GLOBAL CITY REGION

GLOBAL CITY REGION

Integrated Planning and Sustainable Policies of Korea

Edited By
Kyu-Bang Lee

Korea Research Institute for Human Settlements
Hanul Academy Publishing Company

Global City Region: Integrated Planning and Sustainable Policies of Korea

First Published June 2003

Cataloging-in-Publication Data
Global City Region: Integrated Planning and Sustainable Policies of Korea / edited by Lee, Kyu-Bang
- Anyang : Korean Research Institute for Human Settlements, 2003
p. 24cm.
includes bibliographies
ISBN 89-460-3146-8 93980
1. Territorial development-Korea 2. Economic regionalization-Korea 3. Infrastructure-Korea 4. Sustainable industrialization-Korea 5. Regional innovation-Korea 6. Environment-Korea 7. Quality of life 8. Land use-Korea 9. Metropolitan governance
I. Lee, Kyu-Bang II. Title

Published by the Korea Research Institute for Human Settlements
1591-6 Gwanyang-dong, Dongan-gu, Anyang-si, Gyeonggi-do, 431-712
Tel. 82-31-380-0114, Fax. 82-31-380-0470, http://www.krihs.re.kr
and Hanul Publishing Company
105-90, 3F Seoul Bldg., Gongdeok-1dong, Mapo-gu, Seoul, 121-801
Tel. 82-2-326-0095, Fax. 82-2-333-7543

Printed and bound in the Republic of Korea

Preface

Like most industrial countries, urban activities in Korea now reach right across city-region territories. The city-region functions more as a node in national territorial and global hypergrid-networks of highways, air and sea ports for movement of people and goods, and networks of satellites and wires for movement of information and capital.

Patterns of urban activity and its form are also changing as the growth nodes of production and consumption migrate to the urban fringe or edge city. The city itself and people's reason for being there centers on services and consumption, and its cultural cachet competes in a national and global hierarchy. Therefore, the significant impact of globalization is at the city-regional scale where core cities are business and cultural drivers, linked in regional cluster that eventually connects to global networks.

It is these issues that the collection of papers in this volume sets out to explore by overviewing the integrated planning and policies of Korea that affect city-regional development and governance in globalization era.

We thank all participants in this project for their scholarly and professional contribution.

June, 2003

Kyu-Bang Lee

Contents G/L/O/B/A/L C/I/T/Y R/E/G/I/O/N

Part 2 Sustainable Industrialization and Regional Innovation

Part 3

Environment, Housing and Quality of Life

Part 4 Land Use, Urban Planning and Governance

National Territorial Development in Global Perspective

1 New Vision for Territorial Development in the 21st Century

Jeong-Sik Lee
Yang-Ho Park

Promblems and Prospects

The future direction of national territorial development in Korea can be proposed by looking into issues that have been accumulated on the territory as well as by predicting future trends that will influence the spatial organization.

Several issues in the territory of Korea need to be scrutinized. First of all, the concentration of population and industrial activities along the Seoul-Busan axis during the period of economic growth remains a too heavy burden hindering future national development. It entails social cost such as traffic congestion, excessive density, environmental pollution, etc. Particularly, the Capital Region including Seoul, Incheon, and Gyeonggi Province has played too highly dominant roles in urban and regional hierarchy.

The influx of people and industries in the Capital Region has caused high cost of land, housing shortage, traffic jams, environmental degradation, etc. It renders national security more vulnerable. Although the Capital Region occupies only 11.8% of the nation's total area, it accounts for 46% of population, 55% of all manufacturing firms, 73% of all R&D institutions, 77% of all venture companies, 88% of all headquarters of major large enterprises, and 85% of all national governmental offices. Areas other than the Capital Region keep experiencing decrease in population due to lagging economy and stagnant investment.

Regional imbalance also hinders national solidarity and harmony.

Rapid urbanization and industrialization have deteriorated the natural and man-made environment. Disordered development in rural areas surrounding cities has been prevalent as a result of suburbanization. Development focusing on high-density land use still persists. Environmental pollution includes deteriorated quality of water in major rivers. Compared with rising international awareness of environmental crisis and efforts to preserve and protect natural and ecological systems, efforts for environmental preservation are not adequate.

Infrastructure is also in shortage and inefficient. Infrastructures for highway, railway, seaport, airport, and distribution systems are inadequate and so are the linkages among transportation networks. Transportation is becoming less efficient due to the inadequacy of linkage between highway and railways systems. The shortage of transportation facilities not only makes the daily life of citizens inconvenient, but also hinders the nation's economic progress by causing staggering logistic costs. Since 70% of all freight is carried along the Seoul-Busan axis, transportation networks along the east-west axis are relatively weak, which in turn impede east-west exchange.

Unfortunately the potentials and merits of the Korean territorial location in the North-East(NE) Asia have been ignored. It is due to the South-North Korean division of territory as well as the lack of global strategic consideration in territorial development. Territorial strategies to develop Korea's potential role as a gateway to NE Asia remain weak in spite of the free flow of people, goods, and capital.

Some megatrends may affect the Korean territory in the future. With the age of unlimited competition under the WTO system, trade among nations is expected to increase along with the growth of manufacturing industries accompanied by service industry. Enterprises will search for the lowest cost and regulation-free locations, setting a trend toward borderless industrial location. Gaining importance will be the role of national territory and its infrastructure as factors that will determine a nation's competitiveness and wealth. With the global economy being divided into economic blocs, there will be a growing need for cooperation and competition among nations as well as cities and regions. With the great success of its liberalization policy, China is expected to continue a rapid growth in the 21st century. China's current share of the world GDP is 2%(1994), which is expected to

increase to 10% by 2025. In this trend, Korea needs national management strategies to make it NE Asia's regional center of exchange by maximizing its pivotal geoeconomic advantages.

At the same time, acceleration of the process of conversion to a power-sharing and self-governing society will follow the transfer of power and responsibility from the centralized bureaucratic system. National solidarity will become more and more important in decentralization process. Gaining importance will be private and foreign capital as investment sources for regional and local development. Information and revolutions in industry will affect every side of human settlements in the Korean territory.

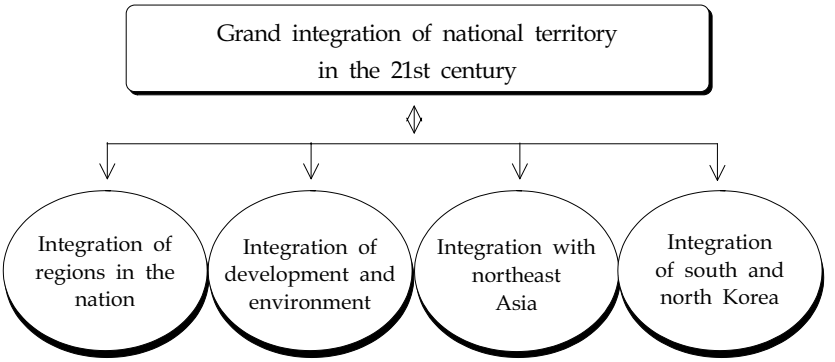
In particular, the relationship between South and North Korea will be more diversified and more strengthened. North Korea may continue to show more signs of opening its doors and behave more pragmatically. The possibility of unification of South and North Korea will become greater, as both domestic and international situation changes rapidly.

Vision: Grand Integration of Territory

This paper deals with main directions of national territorial development of Korea toward the time horizon of 2020. Why 2020? There are a few reasons. First, most of key facilities including expressway, international airports, and major seaports are expected to be complete by around 2020. Second, completion of projects such as urban development, infrastructure, and industrial estate will require approximately 20 years. Third, South-North Korean unification seems to be realized by 2020. Fourth, a new long-wave of global economy starts in the 1990s, and will mark peak in about 2020 according to the fifth Kondratieff economic cycle.

In order to overcome problems and respond well to future megatrends, a vision of national territorial development can be suggested. The vision can be summarized by the grand integration of national territory in the 21st century. Why is it regarded as grand integration? It is because four-type integration will be able to make synergy effects. The first type is regional integration, leading to the national competitiveness and solidarity. The second type is integration of development

[Figure 1] Basic Conception of the Territorial Vision



and environment, leading to sustainability. The third type is integration with North-East Asian economy, leading to strategic gateway of NE Asian region. The fourth type is integration of South and North Korea, leading to harmonized unification. A kind of multi-integration results into grand integration of the national territory.

This vision can automatically lead to four goals:

- Balanced Territory—It presents a foundation for development to realize interregional integration by means of balanced development of the land and for every locality to materialize its unique character.
- Green Territory—By working toward harmony of development and environment in all sectors, it will strive to achieve sustainable development and contribute to the enhancement of quality of life.
- Open Territory—By working toward integration with Northeast Asia which will emerge as a core region of the global economy in the 21st century, it will make efforts for Korea to become a key player in NE Asia and world economy.
- Unified Territory—While aiming for peaceful unification that has long been overdue between South and North Korea, it will strive to achieve inter-Korea integration by creating a foundation for cooperation.

Major Strategies

1. Open and Integrated National Territorial AxesIntegrated National Territorial Axes

1.1 Structure

Territorial framework is required to actualize the function of Korea as a strategic gateway for Northeast Asia. It is necessary to make strategic use of the geographic advantages of the Korean Peninsula as a convergence of a continent and an ocean, and to establish a development strategy to interlink the three economic spheres of the Yellow Sea Rim, the East Sea Rim, and the Pacific Rim. Korea's strategic locational advantages as a strategic gateway can be marked by its continental link to China, Russia, Europe, etc. to the north and its oceanic connection to the east.

Virtue of its peninsularity could work as a launching pad to penetrate the Northeast Asian region. Korea could efficiently utilize the huge regional market of NE Asia composed of China(north of Shanghai), Japan, Far Eastern Russia, Mongolia, and North Korea, whose combined population and GNP runs up to $700 million and $6 trillion respectively. To become a strategic gateway, Korea needs to create an open territorial structure equipped with a land-water-air logistic infrastructure that includes an international hub of airports, harbors, and continental railway networks serving NE Asia and Eurasia.

The new framework also needs a balanced and competitive territorial structure. It should promote regional strength to achieve balanced regional development and enhance national competitiveness at the same time.

There may be three coastal axes leading to the world by utilizing three sides of the Korean peninsula.

1) East Coastal Axis: Busan/Ulsan - Pohang - Gangneung/Sokcho - Rajin/Seonbong
2) South Coastal Axis: Busan - Gwangyang/Jinju - Mokpo - Jeju
3) West Coastal Axis: Mokpo/Gwangju - Gunsan/Jeonju - Incheon - Sinuiju

[Figure 2] Open and Integrated Axes of National Territory

They may also be the east-west inland axes to propel balanced development in the inland regions.

1) Southern Inland Axis: Gunsan/Jeonju - Daegu - Pohang
2) Central Inland Axis: Incheon - Wonju - Gangneung/Sokcho
3) Northern Inland Axis: Pyongyang - Wonsan(a long-term consideration after unification)

1.2 Strategic Role of Individual Axis

Each territorial axis should play strategically its role in the division of functions.

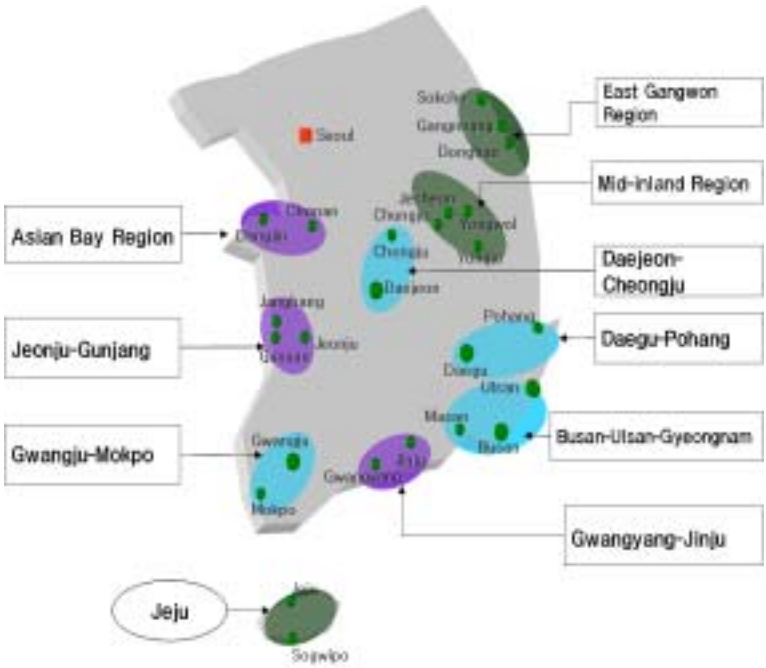
1) East Coastal Axis upgrades international tourism and key industries in the East Sea Rim sphere. It activates tour routes in the east coastal areas including international tourism covering Mt. Seorak and Mt. Geumgang. It also accelerates the process of upgrading key industries such as Pohang Steel, Ulsan Auto and Heavy Industries, Donghae Resource Processing, and so on.
2) South Coastal Axis is toward a specialized site highlighting international logistics, tourism, and industry. It nurtures the ports of Busan and Gwangyang, constructs a tourist belt along the south coast region, and develops specialized industrial sites including Masan, Changwon, Jinju, Sacheon, Gwangyang, Suncheon, and Mokpo among other places.
3) West Coastal Axis constructs a network of new industrial sites to correspond with China's growth. It builds a network of new industrial sites to be linked to Incheon, Asan Bay, Gunsan, Janghang, and Mokpo with an emphasis on complimentary growth. The ecological value of the Yellow Sea coast calls for environment-friendly development.
4) Southern Inland Axis strengthens regional linkage for balanced development in the east and west regions. It constructs an expressway network connecting Gunsan, Jeonju and Muju to Gimcheon, Daegu and Pohang. It also pursues an inter-regional cultural tourism project, and promotes exchanges between the East Sea and Yellow Sea Rim spheres.
5) Central Inland Axis shares functions of the Capital Region while activating interlinked tourism for mountain and coastal areas. It disperses the functions of the Capital Region to southern regions, and develops a specialized mountain-coastal area tourist zone to link the Capital Region with Gangwon Province.
6) The existing Seoul-Busan axis needs to build bases for industrial restructuring. It should disperse population and industries to enhance regional competitiveness and devise ways to reform existing industries into competitive industries generating high value added.

Some strategies are needed to form open and integrated axes of national territory. It is necessary to build 'A Network of New Industrial Sites' to nurture new industries. It is a network of new industrial sites linking the South Coastal Axis with the West Coastal Axis that includes Incheon, Asan Bay, Gunsan, Janghang, Mokpo, Gwangyang Bay, and Jinju among other places.

The structure of territorial axes requires physical transportation infrastructures for the nation to play its gateway role in Northeast Asia. It is needed to develop Incheon International Airport, and the Ports of Busan and the Gwangyang into NE Asia's hub airport and seaports, respectively. On a long-term basis, there should be a link the nation's high-speed railways to inter-Korea tracks, the Trans-Siberian Railroad(TSR), and the Trans-Chinese Railroad(TCR).

The new territorial structure requires a development scheme of growth pole regions to play the leading role in regional growth. Several growth pole regions can be proposed along the new territorial axes. They

[Figure 3] Strategic Development of Ten Growth Pole Regions



should play the role of a regional center for balanced development. They also play the role of the foundation to promote the axes. They should play the role of a regional center for balanced development. They also play the role of the foundation to promote the economies of scale and to empower then to lead regional progress in securing check and balance against the capital-dominant spatial structure. In order to make the growth pole regions grow into outposts for globalization, it is required for the regions to be strengthened for internationally-oriented production and logistic functions while expanding international infrastructure including airports, harbors, and information/telecommunications facilities.

2. Strategies for Balanced Territory

2.1 Dispersal of Capital City Functions and Globalization of the Capital Region

It is required to decentralize capital functions to provincial regions in order to secure balanced territory. Recently the Korean government has endeavored to disperse private businesses in large or medium companies of the Capital Region to local cities. The government has given strong incentive packages such as tax relief, soft loan, and deregulation of city development for private enterprises. There have been little effects. The implication is that it is very difficult to push private companies to areas outside the Capital Region, even with incentive packages. The dominant power of the Capital Region is too strong. It means that public institutes should play a leading role in decentralizing functions of the Capital Region.

Therefore, it is necessary to expand the dispersal and transfer of the agencies and powers of the central government. Dispersal of the central government agencies will likely contribute to balanced territory. Priority of decentralization can be given to simple administrative or implemental functions of the central government, which are closely related to local affairs.

And then, some effects will be seen by suggesting incentives for the relocation of key private institutions, including the headquarters of enterprises, factories, and financial institutions from the Capital Region. An integrated support system may be needed. And, at the same time,

it is needed to promote the transfer of headquarter functions such as investment decisions, production management, procurement, information processing, etc. which are closely connected with local economy.

For the case of efficient dispersal of highly concentrated functions within the Capital Region, the spatial specialization may be desired for intra-regional dispersal in order to enhance the competitive edge of the Capital Region. It means that a kind of double decentralization is needed: intra-regional decentralization and inter-regional decentralization. In this process of decentralization, international functions of the Capital Region should be intensified. By providing physical infrastructure and nurturing professional service industries, Seoul will enable to perform its international functions. In order to promote Seoul to a global city, Seoul-Incheon belt may become a key corridor with international functions. It is because that Incheon has an international hub airport, and Seoul alone has its weakness. It implies that Seoul-Incheon metropolitan area should be restructured as an international belt of finance, trade, and business plus the home base of multi-national enterprises. In this belt, Incheon will play the role of a global outpost accommodating international logistics, shipping, information and high technologies. It is possible by restructuring as a free airport town to be interconnected with Incheon international airport.

2.2 Regional & Urban Specialization within Decentralization

Industrial specialization for each city can strengthen urban competitiveness in the process of inter-regional decentralization. A kind of industrial cluster is needed for each city. This strategy of urban industrial clustering is one of transforming urban hierarchy with extremely dominant role of Seoul to urban network system in which each city has its unique competitiveness. The Korean experiences of industrialization and urbanization show that urban industrial specialization can lead to boom towns such as Pohang, Ulsan, Gumi, Changwon, and Masan. In this conception, major regional cities can be fostered to become an industrial capital. It is a strategy to develop each major city as an industrial capital of a particular industry in Korea, thereby actively sharing the functions presently concentrated in the Capital Region. Industrial capitals can be suggested. The candidate cities include Daejon as a capital of science and technology industry, Busan as a capital

of international logistics industry, Daegu as a capital of textile and fashion industry, Ulsan as a capital of auto industry, and Gwangju as a capital of opto-electronic industry.

As promoted to industrial capitals, the major regional cities will be able to function as the home of a specialized cluster of industries, attracting support services, and cultivating related human resources in those cities. Self-selection of industries is needed, in other words, by considering the features of its industrial structure and its potentials, each city will choose a particular industrial sector. This strategy should be pursued to nurture regional cities in accordance with the overall national industrial development strategies, while linking them to the regional industrial promotion plans.

At the same time, small and medium-sized towns should be transformed to be cities with specialized functions. For their transformation, they should be developed as cities of specialized clusters of industries in light of their particular regional potential and conditions. The central government's role is also required. The central government can play a promotive and coordinative role by supporting small and medium-sized model city projects. Each city has to select a development strategy, focusing on its specialized industries by taking into account the development potential.

3. Strategies for Green Territory

3.1 Sustainable Territorial Management

The concept of sustainable development should be introduced in harmony with the environment in all sectors of national development planning including regional development, industrial location, construction of infrastructure facilities, tourism, urban management, resource management, and so on. It is needed to establish an inter-governmental system of cooperation and integrated management for building a sustainable nation and securing advanced standards and means of environmental protection. It is also necessary to establish guidelines of environment-friendly models of development. They can be applied to the entire process of development projects from the stage of planning and designing.

3.2 Integrated Ecological-Territorial Network

The ecological network of Korea is unique. It can be structured by creating an integrated ecological management system, and building a network embracing major mountain ranges - major rivers - major coastal areas. It is possible because the Korean territorial feature shows that mountains, rivers, and coastal areas are very closely located.

Interconnection is needed among such natural properties of great ecological value as the Baekdu orogenic range, DMZ, wetlands and mudflats, streams and valleys, and big lakes within the integrated national ecological network. Rational measures are needed to protect and enhance the ecological value of rivers, streams, and coastal areas, and to provide diverse bio-habitats, by the implementation of nation-wide projects. They aim to turn the entire country into an ecological park and restore the nation's eco-system.

4. Strategies for Open Territory

4.1 Synthesized Transportation System

Future transportation system should be based on a balanced consideration of the attributes of modal split and demands for transportation by passengers and cargo. Highways need to be assigned a leading role for passenger travel and short-distance trips. The share of passengers and cargo transport by railroads will be an efficient means of long-distance hauls. And the share of transport by marine vessels will increase, which will be suited for low-cost, long-distance hauling of big cargo, resulting into decrease in logistic costs. However, the construction of highway networks needs to be completed while gradually strengthening the railroad system.

In particular, main seaports and international airports should be made as the third-generation types of comprehensive logistic bases. For the construction of comprehensive third-generation types of logistic bases, it is necessary to build interconnecting transport system and hinterland logistic centers between ports and their hinterlands equipped with transport, distribution, and information networks.

4.2 International Transport Infrastructure and Free Port Zone

For the nation's prospective role as the strategic gateway to NE Asia, Incheon international airport should be fostered as the Asia's central airport. It is thus necessary to heighten its linkages with the major airports of neighboring countries to secure demands for transfer by Asian passengers bound for the United States and Europe. The vicinity area of the Incheon international airport needs to be developed as an area-wide free trade zone equipped with the multiple functions of information/telecommunications, logistics, and leisure industry.

And the improvement of Busan and Gwangyang seaports should be made to play a role as NE Asia's logistic center. One of their major roles is to absorb the transfer loading function of the NE Asian region through ongoing expansion of port facilities and intensified linkages with international trunk lines and shipping companies.

A peninsula-wide railway network is highly recommended. First of all, south-north transportation corridor is required to play a role as links to NE Asia: Busan/Mokpo - Seoul - Sinuiju - China, and Seoul - Wonsan - Cheongjin - Russia. It is also needed to form a Northeast Asian network of arterial railroads by connecting major lines with Trans-Chinese Railway(TCR), and Trans-Siberian Railway(TSR). The high-speed railroads can be extended to TCR and TSR.

For the case of a continent-bound highway network, it may be an important project to construct the 7×9 national arterial expressway system. The highest priority may be given to interconnecting the Seoul - Pyongyang - Sinuiju(China), Seoul - Wonsan, and Gangneung - Cheon - jin - Seonbong - Russia. This arterial system can be linked with the North Korea's main roadway network to hook eventually them up with Asian Highway. For the Korean territory to become efficient open land, it is necessary to build a marine transport network on the Korean peninsula and in NE Asia on the long-time horizon. Some projects should be initiated to construct a coastal transport network on the Korean peninsula that can be inter-linked with the ports of North Korea such as Nampo, Cheongjin, Rajin, Seonbong, and so on.

Particularly the open territory requires strategic bases for a new open economy. The territory has to nurture tax-exempt 'Free Port Zones' as a regional center to accommodate the new open economy. Such zones will be able to be designated as national strategic points

equipped with international airports and harbors, new industrial complexes, hinterlands, and professional manpower. They should guarantee free custom activities such as logistics, intermediate trade, processing, and so forth within the zones, and provide business-friendly conditions. Diverse incentives including benefits for tariff, income tax, corporate tax, and easy access to infrastructure and information/ telecommunication networks, and expansion of cultural, medical, and recreational facilities are needed.

4.3 Strategic Development of International Tourism

The Korean territory has very diversified resources for tourism from climate to culture, mountains, and seasides. Among them, Jeju Island can be developed into an international free city of tourism in the Asia-Pacific region, making the island a principal tourist zone in North East Asia. It can be done by blending its insular culture with the natural alpine(Mt. Halla) and oceanic resources. In this regard, it is necessary to strengthen its infrastructure for a free tourist zone by offering visitors no-visa and no-tariff entry privileges. In particular, with improving inter-Korea relations, Mts. Geumgang and Seorak, can be developed as a new international zone of tourism. By utilizing seashore resources, it is possible to actively pursue efforts to develop a tour package of the oriental cruise interconnecting NE Asia's key points of interest. The routes can cover Tianjin - Western coast of Korea - Jeju, Shanghai - Kyushu, North Sea Islands of Japan, and Eastern coast of Korea - Western coast of Japan - Russian shores of Asia.

5. Strategies for Unified Territory: Inter-Korea Integration

5.1 Direction

Although South Korea and North Korea are in difficulty in terms of mutual cooperation, a unified territory will be eventually restored. The two Koreas should land softly to the unified territory. If the unification is achieved in the future, many issues will appear. Most important one of them may be to deal with migration flow from North to South Korea, resulting from differences in job opportunities between

them. The migration may create difficult problems such as further congestion of the Capital Region in the South Korea and shortages of potential labor in the North Korea. In order to induce harmonized 'unification reducing problems that may be created after unification, it is quite necessary for South and North Korea to construct cooperative bases and to make system stability' by promoting diverse exchanges between them.

5.2 Management of Border Region

The border region between South and North Korea is important for the harmonized unification as well as inter-Korean active cooperation. The border region may play diverse roles. It can play a role of strategic space for inter-Korean cooperative projects. It is able to serve as a role of ecological place. And it will play a role of absorption place of migrated people after unification.

By considering these roles of the border region, it is necessary to develop a comprehensive management system of the border region. It can be managed for the utilization of development potential and the preservation of natural environment according to separate criteria: areas for preservation, areas for semi-preservation, and areas for maintenance.

In the areas for preservation, it is desired to promote active protection for the ecological resources. In the areas for semi-preservation, it is needed to assign tourist functions making use of their natural environment. In the areas for maintenance, it may be possible to strengthen the foundation for regional growth through infrastructure expansion and designation of special zones for inter-Korea cooperation. It is also necessary to expand social infrastructure in southern side of the border region in preparation for active inter-Korea exchanges. More detailed plan is needed to expand social infrastructure in the border region, and to intensify support for the expansion of transport networks to improve quality of life.

More innovatively, it may be desirable to transform border region from on-going conflict to a 'Peace Belt' on a mid- and long-term basis. Development of conditions has to be implemented to build a peace belt by interlinking projects for South-North interchange and cooperation. Conceptually, the proposed peace belt will link the currents of inter-

change and cooperation triggered by Mt. Geumgang tours with agricultural cooperation in the mid-inland regions, peace eco-parks, joint management of water resources of the Imjin River, and so forth. In anticipation of cooperative projects to be pursued jointly by South and North Korea in the border region, it is necessary to develop specific zones of interchange and cooperation.

