	8,136	524	.0257	.35	---
Restaurant/lodging	600,411	.0416	8,326	.0760	1.83	3,776	237	.0116	.28	---
Total	4,532,312	.3143	63,186	.5774		31,778	16,466	.8077		12,841
Total employees in all industries	14,424,000	1.0000	109,491	1.0000			20,390	1.0000		

Sources: The Control Office of Korea Industrial Estates, Korea Industrial Directory, 1982. The Sungnam City Government, Development Plan In Sungnam, 1983. The Office of the Banweol Industrial District, Industrial Status, 1982. The Banweol Branch Office, Banweol Statistical Yearbook, 1982,1983. The Economic Planning Board, Korea Statistical Yearbook, 1983.

and publishing: producer goods include nonmetallic mineral products, metallic mineral products, and machinery. Two are services, namely retail and wholesale, and restaurant and lodging. Textiles and leather, and machinery categories have the largest employment of the export activities.

Meanwhile, medical care and public service categories have location quotients below unity. This result suggests that service sectors, such as medical care and public service, have import functions, whereas manufacturing sectors, such as food, textiles, nonmetallic and metallic mineral products, and machinery categories, have export functions.

The total numbers of employees for basic activity, the total numbers of employees for non-basic activity, basic/non-basic ratios, and economic base multipliers for the new towns are in Table 5.6. These are calculated by using equations 5.2 through 5.5. Though Sungnam has more industrial categories which are basic activities than those which are non-basic activities, the total number of employees in basic activity are almost the same as those in non-basic activity in the city (Table 5.6). Expressed another way, Sungnam has balanced economic functions between basic and non-basic activities, as reflected by the basic/non-basic ratio.

TABLE 5.6: Basic and Non-Basic Activities in the New Towns

New Town	Basic Activity(B)	Non-Basic Activity(N)	Basic/ Non-Basic Ratio (B/N)	Multiplier
Sungnam	31,778	31,408	100:99	2.012
Banweol	12,841	3,625	100:28	4.542

SOURCE: Calculated by the author

Economic Activities in Banweol
Based on Location Quotients

In producing values of location quotients, available
data on employment in the twelve sectors of the economy of
Banweol in 1982 were used (Table 5.5).   The urban economic
bases were examined using the location quotients.   Out of
twelve categories, seven had values above unity, whereas
five had values below unity.   Thus, seven had predominantly
export functions, five had mainly import functions.   The
seven categories which had export functions were: textiles
and leather, lumber and furniture, printing and publishing,
chemical   and petroleum,   nonmetallic mineral products,
metallic mineral products, and machinery.   Among these
seven, though the metallic mineral category had the largest
location quotient, 13.57, the numbers of employees in basic
activity were not so significant because the category had a
relatively small number of employees in the new town.

However, the machinery category had a remarkably large number of employees for a basic activity. This category had the largest number of employees, so it had the strongest export function in the new town.

Meanwhile, five categories with location quotients less than unity had mainly import function. They were: food, medical care, public service, retail and wholesale, and restaurant and lodging services. Of the five, medical care had an extremely small value, 0.05. That is, the medical care category had a strong import function because activity in that category is only weakly developed in Banweol (See Chapter Six). The values of location quotient for Banweol clearly showed that Banweol is a manufacturing new town, because manufacturing categories have strong export functions, whereas service categories have strong import functions.

In comparing Sungnam's location quotients with those of Banweol, the latter had more industrial categories with location quotients below unity than Sungnam, whereas Sungnam has more industrial categories with location quotients above unity. However, the number of industrial categories is less meaningful than numbers of employees in dealing with the economic bases of the new towns, because the number of employees can be considered as a source of economic activity, basic or non-basic. In the case of Banweol, the proportion of basic activity was significantly large in

comparison with the proportion of non-basic activity. The basic/non-basic ratio, 100:28, shows the large proportion of basic activity (Table 5.6). The value of the multiplier for Banweol was more than twice that of Sungnam. Thus, Sungnam had a more balanced economic base than Banweol. Furthermore, Sungnam had a self-sufficient function in the chemical and petrolum category, whereas Banweol did not have a self-sufficient function in any category. This result supports the finding of many studies that the larger cities are more balanced in economic bases than the smaller ones. [17]

TABLE 5.7: Numbers of Industrial Categories in the New Towns Based on Values of Location Quotients

Value of Location Quotient	No. of Categories for Sungnam	No. of Categories for Banweol	Function
LQ > 1	9	7	Export
LQ = 1	1	-	Self-sufficient
LQ < 1	2	5	Import

On the other hand, food, retail and wholesale, and restaurant and lodging categories for Sungnam had export functions, while those of Banweol had import functions, based on the roles set for the new towns by the government (i.e., Sungnam is primarily residential and Banweol has a

manufacturing function in producer goods). Both Sungnam and
Banweol have import functions in the medical care and public
service categories. In other words, both new towns have
weak medical and public services.

Summary

This chapter examined some aspects of goal achievements
in new town development, which are diversified industrial
composition, and urban economic bases for self-sufficiency.
From the examination of the goal achievements, several major
findings can be summarized.

First, the result of examination of industrial
diversification using the Gini indexes did not support the
hypothesis that the degree of industrial diversification in
Sungnam was larger than that of Banweol. Only the
manufacturing sectors was dealt with in examining the degree
of industrial diversification. This was hypothesized based
on size of population. However, the results of examination
based on the Gini indexes found the degree of industrial
diversification in Banweol to be larger than that in
Sungnam. One reason for a more diversified industrial
composition in Banweol was the more evenly distributed
industrial categories. Another reason was that industrial
diversification had been more influenced by development
policies for the new towns than by population size in new
towns in the Seoul Metropolitan Region. More diversified

industrial composition in Banweol than in Sungnam was traceable, in part, to the development policy which emphasized moving only small-size industries from Seoul to Banweol. However, if Banweol had some large assembly plants, such as automobiles, ship building yards, and fertilizer plants, rather than small factories which produce only parts of automobiles and ships, the resulting industrial diversification would be different from the present situation.