Some of prior projects include a project to establish peace and environmental preservation on the Korean peninsula by working out an inter-Korea agreement for such symbolic programs as the creation of a peace eco-park inside the DMZ(Cheolwon-Pyonggang). On a medium- and long-range basis, it is also necessary to develop a special tourism and trading zone to assume the dual function of an international tourism complex and a trading post utilizing ocean-borne resources along the coastal corridors.

5.3 Various Exchange & Cooperative Projects within North Korea

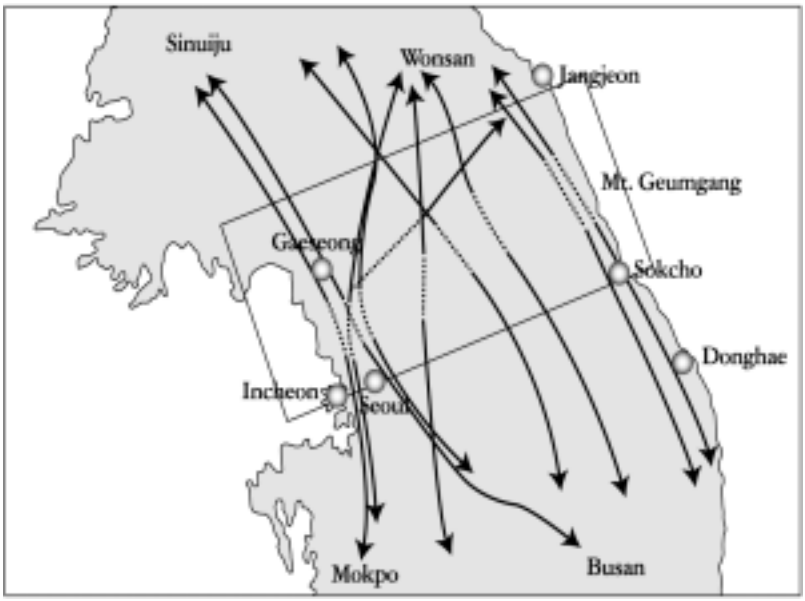
In order that South and North Korea may cooperate more positively and openly, it is possible to develop industrial complexes in the coastal areas and to expand infrastructure in North Korean regions. Industrial complex project has been already started in Gaeseong in North Korea. The locational factors of the project may include the feasibility of materializing a scheme to develop industrial complexes in coastal areas in the form of special economic zones around North Korea's existing industrial zones equipped with port facilities. On a mid- and long-term basis, it is necessary to expand power-generating facilities and gas pipelines to secure stable energy supply in North Korea.

To start inter-Korean cooperation, it may be quite productive to restore in phases the inter-Korea transportation networks that remain divided(6 national highways, 4 railroad lines). In addition to these, it is also necessary to construct a coastal transportation system to interlink South and North Korean ports along the West Sea and East Sea coasts.

5.4 Strengthening the System for Advancement of Inter-Korea Cooperation

Various inter-Korean cooperative projects need to be integrated and coordinated. It is also necessary to establish a cooperative system

[Figure 4] Restoration of Transport Routes Divided between South and North Korea



between private initiatives and governmental support. Basically, private initiatives need to steer the interchange and cooperative projects. For projects that may not be receptive to such private approach, it is desirable to seek cooperation from public agencies.

Furthermore, an international cooperative system is needed to activate South and North Korea's economic exchange and cooperation. To secure revenues for investment, it may be possible for South Korean enterprises to engage in joint investment projects with foreign enterprises. In particular, one of options is to develop a special cooperative system with such neighboring countries in NE Asia as Japan and China. It is also suggested to enhance the stability of projects by persuading for joint projects for economic cooperation involving international financial institutions such as ADB and IBRD, and enterprises both domestic and foreign ones.

Planning and Implementation

Planning should not be separated from implementation. Most proposed strategies have been already included in the 4th Comprehensive National Territorial Plan of Korea(2000-2020). The plan has been under implementation since January of 2000. In order to implement it efficiently and cooperatively, three factors should be emphasized.

The first is financing. 'For the case of infrastructure, 2.6% of GDP should be invested. In the 1990s, the Korean government had invested 2.2% of GDP in infrastructure. In order to meet additional financial demand for infrastructure, the investment from the private and international sectors should be mobilized. In addition to this, diverse projects for inter-Korean cooperation need private and international investments. The second is 'organization.' National special body of implementing the new territorial plan is needed to coordinate and promote the related ministries. The French special body such as DATAR may be a benchmark organization. The third is 'law' and 'contract system.' To implement the plan, some related laws are needed. In particular, cooperative implementation system is desired between the central government and local governments. In particular, the intergovernmental contract system may be needed for territorial development cooperation between the central and local governments. The French version of plan contract can be introduced in Korea.

References

J. S., Lee. "National Development Planning: Priority Setting and Implementation Strategy." in Gun Young Lee and Hyun Sik Kim(eds.), *Cities and Nation: Planning Issues and Policies of Korea.* Seoul: KRIHS, 1995: 29-51.

J. S., Lee. "Regional Development Strategies in the New Millennium." Keynote Speech at the Jeollabuk-do/OECD Conference, November 2000.

The Republic of Korea. *The 4th National Comprehensive Territorial Development Plan(2000-2020)*. Seoul, Korea, 2000.

Y. H., Park. "Future Issues for the Territorial Improvement in the Twenty-First Century." Proc. of the Conference on the Korean Territory 2020. Anyang, Korea: KRIHS, May 1994: 1-25.

Y. H., Park. "The Visions and Strategies for National Territorial Development Toward the Twenty-First Century." Anyang, Korea: KRIHS, 1998.

2 Korea as a Northeast Asia's Business Hub: Potentials and Constraints

Won-Bae Kim

Introduction

The government of the Republic of Korea(Korea hereafter except when necessary to distinguish from North Korea) has recently announced a strategy of making Korea as a Northeast Asia's business hub(MOFE, 2002). This strategy can be regarded as a part of Korea's search for its future in a rapidly changing external environment. The intensifying trends of globalization and regionalization provide reasons underlying the formulation of the strategy, while the rise of China and the doubts on the efficacy of the commodity export strategy pursued by Korea in the past four decades constitute more immediate reasons for Korea's search for its future position in the global and regional economy. The 1997 financial crisis in Korea certainly added a factor of urgency in the discussion about Korea as a Northeast Asia's business hub. In short, the strategy, although it needs to be further refined, is an attempt to chart a new course for the Korean economy in the 21st century.

Doubts exist, however, on the appropriateness and feasibility of the government strategy. For example, foreign investors discount the possibility of Korea becoming a Northeast Asia's business hub because of its small market size, unfavorable business environment, and political risk arising from North Korea's brinkmanship diplomacy. Even some Koreans are doubtful of the idea of a business hub since Korea does not have a strong service economy and world-class

financial institutions. Instead, they strongly believe in the possibility of upgrading Korea's manufacturing competence with enhanced R&D activities. These doubts certainly reflect different perceptions of the reality in which Korea is located in time and in place. Also reflected are different visions of the future. So the business hub strategy is not purely in the domain of positive analysis but in the domain of normative exercise.

This paper is a small attempt to clarify some of ambiguities contained in the government strategy of making Korea as a business hub. First of all, it will discuss the appropriateness of the strategy with a balanced assessment of the potentials and the constraints that Korea has. Second, this paper will discuss the meaning of a business hub in a broad political-economic context invoking the concept of centrality. Third, the paper will discuss some essential works to be done before embarking the strategy in concrete policy terms.

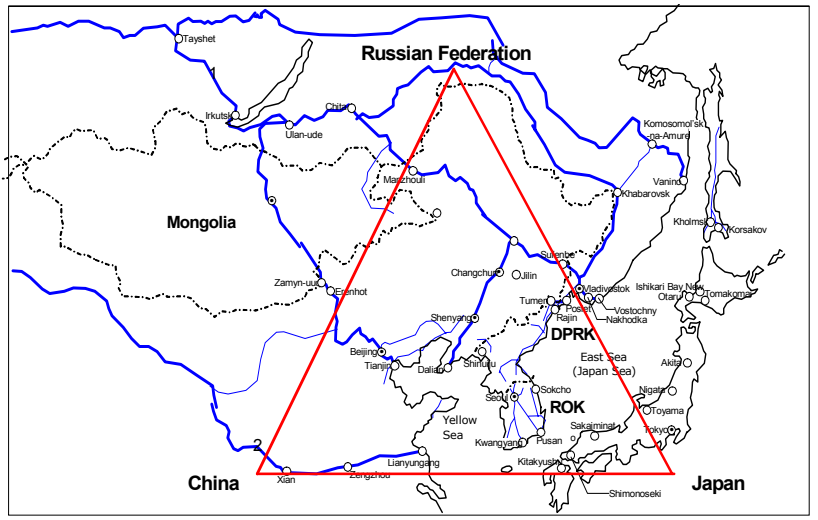
Assessing the Appropriateness of the Aims of the Government Strategy

The government strategy aims at making Korea as a business hub in Northeast Asia. The business hub idea contains three components:

1) a logistics hub for Northeast Asia;
2) a prime place for regional headquarters of transnational companies(TNCs); and
3) a financial center for Northeast Asia.

The major rationale behind this seemingly ambitious aim lies in Korea's geo-economic location in Northeast Asia. Korea is located in the triangle of emergent or emerging economic and military power(Figure 1). Japan, whose economic power still holds on the world's second position despite its long recession. China, with a huge potential market, is fast emerging as an economic powerhouse of the world. Russia, whose economic strength has dwindled after a transition to the market economy, is still a great military power. In addition, Russia has abundant natural resources and a European land connection of Trans-Siberian Railroad.

[Figure 1] Korea within the Triangle of China, Japan and Russia

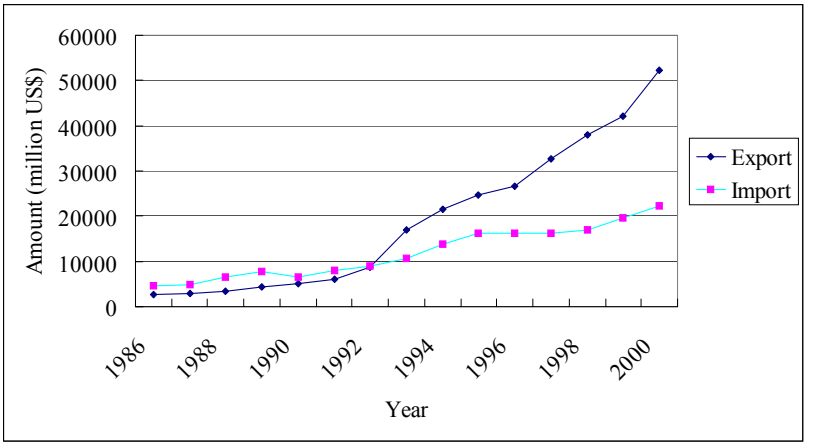


The geo-economic location of Korea undoubtedly provides a potential advantage but not a revealed or readily usable advantage. Without the opening of North Korea and the physical connections between North and South Korea, the geographical advantage of Korea cannot be fully utilized. This geographical advantage, if realized, may help Korea build a logistic hub but not necessarily a business or financial center since geography is not a key factor for the latter. This is why a few specialists in Korea argue for building up a logistic hub as a first priority(Nam, 2002; Jun, 2001).

1. Korea's Potential as a Logistics Hub

Korea already reveals comparative advantage in logistic functions. The port of Busan, ranking within the world's top three container ports in 2001, dealt with 8.07 million TEU(twenty feet equivalent units), of which 36.5%(2.94 million TEU) are transshipment cargo. Indeed, double digits growth rates in China's export and import are largely responsible for the growing transshipment function in Busan port(Figure 2). High costs of inland transportation between cities in Japan are an additional factor in the increasing use of Busan as a hub port by Japanese freight owners in the southwestern part of Japan. How-

[Figure 2] China's Export and Import with the U.S.



ever, sustaining the comparative advantage of Busan as a hub port depends on, firstly, how timely port handling capacity will be expanded in response to growing quantities of cargo and how efficiently port operation will be improved and, secondly, how effectively the Busan port will build up a feeder system with Chinese and Japanese regional ports so as to secure sufficient volume of transshipment cargo. The latter effort is necessary to compete with rapidly expanding international ports in a greater China(Table 1). Even though Shanghai may become an international port with direct calls from trans-Pacific ocean liners, Chinese ports in the northern coast such as Dalian, Tianjin and Qingdao will have to use Busan or other hub ports because they are off the trunk lines.

Regarding air transportation, Korea's Incheon airport is rated favorably in terms of international and regional linkages. This stems from the geographical advantage of the airport. For example, there are 43 million-plus population cities within the airport's three and half flight hour distance(approximately 3,000km radius). With current aviation technology, flights originating from Southeast Asia have to stop by either in Korean or Japanese airports in order to reach the east coast of North America. This renders an opportunity to the Incheon airport to function as a hub for transfer passengers and cargo. As of August

[Table 1] Ports Capacity and Expansion Plans in Greater China

	Harbor depth(m)		Number of berths		Freight volume handled (million ton)	Container cargo handled (1,000 TEU)
	Current	Planned	Current	Additions planned		
Tianjin	12-15.2	15	12	4	95(2000)	2,011(2001)
Dalian	12-14	16	11	4	90(2000)	1,220(2001)
Qingdao	14.5	16-17	31	18	86(2000)	2,640(2001)
Hong Kong	15	15	26	23	178(2001)	17,826(2001)
Shanghai	9.5-14.2	15	18	58	204(2000)	6,330(2001)
Kaoxiung	15	15	27	23	373(2001)	7,420(2000)

Source: Nam, 2002

2002, the share of transfer passengers was about 12% and it is rising. For cargo transshipment, the average volume per day is about 2,300 ton and the share of it in the total cargo reaches about 50%(Cho, 2002).

Korea's geographical advantage in regional transportation and logistics will be further strengthened when its railroad will be connected with trans-Siberian rail and trans-China rail. This land connection to China and Europe via Russia will provide an opportunity for Korea to become a logistics hub complete with sea, air and land connections. It means a significant expansion of the service area of Korea's logistics function. The major hurdle that South Korea has to overcome is obviously North Korea. According to the agreement between South and North Korea, rail connections between Seoul and Gaeseong in the west coast and between Gangneung and Goseong in the east coast were supposed to be completed by the end of 2002. The construction of rail on both sides of the demilitarized zone is known to be almost complete. But the actual connections are delayed because of unexpected problems developed recently by North Korea's dangerous venture with nuclear reactors. If tension increases between South and North Korea and between the U. S. and North Korea, it will not only delay the completion of creating a regional logistics hub in South Korea but also negatively affect the investment climate in South Korea.

Therefore, a peaceful solution of North Korea's nuclear development program is a must for South Korea's business hub strategy.

2. Korea's Potential as a Regional Headquarters of TNCs

The aim of becoming either a center for regional headquarters of TNCs in Northeast Asia appears not easily achievable. First, foreign investors do not perceive Korea as a hospitable country, in which foreign-invested firms can operate their business free of unnecessary regulations and discriminations. Business environment in Seoul is not as favorably rated as competing cities such as Hong Kong, Tokyo, Singapore and Shanghai(Table 2). Government regulations and their not so transparent applications, rigid labor markets, and restrictions in the use of foreign currencies are regarded as major factors responsible for an unfavorable business environment in Seoul. Difficulties in raising and educating children in Korea are also pointed out as a negative factor by foreign firms. Furthermore, North Korea adds another risk factor, when foreign companies consider investing in South Korea. Despite the liberalization of foreign direct investment regulations after the 1997 crisis, all those negative factors still remain as an obstacle in hosting green-field investment. This is reflected in the statistics on FDI distribution in East Asia(Table 3).[1] Thus, creating a business-friendly, low-risk environment is a key for Korea to become a business center.

Second, Korea does not currently possess many strategic assets to attract foreign investors. Although it has a strong competence in production capacity in a few sectors, Korea does not have a strong competence in R&D, marketing or design capacity and it lacks international expertise on Chinese or Northeast Asian markets. Considering that expertise on China and banking helped make Hong Kong a financial center and that expertise on Southeast Asian countries and well-developed logistics and business networks with them helped establish Singapore as both a logistic and business hub in Southeast Asia, Korea has to enhance its international expertise on Northeast Asia by nurturing regional experts(Kim, 1999; Ho, 1999). The utilization of experiences of

1) FDI has increased substantially after deregulation measures were taken in 1998. However, FDI inflow has been declining after reaching a peak in 1999(recording 15.5 billion US$). It has fallen down to 9.1 billion US$ in 2002(SERI 2003).

[Table 2] AMCHAM Business Environment Survey Results

Category	Seoul	Shanghai	Hong Kong	Singapore	Tokyo
Macroeconomic environment	4	1	2	3	5
Global business environment	5	1	2	3	4
Tax system	3	5	1	2	4
Foreign exchange controls	5	4	2	1	3
Labor flexibility	5	3	2	1	4
Worker permits & immigration	5	4	1	2	3
English language skills	4	5	1	2	3
Country image	5	3	1	2	3

Note: 1 means most favorable and 5 means least favorable

Source: AMCHAM, 2002

[Table 3] Foreign Direct Investment Distribution by Country In East Asia

Country	Hong Kong	Singapore	China	Taiwan	Korea	Japan
FDI in 2000 (million US$)	6,448	6,390	40,772	4,928	10,186	8,187
FDI stock (million US$)	469,776	89,250	346,694	27,924	42,329	54,306

Source: UNCTAD, 2001

[Table 4] Distribution of Regional Headquarters of Fortune Global 100 as of May 2000

City	Number of regional headquarters
Hong Kong	22
Beijing	5
Shenzhen	1
Tokyo	5
Kobe	1
Seoul	1
Singapore	12(21[1)])

Note: 1) refers to the cases when regional headquarters exist in other cities of Northeast Asia

Source: adopted from Lee, 2002

Korean TNCs in regional and global production, distribution, and marketing would be one way to enhance Korea's international expertise. Certainly, professional expertise in multi-country management with language proficiency would be an important asset to attract the regional headquarters of TNCs into Korea. Unfortunately, as of now, Korea is not a highly rated location for TNCs regional operation. Compared with Hong Kong and Singapore, Korea occupies a minor position in East Asia(Table 4).

Competence in production technology and R&D capacity in a few sectors such as semi-conductors, mobile phones and other communication equipments, automobiles, ships, and steel has been a strategic asset of the Korean economy. Actually a substantial proportion of foreign direct investment into Korea has been attracted for this reason. Doubts are growing, however, i.e., how long can Korea sustain superiority over China in the production and production related R&D capacity in those sectors? Considering the fact that TNCs including Koreans have been expanding their investment in both production and R&D capacity in China, the prospect is not so bright. Many observers agree that Korea has to find a way to enhance its R&D capacity in a few strategic sec-

tors such as communication equipments and industrial machinery(Yoo, 2001). More importantly, Korean manufacturing firms have to collaborate with Chinese firms through role differentiation, i.e., Korean firms concentrate on high-value-added, non-standardized products and processes, while utilizing Chinese firms as producers of standardized products and processes. Building up a collaborative industrial structure in an increasingly competitive environment requires not only a strategy of restructuring of domestic firms but also a strategy of collaboration with Chinese firms. Obviously, expertise on Chinese industry and market is a prerequisite to formulate such a strategy.

3. Korea's Potential as a Financial Center

The idea of becoming a financial center in Northeast Asia seems premature. Even though restructuring of the financial sector after the 1997 crisis made some improvements, Korea does not enjoy comparative advantage in the financial sector. The size of Korea's financial sector is too small to pull financial capital into Korea. As of the year-end of 2001, the total volume of stock exchange market in the world reached 31 trillion dollars. The New York stock exchange took the lion's share 41.4% of the total. If we add Nasdaque(about 2.7 trillion dollars) to it, the share of New York in the global stock market is dominant(World Foundations of Exchanges, 2001). Followed by New York are Tokyo and London. As such, global financial centers are closely related to the order of economic power by country. An exception may be Hong Kong because of its unique position in Northeast Asia. Hong Kong has been playing a role of a regional financial center serving China and Northeast Asian market excluding perhaps Japan. Given the small size of the Korean stock market(194.5 billion dollars), it does not have a large influence over the Northeast Asian region.

However, there are a few promising signs that Korea can become a regional financial center. The size of bond market in Korea is the largest(246 billion dollars as of the year end of 1999) in East Asia(Kim, K. H., 2002). Moreover, after the restructuring of the banking sector, Korea's Kukmin Bank became the 14th largest bank in East Asia.[2)]

2) The Kukmin Bank ranked 68th in the world. Top twenty banks are mostly owned by G7 countries except for two Chinese banks(The Banker, 2002).

Mergers contemplated now are likely to create two or three more large banks. Significant improvements have been made in the operation of banks since the 1997 financial crisis. For example, the capital adequacy ratio in most Korean banks reaches around 12% now. The financial sector has been rapidly internationalized since 1997; foreigners occupy one quarter of stocks in the financial sector of Korea now. The availability of Internet broadband service to households, firms and financial sector provides an advantage for Korea to carry out on-line transactions in the financial market including and stock and foreign exchange. Despite these recent improvements, Korea has to supplement its weaknesses. Most of all, government regulations over capital transactions have to be reformed so as to create new financial products. Korea's banks must learn advanced financial techniques and know-how to lead the banking sector in the region. Related services such as accounting and legal services should be nurtured. A cluster of those specialized finance-related services is known to be a key factor in sustaining global financial centers such as New York and London(Sassen, 1999).

4. Prospect for a Business Hub

The foregoing discussion suggests that Korea has potentials to become a logistics and partially business hub in Northeast Asia. The prospect for a logistics hub is relatively brighter than that for a regional headquarter of TNCs and for a financial center. Such a prospect is, however, premised upon several conditions such as a continued economic reform, building up cooperative relations with neighboring countries and an open social system to accommodate foreigners and foreign cultures. The government of Korea seems determined to further its economic reforms, although reforms are likely to take some time. Regarding with the second condition, Korea is poised to take challenges. The question, however, is whether Korea has the capacity to effectively form cooperative relations with China, Japan, the U. S. and Russia. Diplomatic initiatives taken by Korea in the late 1980s and the early 1990s with respect to Russia and China testify that Korea has a potential capacity to do it. But challenges facing Korea in the early 21st century are much more complex and difficult than those in the latter 20th century since more actors are competing for better position in a new economic order of Northeast Asia. The immediate challenge that

South Korea has to deal with is nuclear and missile problems engendered by North Korea's brinkmanship diplomacy. Other challenges with long-term implications include how to set up collaborative relations with China, Japan and Russia so as to utilize interactions with them for the benefit of Korea. In a broad sense, this amounts to the utilization of opportunities, while minimizing risks, arising from regionalization and globalization processes. At the moment, no one is confident to say that Korea has all the necessary skills and strategies. A cautious optimism is possible if Korea can handle its current crisis-like situation in the Korean peninsula. A successful resolution of the crisis will provide Koreans with valuable diplomatic skills and know-how to deal with big powers in Northeast Asia.

The most difficult and perhaps the most fundamental task is to overcome xenophobia and to build up an open society. For anyone, who knows Korean history, can readily tell that Korea did not have experiences of aggression towards other countries. On the contrary, its history is dotted with numerous invasions and wars initiated by external powers. As a result, Koreans tend to be more inward-oriented and occasionally xenophobic. There seems to be no quick solution for xenophobia. It is only possible to overcome fears through more interactions with foreigners and foreign cultures. By then, Koreans can learn how to deal with foreign countries and cultures comfortably. As a matter of fact, Korea has a great potential in mediating cultural gaps between the East and the West, and even among East Asian countries. The so-called, Korean Wave, in recent years is one example, in which one can find a potential in creating pan-Asian cultural code through television drama, music and movies. This role of mediator can certainly be extended to economic arena so that Korea can play a role of a standard setter in Northeast Asia. In addition, Korean diasporas in China(about 2 million persons), in Japan(0.7 million persons) and in Russia(about 0.3 million) is a great human asset, which can be tapped for bringing these countries together for the peace and prosperity of Northeast Asia.

Redefining the Meaning of Centrality to Realize the Idea of a Business Hub

The government strategy of a business hub assumes that Korea can establish its centrality in the geo-economic space of Northeast Asia. As discussed in the above section, Korea certainly has a potential to become a logistics hub at least. But this potential may not become a reality unless Korea is committed to renovate its institutional infrastructure and to reformulate its strategy of cooperation in a globalized era. With respect to the first point, many suggestions are already proposed for reforms in education, labor market, tax regime, and so forth. The second point is, however, insufficiently considered in either government policy or academic discussions. It is naively assumed in the government strategy that Korea can become a business hub in Northeast Asia by building a few special districts exempted from domestic business laws and regulation. Establishing a business hub is not the same as building special economic zones, which can be found in many places of the world. It entails an elaborate strategy of cooperation with neighboring countries because a hub requires a supporting area or hinterland(Kim, 2002). The geographical extent of such a hub would vary depending on the type of hub. Hong Kong, for example, has been serving southern China as the major trade port, while it has been playing a role of a financial center for the Far East. Recently, however, Hong Kong's position is being challenged by Shanghai in both logistics and financial hub functions.[3] In result, Hong Kong's centrality is being reduced as its service area shrinks.

As the example of Hong Kong indicates, globalization and regionalization processes in general and the emergence of China as an economic power in particular are responsible for changes in the dynamics of individual centers or hubs in Northeast Asia. At the country level, both China and Japan can claim centrality over the geo-economic space of Northeast Asia as they have big markets and economic power. But their centrality is of limited influence since they are not leaders in setting or spreading global norms and standards. In spite of its eco-

3) The reintegration of Hong Kong into China as a special administrative region was an additional factor contributing to the shrinking role of Hong Kong as a financial and logistics center in Northeast Asia.

nomic might and technological prowess, Japan has failed to lead the countries in Northeast or East Asia. As Sassen observed(1999), Tokyo's failure to remain as top three global financial centers was that it stayed too Japanese. Even if Japan recovers from the long recession, it is unlikely to claim centrality over the geo-economic landscape of Northeast Asia because of its weak international leadership and eroding international competitiveness.[4] China, on the other hand, has a potential to become an economic center in the distant future. But it is not expected to play a role of a regional leader in the economic arena in the immediate future because China's economic institutions have yet to be modernized and its infrastructure has to be significantly improved. For the time being, the geo-economic space of Northeast Asia will be in a fluid situation, where China and Japan compete with each other to expand their respective economic gravity field. The influence of the U.S. will be undoubtedly significant in the formation of a new economic order in Northeast Asia. In sum, there is a window of opportunity for Korea to establish its role in a new economic order of Northeast Asia.

What inspires from the above discussion is that centrality is neither a simple function of economic power nor a function of tangible factors. It entails both hard and soft power borrowing the concept of Nye(Keohane and Nye, 2000). It also includes both tangible and intangible factors including norms and beliefs. Centrality can thus be achieved through networking using both soft and hard power. Netherlands is perhaps an example of a country, which succeeds in achieving centrality in Europe by utilizing its soft power. The reputation of Netherlands as one of Europe's major distribution centers is not simply established by its geographical location or physical infrastructure. Dutch people's language skills, mercantile spirit, business ethics, and multicultural management and diplomatic skills that have been accumulated through history add up to the soft power of Dutch(Lehman, 1999). In other words, the centrality of Netherlands is a product of combined factors including both tangible and intangible assets and cooperation-oriented geo-economic strategies. The success of Netherlands as a distribution

4) The port of Kobe has lost its hub port position in Northeast Asia because of its low price competitiveness. The great Hanshin earthquake gave also a fatal blow.

center in Northern Europe boils down to its ability to minimize transaction costs and to maximize network benefits. Of course, it can be added that the European context, where many countries share more or less common norms and standards, provided a larger institutional frame for Netherlands to utilize networking with neighboring countries. Netherlands may be not the leader in setting global or European norms and standards but it is considered to be an active agent in assisting the spread of such norms and standards.

Therefore, in order for Korea to assert centrality in Northeast Asia, two-front efforts are necessary. First, it should work towards setting up broad institutional frameworks through which the geo-economic space of Northeast Asia can be free of barriers. Free trade agreement, which has been widely discussed in East Asia, is one kind of institutional frame-making strategy. It contributes to overcoming national barriers in trade by eliminating tariffs between countries in agreement and helps make a homogeneous institutional space across countries. Investment protection treaty also helps free capital movement. With respect to air transportation, an open-sky agreement is important in opening up the space for air transportation. Setting up common technology and logistics standards helps save transaction costs between the countries in Northeast Asia. All these inter-state institutional arrangements cannot be unilaterally made and they must be made bilaterally or multilaterally. Active diplomacy in the spirit of cooperation with competition is a must to achieve either bilateral or multilateral agreements regarding economic cooperation in Northeast Asia.

Second, Korea should earn trust from neighboring countries. Trust or respect cannot be earned by self-interested behavior. Although national interest is a *raison de tre* of a nation-state, it cannot be a *modus operandi* in a globalized economy. Sharing benefits by cooperation should be a key principle in forging networks with neighboring countries. This applies not just to nations but local and regional political entities as well as private firms. Trust, as Fukuyama(1995) points out, reduces transaction costs, which in turn enable firms, cities and nations to expand their economic space and enjoy the benefits of networking across national boundaries. Establishing business ethics applicable to Northeast Asia and practicing them may be the first step in earning trust from neighbors. Caring about poor areas and peoples, thus, becomes an important criterion in discussing about business ethics in

Northeast Asia. This is a contrasting point from European Union, where economic and cultural distances between member countries are not as great as in Northeast Asia. As Morishima(2000) observes, the principle of a market or unlimited competition principle cannot be unconditionally applied to Northeast Asia. Another important criterion to be considered in Northeast Asia is environment. Yellow dust, acid rain and marine pollution are not merely problems of China but they are problems of Northeast Asia. These environmental problems require concerted efforts between nations and more importantly between firms and citizens. Exporting pollution-causing industries from Japan and Korea to China should not be tolerated.

Earning trust from neighbors will not be easy, however. As we are observing, misperceptions among peoples in Northeast Asia abound and occasionally lead to conflicts. It is, therefore, essential to understand neighbors' cultures and their needs. An accommodating attitude is necessary to the extent that it does not incur losses to oneself. Language skills and multi-cultural management skills are thus essential at all levels of society. This is perhaps the most important condition for buil-
ding a centrality in a globalized world. When Korea earns trust from neighbors through cross-border learning, it can play a role of a center, whether it is logistics or financial. Such a center is not meant to be a place of dominance but an essential part of the network, serving broad aims of coexistence and prosperity of the Northeast Asian region. In sum, given the small size of the Korean economy relative to Japan and China and the geo-political reality of a divided peninsula, Korea cannot resort to hard power alone. Instead, it should use its soft power as much as possible to forge cooperative relations with neighboring countries including North Korea.

Necessary Steps towards a Business Hub in Northeast Asia

The geographical location of Korea certainly provides a potential to become a business hub in Northeast Asia. Such a potential, however, can be materialized only if two conditions are met. First, the geo-eco-

nomic space of Northeast Asia becomes institutionally barrier-free and physically connected. Second, Korea has the capacity to utilize opportunities arising from the formation of a barrier-free, well-connected geo-economic space in Northeast Asia. In order to meet the first condition, Korea has to work together with China, Japan, and Russia. The big obstacle facing South Korea right now is North Korea. Persuading North Korea so as to build an integrated geo-economic entity in the Korean peninsula will take time, however. The first step, therefore, should be forging cooperative relations with China and Japan first. Free trade agreement at the national level or similar arrangements among special economic zones should begin as soon as possible. Other institutional arrangements with China and Japan include the liberalization of markets and standardization of technological specifications and procedures in certain sectors, for example, logistics, transportation and tourism.

Together with these institutional frame-setting efforts, Korea should engage in building intra-regional transportation linkages with Northeast Asian countries. Constructing a feeder service system and enhancing international trunk lines are a priority task for hub ports and airports. Building land transportation linkages with China and Russia is important as well because they expand the geographical extent of a hub port and airport. Russia is greatly interested in linking the trans-Siberian rail with the trans-Korean rail. China is also interested in having rail and road connections with South Korea. It is however, necessary to form international consortiums to renovate North Korean railways. Eventually, these consortiums can be used for upgrading land transport systems in China, Mongolia and Russia.

Transportation infrastructure development has the effect of not only lowering transaction costs but also opening up opportunities for underdeveloped areas in Northeast Asia. Another infrastructure building project, which has a paramount importance in Northeast Asia, is natural gas pipeline. Korea and Japan are energy-poor countries. Although China has energy resources, its energy self-sufficiency is expected to decline soon. Therefore, natural gas pipeline projects will help resolve energy problem in Northeast Asia. As a bonus, they will contribute to the reduction of air pollution in Northeast Asia. In addition, region-wide infrastructure building projects like transportation and energy are critical for creating a development community in Northeast Asia. Mul-

tilateral governmental commissions for transportation and energy in Northeast Asia would be the first step towards forming a development community. Since infrastructure development requires a large amount of funds, Korea in collaboration with Japan, China, the U.S. and EU should consider establishing either infrastructure development fund for Northeast Asia or Northeast Asian Development Bank.[5] Taking a leading role in such endeavors and hosting the headquarters of new regional institutions will help establish Korea's position in a new economic order of Northeast Asia.

In order to meet the second condition, it is necessary for Korea to take multi-front actions covering from educational reform to infrastructure development. Considering that manpower with language and cross-cultural management skills is essential for a hub country, educational system should be tailored to meet such a need. For the time being, foreign talents and Koreans with foreign passports should be employed to fill the gap. Accordingly, immigration laws must be relaxed to import them. Financial reform should also be continued to enhance the competitiveness of Korean financial institutions. Of course, many other areas such as labor market and tax system are in need of reform, which require perhaps a separate paper. One additional point to make regarding the capacity building is infrastructure building. As discussed earlier, Korea has a comparative advantage in maritime and air logistics. But this is perceived narrowly in terms of point, i.e., port or airport. Maintaining comparative advantage from a single point will be difficult, considering increasing competition from other countries. Because of a small territorial size, Korea can pursue building a logistics platform composed of lines(rail and road) and points(ports and airports). Interweaving such a logistics platform with production complexes, R&D centers, business centers and culture and tourism attractions will greatly enhance the competitive advantage of Korea.

To sum up, Korea's capacity building should focus on three A's and they are *attraction, accessibility and accommodation*. Attraction means having magnets by which foreign firms are induced to locate in Korea. In order to enhance attraction, it is necessary to build up strategic

5) The idea of Northeast Asian Development Bank has been circulated almost a decade now. The key for the realization of the idea lies in the willingness of putting up funds by the Japanese government and the support from the U.S. government.

assets such as logistics platform, institutions with global standards and regional expertise. Accessibility basically means easy transportation and communication linkages with outside world. It includes not only physical facilities like airports and Internet services but also languages and business standards. Adopting English as a second language and global standards for business operations are essential measures to enhance accessibility. Accommodation refers to a capacity to absorb and digest different ideas and opinions including foreign ideas and practices. This is perhaps Korea's weak point as discussed in this paper. Making Korean social and economic system open to diversity and accommodative of foreigners and foreign firms will be the most challenging and yet rewarding task. Building up a cultural crossroad and thus acquiring centrality based on soft power should be the ultimate aim for Korea as a business hub in Northeast Asia.

References

AMCHAM(American Chamber of Commerce). "Dynamic Korea: hub of Asia." *Press Conference March,* 13, 2002.

Chang Jae, Lee. "A hub country strategy and its policy priority." *Planning and Policy,* No. 9(in Korean), 2002: 15-22.

Duck Woo, Nam. *Let us look at Northeast Asia.* Seoul: Samsung Economic Research Institute(in Korean), 2002.

Fukuyama, Francis. *Trust.* New York: The Free Press, 1995.

Il Soo, Jun, "A new paradigm for a national development strategy: building a logistics center in Northeast Asia." Paper presented at the Northeast Asia Economic Forum and Korea Transportation Institute Conference on Building a Logistics Center in Northeast Asia. Seoul, September 13-15, 2002.

Jin Suk, Yoo. "The emergence of China and our response." Samsung Economic Research Institute CEO Information 284(in Korean), 2001.

K. C., Ho. "Singapore strategy for sustaining its competitiveness." in C. Hong and W. B. Kim(eds.), *Management Strategy for the Korean Peninsula in the 21st Century.* Anyang: Korean Research Institute for Human Settlements(in Korean), 1999.

Keohane, Robert O. and Nye, Joseph S. Introduction, J. S. Nye and J. D. Donahue(ed.). *Governance in a Globalizing World.* Cambridge: Brookings Institution Press, 2000.

Kee Hwan, Kim. "Korea can become a financial center." *World Village,* No.1(in Korean), 2002: 98-106.

Lehman, Jean Pierre. "Geo-political and geo-economic choice for Korea and lessons from Europe." in C. Hong and W. B. Kim(eds.), *Management Strategy for the Korean Peninsula in the 21st Century.* Anyang: Korean Research

Institute for Human Settlements(in Korean), 1999.
MOFE(Ministry of Finance and Economy). *Strategies for a Hub Country in Northeast Asia*, 2002.
Morishima, Michio. *Collaborative Development in Northeast Asia.* New York: St. Martins Press, 2000.
Sassen, Saskia. "Global financing centers." *Foreign Affairs* Jan/Feb 1999: 75-87.
SERI(Samsung Economic Research Institute). *Economic Brief,* No.298(in Korean), 2002.
UNCTAD(United nations Center for Trade and Development). *World Investment Report 2001.*
Won-Bae, Kim. "The geo-geo-economic position of Korea and its choice." in C. Hong and W. B. Kim(eds.), *Management Strategy for the Korean Peninsula in the 21st Century*. Anyang: Korean Research Institute for Human Settlements (in Korean), 1999.
Won-Bae, Kim. "The nature and meaning of a business hub in Northeast Asia." *Planning and Policy,* No. 9(in Korean), 2002: 41-17.
World Foundations of Exchange. *Annual Report 2001.*
Woo Hyun, Cho. "The potential of the Incheon international airport." *World Village* No.1(in Korean), 2002: 130-136.

50쪽 백면

3 Globalization Network and Economic Regionalization

Jeong-Ho Kim

Introduction

The Korean government formally announced last April that the Korean peninsula should be developed as a regional hub for international business in Northeast Asia. The idea is based on the need for integration of regional economies, primarily those of China, Japan, Korea and the ASEAN to a less extent. Such a need comes with the emergence of China as an economic super power. In fact the combined GDP of the three countries accounted for about 20% of the world's total GDP in 2000. The percentage share will most likely increase further up as the Chinese economy is expected to achieve an annual growth rate of 7-8% for the next twenty years. By then China will probably be the second largest economic power in the world.

The dramatic change in regional economies poses both an opportunity and a threat to Koreans. Korean policy makers view the change optimistically and want it to play a major role in regionalization effort by bridging the Pacific Ocean economy and the Continent economy. Korea will have to exploit its geo-economic location and relatively well-developed telecommunication system and IT bases in order to achieve regionalization/globalization objectives. Koreans refer this regionalization strategy as a 'hub strategy' and define it as 'regionally inward globalization,' meaning that the country should act as the regional center for trade, logistics, financial and information flows and also for goods and

capital flowing through land, sea, and air.

Both the Japanese and more recently, the Chinese economy has traditionally depended on the U.S export market for its growth, and so has the Korean economy. However, it is very likely that the Northeast Asian countries can no longer maintain economic dynamism through the U.S dependent, export oriented strategies alone. One reason is the emergence of intra-regionally organized economic blocs, e.g., NAFTA, EU, etc. Obviously the world economy has rapidly been globalized under the WTO system, but at the same time it has been "regionalized" as much. The other reason is that China has become the world's leading manufacturing center and its preeminence helps change the region's status on the global economic scene and also necessitates economic interdependence among the Asian countries, especially the ones in the Northeast Asian region.

Korea wants to be prepared for such a change and take advantage of it. In fact, it intends to initiate and lead the trend. Given the country's geographical location and its advanced IT infrastructure, it can serve as an access point and gateway to both the Chinese and Japanese markets. But there are many obstacles to tackle with, and one of them is inadequate provision of costly hardware infrastructure facilities, including region-wide transportation and telecommunication networks. And the other one is the difficulty of institutional and cultural integration. Without the presence of adequate infrastructure, a regionally integrated market cannot be developed even if the border would vanish. Moreover, substantial transport system has not been seriously considered yet.

This paper briefly describes government-planned transportation infrastructure development, being designed to support globalization and regionalization efforts in Northeast Asia. The basic strategy is to develop global/intra-regional networks of air, sea and surface transportation connecting Korea with major international cities within the region and throughout the world. Various infrastructure development schemes will be briefly discussed in conjunction with regional/global hub strategies. But physical infrastructure alone cannot help such a strategy to realistically work. Thus, discussion will focus on non-physical elements as well, required for promoting regional/global hub concept.

Need for Cross-border and Intra-regional Economic Cooperation

Since when the WTO system began to operate, a new trend in the world economic scene has been the formation of cross-border regional entities. EU, NAFTA, and ASEAN are good cases in this point. These regional organizations are motivated rather economically than politically. In other words they depend on economic complementarity and geographical proximity. This is the reason that Scalapino calls them "natural economic territories"(Scalapino, 1992).

A regional trade agreement(RTA) is a global trend in which two or more markets form special trade relationship. According to the WTO, the number of RTAs around the world totals 240, with 70% of them in effect. And over 100 of them were concluded since 1995. Such an increase is attributed to the fact that the regional integration initiated by U.S and Europe has resulted in economic benefits as demonstrated by NAFTA and EU while attempts to liberalize trade through the WTO have been frustratingly slow.

Only recently however, countries in East Asia recognize the importance of such an intra-regionally organized cooperative effort. They could have done it without intra-regional organization, but things have changed so rapidly that they may have to organize such an entity in order to maintain sustainable growth. Many scholarly works have been done to support such an effort in this region. It makes sense because East Asia has now emerged as one of the three axes of the world economy; North America, Europe and Asia. North Americans organized NAFTA while Europeans and Southeast Asians formed EU and ASEAN, respectively, but there is none for Northeast Asians. They have witnessed significant and continuous growth over last decade. But they may no longer sustainable growth without intra-regional cooperation. The percentage shares of intra-regional trade in 1997 for NAFTA and EU in particular was 43.5% and 59.7%, respectively. On the other hand, the percentage of the trade shared among the Northeast Asian countries, namely, Korea, China and Japan, recorded only 8.7% for the same year(KIEP, 1999). Korea and China are the only countries without a single FTA(Free Trade Agreement). They should work on mid-to-long term FTA with major partners such as Japan, the U.S. and ASEAN.

The Northeast Asian economy is expected to grow at a rate twice as high as that of North America and EU. Clearly China will lead the region's economic future and continuously serve as the world's production base for the firms from advanced economies, especially, the Japanese and the American firms. And more recently a large amount of capital has been flowing into this region as a result of liberalization of the financial market. As the financial market advances and manufacturing spillovers increase, the Northeast Asian countries become more interdependent with each other. Since the 1980s intra-regional trade and investment have significantly grown and this trend will intensify for the years to come.

Consequently the Northeast Asian countries must realize the importance of trans-border cooperation in any form feasible for sustainable economic growth. In fact, had such a cooperative body existed, they might have avoided or minimized the negative effects such as an economic crisis as experienced in 1997. They have not only to compete, but to cooperate when deemed necessary. Otherwise they will always be outpaced by such super powers as North America and EU. Normally intra-regional cooperation takes place when countries involved are unequally developed or share distinctive endowments. For example, Singapore-Johor-Riau(SIJORI) cooperative triangle works because of distinctive production factor endowment that each country possesses; Singapore, providing capital and highly skilled labor, Johor, cheap land and less costly skilled labor, and Ria, low cost labor(Ho and So, 1997).

Also conceivable for cross-border economic cooperation is when neighboring countries are in different stages of industrialization and/or in the process of structural transformation of the national economy. For example, Japan is one of the most advanced economies in the world, yielding its manufacturing base to China and other ASEAN countries whereas China is fast growing predominantly with the agricultural and manufacturing sectors. Korea undergoes gradually industrial restructuring. Manufacturing activities, the labor intensive ones in particular, are no longer sustainable in Korea. Only the ones that are high value added and capital intensive can survive from severe competition, e.g., semiconductor, electronics, etc. If Korea wants to maintain sustainable growth it must rely on the financial and related business sectors. Logistics is another area that suits Korea because of its geographical location in Northeast Asia.

Given the changing economic structure that each country is now experiencing, the three counties in the region should seriously consider formation of cross-border cooperative body similar to NAFTA in order to mutually benefit from each other and more importantly, to collectively and strategically compete with the world's economic super powers. Accordingly, they may have to come up with FTA bilaterally or multilaterally. Generally FTA is one of the two most important prerequisites for intra-regional cooperation. Mutual agreement on FTA should be an objective that they have to collectively pursue. The other one is to provide high quality infrastructure, especially transportation and communication infrastructures. Cross-border cooperation normally takes place only when there exist geographical proximity, economic complementarity and infrastructure.

The Yellow Sea Rim has been suggested as a new cross-border intra-regional cooperative sphere. The area covers most of China's northern coastal region from Liaoning down to Shanghai, the western coastal region of both South and North Korea, and the Southwestern part of Japan. The Rim as shown in figure 1 below will be potentially most powerful economic zone if the four neighboring countries co-exist peacefully. The area is most populated, where businesses are concentrated. Over 1 billion people live and about 80% of the business activities in this region are known to take place there. The picture in 2025 is even rosier; it will hold 1.5 billion inhabitants, 30% of the world's total GDP and 40% of the world's total manufacturing products. Undoubtedly the region will be the world's largest market by then.

The four-way cooperation was inconceivable even a few years back. The isolation policy of North Korea has been an obstacle for the Korean peninsula to play an intermediary role in Northeast Asia. If the intra-urban connection system is fixed as it is now, Korea will have to pay high cost for its restructuring when it is reunified. Fortunately, now things have changed dramatically as North Korea began to open up its door to outsiders. This positive change means a possibility of linking the South Korea to the continent by land routes. North Korean leaders should realize that open door policy is the only way for them to survive although it may not be politically palatable.

In conclusion the time seems to be ripe for the four Northeast Asian economies to establish an intra-regional organization in order to speed up inward globalization. Korea wants to play a leading role in

the regionalization process. But it lags behind the advanced countries of infrastructure facilities, both hardware and software.

Infrastructure Development Scheme

1. Seaports

One of the key strategies to promote global business hub concept is to develop and modernize seaports, leading eventually to mega hub ports, large and sophisticated enough to serve the whole Northeast Asian region. Busan and Gwangyang ports are strategically located on the trunk line of the trans-pacific shipping route linking Los Angeles and Kaoshung, Taiwan. The two-port system can handle transfer freights from Japan's western coast and Northern China. Should inter-Korean rail transportation network be reconstructed, the system would offer the shortest transportation route for Northern China's export freight because the network will eventually develop into the Trans-Asian Railway (TAR). The TAR comprises the TSR(Trans-Siberian Railway) and the TCR(Trans-Chinese Railway), both leading all the way to the European countries. And the Asian Highway System(AHS) is another possibility if the two Koreas agree to link their long separated road systems together. The inter-Korean road can be incorporated into the Asian Highway passing through China and Russia.

Both Busan and Gwangyang ports are known to have competitive edge over the major ports in the Northeast Asian region in terms of their location and relatively reasonable service fee in particular. The fee is as much as 110% of that of Kobe and Hong Kong, 30% of Singapore, and 60% of Kaoshung. Presently both ports are serving primarily as container ports with 21 berths for Busan and 8 berths for Gwangyang. Besides both ports are located in the middle of the Northeast Asian region with over 700 million people in a radius of 1,200km. Busan port is the world's third largest deep-sea container port in terms of total amount of freights handled.

Busan container port has now been utilized to its fullest capacity and thus, given that container cargo increases at a rate of 10% a year. Its expansion is an absolute necessity, and the sooner, the better. Expansion works are in progress now as the Busan's port authority started

[Table 1] Major Port in Northeast Asian Region

World ranking (2001)	Port	Total container volume (1,000TEU)			Port charge ratio (Busan=1)
		1999	2000	2001	
1	Hong Kong	16,211	18,100	17,900	2.19
2	Singapore	15,945	17,040	15,520	1.30
3	Busan	6,440	7,540	7,907	1.00
4	Kaoshung	6,985	7,426	7,540[1)]	1.61
5	Shanghai	4,216	5,613	6,340	0.95
25	Kobe	2,176	2,266	2,100[1)]	2.19

Note: 1) Estimated

Sources: Containerisation International Online(http://ci-online.co.uk); Korea Maritime Institute(KMI), 1999

to construct Gadoek port and simultaneously consolidate Gwangyang port as well. Gadoek is located close to Busan and the port facilities, once built, will be integrated into Busan port. A total of 34 berths will be added to the existing 36 ones at both ports by the year 2011.

When both ports are expanded as scheduled and their services are fully modernized as planned, major coastal feeder routes will be open with China and Japan to serve as an intermediate role for North America-bound Chinese freight and Korean traders' use of the TCR for EC bound shipments. These transportation routes will result in sharp cuts in transport costs and time.

[Table 2] Outline of Busan-Gwangyang Seaports

	Quay length (m)	Capacity (1,000TEU/yr)	Development plan (2011, total)	
			Berths	Capacity (1,000TEU/yr)
Busan	5,973(21berth)	4,660	53 (Gadeok : 30)	13,360 (Gadeok : 8,100)
Gwangyang	2,550(8berth)	2,010	33	9,321

Source: Korea Maritime Institute, 2001

Busan-Gwangyang twin-ports will be developed into integrated logistics hub ports instead of ordinary cargo transfer center. A hub port can exercise a multitude of functions other than freight transport, including industrial assembly, valued added activities and international trades and businesses. In order to give further momentum, the government will designate the two ports and their surrounding areas as a "special economic zone(SEZ)." Once designated as such, foreign firms will be treated preferentially in those areas. The SEZ is designed as a tool to attract foreign direct investments(FDI), particularly those of multinational enterprises(MNEs). Various incentives will be provided for those firms to locate there, including exemption of corporate and other national taxes, tariff-free services, free circulation of foreign currencies, flexible land use and especially, industrial estates fully equipped with electric power, telecommunication and information networks, and safety features. Also provided will be high quality residential amenities, medical services, leisure and recreational facilities, and tax-free shopping and business support services such as professional accounting and legal services, and tax-free shopping facilities. Promotional efforts will focus on attracting knowledge based and technology intensive and high value-added industries, e.g. IT, bio-technology, and environment in particular.

[Figure 1] Major Sea and Air Ports in Northeast Asia

2. Airport

Airport is as much important as seaport in supporting the regional hub scheme. Incheon International Airport opened on March 29th of the last year with an ambitious plan that it would also serve as the region's hub for air traffics. The airport is also strategically located within a three-hour reach from over 40 cities with population exceeding 1 million. The total number of population combined within this region amounts to 1 billion. Furthermore, the American and European cities can be reached on non-stop flights. Flying time can be also reduced by 3 hours if the routes over China and Siberia are allowed to use in the future.

There are, however, a number of airports competing with Incheon International Airport, especially Kansai, Japan and Chek Lap Kok, Hong Kong. But the former airport is built on reclaimed land and thus, is known to be difficult and costly for future expansion. And the airport use charges are relatively high. The latter one is not free from various constraints either because it is built on a cone-shaped land that had to be flattened. The airport charges are also expensive there. On the other hand, Incheon airport is built on coastal land and thus, it can minimize the site development costs which help the airport fee be drastically reduced. In fact, the user fee is 30 to 70% cheaper now than competing airports in the Northeast Asian region.

[Table 3] Major Airport Charges in Northeast Asia

	Incheon	Kansai	Pudong	Chek Lap Kok
charges($)[1)]	2,800	6,102	4,790	4,885
(ratio, %)	100	217.9	171.1	174.5

Note: 1) Take off and landing charges

Source: MOFE. *Realization Strategy for Business Center in Northeast Asia*, 2002

The airport is built on 11.7 million square meter site and has two 3.75km long runways. It can even facilitate supersonic and super-sized airplanes to land and take off twenty-four hours a day. The terminal facilities are the world's largest of their kinds although they are not yet

fully occupied. The control tower is known to be highly resistant to strong winds and earthquakes. The airport is well equipped with high technology, automatically managed, controlled facilities and safety features, comparable to world-class airports, including ultra-precise modern landing system and integrated information system.