Second, industrial diversification has increased over time. In both Sungnam and Banweol, values of the Gini indexes have gradually decreased over time. This means that industrial diversification in Sungnam and Banweol has increased over a period of time. But the degrees of industrial diversification between Sungnam and Banweol are different. Values of the Gini indexes in Sungnam have slightly decreased over time, whereas those of Banweol have greatly decreased over time. The result is that industrial diversification in Banweol has been more rapid than in Sungnam over time.

Third, concentrations of employment based on industrial categories were different between Sungnam and Banweol. Sungnam was dominant in manufacturing consumer goods such as food and textile products, whereas Banweol was dominant in manufacturing producer goods such as machinery and metal.

Fourth, both Sungnam and Banweol were found to have more export functions than import or self-sufficient functions. In the case of Sungnam, nine out of twelve industrial categories had export functions. In Banweol, seven out of twelve industrial categories had export functions. This also indicates that cities located around Seoul have more export functions than import functions.

Fifth, both Sungnam and Banweol had import activities in service sectors such as medical care and public service. That is, the service sectors were weak in the new towns.

Finally, considering all twelve categories together, it could be concluded that overall Sungnam was relatively more balanced in its economic base than Banweol. This was based on the values of location quotients and basic/non-basic ratios. This result represented that the economic base of Sungnam was more similar to that of the nation than Banweol's. However, according to industrial categories, the results of the examination in urban economic bases would be varied. Also, results would differ between planned cities, which have particular purposes, and naturally grown cities.

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CHAPTER SIX

MEASUREMENTS OF GOAL ACHIEVEMENT IN
SUNGNAM AND BANWEOL: JOB OPPORTUNITIES
AND URBAN SERVICES

This chapter also concerns self-sufficient and balanced development of the new towns, Sungnam and Banweol, in employment and living conditions. As mentioned previously, the most important goal of new towns is to explain self-sufficient and balanced development in employment and living conditions. This chapter concentrates on an examination of the following categories: (1) the extent of the new towns' self-sufficiency in providing job opportunities for their residents, and (2) the extent of the new towns' self-sufficiency in providing the urban services and facilities necessary to attract and retain residents. Specifically, the issues are the balance between job opportunities and job seekers in the new towns, and their urban services and facilities in comparison with Seoul.

The Balance Between Job Opportunities and Job Seekers

To maintain self-sufficient and balanced development of the new towns in employment and public services (including

facilities), the new towns should provide appropriate job opportunities for their residents. If a new town supplies jobs in numbers corresponding to the demand for jobs by the residents of the new town, the residents can work within their local community. However, if the new town cannot supply adequate numbers of appropriate job opportunities for its residents, workers must commute to other places. In general, journeys within a new town are called "local journeys," whereas "crossing journeys" are the sum of (1) journeys by a town's residents to other places to work and (2) journeys by outsiders to work in the new town. The ratio of local to crossing journeys represents an "index of commuting independence." It can be simply expressed as:[1]

$$I = \frac{LC}{IC + OC} \qquad (6.1)$$

where: I = index of cummuting independence

LC = the number of local commuters

IC = the number of commuters crossing to the town

OC = the number of commuters crossing from the town

The higher the value of the index of commuting independence, the more self-sufficient and balanced the town. Using the value of the index, therefore, the

self-sufficiency of the new towns was examined. As previously noted, Banweol had a dominant industrial base that provided job opportunities for its residents, whereas Sungnam had a dominant residential role for its residents. Another aspect was that Banweol is located farther from the mother city of Seoul (35 km) than Sungnam (20 km). Generally, the longer the distance the smaller the number of commuters. Based on these functions and locations of the new towns, the hypothesis regarding the index of commuting independence was expressed as:

> The value of the index of commuting independence for Banweol is higher than that of Sungnam.

Index of Commuting Independence for Sungnam

The numbers of commuters crossing between Sungnam and other places are shown in Table 6.1. Seoul, Inchon, Suwon, and Gwangju were the major job destinations of Sungnam's crossing commuters. Of the four, Seoul was easily the most dominant, as the destination or origin of 89.1 percent of total commuters. In 1982, the total number of employed persons in Sungnam was 109,491[2] and the number of crossing commuters was 53,210. The number of local commuters, therefore, could be inferred as 56,281, which was calculated by subtracting the number of crossing commuters from the total number of employed persons in Sungnam.

TABLE 6.1: Daily Commuters Crossing to and from Sungnam, 1982

	Seoul	Inchon	Suwon	Gwanju Township	Others	Total
From Sungnam	41,514	1,060	2,254	127	1,625	46,580
To Sungnam	3,801	110	289	284	2,146	6,630
Combined Crossing Journeys	45,315	1,170	2,543	411	3,771	53,210

SOURCE: Transportation Department of the Sungnam City Government, "Unpublished Data on Commuters," 1982. Development Plan in Sungnam, 1983.

The index of commuting independence for Sungnam produced by the equation 6.1 was thus 1.058. The value of the index was relatively small because the proportion of crossing commuters represented almost one-half the total of employed persons, demonstrating that Sungnam could not provide sufficient job opportunities for its residents. At the same time, the ratio of workers commuting from Sungnam to other places to workers commuting from other places to Sungnam confirmed the relative lack of job opportunities in Sungnam. That is, the number of commuters from Sungnam to other places was 7.0 times larger than the number commuting to Sungnam from other places. Since the majority of out-commuters from Sungnam travelled to jobs in Seoul, the new

town of Sungnam must still be considered dependent on Seoul for employment.

Index of Commuting Independence for Banweol

The numbers of commuters crossing to and from Banweol are shown in Table 6.2. The four cities of Seoul, Anyang, Inchon, and Suwon were major sources of employment for commuters who crossed from Banweol and provided some workers who crossed to Sungnam. Seoul was the most dominant source of jobs for workers from Banweol, as was the case for Sungnam. The total number of employed persons in Banweol was 20,390 in 1982.[3] Given that the number of crossing commuters total 7,618 (See Table 6.2), the number of local commuters (by subtraction) was 12,772.