[Table 4] Outline of Incheon International Airport and Development Plan

	Current	Final(2020)
Area(m^2)	11,724,000	47,440,000
Runway	2(3.75km×60m)	4(3.75-4.2km×60m)
Cargo terminal(m^2)	164,000	419,100
Cargo(1,000 ton)	1,200	7,000
Passenger(10,000 person)	1,941	10,000
Aircraft movement(times/week)	2,959	9,000

Source: Young Wha Park, 2001(http://www.airport.or.kr)

The airport will be gradually expanded in four phases and its operating systems will be further integrated. The current airport facilities represent the first of the four phases and when all phases are finished by the year of 2020, the airport is expected to have 4 runways, 667 thousand square meters of passenger terminal, four boarding terminal, a cargo terminal of 419 thousand square meters and a moorage area that will accommodate 252 aircrafts simultaneously. By then it will be capable to handle a total of 480 thousand flights, 100 million passengers, and 7 million tons of cargos annually.

By 2005 the airport will rank as the world's third largest airport in terms of cargo handling. It carried a total of 164 thousand tons of cargo last April, up 18% from the same month of the last year. Transit passengers are on the rise too. The airport is geared to securing transit passengers with a rate of 25% up to 30% a year and a cargo transit rate of 70% by 2005. It will have to attract more airlines, including such global freight airlines as UPS and FedEx by expanding routes.

The second phase construction project is scheduled to start next year. It plans to add one runway, one boarding terminal and a moor-

age area of over 1.5 million square meters in size. In total, 8.25 million square meters will be added to the current facilities. And a 4km long runway will be completed by 2005 for a commercial aircraft of 600 tons, a moorage area to accommodate additional 56 planes and a boarding terminal for 32 planes all at once. If everything goes well as scheduled, the second phase will expand the capacity to 410 thousand flights a year, up from the current 240 thousand. The number of passengers will increase from 30 million to 44 million and cargo from 2.7 million to 4.5 million tons.

Simultaneous with the second phase construction project, the area around the airport will be developed into an international business center(IBC) and tax free zones. Almost 2 million square meters of land is set aside for logistics activities, including loading and unloading, warehousing, product processing and sales.

Once the second phase completed, the airport will witness freight handling grow by 8% a year and rank sixth in the world and second in the Northeast Asian region in terms of cargo handled and transported. The airport will be functionally linked with Incheon seaport in an integrated manner and the Incheon Metropolitan City now works on the project, collaborating closely with its airport authority.

However, there are many problems that must be overcome; mobilization of development funds in particular and timely provision of transit facilities connecting the airport to major cities, both domestic and international. Presently the airport highway is the only means through which people and cargos can move in and out of the airport, heading the Seoul Metropolitan Area and other parts of the country. Privately financed mass transit system has been planned, but its construction is far behind the schedule. The airport is situated in an island, requiring bridges to reach mainland. Bridges are very costly to build and the government wants the private sector either to be built, own and operate(BOO), or to build, transfer and operate(BTO), or to build, operate, and transfer(BOT) them. There are a number of investors, both domestic and international, who are interested in those projects, and negotiations are under way. Such an investment seems to be worthwhile because the long and medium term rate of return will be relatively high, given the fact that the Asia-Pacific region's air transport demand is increasing faster than any other parts' demand of the world. The region's percentage share of the world's total air transport was

36.2% in 1995, but it rose up to 38.5% in 2000. The Korea Transportation Institute(KOTI) recently forecasted that the share would jump up to 44.6% in 2005 and 49.8% in 2010.

3. Surface Transportation

Surface transportation normally consists of railway and road transportation systems. Much of the talk between the two Koreas on surface transportation has focused on railroad and so the discussion that follows emphasizes inter-Korea railway system that can run all the way to Europe via Russia and China.

Rail transport system is known to be relatively efficient when it comes to moving the bulky freight. Normally the system generates positive return on investment if its length runs at least 500 kilometers, but the longest one in Korea is only 422 kilometers running from Seoul to Busan. This is one reason why rail transportation investment effort has not been actively pursued in Korea. Much of the effort has placed on adequately maintaining the existing system.

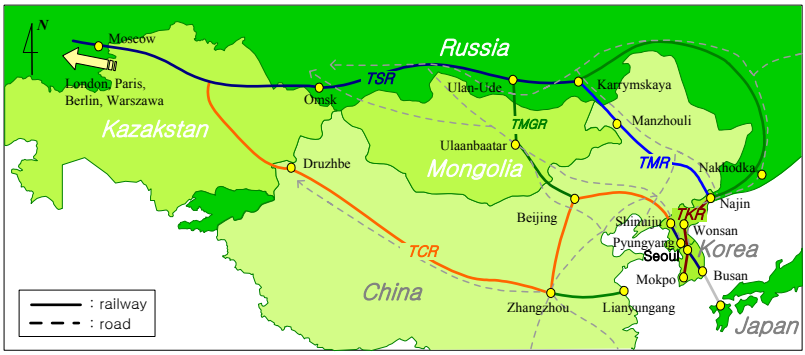
[Table 5] Surface Transportation of Korea

	Major plan			Networks
		1997	2020	
Roads	Construct 7×9 networks of arterial expressways	-	-	· can use the Seoul-Busan, western sea, and the east coast expressways · national road 1, 3, 5, 7, 3, 43 line can link wind North Korea
	Projected highway expansion	87,000km	200,000km	
	Total expansion of express highway	1,900km	6,000km	
	Ratio of 4-lane highways	25%	over 50%	
Rail-roads	Construct high-speed electric railroad	-	-	· West coast line: Mokpo-Seoul-Pyongyang-Sinuiju-TCR · East coast line: Busan- Seoul-Wonsan-Rajin-TSR
	Railroad expansion	3,118km	5,000km	
	Rate of double tracks	28.9%	80.0%	
	Rate of tracks to be electrified	21.2%	82.0%	

Negotiations have been taking place with North Korea since the summit meeting of last June in an effort to connect inter-Korean railway systems along with the development of road network systems. Both Koreas have agreed to do so because such systems would benefit not only both parties, but other countries in Northeast Asia, including China, Russia and Japan. Two major lines have been emphasized; the Busan-Seoul-Sinuiju line and Busan-Seoul-Wonsan-Chungjin line. The former is called the 'west coast line' and the latter, the 'east coast line.' The completion of the Trans-Korean Railway(TKR) will facilitate a connection with the Trans-Chinese Railway(TCR) to the west and the Trans-Siberian Railway(TSR) to the east. Both lines reach as far as Europe, and that is why the railroad systems are called, the 'Eurasian Silk Road.' Clearly the TKR will play a fundamental role in opening up with Japan, the other end of the route.

South Korea has already completed the reconstruction of 12 kilometer long section of the western railroad line and is waiting for the North to follow the suit by completing the remaining 2km along with the Demilitarized Zone(DMZ). The government is now working on the east coast railway line, which stretches 127km from Gangneung to the

[Figure 2] Cross-Border Corridor in Northeast Asia



	Route	Length(km)
TCR	Dandong-Beijing-Zhangzhou-Druzhbe-Moskva-Berlin-Paris	12,971
TSR	Vladivostok-Karrymskaya-UlanUde-Omsk-Moscow	9,297

North Korean border. If the North collaborates by fulfilling its share of completing 18km section of the east coast railway, the North Korean part of Rajin could serve as the outpost for trade with Eurasia, given the fact that it presently takes at least 40-45 days to sail from Busan to Paris while the cross-continent railway, once completed, will take 18-20 days to travel 13 thousand kilometers. In other words Korea will attain a competitive edge with respect to international trade once the TKR system operates. Also there are some who conceive an undersea tunnel between Busan, Korea and Kushu, Japan, which will help neighboring countries of China and Japan reach each other within an hour.

[Table 6] Comparison of the TSR and Maritime Transportation

	Transportation	Distance(km)	Delivery date	Fee($)
Busan-Hamburg (20feet)	TSR	12,360	19 days	1,232
	Maritime	19,187	28 days	1,400

Russia wants to activate the TSR, the world's largest railway, stretching 9,334km from Moscow to Vladivostok, but the system will gain momentum only if it connects the TKR and possibly Japan Railway(JR) through undersea tunnel. The TSR is said to suffer from a decline in freight due largely to a reduction in ocean transportation fees. The TSR carried 7,453TEU(twenty-foot equivalent unit) of container traffics, which constituted only 6.7% of the total amount of freights handled in the peak days of the 1980s. The connection of the west coast line will also contribute to transporting Chinese goods to Korea and Japan. Transport demand along the Harbin-Dalian route in China will be eased when the west coast line fully operates. When the TKR and the TSR, once in operation, will help transportation of cargo to Europe being reduced to 20 days from approximately 40 days, and some analysts say that the North Koreans will gain an immediate $150million in annual fair revenues if 20% of Korea-Europe freight and 5% of Japan-Europe freight is transported via railway.

The linkages between the TKR and the TSR will receive international recognition. For example, the Korea Transportation Institute(also

known as KOTI) estimates that transportation cost between the two Koreas will fall to about one quarter of the current cost of sending goods by ship; i.e., from current cost of $800-1,000 down to $200-250 per TEU. However, a substantial amount of investment seems to be required for the railway system of the North to modernize and integrate with that of the South. The one in the North is known to be old, impaired, and unsafe.

An alternative to railway transportation system is the road network. It is less costly, and takes less amount of time to build. The west coastal highway in the South has been in service since 1999 and this line can easily be extended all the way to Sinuiju, the newly designated Special Economic Zone(SEZ) by the North Koreans. On the other hand a lot of works should be done for the east coastal highway network to establish.

Another important point is the necessity to build a surface transport system to connect Incheon airport with Busan seaport. Generally a hub seaport and a hub airport are located closely, in about 30-40 minute ride so that both facilities can be utilized more effectively. But unfortunately Busan and Incheon are 300 kilometers away from each other. In order to deal successfully with this problem, the government has to develop such hardware system as road, railway, and coastal routes, and also software to effectively manage them, e.g., information system.

4. Telecommunication and IT Infrastructures

There are other hardware facilities that would help the Korean peninsula to become a logistics and business hub in Northeast Asia. They are telecommunication and IT infrastructures. Korea's telecommunication infrastructure is already second to none in Asia. Also the country is known to be a leader in internet technology; over 51% of Koreans use internet as compared to 40% of Taiwanese, 29% of Japanese, and 21% of Singaporeans. Three quarters of the Korean businesses are connected to the internet; the same percentage of the stock transactions take place on line. And in particular, 63% of the internet users are connected to broadband high-speed services, the highest in the world. In the internet service area, more works are underway enabling Korea to emerge as a digital hub in the Northeast Asia region.

The high speed in broadband services is made possible in the form of ADSL(asymmetric digital subscriber line) by upgrading existing local loops.

The Korean government developed a comprehensive plan for information infrastructure as early as 1995. The plan was aimed at deploying high speed and high capacity networks. The Korea Telecommunication(KT) Corp. and the Dacom fostered the broadband internet service market, providing broadband internet services to non-profit organizations, educational institutions, and research institutes to expand the broadband internet service market. The plan also emphasized on the provision of broadband networks to all households by 2010 at a total cost of $24.5 billion. Out of the total cost, the government's share was only $1.5 billion. Meanwhile the government provided loans worth $77 million at a prime rate for investment into access networks in 1999. Additional $79 million was provided to invest in less densely populated areas, small cities and towns.

Several reasons are cited for the successful broadband internet service market in Korea; one is the deregulation on entry and pricing, and a solid infrastructure for the dial-up internet access service, and the other is high demand for entertainment. Most significant is a market environment of free competition spurred by deregulation. The government has exerted efforts to deploy a high capacity backbone. Market competition in the private sector is the major source of the market growth. All in all facility-based competition, coupled with deregulation on entry and pricing, industry promotion and encouragement programs by the government have spurred market growth.

How about the IT sector? Korea has continuously improved IT infrastructure. It has made extraordinary strides in enabling a high-speed communication networks and spreading the internet uses. In fact the production of the IT industry as a part of GDP has increased from 7.7% in 1997 to 15.6% in 2001. Also the penetration rates of high-speed internet connections and wireless communications are among the world's highest. The government plan suggests the use of 2Mbps minimum broadband internet services by 2005 as a part of the efforts to develop the country as the hub of the Northeast Asia's communication network. The Ministry of Information and Communication(MIC) is pushing ahead with the "global leader, e-Korea project." The project is aimed at upgrading the country's information technology infrastructure,

which provides the foundation for Korea's vision of becoming a digital hub in the region. The continued boom in internet business in Korea is also giving fresh hope to on-line shopping mall web sites.

Thanks to the rapid build-up of infrastructure spearheaded by the government, Korea's IT industry is now the nation's highest growing industrial sector. The MIC said the information technology industry has pulled off 18.8% annual growth rate on average since the late 1977. In fact, e-commerce or e-business is fast growing; internet friendly customers and superb networking infrastructure make such businesses thrive. This explains why there are so many information technology venture business start-ups in Korea. Foreign firms can utilize this facility as well.

Some Problems to Cope With

As discussed all along, Korea in a few years may be very well facilitated with those infrastructures necessary to make the country serve as a logistics and business hub of the Northeast Asian region. They will certainly help increase the country's competitiveness, but the international business communities in town argue otherwise. They say that the provision of physical infrastructure may be one of the necessary conditions, but it would not be sufficient. The problem is that Korea is not highly recognized as a potential business hub, because they feel that Korea lags behind in terms of corporate culture and business environment.

The International Management Development(IMD), for example, ranked Korea at 28th overall in terms of national competitiveness in 2001 among samples of 49 countries. Incidently, its neighboring countries such as Singapore, Hong Kong, Taiwan, and Japan ranked 2nd, 6th, 18th, and 26th, respectively.

More recently the top business leaders who attended the World Business Leaders Roundtable 2002 in Seoul also cited Korea's weak English language skills and heavily controlled regulatory systems as major bottlenecks for FDI and ultimately for the goal of becoming the business hub of Northeast Asia.

Some efforts have been made afterwards to identify problems which prevent Seoul(for that matter, Korea) from participating in a

group of business friendly competitive cities in the world. Surveys were undertaken in Hong Kong and other countries to find out what makes executives of multinational corporations attractive when locating firms. Most realistic among the studies was the one that was conducted by the American Chamber of Commerce in Korea(also known as Am Cham). Am Cham asked executives of multinational firms in this region to rank the business environments of major cities in Asia, Unfortunately Seoul was placed last and many problems were identified(e.g., taxation, labor, etc,), but they are not easy to resolve in a short period of time.

Other studies brought up urban problems inherent with the city of Seoul; for example, traffic congestion, pollution, high density of population and expensive homes. In other words, the build-up of cross-border physical infrastructure alone would not help much in improving the country's identity as a global business center. The findings were quite surprising and disappointing, and from then on, government as well as the Korean business community has worked out various programs to cope with them. The problems as pointed out are not easy to overcome in a relatively short period of time; nevertheless they have to be taken into serious consideration and resolved gradually.

1. Issues to Enhance Business Environment

As pointed out, the fundamental issues raised in conjunction with sound business environment in Seoul are summarized as follows; high personal income tax, labor market rigidity, impractical English education, ambiguous country image, restriction on foreign exchange transaction and corruption to a lesser extent.

Regarding high personal income tax rates, one must approach the issue by analyzing effective tax rates and tax incidences in a comparative manner, i.e., comparing them with those of major Asian countries competing against Seoul, including Hong Kong, Singapore, China(Shanghai), Japan, Thailand, Taiwan, etc.. Government officials argue that the Korea's tax rates are not unreasonably high as they claim them to be; they may be higher than those of advanced economies, but largely within the medium range of samples surveyed. That may be the case, but they have to examine and weigh the tax rates more carefully, and to see any way to reduce in order to make Seoul more attractive.

With respect to the issue of foreign exchange market, the government recently announced a blueprint for liberalization, which will take place in three stages. At the first stage of 2002-2005, the government will ease regulations on foreign exchange transactions for individuals and corporations. In the second stage of 2006-2008, all regulations will be removed, which pertain to government permission for foreign exchange transactions. At the final stage of 2009-2011, the whole liberalization scheme will be completed by introducing a new Foreign Exchange Law which will replace the current Foreign Exchange Transaction Law.

The issue of labor flexibility has been widely debated in recent years. It is considered as the key to success amid intensified global competition. Korea has experienced high rate of wage increase since 1989, the year when the Labor Unions Law was enacted, far in excess of productivity growth. Foreign consultants advised the Korean government that wage increase would not only hurt Korea's global competitiveness, but make Korean companies less competitive in domestic markets as they would have to challenge more sophisticated foreign competitors. Solutions are not in sight because labor leaders would not go along with the productivity argument. Some scholars insist on eliminating "value destroying jobs" and using skills, knowledge and information in order to reduce labor demand, but such an idea may have only a limited applicability.

As much critical is labor-management harmony and cooperation. Management can share information with its employees so that the latter feels the sense of participation. It also can distribute the profits through performance-based, fair profit sharing system. At the same time government must strengthen the social safety net and make sure that it works adequately. More studies are required to determine what constitutes labor productivity and to account for how the labor market works before making any productive suggestions.

Korea's country image has improved substantially in recent years, particularly after the World Cup, but not enough to attract foreign businesses. What is necessary is to create business friendly atmosphere, but that does not happen overnight. There are a lot of things that the government, the citizen and the business community can do either separately or collectively to improve the country image and business environment. The government's role is still critical; it should not dictate

the details of competitive activities of the business community and intervene with the market, but it is responsible for sound macro-economic policies that ought to be formulated and executed in a manner that is both predictable and transparent. It must also provide sound business environment of efficient foreign exchange rate, prudential regulations, fair dealings, effective legal system, excellent education and social welfare and public health. It must ensure a long term vision, and earn confidence and credibility from business community within and without.

The Korean business community must adhere to stringent disclosure rules and abide by the international accounting/audit standards. Otherwise it will lose credibility from investors within and without. What is urgently required is sound financial market to meet the increasing demand for capital in this region. According to the IMD's report on a survey of 49 countries, Korea's financial market was ranked at 29th in overall competitiveness, but domestic financial institutions ranked way down at 36th in transparency. Clearly significant improvement has to be made with regard to bond, brokerage, and derivative product markets if it wants to be regional financial center.

Corruption is normally considered as a source of business risks. According to the Transparency International, Korea ranked 42nd among 91 countries compared with a corruption perception index of 2001. The scale ranges from 1 to 10 and Korea scored 4.2. Corruption is not so bad as it used to be, but more effort should be devoted to its eradication. There are a large number of citizen groups and NGOs in Korea, and some of them act as 'watchdog' to detect corruption and bring the corrupted officials and businessmen to justice. As citizen awareness movement like this prevails, corruption will disappear.

2. Issues as Related to Business Friendly Urban Environment

The concept of 'hub' is defined as a center of activity and successful models are those of Singapore and Hong Kong as they succeeded in building up business service activities and attracting financial industry's regional headquarters. Their strength is founded on efficient transportation and telecommunication infrastructure and good quality residential amenities. Besides there are other qualities that favor international businesses, including low taxes, easy work permits, free and

open market, high quality primary and secondary schools and English speaking domestic workers. These two cities are the ones that Seoul wants to emulate. With economic momentum shifting from ASEAN to Northeast Asia, however, these cities may lose some of their preeminent position in fulfilling their roles as effective hubs for the region as a whole. Seoul seems more likely to play a hub role in Northeast Asia although it must take into account other major rival cities such as Shanghai and Tokyo.

Korea underwent a significant change after the 1997 financial crisis and so did the business environment even more decisively than its neighbors. And with the current growth prospects, its economy will double in size, matching that of U.K. by 2010. And government planners want to build on this momentum and move ahead in selected areas of competence, e.g., logistics and international finance.

Seoul should serve as a growth corridor(or hub) in materializing the government's regionalization scheme, but not ready yet. According to a study by Smith and Timberlake, Seoul joins the elite nine cities since 1994 when rank-power was measured for 23 cities worldwide, using the data of ICAO(International Civil Aviation Organization). It is a measure of a city's ability of network prominence relative to the power of the most dominant city. London is the most preeminent city in the network as it dominates the whole network of world cities, being followed by Tokyo, Frankfurt, Paris, New York and Seoul, the 6th among the 23 world cities examined. Seoul's preeminence has been dramatic; it jumped from 17th in 1991 to 6th in 1997 with the rise of the Asian economy. The city is outward-bound and gradually globalized. It has played a brokerage role as intermediaries between US based buyers and manufacturers elsewhere in the Pacific Rim, especially China and Southeast Asia.

If Seoul wants to play a hub role, it must be developed into a cosmopolitan city with diverse features, cultural, political and social. It must be able to accommodate foreigners of different backgrounds from all over the world. Social mix is as much important as cultural mix. Efforts should be made to minimize road congestion and pollution and to ease housing costs. The city is too densely populated. Its population should be reduced to about 8.5 million down from over 10 million now and the rest should be dispersed throughout the metropolitan region.

Equally important is to establish inter-city networks through which

the city can interact more closely with its neighboring world cities, especially Shanghai, Tokyo, Osaka, and Hong Kong, thus promoting its own image. It should also strengthen mass transit system and expand public parking space. The city must also undergo urban industrial restructuring by doing away with the manufacturing sector and attracting value added financial and business support industries, and the knowledge-based and other advanced service sectors. The success of the city as a hub depends a lot on industrial cluster. Clustering is achieved when the external effects of cooperation among companies are minimized (Porter, 1990). The city's cultural and historical assets are as much important as the uniqueness of natural environment in attracting international businesses. Obviously the basic infrastructure such as intra-urban transportation system and telecommunication is also critical to become a globally networked city.

It may take a few years or even longer for the city to be well prepared for becoming a hub in this region. In the mean time, infrastructure investment must continue.

Korea is promoting the Northeast Asia's logistics and business hub plan. This plan centers around the Busan-Gwangyang region and the Capital Region. In this plan, the Busan-Gwangyang region will play primarily as logistic center while Capital Region play as financial business center. Busan-Gwangyang twin ports, located on the trunk line sea route, are handling a large amount of cargoes. If the Eurasian Silk Road is completed, this region will serve as its starting point. And the Capital Region has advantageous location, with an easily accessible international airport and a population of 20 million. A few months ago government designated as FTZ(Free Trade Zone) substantially large area sections around Incheon airport and Busan-Gwangyang seaports. By spreading the effect of this FTZ and developing local footholds, Korea hopes to grow into the center of Northeast Asia.

3. Issues to Promote Regionalization Scheme

As trade deficit of America is deepened and EU's economic recovery slows down, protective moves in foreign trade in developed countries are emerging. Under such circumstances, current global economic structure makes Asian countries more dependent on developed economies. This is one of the reasons why economic regionalization in

Asia is needed. Especially, the neighboring three countries, namely Korea, Japan, and China have good reasons for interdependence.

Japan has undergone long economic slump after the collapse of bubble economy and thus, needs overall economic reform. It has to dispose aged plants and to resolve labor shortage problem. Therefore, Japan is looking for overseas investments and industrial exodus.

China has vast potential markets and investment demands. It is expected that by regionalization, China may be able to solve the unemployment problem caused by the structural reform of government enterprises and to develop infrastructures for the undeveloped west region.

Although Korea has almost recovered from a painful recession, its future is still uncertain. Korean enterprises, except for a several, don't have a competitive edge at the international markets. But global enterprises need local supporters, and in that sense Korea can play such a supportive role because it has geographical proximity as well as relatively advanced manufacturing industry.

Certainly, the intra-regional economic cooperation will bring mutual benefits to the Northeast Asian economies. Besides the economic effects, there are other benefits too, including easing the military and political tensions. Such a mutual cooperation can start from a substantial progress in the fields of such infrastructure as railroads, roads, electricity, harbors, etc. And at the same time, efforts should be made to remove social or political barriers like Japan's past affairs and to take North Korea as a responsible member of the international community.

Conclusion

Northeast Asia is positively changing and its economic importance in the world is rapidly growing. Korea as a member of this region economy wants to serve as a regional hub of logistics and business. With this objective in mind, it develops seaport and airport infrastructure and various software schemes to attract foreign enterprises.

A city or region cannot serve as a hub unless it is adequately facilitated not only with inter- and intra-urban transportation infrastructures, but more importantly with global business supporting environ-

ments, including flexibility of labor market, a large number of English speaking people, and elimination of institutional and legal barriers inconsistent with global standards. Obviously efficient telecommunication and IT infrastructures are as much critical. Also important is FTA among the three countries and possibly with ASEAN and other Pacific Rim countries to accelerate economic regionalization.

References

David, J. B., Stephen, L., and Joe, B. H. *Logistics*. Prentice Hall, 2002.

Institute of Highway Economics. *Logistics Integration in the Asia-Pacific Region*. 2000.

Jepma, C. J., Jager H and Kamphuis E. *Introduction to International Economics*. Nether-lands Open University, Longman, London, 1996.

Jung-Dong, Park. *21st Century and Northeast Asia*. Korea Development Institute, 2001(in Korean).

K. C., Ho and A. So., "Semi-Periphery and Borderland Integration: Singapore and Hong Kong experiences." *Political Geography,* 16(3), 1997.

Korea Maritime Institute. *A Study on Port User Fee of the Busan New Port*. 1999(in Korean).

Korea Maritime Institute. *Revised Port Plan*. 2001.

Ministry of Finance and Economy. *Realization Strategy for Business Center in Northeast Asia*. 2002.

Saskia, Sasson. *Global Networks; Linked Cities*. Routledge, New York, 2002.

Scalapino, Robert A. "The Politics of Development and Regional Cooperation in Northeast Asia." Kim Won-Bae et al. edited, *Regional Economic Cooperation in NE Asia*. Proceedings of Vladivostok Conference, Vladivostok, Russia. August 1992.

Vernon, Raymond et al. *The Manager in the International Economy*. Prentice Hall, Englewood Cliffs, New Jersey, 1991.

Won-Bae, Kim. "Cross-Border Regional Development and Inter-City Cooperation in East Asia." *Training Program on Economic and Regional Development Strategy*. April, KRIHS, Korea, 2000.

Yonghwa, Park. *A Plan to Strengthen the Competitive Positioning of the Incheon International Airport*. The Korea Transport Institut, 2001(in Korean).

4 Infrastructure Development: Current Status and Strategies for Expansion

Kyu-Bang Lee

Introduction

The twenty-first century is an era of knowledge and interconnectivity where the role of information is vital to economic development. It is also an era of limitless competition without boundaries between economies. A nation's competitiveness during this era of unbounded competition is determined by its ability to provide timely and efficient production infrastructure. It is essential for Korea to establish social overhead capital(SOC) appropriate in advancing into the twenty-first century, which can support continuous economic development and constant improvement in living environment.

Korea can overcome the disadvantages of limited land area and natural resources by providing efficient infrastructure suitable for the twenty-first century and the cutting-edge information system of combined logistics service, and as a result it is able to establish the foundation to continue its role as a key nation on the international stage in this era of fierce economic competition.

Status and Issues in Infrastructure

1. Changes in Investment Policy

There have been many changes in investment policies over the past four decades in Korea. In the early 1960s, investment was made mainly in railway construction for commercial use. Investment in railway development accounted for 64.2% of total investment in the transportation sector from 1962 to 1966. Besides railways, large industrial ports were constructed for handling imported materials. However, the focus of investment in the transportation system shifted from railways to roads with massive construction of expressways in the late 1960s. The two major construction projects were Gyeongin Expressway in 1968 and Gyeongbu Expressway in 1970. Many expressways, urban railways, and container ports were built in the 1970s.

The 1980s was the beginning of the era of expressways and urban railways. However, more emphasis on balanced regional development resulted in spreading out funds, leading to inadequate infrastructure investment with heavy traffic congestion problems.

In the 1990s, many national-level infrastructure projects were launched, such as the construction of the Gyeongbu high-speed railway, Incheon International Airport, and Gadeok New Port. The 1990s was the beginning of implementation of private participation in infrastructure(PPI) policy through private investment projects and privatization. As a result, the importance of public transportation system covering logistics and major metropolitan areas became widely recognized.

2. Problems in Infrastructure Investment

2.1 Inadequate Investment

The developing economy and higher incomes naturally called for an increase in transportation demand. However, the limited number of facilities could not accommodate the rapid growth in demand. The insufficiency of transportation facilities was not only inconvenience to the public but also an obstacle to economic development due to increased economic and social costs.

The major cause for the lack of transportation facilities can be attributed to the fund shortages in the 1980s and unbalanced budget allotments to transportation facilities. Even though the number of registered vehicles and transportation demand increased dramatically by an annual average increase of 6.9% for passengers and 8.2% for cargo, the ratio of investment in transportation facilities to GDP has remained constant at 1.5-1.7%. The inappropriate distribution of funds to various transportation facilities resulted in ineffective and unbalanced investments and set the basis for problems in the overall transportation system.

2.2 An Inconsistent Investment Strategy

Investment in the transportation system has been concentrated in certain specific areas rather than approaching transportation problems holistically. This selectivity resulted in ineffective investment planning, and problems arose erratically in different areas. Investment was centered around metropolitan areas, particularly the Seoul and Busan areas. Other regions could not receive adequate funding. Compared to the north-south corridor, the transportation network between the east and the west was relatively insufficient, which contributed to problems in regional interaction between these areas. A global feasibility study, which also considered the effects of regional development, could not be established, and accordingly the government's plan to introduce balanced regional development through infrastructure investment projects was itself unbalanced.

Investment was focused on individual transportation modes, resulting in difficulties in the transfer of people or goods between them. The transportation network for integrated linkage of road and railway has not been facilitated, attributable to inefficiency in transportation. Inadequate connections and transfer services between public vehicles such as subways and buses are responsible for severe congestion in urban areas.

2.3 Ineffective Project Implementation

Until now, investment has not been based on the objectiveness and feasibility of projects but rather on political reasoning. In other

words, though problem areas have not received the necessary investments, most of the funding tends to be invested in projects focusing on "equal" regional development.

Excessive decentralization of the project planning and implementation systems has led to dispersed and overlapping investment. Expressways, national highways, and local roads are planned and invested by their respective authorities even though all of them are included in road facilities. As a result, investment projects are duplicated, and carried out in adjacent areas, thereby reducing the economic benefits.

Excessive restrictions on the project implementation process proved to be ineffective. In the case of larger projects, management and control fees have increased than necessary because the projects are implemented on a yearly basis, or by construction phase. And complicated budget criteria and procedures only create unnecessary costs.

2.4 Ineffective Operation and Rigid Rules and Regulations

The rigid rules and regulations governing transportation-related industries, such as freight transport, railway, and logistics, lead to difficulties in efficient provision and management of facilities and services. Inefficiencies are also attributable to pricing restrictions. Finally, restricted entry to transportation markets is an obstacle to the smooth restructuring of the transportation sector.

Although an effort is made to increase the number of transportation facilities, there is a severe lack of effective measures to properly utilize these facilities through transportation information and demand management.

As facilities are established from the provider's perspective, provision and operation of user-oriented facilities are far from adequate.

Outlook of the Changing Future

1. Global Advancement of Economic Activities and Greater International Exchanges

Global integration and economic freedom are gaining momentum

along with increased trade between countries due to globalization and economic deregulation and competition in the global market is intensifying. The enhanced economic cooperation within Northeast Asia is likely to increase transportation demand with increase in transshipment of Chinese containers.

2. Steady Increase in Transportation Demand

The level of car ownership continues to rise, and is expected to come close to the level of advanced countries(about 500 cars per 1,000 people) because of increased incomes and diversified leisure activities. The number of vehicle owners is expected to rise from the current 11 million to 22 million by 2020(or 420 cars per 1,000 people). Further increases are not likely to be as significant.

Because of continued expansion in international exchange and trade, passenger and freight travel demand will also continue to grow, expected to nearly double by 2020.

Advancements in South-North Korean reconciliation and cooperation will lead to the expansion of transportation corridors and growth in long-distance passenger demand. The current length of about 500km of land transportation corridors is expected to increase to 1,500km or greater with changes of people's choice in transportation modes. Freight demand from Japan and China as well as between two Koreas is expected to grow in the future.

3. Transportation Demand and Environmentally-friendly Upgraded Facilities

More and more people choose faster and better transportation modes. With the public awareness on the value of time, the preference for high-speed transportation that can ensure punctuality also increases. Areas with poor transportation facilities have a higher demand for short-distance, high-speed transportation services, and thus the need for aircraft that can take-off and land over short distances(e.g. VTOL, STOL) will be greater in these area.

More and more state-of-the-art transportation methods are developed and implemented.

- -Road: Development of up-to-date driving systems, such as the establishment of ITS and development of environmental-friendly transportation such as electronic automobiles, guideway buses, etc.
- -Railway: Development of high-speed railway and linear motor cars
- -Seaport: Development of hi-speed cargo and cruise ships capable of 50 knots per hour or faster
- -Airport: Development and commercialization of super-speed planes that can fly at Mach 3 and faster, oversized planes, and VTOL (vertical take-off and landing) planes

With the introduction of the information society there will be many changes in the transportation sector. Home banking, long-distance medical treatment, distance education, video/information meetings, and telecommuting will be available in the near future, and as a result the flow of business traffic will decrease and amount of leisure traffic will be higher. Information complexes are expected to emerge, which link industrial complexes and cities in the hinterland of seaports and airports. Computerized transportation information networks, combined logistics-information networks, etc. will be established with enhancing effectiveness and practical functions of current transportation facilities.

Domestic and international environmental interest groups will press for an introduction of environmental-friendly transportation policy. After entering into the Framework Convention on Climate Change, we need to formulate programs in the transportation sector to reduce air pollution and protect the natural environment. It is required to consider environmental preservation while implementing road and railway projects and to create an environmental-friendly space within seaports and airports. There will be a general consensus to enforce laws and regulations regarding environmental protection. More efforts will be put into developing energy-efficient and pollution-free transportation modes.

4. An Rapidly Aging Society and Increasing Social Acknowledgement of the Less-mobile in the Transportation Sector

As a result of increased life expectancy, people over 65 years old accounted for 6.3% of Korea's population in 1997, and the figure is

expected to quickly rise even higher.

An aging society calls for door-to-door transportation systems. New demands will also emerge as older drivers seek various information facilities.

Infrastructure Expansion Strategies

1. Goals and Strategies

The 21st century is an age of infinite competition created by globalization and the information revolution. As such, plentiful provision and effective distribution of high-quality production infrastructure is essential for national survival and development.

Infrastructure will serve as the foundation for the nation's prosperity. Infrastructure investment must be made in order to support the enhancement of the nation's well-being as an advanced country of the 21st century. Easy access to anywhere in the country must be equally available to anyone. Safety and environmental issues, as well as benefits for the socially underprivileged, must be taken into consideration. Moreover, the purpose of infrastructure provision should be to foster the growth of a competitive nation in this Age of Globalization and to sustain a comfortable and beautiful nation whose citizens may enjoy prosperous life styles.

There are a number of strategies to create a competitive national territory. Korea needs to be improved to be an international exchange base to serve as a strategic doorway to Northeast Asia as well as an international transportation hub. The locational value and economic status of the Korean peninsula should be fully exploited, with an effective and high-quality network system connecting other countries in Northeast Asia.

Logistics system is also required to be improved through the establishment of the 3-E logistics system: efficient, environmentally-friendly, and electronic(IT).

Strategies for establishing a comfortable and beautiful national territory are as follows:

1) Creation of a transportation network that provides access to any part of the country;
2) Development of a unified transportation system through rational allocation of infrastructure supply and connections between transport facilities;
3) Establishment of effective and user-focused public transportation system;
4) Full implementation of disaster prevention systems in order to assure citizens' safety; and
5) Prevention of indiscriminate development and maximization of the attractiveness of urban areas

2. Details of the Plan

2.1 Establishment of an International Exchange Hub and International Transportation Facilities

Korea is required to be improved to be a strategic gateway to Northeast Asia by utilizing locational advantages of the Korean peninsula and its economic success. The location of the Korean peninsula, where the Pacific Rim and the Asian continent meet, should be fully utilized, along the main navigation route for containers in Northeast Asia. Considering the advantage of this location, Korea should serve as a base for the Eurasian Transcontinental Railway and the Trans-Chinese Railway with a short distance from Lianyungang.

Its strategic location allows Korea to be a bridgehead for foreign companies to enter markets in Southeast Asia, China, and Japan. Korea can serve well as a mediating location for gathering and exporting the primary industry products of China, Siberia, and North Korea.

A development strategy can be established by connecting to the economies of the Yellow Sea Rim and the East Sea Rim. Three East-West inland corridors are formed. These consist of the southern inland corridor(Gunsan-Daegu-Pohang), which connects the three coastal territorial corridors(Yellow Sea Rim: Mokpo-Incheon-Sinuiju; Eastern Sea Rim: Busan-Sokcho-Rajin; Southern Sea Rim: Busan-Jeju-Mokpo) to the Yellow Sea Rim and Eastern Sea Rim economic regions; the central inland corridor(Incheon, Pyeongtaek-Wonju-Sokcho); and the northern inland corridor(Pyongyang-Wonsan).

Korea will serve as a transit for transshipment of freight to and from other countries in Northeast Asia. A good model is the Netherlands, which is the gateway of Northern Europe. The Netherlands has made full use of its geographical advantages and formed a logistics system that combines state-of-the-art facilities with an effective operating system. It has risen to secure its place as the logistics center of Europe. Korea's next task is to establish itself as the gateway to Northeast Asia by constructing necessary facilities.

• Airport Development

Incheon International Airport can serve as a global hub airport. The next planned phase of the airport expansion project should begin as soon as possible. There is a need to improve airport connections with major airports of surrounding countries and to attract transit passengers from other airlines in Asia traveling to the U.S.A. and Europe. In order to fulfill the functions of a hub airport, we need to develop world-class international tourist districts along with international business towns that make logistics, information and corporate activities free and convenient.

• Port Development

Busan Port and Gwanyang Port need to be improved and promoted as the central ports of Northeast Asia. The two ports, Busan · Gadeok Port(24 berths, 4.6 mil TEU) and Gwangyang Port(24 berths, 5.28 mil TEU), need to be developed as central container ports and as third-generation international hubs with transportation, logistics, and information network.

Incheon Port and Asan · Pyeongtaek Port should be developed to become central trading ports with China. Incheon Port should improve its functionality through maintenance and repair. Asan · Pyeongtaek Port should be developed as a trading port with China and as a regional port for the greater capital area.

• Connections Between Ports and Their Surrounding Areas

A well-connected transportation network between ports and their surrounding areas and combined logistics depots need to be created. The international central ports should be at most a ten-minute distance from road networks.

Moreover, construction of the Gwangyang-Hamyang Expressway needs to be undertaken as soon as possible in addition to the current construction of the Daegu-Busan Expressway.

[Table 1] Access Between Roads and Airports/Seaports[1)]

	USA	Germany, UK, France, Italy	Japan
International airport	98%(94/96)	72%(79/110)	46%(12/26)
International seaport	93%(52/56)	93%(26/28)	33%(12/36)

Note: 1) The figures in parentheses are the number of facilities that can be reached within 10 minutes from an expressway versus the total number of eligible facilities. An international airport is defined by the availability of international flights out of the airport. An international seaport is defined by the amount of cargo handled in a year: in Europe 10 million tons and over, and 5 million tons and over for the USA and Japan.

• Connection Network of Hi-speed Railway

The construction of all sections of the Gyeongbu Express Railway is expected to be completed by 2010. Improvements on the Honam Railway are also expected to be completed by 2010, with transit operation of the hi-speed express railway. New constructions should begin for the Gyeongjeon Railway that connects Gadeok Port and Gwangyang Port, the double-tracking of the Jeolla railway that connect Gwangyang with the Capital Region, and the Mokseon Railway that connects Cheonan and Nonsan. In addition, we need to actively promote plans to link railways in Korea with the Trans-Siberian Railway and the Trans-Chinese Railway.

2.2 Improved Quality of Logistics Systems

Through comprehensive restructuring of the logistics system the ratio of current logistics costs to GDP, currently 16.5%, should be lowered to 10%, about the same as the current rate in Japan.

The logistics facilities should be subject to systematic maintenance. In other words, central logistics depots should be built in major airport bases and port areas. The best candidate locations are Uiwang, Bugok, Pyeongtaek, and Yeongjongdo in Seoul metropolitan area; Yangsan in

Busan metropolitan area; and Gwangyang in the Honam area(the southwestern provinces).

Inland logistics centers are to be built in these areas: the government should not consider regional balance or political reasoning, but rather should follow the economic reasoning of demand and efficiency. The government needs to create a distribution network that connects the 16 major bases for economic activity by 2010. As for logistics bases of larger cities, they should be located adjacent to circulation roads connected to expressways.

Efforts should be given to reduce logistics costs through the systematic maintenance of ports. We need to focus on the maintenance of international container terminals along with domestic container terminals built for an integrated transportation system.

In the case of the capital area, it is required to utilize the Gyeongin Canal Construction Plan and facilitate freight transport on the Han River. A logistics center should be established in the western(Gimpo) and eastern(Guri) parts of Seoul to mitigate heavy traffic congestion and to promote a smoother distribution of logistics.

We need to be especially alert to environmental issues and to seek technological measures to evaluate and mitigate potential effects when utilizing the Han River for freight transport.

The logistics center is also improved through introducing information technology. A comprehensive logistics information network can be created through EDI, CVO, etc. Effective support for e-commerce is necessary and logistics system through the Internet should be established.

Contracting with a professional logistics project company is another way to improve the logistics industry. In this regard, a third-party logistics project company should be promoted. The logistics company should be given equal standing with freight owners; the company will be able to improve its ability to make suggestions in order to develop logistics methods.

Cooperative business schemes should be formed on the basis of logistics items or regions. For example, joint collection and delivery system can be established to increase the efficiency of loading cargo and decrease the distance traveled. A joint receipt system for cargo is highly recommended at high-rise buildings and building structure needs to be renovated to create a barrier-free logistics system.

2.3 Transportation Network Providing Easy Access to Every Part of the Country

An integrated transportation system needs to be created through reasonable allocation of transportation methods and connections. The road serves as the primary means for short-distance travel, the railroad for long-distance transport of passengers and cargo, the airport for long-distance travel, and the seaport for long-distance transport of cargo.

Expansion of the railway network is indispensable to facilitating South-North exchanges. But even before the full-fledged expansion of the railway network, investment in airports is crucial for mid- and long-distance transportation demands. As a result, the amount of demand for roads will decrease and the amount will increase for railway, seaports, and airports. Under the assumption that the demand in transportation will be appropriately distributed, reliable connections between transportation modes need to be secured.

An integrated transportation system must be established by constructing roads and railways in a timely fashion around the areas where major base facilities are located, such as seaports, airports, logistics centers, and industrial complexes. A comprehensive metropolitan transportation network, which connects metropolitan road networks with metropolitan railway networks, needs to be established in large urban areas. It is expected that the demand for automobiles can be turned into demand for public transportation through thess efforts.

• Road

A transportation network that connects the eastern and western coastal regions should be established, focused on the balanced development of national territory. In order to reach an expressway network within 30 minutes from anywhere in Korea, the grid-style expressway network consisting of 7 north-south corridors and 9 east-west corridors is ideal.

The problems of traffic congestions due to the vehicles passing through cities can be mitigated by the construction of alternative bypass roads in small and medium-sized cities and circulation roads in larger cities. More efforts should be given to expand road facilities and to improve problem areas, so as to provide functionality of arterial road corridors and balanced arterial road transportation. By

2020, the expressways will be extended from 1,900km to 6,100km, national roads will be extended from 12,500km to 190,000km, and total length of all kinds of roads in Korea will be 200,000km from the current 87,000km.

• Railway

In the case of railway, it is required to make existing route straighter, double-tracked, and electrified in order to improve its transport capacity. And it is desirable to enhance its transport share ratio by establishing a new railway transportation network in the latter part of the projects.

First of all, the sectional railway network — Gyeongbu Line, Honam Line, Jungang Line, Jeolla Line, Janghang Line, and Donghae-Nambu Line — needs to be double-tracked and electrified. In order to speed up regional development, Gunsan Line, Gyeongjeon Line, and Gyeongchun Line need to be expanded. New construction is necessary for Seonam Line, Donghae-Bukbu Line, Jungbu-Naeryuk Line, and the Wonju-Gangneung Line.

An industrial railway network is also needed for the Daebul Industrial Complex, Pyeongtaek Port, Gwangyang Port, and Busan New Port.

A coastal rail network is needed on a long-term basis:

-Seonam Line(Gwangyang-Gunsan-Incheon): in connection of the West Coast industrial districts to Gwangyang Port.
-Donghae-Bukbu Line(Pohang-Samcheok): in preparation for reunification
-Gyeongjeon Line expansion(Boseong-Mokpo): in development of the South Coast

By 2020, the railway is scheduled to be extended to 1.4 times its current length, which will be about 4,200km. 74% of the entire railway lines will be double-tracked, which will be 2.6 times the current ratio, and 85% will be electrified, about 4 times the current rate.

• Airport

Airports will be developed toward two directions: regional airport bases and small local airports. Gimpo, Gimhae, Muan, Yangyang, and

Jeju must be developed as central airport bases. Gimpo Airport must function as a key domestic airport and air logistics base. As a gateway to the International City of Jeju, no time can be spared on the work to expand and upgrade Jeju Airport's facilities. The Muan and Yangyang airports need to be constructed to serve the Honam and Yeongdong/ Yeongseo areas(in the east/west side of Taebaek Mountains of Gangwon-do). Expansion work on Gimhae Airport and its international passenger terminals should start as soon as possible.

Facilities such as airport runways, terminals, and hangars for local airports such as Daegu, Gwangju, Jeonju, and Ulsan should be expanded to meet the growing demand. A small local airport is needed to be constructed for local residents in Uljin. Along with facility expansion, a short-distance commuter airport can be achieved. The safety of small and medium-sized airports can be greatly improved with instrument (blind) landing systems and flight control facilities. Local airports can also be utilized as rescue shelters in the case of emergency such as natural disasters.

• Port

It is possible to enhance the functionality of the port by improving status of the port as a trade base through maintenance of existing ports and waterfront development. Port authorities should pay more attention to promoting and facilitating more routes to islands and expanding and improving transportation facilities.

2.4 Establishment of Effective and People-centered Public Transportation System

The concerned ministries must establish a metropolitan transportation network within large cities to meet the expanding geographical range of people's daily routines. An arterial road network and metropolitan rail network needs to be established in order to connect urban areas such as the Capital Region, Busan region, Daegue region, Gwangju region, and Daejeon region to their surrounding areas.

Circulation roads need to be constructed in the 6 major urban areas. In the case of the Capital and Busan regions, the metropolitan subways need to be expanded with operating efficiency.

Satisfactory transportation conditions can be created by introducing new transportation modes such as light rail transits, two-story

trains, express trains, etc., which are more efficient and faster with less pollution. The allocation system between transportation modes needs to be improved. In order to establish a transportation system that focuses on public transportation such as urban railway system and metropolitan buses, additional transit parking lots and combined transit centers need to be constructed.

- Establishment of Integrated Operation System of Public Transportation

The relevant ministries need to pursue a seamless policy on urban public transportation. For example, connections between urban subways and suburban railways must be made convenient. The subway fare system is required to be proportional to the distance traveled. And passengers should be able to enjoy the benefits from transit discount fares with an integrated fare system.

In Germany all transit connections are free, and in USA any transit connections within 2 hours are free. With reference to transportation systems of other advanced countries, we should give more efforts to provide appropriate and efficient service to meet users' demand.

The government should also endeavor to shorten commuting time and improve the punctuality of public transportation.

The relevant ministries need to formulate transportation policies that are environment-friendly and consider the welfare of society. City buses can be replaced by new natural gas buses. It is desirable to give incentives to people who use environment-friendly alternatives such as bicycles. Relevant policies and facilities need to be established and maintained accordingly.

It is necessary to make an effort to remove any barriers for the less-privileged in public transportation systems. Crosswalks or overpasses, elevators at subway stations, and transportation information systems for the disabled and/or senior citizens can be suggested. State-of-the-art transportation technologies, systemized transportation information, and intelligent transportation systems(ITS) should be researched and developed for practical use.

2.5 Disaster Prevention Systems for Public Safety

A disaster prevention system in preparation for natural disasters

should be established during the construction phase. A flood prevention system in preparation for sudden downpours of rain and flooding is necessary.

Japan has introduced a flood prevention system in order to increase the flooding prevention ratio[1] and made an effort to reduce the number of casualties from flooding. This ratio has increased from 30% in 1975 to 51% in 1995.

Road network systems need to be improved to enhance safety from natural disasters. Alternative bypass roads need to be secured in preparation for road closures due to heavy rain or other natural disasters. The toll roads could be used temporarily without charge.

A transportation system needs to be established to ensure safety and convenience of people. When design standards for transportation facilities are revised, safety criteria need to be reinforced in consideration of users' safety as the top priority. Relevant authorities need to execute safety audit measures and complete post-event evaluations.

The highest priority should be given to traffic accident-prone areas for road improvement projects. The road structure and signaling systems are required to be improved. Railways, seaports, and airports also need to be prepared for all kinds of major accidents. Flight control, landing, and takeoff systems should be improved along with the establishment of a high-quality marine control system. GPS, GIS, and Internet systems can be utilized to provide ongoing weather reports and other pertinent information in order to prevent accidents.

2.6 Beautification of Cities and Prevention Against Over-development

The environment should be preserved and improved by preventing over-development. A plan to separate land ownership and development rights is considered. On a short-term basis, the government should reinforce the policy for collecting profits from development. The current complex legal system should be simplified and made transparent.

The government should establish a planned development system with basic principles of restricted construction. It means that the gov-

---

1) flood prevention ratio: The ratio of area, which is capable to absorb and channel a downpour of 50mm an hour, to total land area

ernment should forbid development in unplanned areas, and make an effort to control and regulate development plans even in the areas where development is already planned. District zoning and detailed zoning plans should be in full application.[2)]

A city's identity needs to be enhanced by making the land more attractive. This can be achieved by constructing a unique urban view and cultural and historical parks. By constructing landmarks and breathing life into a city through various entertainment events, information about the city can spread widely. The city can be turned into a culturally-rich region by improving the environment and establishing a maintenance strategy in certain areas and utilizing zone planning. A 'friendly neighborhood' residential community can be achieved by establishing an urban planning system of integrated urban and agriculture districts.

Provisions for Barrier-Free Construction of Infrastructure

For the effective infrastructure construction, the followings are necessary: satisfactory financing, adequate facility provision and operating systems, comprehensive management of infrastructure investment, and active participation of the private sector.

1. Satisfactory Financing

- Estimation of Infrastructure Investment and Potential Financing Amount

Up to the year 2020, total investment in the transportation sector is estimated to be 378 trillion won(2.6% of GDP), including roughly 344 trillion won for infrastructure investment and 10% of this amount for facility maintenance and repair, technology development, etc., as follows:

2) Korea can reflect on the experiences of Europe, particularly the United Kingdom and Germany because they established a firm national territorial management policy in the mid-20th century after national land reforms and territorial deterioration in the 19th century due to over-development.

[Table 2] Estimated Investment Amount

	Investment amount (2000~2020, billion won)	Remark
Road	196.4(57.1)	7×9 construction, territorial construction
Railway	72.9(21.3)	Hi-speed railway, expansion of existing railways
Airport	15.6(4.5)	Development of new airports, Expansion of existing airports
Seaport	38.36(11.1)	New port construction, Expansion of existing ports
Logistics	20.5(6.0)	Logistics bases and distribution districts (most distribution districts will be invested in by the private sector)
Sub-total	343.7(100.0)	
Total	378.1	10% of the total added for operation, maintenance, technology development

If the government continues to invest infrastructure, it will experience the lack of funds. The total amount of funds raised through subsidies and public corporations would be 355 trillion won and the difference of 23 trillion won can be made up through additional financing or through overall investment readjustment.

Measures to make up the difference in funds are suggested as follows:

1) Sharing cost with the private sector through inducing private investment including foreign investors
2) Increasing the cost burden of the beneficiary or the causer through collecting users' fees in order to enhance revenue and encourage efficient, timely management and utilization of facilities
3) Issuing government bonds to a broader range of customers

However, the easiest and the most effective measure would be to

promote private investment participation from domestic and foreign investors.

In the period up to 2006, when the financial status of infrastructure is expected to be the worst, an annual minimum of 3 trillion won is needed. Based on the current economic perspective and construction economy forecast, it seems to be possible to obtain this amount of funds.

2. Restructuring, Inducement of Efficiency in Operating Systems and Private Sector Participation

Up to now, investment has been made from providers' perspective. It is the fact that providers have been protected from competition under a protective policy. Facility operation and management are currently out of the hands of government officials. The implementation of projects for the sake of the country has left facilities, which have been riddled with waste and inefficiency. The infrastructure sectors must go through restructuring for reform and innovation.