By using the same equation (6.1), the index of commuting independence for Banweol was calculated to be 1.677, which indicates the ratio of local commuters to crossing commuters.

The index of commuting independence for Banweol of 1.677 was greater than that of Sungnam at 1.058, indicating that Banweol was more self-sufficient in employment than Sungnam. This result supports the hypothesis that the value of the index of commuting independence in Banweol, with its industrial functions, would be higher than that of Sungnam.

TABLE 6.2:   Daily Commuters Crossing to and from Banweol, 1982

	Seoul	Anyang	Inchon	Suwon	Others	Total
To Banweol	3,790	1,529	681	504	307	6,811
From Banweol	347	188	63	90	119	807
Combined Crossing Journeys	4,137	1,717	744	594	426	7,618

SOURCE: The Office of Banweol Industrial District, Industrial Status, 1982,   Guideline for Industries, 1983.

The commuting pattern for Banweol was also different from that of Sungnam.   Banweol had 8.4 times more in-commuters than out-commuters, that is, a much larger number of non-local persons coming into Banweol to work than the number of local persons leaving Banweol to work elsewhere, whereas Sungnam had just the opposite.   Banweol provided more job opportunities than needed by its residents, whereas Sungnam provided fewer job opportunities than needed.   This result reflects the observation that Banweol is a predominantly industrial new town providing sufficient job opportunities, whereas Sungnam is a predominantly residential new town providing insufficient job opportunities.

Comparison of Urban Services and Facilities
between the New Towns and Seoul

As noted earlier, one of the government's primary objectives in promulgating new towns is to relieve the industrial and population pressure on Korea's capital of Seoul that is straining its infrastructure and reducing its quality of life. In this regard, the quality and quantity of urban services and facilities provided in the new towns are important in inducing Seoul's residents and industries to move into the new towns. Accordingly, comparisons were made of urban services and facilities between each new town and Seoul. Components compared were: education, health and recreation, transportation, and housing, because these are the essential urban services and facilities.

Educational Facilities

One way to measure educational facilities could be to deal with a ratio of classrooms to a number of classes. In order to examine the sufficiency of educational facilities in the new towns, the 1982 ratios of numbers of classrooms to numbers of classes in elementary, middle and high schools, were obtained for Seoul, Sungnam and Banweol. The ratios for the new towns were then compared with those of Seoul at all three levels (Table 6.3). A ratio value greater than unity indicated that the new town provided

Table 6.3:   Comparison of Educational Facilities and
              Matriculating Ratios (1982)

School		Seoul	Sungnam	Banweol
Elementary	Classes	19,001	901	105
	Classrooms	15,372	602	92
	Facility Ratio	0.809	0.668	0.876
	Graduates	189,672	7,057	547
	Matriculates	188,692	6,756	531
	Matriculating Ratio	0.995	0.957	0.971
Middle	Classes	7,832	282	6
	Classrooms	7,856	329	16
	Facility Ratio	1.003	1.167	2.667
	Graduates	155,804	4,590	–
	Matriculates	147,959	4,480	–
	Matriculating Ratio	0.950	0.976	–
High	Classes	4,279	176	6
	Classrooms	5,584	171	9
	Facility Ratio	1.305	0.972	1.500
	Graduates	77,776	2,870	–
	Matriculates	42,476	351	–
	Matriculating Ratio	0.546	0.122	–

SOURCE: Seoul Statistical Yearbook, 1982. Development
         Plan in Sungnam,   1983. Banweol Statistical
         Yearbook, 1982 and 1983.

sufficient classrooms, whereas a ratio value less than unity revealed that the new town had insufficient classrooms.

All ratios for elementary schools in Seoul, Sungnam and Banweol were less than unity, indicating common shortages of educational facilities at this level in all three places. Shortages were most severe in Sungnam which had the lowest ratio (1:0.668) and least severe in Banweol where a 0.876 ratio prevailed. That is, one elementary class in Banweol had 0.876 classroom, whereas that of Sungnam had 0.668 classroom. The practical consequences of this is that the class day has to be split into shifts to accommodate all the students. The classrooms per class in Banweol was greater than in Seoul, but the classrooms per class in Sungnam were smaller than in Seoul.

In contrast, Sungnam, Banweol, and Seoul supplied sufficient middle school classrooms, with rates of 1.167, 2.667 and 1.003, respectively. The new towns have values greater than Seoul. Particularly, Banweol has more than sufficient educational facilities at the middle school level, perhaps indicating that authorities anticipate rapid increases in population.

Banweol and Seoul also has ratios above unity for high schools, whereas Sungnam had a value below unity: 1.500, 1.305, and 0.972, respectively. The ratio for Banweol was greater than that for Seoul, but the ratio for Sungnam was smaller than that for Seoul. Thus, Banweol supplies more

sufficient educational facilities at all levels compared to Seoul, but Sungnam provides less sufficient educational facilities than Seoul. Only at the middle school level was Sungnam superior to Seoul.

The matriculating ratios for Seoul, Sungnam, and Banweol, by elementary, middle and high schools, are also shown in Table 6.3. The matricultating ratio is the ratio of the number of matriculants to the number of graduates at elementary, middle and high school levels. Matriculants are those who go on to the next level of education. The matriculating ratio of elementary schools in Seoul was slightly (0.991) greater than those of the two new towns (0.957 for Sungnam and 0.971 for Banweol). However, in the case of middle schools, the matriculating ratio of Sungnam (0.976) was slightly greater than that of Seoul. The matriculating ratio of middle schools in Banweol in 1982 could not be calculated because one middle school was so new it had not provided any graduates until that year.