• Suggestions for Restructuring

A policy reform is necessary to remove any protective screening in the facility provision and operation. Project companies should not be allowed to rely on vested rights to exclude competition. In addition, the factors to hinder competition should be removed from bidding and contracting systems, and a project management policy should be introduced in order to pursue efficiency throughout the entire process of contracting, construction, and operation.

A new policy needs to be sought for innovation with private sector participation. The government should verify the marketability of all projects and disclose the results to the public, thereby providing an opportunity for the private sector to participate. This process will also serve as an opportunity to investigate the efficiency of government-financed projects.

It is necessary to distinguish between private sector-led projects and government-led projects. The former must be given the confidence in the private sector, and the latter should treat the private project participant as a partner or a cooperative sponsor. Part of the infrastructure budget should be leveraged into inducing private sector participa-

tion. Policies and systems should be operated in accordance with international practices and regulations, with appropriate investment profit guaranteed. Risk sharing allotment among involved parties should be established.

3. Comprehensive Management and Effective Promotion

Higher priority will be given to investments, which can create the greatest synergy effect between networks and means of transportation, for infrastructure facilities to meet the international standard.

A comprehensive 5-year infrastructure investment plan will be prepared to combine government financing plans and various infrastructure plans. The plan should correspond to the time period of the mid-term government financing plans. Higher priority will be given to project packages, which are highly profitable and have far-reaching effects, or other packages having connections with other transportation modes.

In the case of projects with recurring expenditures, it is required to adjust the projects reasonably and flexibly with reevaluations conducted once or twice during the project period.

Networking and coordination between relevant ministries should be reinforced. A task force team, which supervises comprehensive plans, should be placed under the President's authority and an investigative meeting every quarter or half-term attended by high officials should be made mandatory in order to secure effectiveness. By developing accomplishment indicators[3] of infrastructure investment projects, the team can measure their achievement and make opportune adjustments based on the feedback of previous results.

It is necessary to improve the current policy or devise a new one for effective project promotion by preventing any delays that may occur during project implementation. The time to grant permits and other provisions can be shortened by simplifying and clarifying the laws and decrees related to the land and environment. Unnecessary costs can be reduced if the compensation price is determined when the

3) Examples of indicators: number of major congested traffic areas, traveling speed in major cities during peak hours, and completeness of facilities in urban parks within walking distance.

project is announced, rather than when negotiations on the project end as currently conducted. Project cannot be delayed by encouraging resident participation from the planning stage.

Japan's public involvement policy has been implemented to prevent unnecessary and wasteful debates that may occur in the negotiation process between interest groups and ministries during project implementation. In France, a project with administrative procedures 'Declaration of Public Utility,' which is an administrative statement necessary for the authorization and public funding of infrastructure projects, must begin its construction within 5 years of the announcement. And in Germany, when a project has come to a basic agreement in its promotion, neither party is allowed to debate further on the project planning.

Conclusion

Since the 1960s when infrastructure investment was first undertaken in full force, Korea has only focused on quantitative expansion of infrastructure. Considering the fact that demand continues to outweigh supply of infrastructure, it is inevitable to strengthen expansion in infrastructure supply. However, increasing international economic competition forces us to turn our attention toward qualitative infrastructure improvement as well. It is because a nation will not be able to survive international competition, unless it facilitates efficient infrastructure, which provides just-in-time and prompt service and meets various demands of customers.

Another important issue in infrastructure investment is to reduce expenditures on infrastructure through efficient construction and operation of public facilities. With state-of-the-art construction technology, introduction of CM methods that utilize professional knowledge, and advanced management and operations systems, cost-efficient construction will be possible. To this end, the government should actively encourage private investment in infrastructure, and remove rigid and unnecessary regulations in order to fully utilize the creativity and efficiency of the private sector. The public and private sectors must work together in the construction and operational management of infrastruc-

ture projects through a cooperative system of technology, finance, accounting, management, etc. In this dawning century, it is possible to gain competitive edge of infrastructure by expanding our perspective to understand and apply newly emerging technologies and systems with a new way of thinking.

References

Kyu-Bang, Lee and Song, Byung-Rok. *New Initiative for Private Participation to Infrastructure*. KRIHS, 1998.

Kyu-Bang, Lee and Yoon, Ha-Jung. *The Mid- and Long-term Plan for Private Investment in Infrastruture*. KRIHS, 2002.

MOCT. *The Fourth Comprehensive National Territorial Plan*. 2001.

MOCT. *The Road Improvement Plan(1988-2011)*, 2001.

MOCT. *The National Intermodal Transportation Plan(for the years 2000-2019)*. 2001.

MPB. *The Mid-term Fiscal Plan*. 2001.

Part 2

Sustainable Industrialization and Regional Innovation

98쪽 백면

5 Directions toward Sustainable Industrialization in Knowledge-based Economy*

Sam Ock Park

Introduction

One of the important challenges confronted in industrial society is devising ecologically and environmentally sustainable forms of production system, due to the growing concerns about serious damage of the environment and health by industrial growth. The Report of Rome Club on the 'Limit to Growth' provided the turning point of concerns and debates about environmental constraints on growth. It is, however, recent years that the growing concerns about the sustainability of current industrial development patterns have spread globally, especially since the Rio Earth Summit in 1992(UNIDO, 1997). During the 1980s, diverse environmental problems such as global carbon pollution, ozone depletion, and loss of species, forests, and fertile soils suggested that environmental damage became more global and more serious than expected(Schmidheiny and Zorraquin, 1996). The importance of sustainable development policies has been well recognized even in developing countries in recent years because rapid industrialization and economic growth in developing countries, especially in China, has led severe environmental degradation and pollution in the last decade(UNIDO, 1996;

---

* This paper is the revised version of the paper entitled "Paths of Sustainable Industrialization in the Knowledge-based Economy", published in Knowledge, Industry and Environment, edited by Roger Hayter and Richard Le Heron, Ashgate, Aldershot(2002).

Zhang, et al., 1999).

Albeit the worldwide movement towards sustainable development and emphasis on the importance of natural environment during the last decade, most companies still regard environmentally sound production and distribution as a factor of the potential threats of rising costs, decreasing competitiveness and increasing legal challenges(Rondinelli and Vastag, 1996). Traditionally, environmental regulations were regarded as an unfavorable factor for industrial location and competitiveness. In this traditional view, the environment and industry are regarded as incompatible. In recent years, however, there is a growing consensus that industry and environment can be inseparable with each other in the academic fields and international organizations. Empirical studies suggest there is no clear evidence of negative impact of environmental control on industrial competitiveness, and some studies suggest the strong environmental regulation contributes to the innovation and international competitiveness of industry(Jaffe, Peterson and Portney, 1995; Robinson, 1995; Wallace, 1995).

Responding of business sector to the challenges arising from the UN Conference on Environment and Development in Rio in 1992, the World Business Council for Sustainable Development(WBCSD) was formed in 1995 through a merger of the Business Council for Sustainable Development in Geneva into the World Industry Council for Environment in Paris. The WBCSD plays an significant role in policy development for the issues regarding sustainable development through closer cooperation between business and government(Schmidheiny and Zorraquin, 1996). United Nations Industrial Development Organization (UNIDO, 1991; 1996) has developed several programs for sustainable development of industry in recent years. Diverse strategies for sustainable industrial development in developing countries have been also suggested by several scholars(for example, Schmidheiny and Zorraquin, 1996; Wallace, 1995; 1996; Wallner, 1999). Along the challenge of developing model of sustainable industrial development, a few researches in economic geography have been conducted to conceptualize the links between the environment, economy, and society and to suggest appropriate strategies and policies for sustainable development during the last decade(for example, Conti and Dansero, 1995; Angel and Rock, 2000; Taylor, 1995).

Most of the researches regarding sustainable industrial development

emphasize the development of new industrial systems in order to make the process of industrialization itself an agent for sustainable development. The new production systems have not yet successfully developed, however. We need more concrete conceptual frameworks and empirical studies with regard to the development of information and communication technologies and knowledge-based economy. The aims of this paper are to examine dimensions of sustainability and directions toward sustainable industrialization in the era of the knowledge-based economy. In the following section, changes of production systems and their relationship with environment will be discussed. The Dimensions of sustainability will be discovered in the subsequent section. Then, paths of sustainable industrialization will be examined.

Changes of Production Systems and Environment

There have been continuous changes in production systems in the industrial history. In the industrial revolution in the United Kingdom, craft production techniques were developed by integration of traditional skills of artisans with new sources of power such as steam engines powered by coal(Womack et. al., 1996). In the early twentieth century a new production system, that is, mass production system was developed with various technical and managerial innovations in the United States. From the second half of the 1960s, the crisis of profitability of mass production was recognized in the advanced capitalist countries and firms sought alternatives to the old mass productions. The Marshallian industrial districts in the Third Italy, "the rediscovery of craft production"(Hudson, 1995), can be regarded as one of the alternatives to mass production focused on small firms. This alternative is based on the networks and cooperation between capital and labor as well as between firms linked with horizontal division of labor in a supportive social environment. However, as a major alternative to the mass production, lean production system has been developed based on more flexible production and working patterns in Japan since the 1960s(Womack et al., 1996). It was generally recognized in the United States and Europe in the 1980s.

The profound change of the production system has not occurred

in the same country where previous major production system was developed. The place of the emergence of the new production system has shifted from UK, to USA, and to Japan. It should be noted that overlapping production systems are coexisting in the mature industrialized countries. Based on the historical trend of the emergence of new production system, Wallace(1996) argues that those developing countries where rapid industrialization is now beginning are the natural location for the evolution of new production system based on new principles of sustainable development. Considering recent increasing concerns about environmental issues, environmental sustainability will be the most important factor for the newly emerging organization of production system.

The alternative production systems have been emerged based on the logic of profitability of capital over time(Hudson, 1995). That is, the alternative production systems have occurred to provide sustainability on the view of capital. Sustainability with respect to environment was not an important criterion of serious consideration in the development of the alternatives. Accordingly, the above three major production systems cannot be a viable alternative for sustainable industrialization in which environmental protection and management are emphasized.

The major production systems have a different implication on environment in terms of management of materials(Wallace, 1996). The craft production system had no critical impact on the sustainability of environment because there was little of the gross waste of resources caused by scrapping and unwanted products. However, it is not appropriate to the modern society of grand demand because the use of raw materials per unit of output could be inefficient due to the generation of a large amount of unusable off-cuts or casting residual. Mass production system allows the production processes to reduce the amount of wastes per unit of output by standardization and economies of scale. The long production runs in the mass production systems could result in large inventories of unwanted goods and waste of physical resources due to the scrapping or dumping goods at below cost, resulting in widespread environmental degradation. In the lean production systems, problems of large inventories and scrapping of finished goods are not serious with adopting flexible manufacturing techniques and just-in-time production.

The relationship between environment and production systems

suggests that the management of physical resources has evolved effectively along the changes of the production system. However, with increasing pressure on the population growth and rapid industrialization in developing countries, conventional management boundary of production processes which include primary processing, design, manufacture, and distribution is not enough to evaluate the sustainability of environment. Beyond the conventional boundary, material extraction, consumers' use, and disposal should be included in the evaluation of environmental impacts(Wallace, 1996).

Along this expansion, there are impacts on environment at every stage of production chain and consumption. Accordingly, there are increasing demands for firms to consider life-cycle analysis on their products with understanding the final fate of their products and the way of using products by consumers(Wallace, 1996). There are also increasing pressures on firms to reduce their consumption of materials or to shift with less environmentally damaging materials. Because of these pressures with regard to the need for rational use of raw materials and improved manufacturing processes, development of low-waste technologies in engineering industries is an important issue for firms and international organizations(ECE, 1994). That is, the development of environmentally sound and innovative technologies and processes is now critical for environmental sustainability and firm's competitiveness in the industrial world(Porter and Linde, 1995). Furthermore, firms should adopt techniques such as eco-auditing or legislative liabilities for consequences of pollution and should consider significantly consumers and local communities in their decision-making processes. The role of knowledge-based engineering technologies and services is more important in the development of sustainable production systems in this new century(Schulz, 2000).

These changes reflect the growing importance of environmental business services which are knowledge intensive activities, reflecting the need for new production system for sustainable development. New organization of production system should consider environmental sustainability as well as the socio-economic sustainability. The creation of environmental knowledge and the diffusion of the knowledge are becoming more important for the newly emerging production system.

Dimensions of Sustainability

1. Dimensions of Sustainability

In the report of World Commission on Environment and Development(WCED), sustainable development is described as development that meets "the needs of the present, without compromising the ability of future generation to meet their own needs"(WCED, 1987: 43). Sustainability in this definition encompasses the relationships between the environment and economy, and is characterized by commitment to equity in inter-generations as well as intra-generations and in space. The "sustainability" in the "sustainable industrialization" is related to firms' use of natural resources, human resources, and the society around them(Wallace, 1996). However, "sustainability" in the sustainable industrial development can be a slippery concept actually to capture and pin down because "whose sustainability?" is a key issue(Hudson, 1995). Accordingly, the concept of sustainability in the sustainable industrialization has various dimensions.

Doryan(1993) identified four elements in a sustainable competitive view of development such as productivity increases, environmental conditions, socio-political stability, and enhancement of human resources. Based on these four elements, he defined four dimensions of sustainability as follows(Doryan, 1993: 452):

1) Productivity sustainability is defined by market, macroeconomic and financial dynamism, infrastructure development, industrial efficiency, and globalization of the domestic economy.
2) Environmental sustainability is defined by pollution indicators, rules and procedures to control waste, institutions built to manage natural resources, and behavior of citizens toward the environment.
3) Socio-political sustainability is defined by indication of institutions that allow freedom of expression, human rights, and confidence toward the judiciary system and the government.
4) Finally, "humanware," or human resources sustainability, is defined by educational and training opportunities and by openness of the population and the labor force toward technological

and managerial changes and science and technology infrastructure.

The above dimensions of the sustainability are quite comprehensive, but they are defined mainly for measuring the competitive sustainability and performance of countries in South America. Here, productivity sustainabilty can be regarded as economic sustainabilty; sociopolitical and human resources sustainability can be considered as social sustainability. Accordingly, at the conceptual level the above four dimensions can be reduced to three dimensions: economic, social, and environmental or ecological.

Considering that current industrial production systems cause negative environmental and social impacts, an environmental point of view has been emphasized for the improvement of the industrial systems in recent studies(Angel and Rock, 2000; Erkman, 1997; Wallner, 1999). That is, clear shared industrial growth and eco-efficiency are considered in priority for sustainable development. Accordingly, even though the sustainability has economic, social, and ecological dimensions, ecological dimension has been given clear priority(Wallner, 1999). Hudson(1995: 39) also considered the sustainability in terms of "social sustainability of the level and distribution of employment and of income, and of the ecological sustainability of the level and composition of output." Even if ecological sustainability is more emphasized in some of recent studies, industry cannot be viable without economic sustainability or profitability. Therefore, three dimensions — economic, social, and ecological sustainabilities should all be considered in the sustainable industrialization paths.

2. Problems for Sustainable Industrialization

Rapid industrialization of developing countries in recent years has resulted in rapid depletion of natural resources and pollution and health problems. It is expected that the most of the increase in world atmospheric carbon emissions in the next 20 years will be originated from the developing countries(UNIDO, 1996). Waste emissions have serious environmental impacts at global, regional, and local levels(see Table 1). The environmental degradation and problems resulting from the current industrial production systems suggest that a new paradigm

[Table 1] Environmental Impacts of Waste Emissions

Global impacts	· The build up of greenhouse gasses in the atmosphere and the consequent warming of world climate · A rise in sea level with climate warming · Damage to the stratopheric ozone layer · Loss of biodiversity
Regional impacts	· Acidification and toxification of soils and surface waters · Deforestation, desertification and erosion · Loss of natural diversity
Local impacts	· Exposure to toxic chemicals, especially pesticides · Urban air pollution · Contamination of soils, rivers, streams and ground water with untreated sewage, pesticide and other toxic industrial wastes

Source: UNIDO, 1996.

for industrial development should be needed for sustainable development in the global society.

The evolution of new industrial production systems is necessary to include all the three dimensions of the sustainability for future sustainable industrialization in global society. Addition to the three dimensions of the sustainability, the development of information communication technology, knowledge-based economy and globalization should be considered for sustainable industrialization. United Nations Industrial Development Organization(UNIDO) is one of the most active organizations in developing the new model of sustainable industrial development. UNIDO(1996: 92) defines ecologically sustainable industrial development as "patterns of industrialization that enhance the contribution of industry to economic and social benefits for present and future generations without impairing basic ecological processes." The patterns might differ by country depending on resource endowments and stage of economic development. In this definition, developments of appropriate technology, institutions, policy framework and incentive structures are assumed for a complementary relationship between industrial development and environmental sustainability.

Wallace(1996) argues that the ways of achieving sustainable industrialization are more likely to emerge from developing countries.

However, there are several issues to be considered in the evolution of new production systems in developing countries. First, even though environmental degradations are resulted from the rapid industrialization in developing countries, the industrialization cannot be stopped in the developing countries because economic growth and sustainability are critical issues in developing countries. Second, "dirty" industry may move to developing countries to avoid strict environmental regulations and control in the advanced industrialized countries. Third, economic globalization and liberalization of markets may have negative impacts on the sustainability of developing countries with a tight control from the parent country of multinational corporations(MNCs) and intensified spatial division of labor. Fourth, financial problems for the development of environmentally sound technologies such as cleaner production process and waste minimization technologies exist in developing countries. Lastly, innovation potential of developing countries is relatively weak in developing countries due to the institutional and human resource problems.

Considering the above problems and the dimensions of sustainability, eco-efficiency in the industrial development, role of MNCs in globalization, knowledge creation and innovation networks for environmentally sound technologies and new products, and financing change are the key elements for sustainable industrialization. These elements can be related to the following four paths or directions of sustainable industrialization.

Directions toward Sustainable Industrialization

1. Industrial Ecology and Sustainability

Achieving ecologically and environmentally sustainable industrial development is a major challenge of the new century. Industrial ecology and industrial metabolism allow some insights into the links between production system and environment for sustainable industrialization(Chertow, 1998; Erkman, 1997; Hudson, 1995; Wallner, 1999). Industrial metabolism is an approach to construct a balance sheet of the physical and chemical inputs to and output from production. It

is basically an application of material-balance principle, "aimed at understanding the circulation of the material and energy flows linked to human activity, from their initial extraction to their inevitable reintegration, sooner or later, into the overall biochemical cycles" (Erkman, 1997:1). Industrial ecology is a system view of industrial operation in order to optimize the total material cycles from virgin material, to finished material, to component, to product, to obsolete product, and to ultimate disposal(Graedel and Allenby, 1995; Chertow, 1998). In the industrial ecology, the industrial system can be seen as a certain kind of ecosystem, which is different from the conventional view which considers the industrial system as separate from the biosphere(Erkman, 1997).

Most of the scholars do not make a clear difference between industrial ecology and industrial metabolism, even though there are some distinctions in a methodological and historical point of view. Erkman (1997: 1-2) identifies three key elements of industrial ecology/metabolism perspective as follows:

1) It is systemic, comprehensive, integrated view of all the components of the industrial economy and their relations with the biosphere.
2) It emphasizes the biophysical substratum of human activities, i.e. the complex pattern of material flows within and outside the industrial system, in contrast with current approaches which mostly consider the economy in terms of abstract monetary units, or alternatively energy flows.
3) It considers technological dynamics, i.e. the long term evolution (technological trajectories) of clusters of key technologies as a crucial(but not exclusive) element for the transition from the actual unsustainable industrial system to a viable industrial ecosystem.

One of the earlier applications of industrial ecology concept to industrial system can be found in Japan. Problems of pollution and industrial waste were serious in the 1960s in Japan. Because of the problems, the Ministry of International Trade and Industry(MITI) set up the Industry-Ecology Working Group to develop the idea of reinterpretation of the industrial system in terms of scientific ecology in the

1970s(Erkman, 1997). Since the 1970s, Japan has taken seriously the idea of industrial ecology and put into practice to replace material resources with technology.

Since the late 1990s, many industrialized countries have attempted to introduce the idea of industrial ecology to production systems with regard to waste management. For example, within a firm, the derive to "design out waste" has evolved at the beginning of the life cycle of a product into "design for environment" on the one hand, between and among firms, across the many stages of production beyond the facility boundaries, waste, water, and energy can be shared and traded on the other hand(Chertow, 1998). In addition, the flow of materials and energy can be traced across regions, economies, and the globe, and then the places of the greatest harms can be identified and targeted for policy attention.

In recent years two major directions are suggested for application of the concept of industrial ecology to industrial system such as eco-industrial parks and systemic dematerialization(Erkman, 1997). Firms and community participants can share waste, water, and energy across firm and town boundaries in the eco-industrial park, in which waste or by-products of a firm are used as resources by another firm. Dematerialization strategy intends to optimize the flows of materials within the economy by the increase in resource productivity, which is largely based on technological evolution. Systemic dematerialization is related to the strategy of service economy and refers to "the fact of increasing the resource productivity not only at the level of the product, but at the level of global infrastructures, but also, most importantly, to decrease its speed within the industrial system, thus minimizing the problem of dissipative emissions during normal use"(Erkman, 1997: 7).

Even though industrial ecology approach can contribute to ecological sustainability, it has a limitation. Industrial ecology approach is based on biological analogy and ignores the fact that production is a social process and has manifold social implications(Hudson, 1995). Accordingly, industrial ecology has been called "the science of sustainability", which is critically necessary, but not wholly sufficient for achieving sustainable development(Chertow, 1998). For sustainable industrialization, strategies toward ecological sustainability should be developed under the consideration of economic and social sustainability.

2. Role of Multinational Corporations

Multinational corporations have significantly contributed to diffusion of industry and industrialization of developing countries since the 1970s. Formerly, especially before 1970s, environmental regulations for industrial location and public awareness of industrial pollution in advanced countries had some impacts on the diffusion of specific type of industries to periphery or developing countries. Nowadays, however, there is little strong evidence that environmental regulations have significant impacts on industrial location(Robinson, 1995). Rather, it is argued that environmental regulations have positive effects of industrial innovation and firm's competitive advantage in some industries(Wallace, 1995). Due to the public awareness on the importance of environmental protection, environmental movement of NGOs, and environmental regulations under the WTO, peripheral areas or developing countries are no more attractive places for pollution-causing factories.

Because of the strong environmental regulations and changes in environmental attitudes, development of clean technologies and innovations for environmentally sound products and processes are important issues in our industrial world. However, most of the developing countries have difficulties in investments to the development of environmental technologies due to the lack of capital and knowledge. However, MNCs in industrialized countries have relative advantages in accessing to the capital and environmental technology needed for environmental sustainability.

MNCs can contribute to sustainable industrialization in two ways. First, MNCs can take a significant role in the creation and diffusion of environmental knowledge and technologies to the developing countries through foreign direct investments(FDIs). It is suggested that MNCs, in all their diversity, have much of critical knowledge and technologies required for sustainability and that FDI is a key mechanism for diffusion of the technology internationally(Wallace, 1996). MNCs have capacity to create new environmental knowledge through the process of knowledge creation within firms and the new environmental knowledge and technology can be transferred to host countries through customer and supplier chains in local areas. Furthermore, the interactions of tacit and codified knowledge along the supplier chains in host countries can provide opportunities for the creation of new environ-

mental knowledge which is appropriate to host countries. Managerial expertise, technological competence, and tacit knowledge can be absorbed more effectively and cheaply through employment than through aid or training programs. Accordingly, direct investments of MNCs to developing countries can be an effective mechanism for diffusion and creation of environmental knowledge and technology.

Second, many MNCs can be a vanguard of developing corporate responses to environmental problems and can contribute to sustainable industrialization in host countries. Evidences in developing countries suggest that many MNCs are applying environmental standards far in excess of those required by host governments by bringing the donor countries' environmental standards with them(Wallace, 1996; Schmidheiny and Zorraquin, 1996). MNCs must be, in recent years, much more sensitive to the possibility of consumers' rejects or other image-damaging outcomes of being affiliated with environmentally irresponsible local operations(Zhang et al., 1999). Some MNCs have adopted proactive approaches to environmental issues and are "exploring new concepts such as design for environment, eco-audits, life-cycle analysis, cleaner and zero-emission production, industrial metabolism and industrial ecology"(Wallace, 1996: 68).

Some developing countries are now undergoing rapid industrialization with serious environmental degradation. FDIs and foreign investments to environmental management in developing countries can contribute significantly to break the cycle in which environmental degradation follows on industrial development and improve sustainability (Spofford Jr, 1996). For sustainable industrialization in developing countries, however, more cooperative networks among international organizations, MNCs, domestic firms, and host governments are necessary beyond the positive role of MNCs.

3. Networks for Sustainability

Business networks and cooperation are necessary for economic, social, and ecological sustainability. Cooke and Morgan(1993) suggest the importance of network forms of organization in corporate strategy and regional development. The process of knowledge creation is basically related to the interaction of tacit and codified knowledge along the various networks as examined in the previous section. Most of the

economic geographical studies on intra-organizational and inter-organizational networking, in general, have emphasized economic aspects such as innovation potential, savings in transaction costs and sunk costs, regional development, and other synergy effects, while have paid insufficient attention to environmental issues(Camagni, 1991; Cook and Morgan, 1993; Grabher, 1993; Malecki and Oinas, 1999; Park, 1996a; 1998). The network concept is, however, critical for industrial ecology and industrial metabolism approach such as industrial recycling networks, suggesting that networks are necessary for environmental sustainability.

Since the importance of networking in economic and social aspects has been well recognized in the economic geographical literature, discussion in this section mainly focuses on environmental aspects. The importance of networking for environmental sustainability can be summarized as follows.

First, cooperative networks with suppliers, customers, and stakeholders including competitors can provide opportunities for knowledge creation process and contribute to develope environmentally sound new products. Collective learning through strong regional networking can facilitate the interaction of tacit and codified knowledge and increase the possibility of innovation as examined in the process of knowledge creation.

Second, close networks with environmental service providers can contribute to the creation of environmental knowledge through interactive learning process. Such networking is critical for development of environmental management systems.

Third, industrial recycling networks by substituting primary raw materials with external recycled materials bring about ecological advantages due to reduced consumption of resources and decreasing industrial wastes. The concept of eco-industrial park, in which waste or by-products of one company are used as resources by another company, is based on the network concept.

Fourth, cooperation and networks of specialists from different sectors at both local and global level can contribute to the efficient use of material and development of low-waste technologies in engineering industries. Development of new environmental technologies in the engineering industries is the result of inter-organizational networks as well as in-house R&D activities.

[Table 2] Selected Aspects of ECOFIT-Parks

Function of the ECOFIT-Parks	· Focus not on foundation of an industrial park but on activity center for sustainable development of the region · Selected existing enterprises are integrated into the network concept and new, selected enterprises are located(new enterprises must FIT into the ECO-concept) · Disadvantages for farming population should be cushioned (regional marketing and processing of agricultural products) · New standards must be set up with innovative integrated technology
Alternative sectors in the ECOFIT-Parks	· Center for initiative(incubation center) · Local exchange trading systems(LETS) · Center for regional services · Quality center - local supply markets · Center for creative reuse and recycling(CCRR) · Social and culture center
Work in the ECOFIT-Parks	· Culture of cooperation and trust within and between firms · Trust in workers and their skills · Man-machine relationship towards machine as a tool · Safeguarding and expanding know-how · Active involvement of workers in decision-making processes · Worker motivation through further training

Source: Wallner, 1999

Fifth, participation and cooperative networks of local governments, non-profit organizations(NPOs), non-government organizations(NGOs), private firms, and individuals are a useful procedure for achieving regional industrial development harmonized with natural environment and livelihood(Imaizumi, Yabuta, and Ida, 2000). Networks of NPOs and NGOs have significant impacts on investigating and solving environmental issues in recent years.

Lastly, global networks as well as local or regional networks are important for transfer of environmental technologies and development of new environmental products. Strategic alliances for innovative research at international level are not rare in recent years. The development of information and communication technologies facilitates the global networks with regard to environmental issues and can enhance the interaction of codified knowledge with local knowledge.

In recent years, the network concepts are applied to create an eco-cluster for sustainable development, which is called as ECOFIT-Park (Wallner, 1999). Theselected aspects of the ECOFIT-Parks are summarized in(see Table 2). The possible implementation of the ECOFIT-Park project is now under discussion in Styria, Austria. The basic concept of the eco-cluster is based on two aspects:

1) industrial ecology approach with the idea of recycling and business networking; and
2) constructing a center of innovation and activity for a region. Accordingly, the ECOFIT-Park is aimed to promote ecological sustainability as well as socio-economic sustainability.

4. Financing Environmental Change

Financial markets used to encourage short-term goals and undervalue environmental resources and accordingly did not sufficiently support sustainable development. Commercial banks, insurers, and others in the financial community have been far from the front line of environmental protection and sustainability. However, in recent years, with growing awareness on the importance of sustainable development from the public and business sectors, it is expected that financial markets will change the ways to value the business and will start rewarding eco-efficiency for purely financial reasons(Schmidheiny and Zorraquin, 1996). The concept of eco-efficiency is increasing value added while minimizing resource consumption, waste, and pollution.

Commercial banks in industrialized countries are beginning to have interest in the environmental issues. Before the early 1990s, most of the commercial banks did not see environmental degradation and pollution as their agenda and had no interest in sustainable development. However, under the US Comprehensive Environmental Response, Compensation and Liability Act(known as "Superfund"), liability for cleanup is imposed on owners of contaminated sites and companies threatened with such costs tried to find banks to share the costs(Schmidheiny and Zorraquin, 1996). With growing environmental liabilities, in 1992, about 30 leading banks, working with UN Environment Programme(UNEP), signed a "Statement by Banks on the Environment and Sustainable Development," and the number of banks signed has contin-

uously increased since then. The Statement identified that "eco-logical protection and sustainable development are collective responsibilities and must rank among the highest priorities of all business activities, including banking" and that "environmental risk should be part of the normal checklist of risk assessment and management"(Schmidheiny and Zorraquin, 1996: 177-178). In order to limit their risk, bankers are beginning to consider the concept of eco-efficiency in their lending decision.

Along with the growing awareness of bankers on the environmental issues, bankers can encourage customers toward eco-efficiency in industrialized countries, but it is difficult for banks to be cost-effective in encouraging eco-efficiency in small and medium sized enterprises(SMEs). International organizations can provide funds to encourage eco-efficiency in SMEs and transfer of environmental technology to SMEs. The Global Environmental Facility, a funding source for environmental work, can be used to channel technical and financial resources for sustainable development to developing countries. UNEP, UNDP, and the World Bank are also jointly providing fund for environmental problems with four priorities: biological diversity, global warming, ozone depletion, and protection of international water(UNIDO, 1991).

Insurance companies have already suffered direct financial damage from environmental problems. United States insurers faced on estimated $2 trillion in pollution cleanup and asbestos-related claims(Schmidheiny and Zorraquin, 1996). Due to the direct relations of the insurers with environmental problems, insurers can do a significant role for improving environmental sustainability. Leading insurers concern about the possibility of climate change such as global warming and how this could damage their business, and try to find ways to reduce their risks from unpredictable weather.

As briefly reviewed, there is a trend of emerging financial markets which encourage eco-efficiency to conserve resources and limit pollution in industrialized countries. However, the newly emerging financial markets are mainly related to businesses in developed countries or to global environmental problems. Industrial firms in developing countries and SMEs have poor access to this newly emerging financial markets. Considering that environmental problems in developing countries become more serious with the rapid industrialization, international financial organizations should seriously consider the ways to encourage

eco-efficiency and sustainable industrialization in developing countries. The role of international organization such as UNIDO should be strengthened to support transfer of environmental technology, development of appropriate environmental technologies in developing countries, manpower training for environmental technology, and coordination and networking for environmental sustainability in developing countries. Public-private financing partnership and financial sector reform programs for supporting sustainable industrialization are also important to provide funds for environmental change.

Conclusion

Conventionally, environment was discussed as something separate from development and economic sustainability was in priority for industrial development. However, during the last decade environment and development have been more and more inseparable like two sides of the same coin and ecological sustainability has become important, due to the increasing evidences of environmental problems and damages in the last two decades. Even though there is a trend of growing awareness on the importance of ecological sustainability in general, there are significant differences in the view of sustainability by country or the level of industrialization. Developing countries are now newly industrializing and giving priority to economic and social sustainability. Because it is expected that serious environmental degradation with the rapid industrialization of developing countries and the environmental impacts will extend from local to global, we need environmental policies for sustainable industrialization in the global society.

Industrial ecology approach, the role of MNCs, networks for sustainability, and financing environmental change are suggested as possible paths of sustainable industrialization. These possible paths should be integrated as a whole to reorganize industrial systems for sustainable industrialization in the global society with relatively emphasizing ecological sustainability beyond economic and social sustainability. However, the relative emphasis on the individual path of sustainable industrialization can be different by region and by industry. For example, relative emphasis can be given to the industrial ecology ap-

proach in the food industry, while networking is more important for software industry or SMEs. The role of MNCs and international organizations is more important in developing countries, while market mechanisms of financial markets for financing environmental change will be more important in industrialized countries.

Harmony and cooperation are necessary in the global society for sustainable industrialization. Cooperation and collaboration between private sector and public sector become more important on the one hand, innovative partnership between industry and environment is needed for sustainable industrialization. In addition, governments, private firms, NGOs, NPOs, and international organizations should have cooperative networks at local, regional, and global level for innovation of environmentally sound products and processes, diffusion of low waste and emission-free environmental technologies, spread of environmental information, and environmental education and training. The basic principle of the creation of knowledge through the interaction of tacit and codified knowledge can be applied to the creation of environmental knowledge and the innovation of environmentally sound products and processes.

Considering that the shortages of capital, information, and expertise are hampering the innovation and diffusion of cleaner production in developing countries, new industrial systems should be organized by encompassing the four paths of sustainable industrialization in developing countries. However, it is important to note that without significant changes in individual attitude toward environment and without cooperative networking, sustainable industrialization cannot be easily accomplished. For sustainable industrialization in the knowledge-based economy, information and communication technologies and the trend of globalization should also be positively utilized for the creation of knowledge for environmentally sound products and process innovations.

References

Anderson, J. W. and RFF(Resources for the Future). "Think globally, act globally." *Resources,* 135, 1999: 18-19.

Angel, D. P. and Rock, M. T., eds. *Asia's clean Revolution - Industry, Growth and Environment*. Greenleaf Publishing, Sheffield, 2000.

Braun, B. & R. Grotz. "Environmental management in manufacturing industries: a comparison between British and German firms." unpublished manuscript, 2000.

Braun, B. "Locational response of German manufactures to environmental standards." *Tijdschrift voor Economische en Sociale Geografie,* 89(3), 1998: 253-263.

Camgni, R., ed. *Innovation Networks, Spatial Perspective*. Belhaven Press, London and New York, 1991.

Chertow, Marian R. "Waste, industrial ecology, and sustainability." *Social Research,* 65(1), 1998: 31-53.

Cohendet, P., Kern, F. Mehmanpazir, B. and Munier, F. "Knowledge coordination. Competence creation and integrated networks in globalized firms." *Cambridge Journal of Economics,* 23, 1999: 225-241.

Colby, Michael E. *Environmental Management in Development: The Evolution of Paradigms*. World Bank Discussion Papers 80, World Bank, Washington, D. C, 1990.

Cooke, P. & K. Morgan. "The network paradigm: new departures in corporate and regional development." *Environment and Planning D: Society and Space,* 11, 1993: 543-564.

Doryan, Eduardo A. "An institutional perspective of competitiveness and industrial restructuring policies in developing countries." *Journal of Economic Issues,* 27, 1993: 451-458.

ECE(Economic Commission for Europe). *Low-waste Technologies in Engineering Industries*. United Nations, New York and Geneva, 1994.

Eckersley, Robyn(ed.). *Markets, the State and the Environment towards Integration*. MacMillan Press, London, 1995.

Elkington, John. "Towards the sustainable corporation: Win-win business strategies for sustainable development." *California Management Review,* 36(2), 1994: 90-100.

Erkman, S. "Industrial ecology: A historical view." *Journal of cleaner production,* 5(1-2), 1997: 1-10.

Graedel, T. E. and Allenby, B. R. *Industrial Ecology*. Prentice Hall, Englewwod Cliffs, N. J., 1995.

Grotz, R. and Braun, B. "Territorial or trans-territorial networking: Spatial aspects of technology oriented cooperation within the German mechanical engineering industry." *Regional Studies,* 31(6), 1997: 545-558.

Howells. J. "Tacit knowledge, innovation and technology transfer," *Technol. Analysis and Strategy Mgt,* 2, 1996: 91-105

Hudson, R. "Toward sustainable industrial production: but in what sense sustainable?" In Taylor, M.(ed.), *Environmental Change: Industry, Power and Policy*. Avebury, Aldershot, 1995: 37-56.

Imaizumi, H. Yabuta, M., and Ida, T. "Towards a construction of administrative managed system of common-pool resources." a paper presented at the 6th PRSCO Summer Institute June 13-17, 2000, Mexico City, Mexico.

Jaffe, Adams B. Steven R. Peterson, Paul R. Portney & Robert N. Stavins, "Environmental regulation and the competitiveness of U. S. manufacturing: What does the evidence tell us?" *Journal of Economic Literature,* 33, March 1995: 132-163.

Lawson, C. and Lorenz, E. "Collective learning, tacit knowledge and regional innovation capacity." *Regional Studies*, 33(4), 1999: 305-318.

Malecki, E. and Oinas, P. *Making Connections, Technological learning and regional economic change*. Ashigate, Aldershot, 1999.

Maskell, P. and Malmberg, A. "Localized learning and industrial competitiveness." *Cambridge Journal of Economics,* 23, 1999: 167-185.

O'sullivan, Mary. "The sustainability of industrial development in Ireland." *Regional Studies,* 34(3), 2000: 277-290.

Porter, M. K. and van der Linde, C. "Green and competitive: ending the stalemate." *Harvard Business Review, 73*(5), 1995: 120-123.

Portney, Paul. "Environmental problems and policy: 2000-2050." *Resources,* 138, 2000: 6-10.

Repetto, R., Rothman, D., Faeth, P., and Austin, D. "Has environmental protection really reduced productivity growth?" *Challenge*, January-February 1997: 46-57.

Robinson, K. "Industrial location and air pollution controls: a review of evidence from the USA." *Progress in Human Geography,* 19(2), 1995: 22-244.

Sam Ock, Park. "Network and embeddedness in the dynamic types of new industrial districts." *Progress in Human Geography,* 20(4), 1996a: 476-492.

Sam Ock, Park. *Regional Industrial Policy for Sustainable Development*(in Korean). Korea Environmental Technology Research Institute, Seoul ,1996b.

Sam Ock, Park. "Environmental policy and responses of industry in the USA(in Korean)." *American Studies,* 21, 1998: 153-172.

Schmidheiny, S. & Zorraquin, F. J. L. *Financing Change: the Financial Community, Eco-efficiency, and Sustainable Development*. MIT Press, Cambridge, 1996.

Schulz, C. "Environmental service-providers, knowledge transfer, and the greening of industry." Paper presented at the IGU commission on the Organization of Industrial Space, Dongguan, China, August 8-12, 2000.

Spaling, Harry & Annette Dekker. "Cultural sustainable development: Concepts and Principles." *Perspectives on science and Christian faith: journal of the American Scientific Affiliation,* 48(4), 1996: 230-243.

Spofford Jr., Walter O. "Environmental management during a period of rapid industrial development." *Resources,* 123, 1996: 13-16.

Taylor, M. "Linking economy, environment and policy, in Taylor." M.(ed.), *Environmental Change: Industry, Power and Policy*. Avebury, Aldershot, 1995: 1-14.

Taylor, M., Bobe, M., and Leonard, S. "The business enterprise, power networks and environmental change." in Taylor, M., ed., *Environmental Change: Industry, Power and Policy*. Avebury, Aldershot, 1995: 57-82.

UNIDO(United Nations Industrial Development Organization). *Striving for ecologically sustainable industrial development*. UNIDO, Austria, 1991.

UNIDO. *Industrial Development*. Oxford University Press, Oxford, 1996.

Wallace, David. *Environmental Policy and Industrial Innovation*. Earthscan Publications Ltd., London, 1995.

Wallace, David. *Sustainable industrialization*. Earthscan Publication Ltd., London, 1996.

Wallner, H. P. "Towards sustainable development of industry: networking, complexity and eco-clusters." *Journal of Cleaner Production,* 7, 1999: 49-58.

Womack, J. P., Jones, D. T., and Ross, D. *The Machine That Changed the World.* Macmillan, N. Y., 1990.

WCED(World Commission on Environment and Development). *Our Common Future.* Oxford University Press, Oxford, 1987.

Weikl, Christian & Reinhold Grotz. "Transnational technology transfer of SMEs and its impact on regional development," *Entrepreneurship and Regional Development,* 11, 1999: 301-315

Zhang, Weijiong, Ilan Vertinsky. "Terry Ursacki & Peter Nemetz, Can China be a clean tiger? : growth strategies and environmental realities." *Pacific Affairs,* 72(1), 1999: 23-33.

6 Impact of Foreign Direct Investment on Regional Policy

Sung-Woong Hong

Preamble

Korea has joined in competition for attracting FDI in the late 1990s as a latecomer in the competition of FDI among the Asian developing countries. In Korea, the inbound FDI was managed rather tightly with controls on foreign currency and restrictions of the foreign investment in industrial sectors. On the other hand, the outbound foreign direct investment increased with the rapid increase in wage and radical labor movement in the 1980s. Many Korean industries chose to relocate their production sites in other part of the world, including Eastern Europe, China and Southeast Asia, EU and the U.S. and increased the outward investment. Prior to 1997, the amount of outbound investment surpassed the inbound FDI in Korea. After the financial crisis, however, the local authorities started to engage actively in an effort to attract foreign direct investment. Foreign direct investment is currently considered as a policy instrument for the regional economic development to the regional governments. There are cases that the regional governments have attempted to take an active position in attracting foreign capital and industries.

While the foreign investors are searching for a safe and high returns on their investment, the host regions have their own objectives seeking the foreign direct investment. Foreign direct investment represents a long-term commitment of capital investment and an introduc-

tion of new technology and management as much as a new way of thinking. This is an "additionality" of foreign direct investment which has more profound and lasting impact to a host region, such as increasing employment and production. Therefore, our interest should be more focused on the merits of foreign direct investment in enhancing the competitiveness of the industries in the host region through technical transfer, management know-how and industrial restructuring.

The impacts of FDI are felt primarily by the locality of the production activity operated by the foreign investors. There are not many but a few researches on the regional and local impacts of foreign direct investment(Gertler, 1996; Hong, 1997; Park, 2000; Sun and Parikh, 2001).

This paper investigates the trends of foreign investment in the last few decades. There has been a rapid increase in FDI and drastic shift in investment sectors since the financial crisis. The paper investigates the spatial implication of the recent changes in the directions of FDI. Consequently the paper highlights the implication of FDI on regional development. It also highlights a few points of recommendation in designing regional strategy to attracting foreign direct investment.

Profile of Foreign Direct Investment

1. Trend of Foreign Direct Investment

During the period of 1980's and 1990's, the outbound foreign direct investment(FDI) surpassed the inbound foreign direct investment (Figure 1). There were significant numbers of exodus in the labor intensive industries, including textile and footwear. The competitive edge was sliding in global market due to the rapid wage increase and many firms in those industries relocated production sites to Southeast Asian countries seeking low labor cost and access to market in newly industrializing countries. On the other hand, electronics and auto industries also increased their production activities in North America and European countries for the marketing and technology transfer(Hong, 1997: 240-244). In addition, the unfavorable business climates in Korea discouraged foreign investors. The inbound FDI remained in an amount

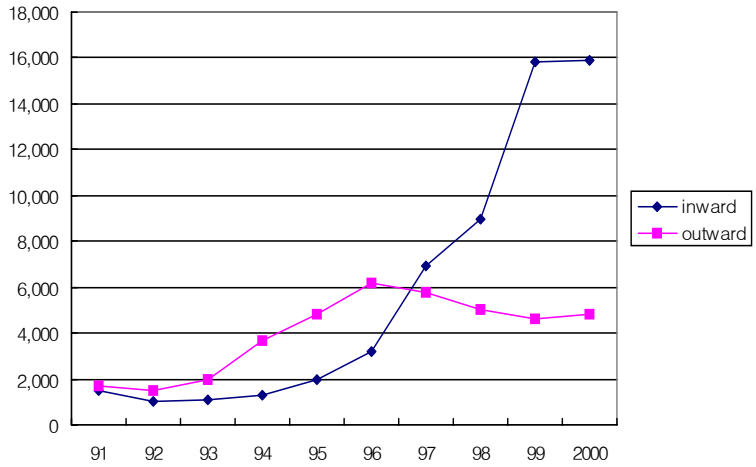
less than 2 billion USD annually during the period.

In the 1990s, most of foreign investment was in form of bank loan and bond issued by domestic corporations and the share of FDI constitutes merely 10% of the foreign capital investment in the period. The picture changed with the financial crisis. At the end of 1997, the foreign debt reached 1,208 USD, which accompanied with the slide of country credit rating, contributed the financial crisis. During the crisis, the inbound FDI jumped up to 8 billion USD in 1998, 15.5 billion USD in 1999 and 15.7 billion USD in 2000. The share of FDI increased from 24% in 1998, to 27% in 1999 and 36% in 2000. The amount of the inbound FDI after the financial crisis is equivalent to that of three decades prior to the crisis.

The dramatic increase of FDI could be partly contributed by the government's efforts in attracting foreign investment at the face of huge foreign debt. In addition, the asset deflation during the financial crisis, however, seemed to be a dominant factor attracting the foreign capital invested in real estates and facilities.

[Figure 1] Inbound and Outbound FDI

(unit: 1,000 USD)



Source : EXIM Bank, Report on FDI by Reion, 2000. 12

2. Country of Origin

FDI among the industrialized countries constituted 72% in 1985 and increased 79% in 1990 of global FDI in total. However, the share of FDI in the developing countries increased during the 1990s as the newly industrializing Asian countries aggressively engaged in attracting FDI. The share of developing countries increased from 21% in 1990 to 28% in 1995 and 37% in 1997. The FDI inflow into China constituted 43% of the total inbound FDI in Asian countries, amounting 291 billion USD in 1999. Hong Kong, Singapore, Malaysia ranked next in order. The inbound FDI of these four countries constituted three quarters of the inbound FDI in Asia. Korean ranked 6th among Asian countries with 10 billion USD(Table 1, Appendix).

Among the countries invested in Korea, the U.S. was the largest investor in terms of the accumulated amounts since 1960 and Japan and Netherlands are next in order. The investment from Japan, however, surpassed that of U.S. in the 1970s and 1980s. However, since 1997, the investment from the U.S. has increased drastically to such an extent that the U.S. investment during the last four years is larger than the U.S. investment for the last 40 years. In 2001, the U.S. investment amounted to 18 billion USD, constituting 27% of the total foreign capital inflow. The inbound FDI originated from the Asian countries had increased since 1996, amounting to over 2 billion USD in accumulation. However, the sources of capital inflow from the Asian countries, mainly from Malaysia and Singapore, are known to be the affiliates and branch offices of the firms from the industrialized countries such as Bell Canada International, Aviti Consolidated, and Delphinium Enterprises.

The capital inflow from the EU countries has also increased after the financial crisis amounts to 20 billion USD in 2001, 31% of the total foreign investment accumulated. The investment from Netherlands, Germany, France and England are next in order.

3. Destinations by Industrial Sectors

During the period of earlier industrialization, the Korean government pursued an unbalanced growth strategy and promoted the investment in import-substituting light manufacturing industry in the 1970s and then the industrial policy was shifted towards heavy chemical

industries in the 1980s. The foreign capital inflow, with the initiation of the central government, was concentrated in the manufacturing sector. In 1991, the foreign investment in the manufacturing sector amounted to 6.2 billion USD far above 3.0 billion USD that in the service sector. With the agreement in the Uruguay Round and WTO, the Korean government has been steadily improving the institutional framework and business environment to attract foreign business in service. Furthermore, after the financial crisis, there has been a rapid increase in foreign producers' service. The majority of investment in service was in a mode of merger and acquisition(M&A) of problematic Korean financial institutions which were in debts and in the process of restructuring. In 2001, the foreign investment in the service sector amounted to 34.9 billion USD which was 51.1% of the total foreign capital accumulated during the period of 1962 to 2001(Table 1).

The shares of the foreign investment have so far increased in banking, insurance, communication, and other services. The foreign investment in the manufacturing sector has been concentrated in paper products and electronic industries.

[Table 1] FDI by Industry

(Unit: 1,000 USD)

	Manufacturing	Service	Others	Total
1962-1990	5,150,259	2,685,205	38,368	7,873,832
1991	1,069,186	325,638	1,172	1,395,996
1992	648,012	244,267	2,197	894,476
1993	526,817	517,330	127	1,044,274
1994	401,693	914,541	270	1,316,505
1995	889,352	1,057,487	390	1,947,229
1996	1,930,158	1,254,198	18,224	3,202,580
1997	2,347,937	4,567,751	55,227	6,970,915
1998	5,735,324	2,938,170	179,033	8,852,527
1999	7,129,445	8,358,516	53,586	15,541,547
2000	7,121,416	8,565,756	2,685	15,689,857
1962-2001. 2	33,084,936	34,999,044	351,319	68,435,299

Source: Ministry of Industry and Resource. *Foreign Investment by Industry*, 2001

4. Modes of Entry: Greenfield vs. M&A

M&A has been a dominating mode of foreign investment over the world. Especially the foreign direct investment between the industrialized countries, which constitutes about 85% in the global FDI, took the mode of merger and acquisition in the 1990s. In the 1990s, even FDI between the industrialized and developing countries has been shifted its weight from greenfield investment to M&A. Especially during the period of financial crisis, from 1997 to 1999, the M&A in Southeast Asian countries averaged $20 billion USD annually. The share of the five Asian countries which suffered most severely during the crisis jumped from 19% up to 68% of the total M&A in the Asian developing countries(UNCTAD, 2000).

Since joining as a member of OECD in 1966, the Korean government has lifted the restriction on the stock purchase by the foreigners. Consequently the share of M&A has increased rapidly in Korea. The shares of M&A in the total FDI were 91.6% in 1999 and 42.6% in 2000 and 69.0% in 2001(BOK, 2002). In the year 2001, the total amount of the M&A has decreased comparing to the previous years. However, the amount of M&A in Asian and the mid-American countries has increased. In terms of amount, the EU countries dominated the Korean M&A market, constituting 81% of the total M&A in 2001.

In developing countries, the greenfield investment is sometimes considered more favorably than M&A because of the extent of local impacts throughout the construction and operation period. M&A and greenfield investment, however, may not be substitutable. Some investments requiring immediate operation of production lines, as in electronics industry or some utility industry with restriction on stock purchase, the investor may have to choose M&A. Generally speaking, M&A is more easily applicable as a mode of entry in industrialized economy than in pre-industrialized economy. The investor who aims to introduce new management and marketing by utilizing the existing production facilities and labor force may prefer M&A when investing in industrialized countries. The recent M&As in the seed and porcelain industries in Korea are the examples of such case.

During the period of Asian financial crisis, in some cases, foreign investors purchased devaluated stocks and asset for the long-term profit. In others, foreign investors purchased the asset of partnering firms

in the host countries to prevent bankruptcy or restructuring. UNCTAD estimated about 39% of M&A in 1998 belong to the latter type in Korea.

According to various estimates, majority of the foreign investment has the mode of entry in M&A since the year 1998. In 2001, 51.6% of M&A was through mergers which aimed to expand the market share. The asset and stock acquisitions had 30.95 and 17.5%, respectively(BOK, Cross Border M&A Trend, 2001. 3).

Regional Impacts of FDI

1. FDI in Region: Regional Context

FDI has drawn more attention to the regional governments both in developing and industrialized countries than other modes of foreign investments. FDI has a broader ramification both to the host and the donor countries. Generally, in a case of FDI, the investors have interests in the management and control of the invested asset over a long period. Because of these characteristics, FDI is considered to be more attractive to the host countries than other modes of foreign investment, portfolio, long-term loans, etc. First, because of the long-term commitment on control and management of the invested asset, the FDI is considered as a more reliable source of foreign capital than short-term investment. Second, it is possible that the FDI activity opens up a close tie with the local firms through marketing and inter-industrial linkages with the host country which can contribute to expanding market for the local industries. Third, the firm specific technological competence of the foreign investors can be transferred to the local firms. Fourth, the presence of FDI stimulates the local industries and creates more competitive business environment. Lastly, FDI can sustain the balance in the industrial mix by filling up the cavity created by the declining industries.