The matriculating ratio for high schools in Seoul (0.546) was much greater than that of Sungnam (0.122). The high school level showed a big difference in the matriculating ratios between Seoul and the new town. The matriculating ratio at the high school level has a more important meaning than those at elementary and middle school levels, because the expenses for college education are much

greater than those for middle and high schools. In Korea, compulsory education applies only to elementary schools.

The matriculation ratio for high schools in Banweol also could not be produced because one high school there did not have any graduates until 1982. In general, however, Banweol has supplied more sufficient educational facilities than Seoul, whereas Sungnam has provided less sufficient educational facilities than Seoul. But, Seoul generally had greater values of matriculating ratios than the new towns. This is not surprising, given the relative youthfulness of the new towns. As a result, Banweol has come closer to achieving its goal of providing sufficient educational facilities, compared with Sungnam.

Health and Recreational Facilities

Health and recreational facilities include theaters, stadiums, billiard halls, hospitals, doctor's offices, dentist's offices, and drugstores in this study. The number of facilities and the number of residents per facility in Seoul, Sungnam and Banweol in 1982 are shown in Table 6.4. The larger the number of residents per facility, the less sufficient the urban services and facilities. Banweol did not have any theaters, stadium, and hospitals until 1982. Furthermore, Banweol had the greatest number of residents per health and recreational facility. This means that urban services and facilities in Banweol were not yet well

TABLE 6.4: Comparison of Health and Recreational Facilities

Facilities	Seoul		Sungnam		Banweol	
	Number	No. of Residents Per Facility	Number	No. of Residents Per Facility	Number	No. of Residents Per Facility
Theaters	84	103,286	5	75,289	None	None
Stadiums	4	2,169,009	1	376,447	None	None
Billiard Halls	3,800	2,283	29	12,981	3	13,888
Hospitals	110	78,873	3	125,482	None	None
Doctor's	3,968	967	53	7,103	3	13,888
Dentist's	1,183	7,334	12	31,371	2	20,832
Drugstores	4,612	1,881	133	2,830	7	5,952

SOURCES: Seoul Statistical Yearbook, 1982. Development Plan in Sungnam, 1983.
Banweol Statistical Yearbook, 1982.

developed.   This could be one of the most critical situations in the further development of Banweol.

Sungnam was equipped with fewer urban services and facilities in the case of billiard halls, hospitals, doctor's offices, dentist's offices, and drugstores than Seoul, whereas it was superior to Seoul in theaters, and stadiums.

In general, Seoul provided the most sufficient urban services and facilities among the three places. Sungnam was next, and Banweol last.   This finding is not surprising either, given relative ages of the three centers. Obviously, Sungnam and Banweol must greatly improve their urban services and facilities if they hope to more fully achieve their goal of attracting residents from Seoul.

Transportation Facilities

Buses and taxis are dominant public transportation facilities in every city in Korea.   The number of residents per bus and the number of residents per taxi in Seoul, Sungnam and Banweol are shown in Table 6.5.   The larger the number of residents per bus or taxi, the less sufficient the transportation facilities.   Sungnam had the largest number of residents per vehicle (1,127 per bus and 1,909 per taxi).   Banweol had the next largest number (1,062 per bus) and Seoul had the smallest (947 per bus and 297 per taxi). In other words, Seoul had more sufficient transportation

facilities than the new towns. Furthermore, Banweol did not have any taxis until 1983 and used buses and bicycles within the town. Residents in Banweol did use taxis which came from other cities such as Anyang, Seoul, and Gwangmyong.

Thus, the conclusion is obvious that Seoul has a much more highly developed public transportation system than either Banweol or Sungnam. In addition to buses and taxis, the subway system in Seoul has an important role but was not included in this study because only Seoul has one. It seems clear that the public transportation facilities in the new towns are not an inducement to get people to move from Seoul. In other words, insufficient transportation facilities in the new towns are a significant problem in achieving the goal of providing good living conditions.

Provision of Housing

To facilitate comparison of housing between the new towns and Seoul, ratios of the number of houses to the number of households in 1981 are shown in Table 6.6. Banweol (ownership: 79 percent) had more sufficient housing than Seoul (ownership: 62 percent), whereas Sungnam (ownership: 47 percent) had less sufficient housing than Seoul. The more recent new town of Banweol, had much more sufficient residential facilities than the older new town of Sungnam.

TABLE 6.5: Comparison of Transportation Facilities

Facil-ities	Seoul		Sungnam		Banweol	
	Number	Residents per Vehicle	Number	Residents per Vehicle	Number	Residents per Vehicle
Buses	9,165	947	334	1,127	48	1,062
Taxis	29,250	297	198	1,901	None	None

SOURCE: *Seoul Statistical Yearbook*, 1982. *Development Plan in Sungnam*, 1983. *Banweol Statistical Yearbook*, 1982.

TABLE 6.6: Comparison of Housing (1981)

	Seoul	Sungnam	Banweol
Houses	1,188,744	40,910	8,947
Households	1,915,104	86,325	11,400
Ratio of Ownership	62%	47%	79%

SOURCES: *Seoul Statistical Yearbook*, 1982. *Development Plan in Sungnam*, 1983. *Banweol Statistical Yearbook*, 1982.
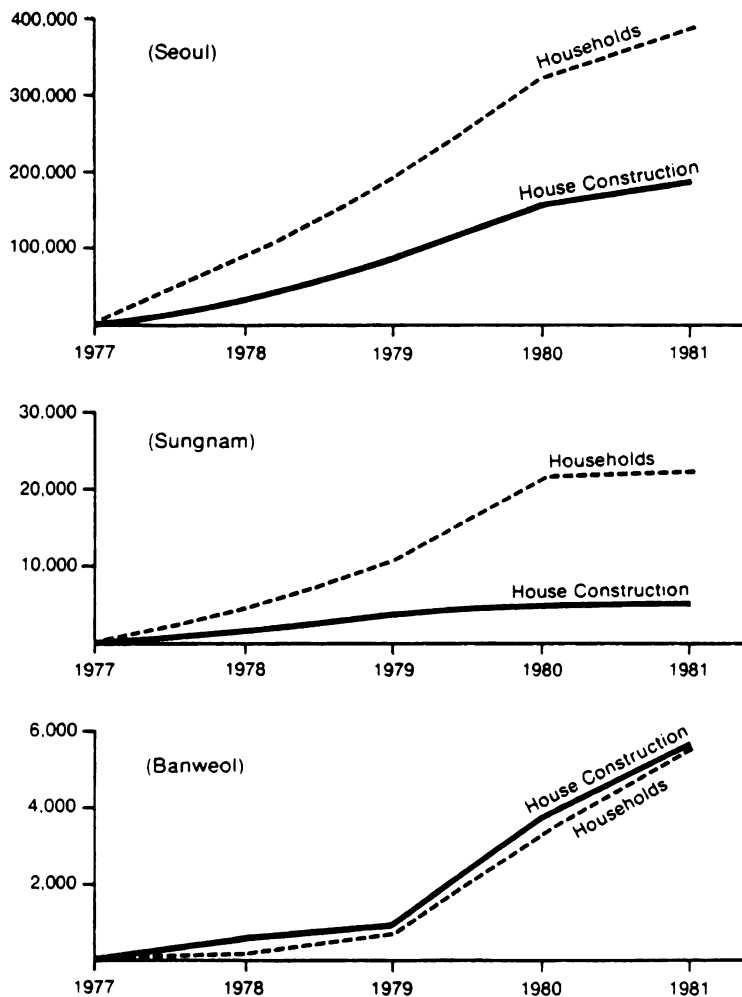
Meanwhile, the numbers of houses constructed and number of households in Seoul, Sungnam and Banweol from 1977 to 1981 are shown in Figure 6.1. The number of houses constructed in Seoul and Sungnam gradually increased, but the number of households increased at a faster rate than the housing construction. This gap between the number of houses constructed and the number of households got larger and larger, resulting in increased housing shortages in Seoul and Sungnam. This situation caused serious urban problems in those cities. Urban services and facilities, particularly housing, generally cannot match the rapid growth of population in Korean cities but Banweol is an exception to this general observation.

Banweol's experience with housing was markedly different. The difference between the number of houses constructed and number of households was very small. Banweol saw the greatest increases in both housing construction and households in 1980 and 1981. The gap between the two was slight, with housing construction regularly exceeding the number of households. Based on this trend, Banweol should be able to meet its future housing needs.

Thus, the newest town, Banweol, had relatively sufficient residential facilities for its present residents and the older cities of Seoul and Sungnam did not. The sufficient residential facilities in Banweol could be one

400,000

(Seoul)

Households

300,000

200,000

House Construction

100,000

1977 1978 1979 1980 1981

30,000

(Sungnam)

Households

20,000

10,000

House Construction

1977 1978 1979 1980 1981

6,000

(Banweol)

House Construction

4,000

Households

2,000

1977 1978 1979 1980 1981

Sources: Seoul Statistical Yearbook, 1982;
Development Plan in Sungnam, 1983;
and Banweol Statistical Yearbook, 1982.

Figure 6.1 Comparison of Number of Households
with Number of Houses Constructed in
Seoul, Sungnam, and Banweol, 1977-1981

factor inducing people to move from Seoul to Banweol, whereas the insufficient residential facilities in Sungnam may be a factor discouraging the movement of population from Seoul to Sungnam. In other words, Banweol has been relatively more successful in achieving its goal than Sungnam.

Summary

This chapter examined some aspects of the self-sufficient and balanced development of Sungnam and Banweol, based on job opportunities, and urban services and facilities. From the examination into the balance between job opportunities and job seekers, and the self-sufficiency of urban services and facilities, the following findings can be summarized.

First, based on the results of the indexes of commuting independence in Sungnam and Banweol, the hypothesis stating that the index of commuting independence of Banweol is higher than that of Sungnam was supported. The result of the examination showed that the value of the index in Banweol, 1.677, was greater than that of Sungnam, 1.058, because of the functions and locations of the new towns.

Second, commuting patterns were different between Sungnam and Banweol. In the case of Sungnam, out-commuters were the majority due to insufficient job opportunities in the city. In contrast to Sungnam, Banweol had a majority

of in-commuters because of sufficient job opportunities in the new town.

Third, the provision of housing in Banweol was excellent for a newly-built town. Though Banweol had the greatest self-sufficiency in housing supply among the three places, there was still some lack of housing affordable by all residents in Banweol. Moreover, in view of its migration rate, Banweol needs to maintain a high rate of housing construction. The fact that the numbers of houses constructed have consistently exceeded the numbers of households in Banweol over the past few years, suggests an ability to continue providing housing in the future. This has important implications for self-sufficient and balanced development of the new towns.

Finally, urban services and facilities such as health and recreational facilities, transportation facilities, and matriculating ratios for Seoul were more sufficient than for the new towns. Seoul had relatively better urban services and facilities. This situation shows the difficulty in inducing people to move from Seoul to the new towns. Even though Banweol was more adequate in housing and classrooms than Seoul, it was much less adequate in health and recreational facilities, and transportation facilities than Seoul. Sungnam was the least sufficient in overall urban services and facilities among the three places. In sum, total urban services and facilities in the new towns are

less sufficient than those in Seoul. This could be one of the critical problems in new town development in Korea. Therefore, the new towns should generate increased urban services and facilities in order to attract people to move into them from Seoul.

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Office of Banweol Township. (In Korean).

CHAPTER SEVEN

SUMMARY AND CONCLUSIONS

This study dealt with a wide number of aspects of urban development as they relate to the new town movement. It examined the development of Sungnam and Banweol in two ways. One objective was to determine different characteristics of urban development between the two new towns, the other was to measure the level of goal achievement in Sungnam and Banweol. Determining the urban development of the new towns was dealt with in Chapters Two, Three and Four, and measuring the level of goal achievement in self-sufficient and balanced new town development, was dealt with in Chapters Five and Six.

Summary

Several categories used for measuring different characteristics of urban development in Sungnam and Banweol were development policies, urban land uses that explained the internal structure of the new towns, and spatial interactions related to the external structures of the new towns. To measure goal achievement in Sungnam and Banweol, this study used the degree of diversification of the

industrial structure, functions of economic bases, the provision of job opportunities, and the level of urban services and facilities in the new towns.

Different Characteristics of Urban
Development between Sungnam and Banweol

For determining different characteristics of urban development in the new towns, development policies were first surveyed using references such as development plans and related documents, books and statistical data. Development policies covered fifteen policy provisions which were grouped into three categories: political development issues, site factors, and socioeconomic aspects. The reason for dividing the development policies into fifteen specific policy provisions was to examine which and how many policy provisions were applicable in the development of Sungnam and Banweol. Political development issues, for example, included four specific policy provisions: balanced development in the Seoul Metropolitan Region, establishing independent new towns, role of growth poles, and public sectors for development. Three of them were found to be applicable to the development of Sungnam, and all of them were applicable to the development of Banweol.

Another category, site factors, consisted of six specific policy provisions: availability of undeveloped land, low land price, physical environment of new towns,

good present transportation access, potential for transportation expansion, and opportunity to preserve historical resources. Five of these were applicable to the development of Sungnam, and all of them were related to the development of Banweol. These results indicated that both political development and site factors were more applicable to the development of the newly built town than the older town.

The final category, which was socioeconomic aspects, contained five specific policy provisions, including relocation of residents from Seoul, housing development plans, solution of squatter settlements in Seoul, relocation of industrial facilities from Seoul, and residents' participation. Three items were applicable to the development of Sungnam, and four of them to the development of Banweol.

Considering all categories together, the recent new town had greater association with development policies than the older town.

Meanwhile, patterns of urban land use were remarkably different between Sungnam and Banweol. In characterizing patterns of urban land use, three categories, patterns of streets, distribution of functional land use, and densities of land use in the new towns, were examined. Although topographical conditions influenced the patterns of streets,

Sungnam had a predominantly grid pattern of streets, whereas Banweol had a radial-concentric patterns as well as a grid pattern. Banweol had three hexagonal nuclei with dominant radial-concentric patterns called Gunja, Suam, and Banweol districts which were planned to contain self-sufficient functions in urban services and facilities. However, these three nuclei had not actually been developed and self-sufficiency in urban services and facilities had not been achieved. As these three nuclei gradually develop urban facilities they will contribute to balanced distribution of subcenters within the new town. In contrast, Sungnam would be regarded as a single nucleus city.

Functional land use was divided into residential, commercial, industrial, greenbelt, and open space. Proportions of these functional land uses were remarkably different between Sungnam and Banweol. The proportion of the industrial district in Banweol, (14.4 percent) was much larger than that in Sungnam (1.1 percent). In contrast, proportions of greenbelt and open space in Sungnam (92.5 percent) were larger than those in Banweol (64.8 percent). Different development policies basically explain these situations.

Densities of functional land use were also much different between Sungnam and Banweol in terms of functional area per unit population, which was 1,000. Sungnam had a much denser population in its functional districts than Banweol. In other words, areas of residential, commercial,

and industrial districts in Sungnam per unit population size resulted in a situation in which Sungnam had much more population (380,000 in 1980) than expected according to the original plan (250,000). The source of this large population was in-migration from the southern part of Korea, Sungnam has been an intermediate stop for people moving from the southern part with plans to finally settle in Seoul. The reason for selecting Sungnam as an intermediate stop could be its close location to Seoul, low housing rent, and relationships between some of the residents who had already moved into Sungnam and some potential residents who wanted to move from the southern part of Korea. In addition, development strategy emphasized restricting the enlargement of the present built-up area within the city. In contrast, Banweol had less population (41,600) than planned (137,600) in 1981. The reason for the small population was fewer migrants from Seoul than expected because of insufficient urban facilities in the new town. About one-third of in-migrants came from Seoul as of 1982. The smaller population as well as development policy have influenced densities of urban land use.

To determine the different characteristics of interactions between the new towns and other urban centers in Korea, the gravity model was used. Estimating parameters using the gravity model supported the hypothesis that interactions with Banweol are more sensitive to the

population sizes of other urban centers, but less sensitive
to the distance between the new town and other urban centers
than those of Sungnam. That is, business calls based on
Banweol's industrial dominance closely corresponded with
market volume, which was related to population size in
other urban centers, whereas personal calls based on
Sungnam's residential dominance closely corresponded with
distance. When data on telephone calls were used for the
gravity relationships, distance decay was a minor barrier to
interactions between the new towns and other urban centers,
considering the distance exponent which was generally at
about 2, and the distance exponents of Sungnam and Banweol
which were less than unity.

Another important result from using the gravity model
showed that interactions by telephones were more closely
related to functions of the new towns. More specifically,
numbers of telephone calls were more closely related to the
industrial or residential function of the new town.

Examination of Self-Sufficient
and Balanced Development

To determine the level of self-sufficient and balanced
development in employment and living conditions in the new
towns, four measures, the degree of industrial
diversification, functions of economic bases, job

opportunities, and the level of urban services and facilities in the new towns, were considered.

The Gini index was employed to examine degrees of industrial diversification and to compare them between Sungnam and Banweol. The Gini index, based on the Lorenz curve, represented the degree of inequality between two variables such as the number of employees and the number of industrial categories in the new towns in this study. More than 147 manufacturing firms and more than 33,000 employees in Sungnam in 1979, 1980, and 1983 were classified into fifty-five industrial categories (three digits) according to the U.S. Standard Industrial Classification code of 1979. More than 188 manufacturing firms and more than 12,000 employees in Banweol in 1981, 1982, and 1983 were classified into sixty industrial categories. The Gini indexes for Sungnam were higher than those for Banweol, indicating that Sungnam had a less diversified industrial base than Banweol. This result could not support the hypothesis that the degree of industrial diversification in Sungnam is greater than that in Banweol.

Industrial diversification had gradually increased over a period of time from 1979 to 1983 in Sungnam, whereas in Banweol, industrial diversification had greatly increased over time.

To examine functions of economic bases in the new towns, the location quotient technique was used based on

twelve industrial categories in 1982. According to the results of the location quotients produced, basic activities rather than non-basic activities were dominant in both Sungnam and Banweol. Manufacturing sectors such as textiles and leather, lumber and furniture, nonmetallic minerals, metallic minerals, and machinery, were predominantly basic activities, whereas service industries such as medical care and public service categories were non-basic activities. Considering all twelve industrial categories together, it was concluded that Sungnam was more balanced than Banweol. That is, the general assumption that the larger city is the more balanced in its economic base can be accepted from this study.

Another category considered in determining the level of self-sufficiency in employment was the provision of job opportunities in the new towns. To measure sufficiency of job opportunities, the index of commuting independence technique was used. The index is the ratio of the number of local commuters to the sum of crossing commuters. The greater the value of the index, the more sufficient the job opportunities. Considering the indexes of commuting independnece, Banweol had more sufficient job opportunities than Sungnam, which supported the hypothesis that the index of commuting independence in Banweol is greater than that in Sungnam.

The commuting patterns of crossing commuters in the new towns were much different. The majority of Sungnam's crossing commuters journyed to work to the outside, whereas a majority of Banweol's crossing commuters journeyed to work from the outside. Sufficient or insufficient job opportunities in the new towns explain these commuting patterns. Meanwhile, the major sources of crossing commuters were Inchon, Suwon, Anyang, and particularly Seoul. The majority of out-commuters from Sungnam journeyed to work to Seoul, whereas the majority of in-commuters to Banweol came from Seoul. In this respect, Sungnam depended on the mother city, Seoul, whereas Banweol was much less dependent on Seoul for job opportunities.

Finally, to examine the sufficiency of urban services and facilities, education, health and recreation, transportation, and residential facilities of the new towns and Seoul were compared. The reason for comparing the new towns and Seoul was that establishment of the new towns was for the purpose of decentralizing Seoul and if the new towns have sufficient urban services and facilities, they will attract people to move from Seoul. However, based on the results of the comparisons, both Sungnam and Banweol gradually provided less sufficient urban services and facilities. In this regard, it is difficult for Sungnam and Banweol to attract people to move there from Seoul. The new

towns need more sufficient and convenient urban services and facilities than presently exist.

Conclusions

Based on this study, it is clear that the new town movement in South Korea faces a number of serious problems. One of these problems has to do with the nature of the new towns built so far in South Korea.

There are essentially two kinds of strategies of new town development in accordiance with social and economic situations of the nation or metropolitan areas. One strategy is to develop industrial new towns for producing various goods for foreign trade. These new towns are predominantly located in the southern and southeastern coastal areas of Korea because those areas have locational advantages for linkages with major trading countries such as Japan and America.

On the other hand, the purposes of new town development in the Seoul Metropolitan Region are different from those in coastal areas. The development strategy in the metropolitan region is to build new towns to facilitate the decentralization of Seoul. In order to disperse people and industries from Seoul, new towns have been established around the capital city in a manner similar to the experiences of many countries of Western Europe. For example, strategies of new town development around London

have emphasized the dispersion of population, industries, and offices from London to the new towns. Around Paris, the development strategy for new towns has also stressed moving, particularly industrial facilities, from Paris to the new towns. The case of Sweden has also shown the decentralization of population and industries from Stockholm to new towns scattered around the city. As in many countries of Western Europe, the urban problems of Seoul have necessitated the establishment of new towns as a means of decentralizing Seoul.

Location near Seoul, however, presents a difficult situation for the self-sufficient development of new towns. For example, Sungnam has insufficient urban services and facilities and must depend on Seoul for employment and education. Although Banweol has sufficient job opportunities, it lacks sufficient urban services and facilities. By contrast, in Western Europe, the goal has generally been to achieve 80 percent self-sufficiency in employment in new towns.[1] In Sungnam and Banweol, there is little chance of achieving such a high degree of self-sufficiency in the foreseeable future. As indicated in Chapter Six, the indexes of commuting independence for Sungnam and Banweol are 1.058 and 1.677, respectively, much below an 80 percent level. In order to achieve a goal of 80 percent self-sufficiency in employment, the indexes of commuting independence for Sungnam and Banweol should be

more than 4.0. Another index, in Chapter Five, which was used to measure the degree of industrial diversification of Sungnam and Banweol, produced figures of 53 and 43, respectively, which also fall far short of the 80 percent level. The larger the value of this index, the less diversified the industrial composition in the city. Thus, the values of the indexes for Sungnam and Banweol should be less than 20 in order to approach the goal of 80 percent sufficiency in industrial diversification. Thus, the new towns in the Seoul Metropolitan Region have not, on the whole, provided self-sufficient and balanced employment.

Development policies are very important in establishing new towns and substantially influence the degree of industrial diversification, land use density and interactions with other urban centers. The source of these policies is mainly the central and local governments of Korea, which are influential in establishing new towns. In this respect, the top-down development strategy, rather than a bottom-up strategy, has been dominant in developing new towns in Korea. This situation is similar to new town development experiences in Western European countries where the development of new towns has been based on the support of the public sector. This support, and long-term development plans in Western European countries, have been regarded as the reason for the relatively successful provision of residential facilities and public amenities for

low and middle-income people. The provision of housing and an adequate living environment for low income people has been a basis of public sector new town development in Western Europe, whereas the private sector is dominant in developing new towns in the U.S. This private sector is likely to provide urban facilities for high or middle-income people, in order to profit from an investment in developing new towns. This profit relationship tends to divert new town development away from idealistic principles.

In the cases of Sungnam and Banweol in Korea, even though the public sector has supported their development, it is difficult to regard them as successful cases, because of financial and unexpected socioeconomic problems, including an influx of population from the southern part of Korea rather than from Seoul. The target year for completing urban development in both Sungnam and Banweol is 1986, but the present situation demonstrates that it will be difficult to provide self-sufficient employment and urban facilities in the new towns by 1986. Banweol is in the first stage in constructing urban facilities and recreation and health facilities are significantly insufficient. In the case of Sungnam, urban facilitites are also insufficient and slum settlements are scattered throughout districts peripheral to the built-up area. Traffic jams in Sungnam in the morning and evening are very serious and Sungnam has many of the same urban problems as large cities in Korea.

The potential for urban growth is different between Sungnam and Banweol. Only Sungnam has a balanced economic base when compared with the national economy, whereas Banweol is dominated by basic activities related to export functions. In general, large cities tend to have more balanced economic bases and to be more influential in the nation's economy than small cities. The balanced economic base in Sungnam is due in part to its large population. In contrast, the dominant basic function in Banweol shows a good potential for urban growth because the foundation of support for an urban center comes primarily from export activities. In other words, Banweol's export activities are channeling income into Banweol's economy. Compared with Sungnam, the increased rate of population growth in Banweol has been large, and its industrial diversification has been relatively rapid over time. Moreover, job opportunities for residents in Banweol are much larger than in Sungnam. This suggests that economic activities in Banweol are dynamic, which is consistent with the development policy emphasizing rapid urban growth. As a result, the economic structure of Banweol is sounder than that of Sungnam, based on diversified industrial composition, relatively sufficient job opportunities, and export activities.

Several other problems related to new town development have appeared in this study. First, investment in developing new towns has been shown to be an important

factor. In the case of Banweol, urban development has lagged because of budget problems. According to the development plan, the population of Banweol in 1981 was to be 137,600, but the actual population was 41,664. This actual population was much less than the planned population. According to the chief of the Banweol branch office of the Industrial Sites and Water Resources Development Corporation, Won-Jae Yu, the original plan has been delayed because of budget shortages in developing the new town, due to recent domestic and foreign unstable economic situations as well as changes in the political leadership in Korea.[2] The budget problems, reflected in the lack of urban services and facilities, are a direct cause of the smaller than planned population in Banweol. The population planned for Banweol in 1986 is 200,000, but at the present development pace, Banweol's 1986 population will be much less than planned. Insufficient urban services and facilities cannot stimulate the prosperous development of the new towns. Strong and continuous public investment could induce private investment in the new town. That is, the multiplier effect of the public sector investment could accelerate the private sector investment. In the case of Sungnam, investment has not been sufficient from the start of the urban development. For example, when squatters were first removed from Seoul, these squatters could not have stable living conditions in the new town because of significantly insufficient urban

facilities.   Sungnam   could   be   regarded   as   essentially   a bedroom suburb of Seoul.

Second,   it   is   not necessarily axiomatic that a   high degree of industrial diversification is ideal in   developing new   towns.   The   result   of this study showed that Banweol was more diversified in its industrial base   than   Sungnam. Also,   Banweol   was   more   self-sufficient in employment than   Sungnam.   Development policies produced   this   result because   only   small and improperly located industries   were induced   to move from Seoul to Banweol.   However,   if large-scale   key industries were built in the   new   town,   Banweol would   be   more   self-sufficient   in   employment and   urban facilities   because   these   key   industries   would   provide working   opportunities   and   living   facilities   for   their employees.   Furthermore, an agglomerative effect of various industries in the new town could be expected.

Third,   Sungnam   needs other reasonable   strategies   to control   the   growth   of its population.   The   strategy   of restricting enlargement of the present built-up area   within the city is not the only means to control population growth. Since   the   strategy has restricted enlarging   the   built-up area,   the   growth   of population in Sungnam has led   to   an increase in the population density.   Because the authorities have   restricted building new houses,   residents who live in rented   houses have increased in   Sungnam.   Relatively   low rents   for houses could induce people to move into   Sungnam,

particularly from the southern part of Korea. The population density in the built-up area in 1981 was 35,407 persons per square kilometer. Urban congestion is directly related to the very high population density. Therefore, Sungnam should have more specific and varied strategies, such as heavy tax policies, for controlling its population.

Fourth, Sungnam should provide greater job opportunities in the city. Because of the lack of jobs in Sungnam, about 40 percent of its total workers journeyed to work on the outside, particularly in Seoul. In order to provide more self-sufficiency in employment, Sungnam should create a stronger industrial base to provide job opportunities for its residents.

Finally, two or three new towns have not been enough to disperse the population from Seoul. For example, Banweol and Sungnam were built with the purpose of dispersing Seoul's population into the new towns. Banweol now has about 50,000 residents, one-third of whom originated from Seoul. This figure does not significantly disperse Seoul's population. The population of Seoul is about 9,000,000. Out of these 9,000,000, one-third of Banweol's population, 17,000, is a relatively small portion. The same situation applies to the case of Sungnam. That is, one-fourth of Sungnam's population, 110,000, came from Seoul. Thus, the establishment of the new towns has not contributed significantly to the dispersing of Seoul's population. For

dispersing Seoul's population significantly, large-scale development of many new towns may be needed.

In conclusion, this study concerned only a small segment of the new town development in Korea. Strategies for public investment, establishing key industries, controlling population, providing sufficient job opportunities, and planning continuous and large-scale development of new towns should be examined more specifically in the wider context of national socioeconomic needs. This study helps our understanding of the new town development in Korea and contributes to the literature of the new town movement, particularly examination of goal achievement in new town development.

CHAPTER NOTES

    1
     John Tuppen, "New Towns in the Paris Region: An Appraisal," Town Planning Review 50 (January 1979):58.
    2
     Interview with Won-Jae Yu, Chief of Planning Department, the Banweol Branch Office of the Industrial Sites and Water Resources Development Corporation, Banweol, 24 June 1983.

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