Poon and Thompson(2001) have found that investment of transnational corporation, as a whole has been spatially immobile. On regional basis, the FDI is “place rooted” and stable local entity, which can be integrated with the native industries and local community. And thus

FDI can become an innovative source of regional growth and industrial competitiveness. Therefore, the inflow of FDI in a region does not only generate local employment and additional income but also induces the investment form the rest of the country. Furthermore, FDI and consequent vitalization of the community in large often influence the regional and central government to increase investment on infrastructure and urban renovation(Bahl, 1992; Wu, 2000; Sun, 2001). FDI, therefore, can trigger a chain reaction to revitalize regional economy.

2. FDI by Region: Before and After the Financial Crisis

In 1999, there were 2,938 firms in Seoul operating with FDI in an amount of 10.4 billion USD which constitutes 34% of the national total(Table 2). Including Incheon and Gyeonggi Province, the amount of FDI in Capital Region was 15.1 USD, 49.6% of the nation's total. On the other hand, FDI in the six major cities including Busan, Daegu, and Gwangju had only 15% of the nation's total.

Over the years, the amount of FDI in manufacturing and service industries accumulated over the years is almost in equal amount, 15.6 billion USD in manufacturing and 14.6 USD in service. Seoul's FDI share in manufacturing sector is 6.8% of the nation's total, while the number of firms by FDI is 22.8%. It indicates that FDI in the manufacturing sector is spread in small amount and to small individual projects. About 32% of FDI in the manufacturing sector is within Capital Region. The share of the manufacturing sector in six major cities is 23.4% in amount and 18.0% in number of firms. About 70% of FDI in the manufacturing sector is in small cities and the rest of nation, which is slightly larger than the domestic share of manufacturing investment in these regions.

FDI in the service sector is highly concentrated in Seoul. The value of the investment amounts to 9 billion USD, constituting 62.4% of FDI in the service sector. The number of service firms operated with foreign direct investment in Seoul constitutes 74.4% of the total number of FDI firms in the sector. On the other hand, the Seoul's FDI share in manufacturing is as low as 6.8% of the nation's total. In the six major cities, the shares in service are similar to those in the manufacturing sector.

Table 3 shows the relative shares of foreign direct investment and domestic capital stock in manufacturing in 16 regions, namely, Seoul,

[Table 2] FDI by Industry and Region

(Unit: 100 million USD, %)

		All Industry		Agriculture		Mining		Manufacturing		Service	
			%		%		%		%		%
Seoul	Firm	2,938	51.7	150	20.0	5	25.0	559	22.8	2,369	74.4
	Amount	10,402	34.0	2	70.1	39	58.2	1,071	6.8	9,142	62.4
Busan	Firm	224	3.9	-	8.0	-	0.0	100	4.1	122	3.8
	Amount	1,003	3.3	-	0.0	-	0.0	432	2.8	571	3.9
Daegu	Firm	75	1.3	-	0.0	-	0.0	61	2.5	1	0.4
	Amount	259	0.8	-	0.0	-	0.0	238	1.5	21	0.1
Incheon	Firm	234	4.1	-	0.0	1	.	189	7.7	44	1.4
	Amount	1,237	4.0	-	0.0	-	0.0	905	5.8	332	2.3
Gwangju	Firm	34	0.6	1	4.0	-	0.0	24	1.0	9	0.3
	Amount	430	1.4	-	0.0	-	0.0	390	2.5	40	0.3
Daejeon	Firm	35	0.6	-	0.0	-	0.0	18	0.7	17	0.5
	Amount	1,316	4.3	-	0.0	-	0.0	357	2.3	960	6.6
Ulsan	Firm	54	1.0	-	0.0	-	0.0	48	2.0	6	0.2
	Amount	1,330	4.3	-	0.0	-	0.0	1,323	8.5	7	0.0
Gyeonggi	Firm	777	13.7	3	12.0	2	10.0	628	25.6	144	4.5
	Amount	3,538	11.6	37	17.3	-	0.0	3,003	19.2	497	3.4
Gangwon	Firm	29	0.5	-	0.0	2	10.0	17	1.7	10	0.3
	Amount	269	0.9	-	0.0	16	23.9	94	0.6	160	1.1
Chungbuk	Firm	134	2.4	-	0.0	2	10.0	116	4.7	16	0.5
	Amount	1,061	3.5	-	0.0	-	0.0	984	6.3	73	0.5
Chungnam	Firm	171	3.0	3	12.0	1	5.0	148	6.0	19	0.6
	Amount	1,405	4.6	19	8.9	-	0.0	1,238	7.9	149	1.0
Jeonbuk	Firm	68	1.2	2	8.0	2	10.0	52	2.1	12	0.4
	Amount	1,545	5.1	6	2.8	1	1.5	1,321	8.4	217	1.5
Jeonnam	Firm	49	0.9	2	8.0	-	0.0	37	1.5	10	0.3
	Amount	1,160	3.8	1	0.5	-	0.0	1,134	7.2	25	0.2
Gyeongbuk	Firm	133	2.3	1	4.0	4	20.0	117	4.8	11	0.3
	Amount	1,554	5.1	1	0.5	10	14.9	1,115	7.1	429	2.9
Gyeongnam	Firm	222	3.9	3	12.0	-	0.0	200	8.2	19	0.6
	Amount	1,955	6.4	-	0.0	-	0.0	1,815	11.6	139	0.9
Jeju	Firm	31	0.5	-	0.0	-	0.0	4	0.2	27	0.8
	Amount	1,155	3.8	-	0.0	-	0.0	1	0.0	1,154	7.9
Unsettled	Firm	473	8.3	3	12.0	1	5.0	135	5.5	334	10.5
	Amount	956	3.1	-	0.0	-	0.0	229	1.5	727	5.0
Total	Firm	5,681	100.0	25	100.0	20	100.0	2,453	100.0	3,183	100.0
	Amount	30,577	100.0	214	100.0	67	100.0	15,653	100.0	14,643	100.0

Source: Park. Y. C. *FDI and Industrial Estates*, KRIHS, 2000

[Table 3] FDI and Domestic Capital Stock in Manufacturing

(Unit : 10 million USD)

	FDI		Fixed Asset	
	10 million USD	%	10 million USD	%
Seoul	10,708	6.9	77,243	3.9
Busan	4,318	2.8	82,423	4.2
Daegu	2,375	1.5	56,861	2.9
Incheon	9,053	5.9	139,373	7.1
Gwangju	3,905	2.5	32,238	1.6
Daejeon	3,569	2.3	25,638	1.3
Ulsan	13,231	8.6	243,250	12.3
Gyeonggi	30,029	19.5	431,977	21.9
Gangwon	937	0.6	41,748	2.1
Chungbuk	9,874	6.4	105,237	5.3
Chungnam	12,378	8.0	171,389	8.7
Jeonbuk	13,209	8.6	78,017	4.0
Jeonnam	11,343	7.4	120,336	6.1
Gyeongbuk	11,152	7.2	198,480	10.1
Gyeongnam	18,147	11.8	167,893	8.5
Jeju	10	0.0	1,834	0.1
Total	154,238	100.0	1,973,937	100.0

Sources: Young-Chul, Park. *Foreigner Investment Status,* 2000; National Statistical Office. *Mining and manufacturing Industries statistical data*, 1999

six major cities and 9 provinces. The correlation coefficient between the two sets of share is 0.90. However, the correlations coefficients between the two sets of variable for each industrial sector are not statistically significant. It seems to indicate that the location of related industries in the locality do not have much bearing on the location decision of FDI.

The regional disparity and spatial concentration of FDI have increased much further since financial crisis. Out of 16 regions, the share of FDI increased in five regions, namely Gyeonggi Province(7.3%), Seoul(4.9%), Gangwon Province(4.4%), Gwangju(1.5%) and Jeonbuk Province(1.4%). The regional share of FDI in Seoul was 29.6% in 1997. Since the financial crisis, the Seoul's share of FDI inflow has increased

to 34.5%. In Gyeonggi Province, the share in 1997 was 12.4%. The share of FDI inflow since the financial crisis increased to 19.8%(Table 4). It is noteworthy that the share of FDI in Seoul constitutes about one third of the total FDI on delivery basis. The concentration of FDI in Seoul can be traced back to the dramatic concentration of FDI in service sectors(Table 2 in Appendix). For example, the Seoul's shares are dominating in insurance(100%), bank and financial services(89.6%), overseas trade(87.9%), real estates brokerage(76.8%), etc. On the other

[Table 4] Regional Share of FDI Before and After the Crisis

(Unit : 1,000 USD)

	Total (1962-2002. 6)	1962-1997	Financial crisis (1998-2002. 6)	Changes
Seoul	25,817,492 (33.0)	6,926,746 (29.6)	18,890,746 (34.5)	4.9
Incheon	3,084,902 (3.9)	984,310 (4.2)	2,100,592 (3.8)	-0.4
Gyeonggi	13,734,306 (17.6)	2,916,026 (12.5)	10,818,280 (19.8)	7.3
Gangwon	2,759,183 (3.5)	111,803 (0.5)	2,647,380 (4.8)	4.4
Chungbuk	1,625,188 (2.1)	9,10,799 (3.9)	714,389 (1.3)	-2.6
Chungnam	4,122,240 (5.3)	1,312,862 (5.6)	2,809,378 (5.1)	-0.5
Daejeon	1,926,205 (2.5)	1,376,548 (5.9)	549,657 (1.0)	-4.9
Jeonbuk	2,099,996 (2.7)	402,447 (1.7)	1,697,549 (3.1)	1.4
Jeonnam	2,253,958 (2.9)	736,897 (3.1)	1,517,061 (2.8)	-0.4
Gwangju	1,760,343 (2.3)	286,409 (1.2)	1,473,934 (2.7)	1.5
Gyeongbuk	5,045,035 (6.5)	1,127,795 (4.8)	3,917,240 (7.2)	2.3
Gyeongnam	3,706,120 (4.7)	1,757,311 (7.5)	1,948,809 (3.6)	-3.9
Busan	2,436,114 (3.1)	980,231 (4.2)	1,455,883 (2.7)	-1.5
Daegu	367,553 (0.5)	175,645 (0.8)	191,908 (0.4)	-0.4
Ulsan	2,566,899 (3.3)	1,057,464 (4.5)	1,509,435 (2.8)	-1.8
Jeju	4,833,638 (6.2)	2,338,351 (10.0)	2,495,287 (4.6)	-5.4
Total	78,139,172(100.0)	23,401,644(100.0)	54,737,528(100.0)	-

Note: Delivery base

Source: Im, Sung Hoon. FDI Policy for Regional Economic Vitalization, 2002: 6

hand, the manufacturing industries are relatively well spread over the regions with some exceptions; in pharmaceutical products(64.3%), machinery(43.7%), electricity and gas(33.6%), and food products(32.3%) in Gyeonggi Province; petrochemical product(52.1%) and metal products (46.3%) in Chugnam Province; paper and wood products(42.6%), clay product(32.5%) in Jeonbuk Province, etc.

3. Technology Transfer

One of the most important contributions of foreign direct investment is expected to be technology transfer. On the national level, FDI serves as an element in the process of promoting industrial restructuring and enhancing industrial competitiveness. However, most of the impacts are felt much more directly and intensively in the local economy at the destination of FDI. Especially, the local impact through the transmission of technological and managerial know-how which can be achieved by cooperation with the local community and industry could create a dynamic business environment in a host region. Especially, depending on the extent of integration of the activities of FDI with the locality, we cannot exclude the possibility of transforming the business practices of other local firms and business community, such as transparency, accountability and other practical details followed by rational and objective decision making process. The benefits of FDI from this "additionality," in fact, can transform the business culture of the host region and will have a profound and lasting impact to the region, then to the nation in turn.

One of major motivation of the outbound investment from developing countries to the industrialized countries is to get an opportunity to acquire advanced technological know how in specific production process. One of the motives of Korean R&D establishments located in Southern California, Boston and Houston is for this purpose. On the other hand, the outbound FDI from the industrialized countries in many cases based on the firm specific advantages. These advantages are not only in production process but often embodied in the scheme of overall process of production, financing, procurement of input material, logistics, bidding or contract procedures. These are the business attributes which cannot be transmitted simply by importing or duplicating production facilities, machines and parts. Whether the mode of

entry is greenfield investment or M&A, the transmission of technological and management know-how can be the most pertinent and urgent objective to attract FDI at the present stage of economic development in Korea. The transmission of the advanced skill and know-how can be achieved by the readiness of two parties, the donor and the host, in addition to the interrelation in technical and business ends. It should be nurtured by trust built upon a close interaction between the two parties in the locality.

According to the home base theory, the R&D activities of the essential technologies in the industrialized countries are known to be based on the location of the headquarters, rather than on the outbound investment in developing countries. A case in Canada reports that most of the R&D activities and R&D related decision making of the U.S. FDI firms in Canada are performed at the location of headquarter in the U.S(Dobson, 1997). According to Korean Association of Industrial Technology Promotion, 41 firms wholly owned by foreign investors established R&D activities which are equivalent to 1% of the R&D activities operated by Korean firms. They generally focus on solving day-to-day technical problems in technical nature. The prime motives of the foreign firms from the industrialized countries have been in expanding market share in the local market, reducing the cost of production and also taking advantage of less restrictive regulations on environmental degradation in developing countries. In the early industrialization period, some of the inbound FDI in Korea may fall into such category. However, in the recent years, especially since the second half of the 1980's, the interest of the inbound FDIs has bent toward to expand the share of the products in the local market with the drastic hike in wage and the increased restriction on pollution although some FDI seem to be a parking fund in nature preparing for an entry to Chinese market. In 2001, 51.6% of M&A was done through mergers who focused on expanding the market share.

However, in spite of the initial motives of the inbound FDI from the industrialized countries, there is a fertile ground to expect a certain level of technological transfer from the foreign firms to the industries in the locality hosting FDI. According to a report by Korea Industrial Bank, about 31% of the foreign firms came with new technology, and 65% of the new technologies have been duplicated by the local firms within 3 years(Park, S. R., 2000).

With the general level of wage increase during the last decades, it should be noted that it will be increasingly more difficult for the foreign investors to find the attractive area to invest for the entire process of a product in Korea. Therefore, the recent trend of inbound FDI is to be narrowly focused on segments of the production process rather than the entire production process from which the high value can accrue. Therefore, the technical transfer from the inbound FDI has to be restricted in the specific segment of value chain in production process where the Korean industries have a competitive edge in global market. That is why the production process utilizing professional engineers, which costs relatively low, may be the most promising area of the inbound FDI in future for technological transfer. For example, the investment from the EU countries has been increasing in the technical joint ventures in electronics. The value chain in Korean electronic industry has certainly attracted the European firms which aim to establish an industrial launching base for the Chinese market. Philips invested 1.16 billion USD.

FDI and Regional Policy

1. Dual Role of FDI

The inbound FDI has various impacts both on national and regional levels. The impacts can be differentiable in national and regional or local levels, because FDI has spatial domain of activity. Consequently, the extent of the emphasis on the FDI policy may vary with the points of view, from either national or regional objectives. On national level, the inbound FDI represent additional source of capital for foreign exchange balance and production capacity. It also provides the capital investment necessary to restructure domestic industry and enhance the global competitiveness. On regional level, the impacts of inbound FDI are direct and intensive in the vicinity of the location of the activities financed by the FDI. To the local government, the inbound FDI can generate additional local revenue. Through the inter-industrial linkages and multiplier effects, it can generate indirect and induced employment and thus increase income of local residents. It can affect

the land use pattern and property value which in turn increases tax base for the local government. Most of all, the most important merit of inbound FDI to the region may be in its contribution in promoting technological and management competence of the local industries. Basically the inbound FDI is the double-edged tool for regional development. On the one hand, it will create effective demand for local industries and local labor. One the other hand, it can enhance the productivity of industries and labor force.

2. Motives of Investors

The international movement of capital has been explained by real interest parity theory and portfolio theory. The real interest parity theory, stemming from the neo-classical framework, attempt to explain the movement of capital as a process of factor price equalization to reduce the difference in the real interest rates between countries. On the other hand, the portfolio theory emphasizes the international movement of capital as a process of optimizing the portfolio mix to minimize investment risk on a global basis(Rugman, 1976).

Theories of foreign direct investment, however, differ from the traditional theories of international capital movement. According to Dunning, the major determinants of FDI are;

1) the investor has the specific advantage of ownership,
2) the host region has the location specific advantage,
3) the investor can take advantage of internalization advantage by producing in the host region.

Therefore, the important criteria for foreign direct investment are the possibility of cost reduction, the size of the local market, and the strategic selection of location for export market in the host country or region.

In the case of M&A, the investment decision may be less dependent on the physical conditions of the locality. The location factors in the host region may intrinsically influence the decision. The location of the asset is generally predetermined by the operation in the past. However, expansion or reduction of the production capacities and/or employment depend on the new management. In the case of greenfield

investment, the business environment of the host region as discussed above will have much more bearing on the decision process. Specifically, the decision in the location of FDI can be bent toward either production or market oriented. As for FDI concerned with production cost, the access to the material inputs and related industries will be an important factor along with other physical and institutional infrastructure of the locality. However, as for FDI with the major interest in the local market, the location of production related industries may not pose as a critical factor.

Furthermore, FDI operated by multinational corporation as part of the global production and marketing network, the choice of location will be extremely complicated and be in broad spectrum in criteria. In other words, the important determinants of inbound FDI do not include only the disparity of interest rates, wages, and rents, but also the tax structure, industrial structural linkages in the host region, the transparency of the market operation and social and institutional infrastructure. Therefore, the region's strategy in attracting new FDI should be flexible and negotiable to accommodate the interest of specific investor.

According to empirical studies, the determinants of FDI somewhat differ by type of investment and the economic conditions of the host country. Studies include the variables such as the differences in interest rate, saving rate, domestic stock market conditions, the opening extent of capital market and country credit, etc. Statistically, the significance of the variables varies by type of investment and by time of analysis (Tayor & Sarno, 1997; Kwack, 1999; Kim, 2000). In particular, some studies on inbound FDI in Korea indicate that the variables of domestic interest rate and foreign exchange rate perform poorly, while the wage rate, government's promotion policy for foreign investment and the vitality in domestic market had significant explanatory power for investment decision in the studies(J. Y., Kim & K. M., Chun, 2001; J. D., Park, 1998; Y. D., Huh, 1998; H. J., Kim, 2000).

The investment is an outcome of an active decision made by the owner of capital. Therefore, in order to host the foreign investment, the effort should be put on generating and packaging the sales points of regional attractions to the tastes of the foreign investors. It will be difficult to push the investor into the decision unless the host-to-be country has definite and concrete advantages over the alternative candidates

located in the world. With the vast amount of the business information in investment opportunity, the multinational corporations can hardly be pushed into the foreign investment decision. In spite of loud sales promotions, many of the regional efforts to attract FDI in the past several years have resulted in vain. The successful promotion of FDI depends on presenting the investment package attractive to the eyes of the individual investor.

According to a recent survey, the prime motive of choosing Korea for their investment is to expand the market share of the product in Korea(44.4%), and the next motive is to establish a launching base for the entry to China and Northeast Asian region(20.0%) and the last is to save labor cost(Y. C., Park, 2000: 107; S. K., Lee, 1997). On the other hand, the conditions which affect negatively the investment in Korea are political instability(20.8%), inefficiency in bureaucracy(16.7%) and the strong labor union(12.5%).

3. Regional Strategy for FDI

3.1 Regional vs. National Perspectives

Some authors distinguish the objectives of the FDI promotion policies by stage of economic and industrial development(Lim, S. H., 2002: 12). In industrialized countries, objectives of the policy seem to have more emphasis on technology transfer and industrial productivity, while the same policy in developing countries is more focused on job creation and regional development. However, there are some exceptions: some of the most industrialized countries like the U.S. and the U.K. put the regional development and job creation as a major thrust of the FDI policy. As a matter of fact, the region means merely a delineation of a nation for the administrative or political purposes. Therefore, the competitiveness of regional industries and labor will certainly enhance the national competitiveness. Moreover, the enhancement of productivity can be achieved by the close contacts between the FDI activities and local firms, more strictly to say, it can be achieved by close personal and business contacts between local and foreign elements, both on skilled workers and the management level. The policy emphasis, however, can be different by central and local government, simply by jurisdiction.

As we have lost competitiveness in production cost, the strategy for the inbound FDI should be focused on the productivity increase and industrial restructuring, both on regional and national level.

3.2 Policy Instruments for Regional Government

Currently various policy measures are available for the local government including the subsidies on purchase and/or lease of real estates, vocational training, employment, and FDI development project. For the sale or lease of government properties, the selective bidding is also permitted to the FDI project under the authority of local government. In addition, the central government can provide incentives to the local governments for their efforts in attracting FDI including dispatching a team of expert abroad for road show explaining their potential projects, inviting CEOs of potential investor and publishing the promotional materials. The central government assumes 70% of the project cost to hire reputable consulting firms, drafting an offering memorandum for the project with great possibility of success.

3.3 Local Objectives and Endogenous Development

During the financial crisis, public and private sectors searched for the sources of FDI in order to obtain additional supply of foreign capital. Retrospectively, the influx of inbound FDI during the short period time contributed to the fast recovery from the crisis. Currently the many local and central agencies are trying to locate the sources of the FDI feverishly. However, the merits of the inbound FDI should not be measured by the number of cases and/or sheer amount of the FDI projects. Contribution of the inbound FDI should be assessed in the light of the local and domestic objectives and priority. FDI should be evaluated in terms of propensity of local employment, the potential for technical transfer and R&D, integration with local business community, etc. The successful FDI should be an integral part of local economy and act as an endogenous factor in promoting region's productivity and competitiveness. Therefore, region should apply its own criteria from the early stage of searching for the potential FDI projects.

3.4 Non-Traditional Policy and Barriers of Social Infrastructure

According to a survey major causes reducing the inbound FDI are associated with the poor performance of the public services in the public sector and militant labor movement(Park, 2000). It is noteworthy that unlike most of Asian developing countries, the lack of infrastructures or skilled labor is not a critical barrier against attracting foreign investment in Korea at present. The problem with the public service and labor union may not be in the traditional realm of regional policy and/or the central government's fiscal policy. The critical barriers are tied with social and institutional infrastructure.

3.5 Regional Initiatives

In attracting FDI, the regional initiative is essential. The local government and community are the direct and ultimate beneficiaries of the FDI inflow. At the same time, they have equipped with more detailed knowledge about the regional attributes, such as the capability and background of firms, business network, industrial linkages and community leaders. To attract FDI, specific sales package should be designed by selecting various regional attributes in conjunction with the specific objectives of individual investors. Before reaching the final agreement, however, terms and conditions should be negotiated with the initial offering document. For this process, the local government and community prepared with detailed knowledge of the locality should take initiative in promotion and negotiation of FDI.

3.6 Targeting the Market: Shopping List and Sales Package

The inbound FDI is merely a tool to achieve the regional development objectives. In planning stage, specific targets should be established on the nature of FDI based on the long-term development objectives. The local government and business community, jointly with the experts from the local R&D and universities, should develop a selection criteria required for the candidate. It should spell out concrete details of the desired FDI reflecting region's needs. They also have to elaborate a sales package containing the lists of regional merits and additional incentives which can be flexible and open to negotiation. The shopping

list should include choice of production process or refined industrial type, the mode of entry, and the size of investment, and also the location of the investment in case of greenfield investment. The shopping list for FDI should be constructed as an integral part of regional development strategy under the guidelines of development priorities. As the requirements for the candidates become more detailed and concrete, the sales package of a region should be more focused on specifics on regional attributes and attractions. The sale package includes the list of locally available incentives as well as tangible and non-tangible attractions that the local industry and community can provide. It should focus on regional niches so that the packages can be distinguishable from those in other regions. To meet specific objectives of various types of foreign investors, a wide variety of the sales packages should be developed. The negotiation among various actors will finalize the terms of final agreement. However, the negotiation should proceed roughly within the range of the guidelines established in the sales package and the regionally required target.

Concluding Remarks

FDI is not a panacea for regional development. The analysis of the inbound FDI, this and other studies indicate that

1) the recent FDI in Korea is not closely tied to the local industries and thus, to the local economy,
2) the extent of technological transfer is limited, and
3) the export propensity and productivity of FDI are not higher than those of the domestic industry.

It is time to reevaluate the nature of FDI in the past and establish a new set of strategy to attract FDI. The investor plays an active role in FDI activity. They are equipped with global perspectives on the investment opportunity. They are well informed and their targets are well set up from the start. It is not easy for the host region to be ready for the wide variety of the individual investor's shopping list for the investment without much effort to study and evaluate own merits and

demerits. Therefore, a strategic position of the local development authority is to set up clear objectives in the region and to define the characteristics of investment project in accordance with the regional development objectives. The target for the foreign investment should be derived from the long-term regional development objectives and elaborated in terms of required characteristics of investment, such as mode of entry and industrial activities. At the same time, various versions of sales list composed of regional merits and additional incentives should be prepared with a comprehensive and in depth evaluation of the regional attributes and capability.

The successful FDI should be an integral part of region's industry and local community which enhance the competitiveness of the regional economy. At the same time, it should have potential to transform the local industry and community. The sustainable growth of a region stems from the endogenous elements. The important sources of endogenous development are from the locality such as local leadership, human resource, R&D capacity and business practices. The investment in physical facilities of production and infrastructure cannot be sufficient condition for the sustainable regional development.

The regional development is earned by the merits of a region. Although the foreign investors can be hardly pushed to their decision, FDI is attracted to the region's merit. It shows how important it is to create a sales package of region's merits and additional incentives. On regional level, the local government and the business community are obliged to create a concrete and specific package to attract the foreign investment. In fact, the attractions appealing to FDI cannot be much different from those for domestic capital investment. The attraction of a region to an investor is no other than the elements of regional development.

The natural and physical endowments constitute only a part of the package. They should be earned by local people who determine the regional competitiveness. Therefore, the final outcomes of the local initiative in attracting FDI depend on local leadership, the network of industry and professionals in R&D and universities, institutional infrastructure and the riles and practices in business and public service.

Some studies indicate that a positive relation between the size of government and the exposure of economy to the world(Yeung, 2002). The risks from the exposure to the foreign capital market and also the

local government's risk involved in attracting the FDI should be mitigated by the government agencies, both on central and local level. The government may have to set up a program assisting local authorities by providing information on multinational corporations and investors in institutionalizing financial and technical support, including matching funding and compensatory program.

References

Bahl Roy W, Johannes F. Linn. *Urban Public Finance in Developing Countries*. Oxford Univeristy Press(World Bank), 1992.

Bank of Korea, Report Materials. "Cross Border M&A." 2002. 3. 3.

Dunning, J. H. "Explaining Changing Pattern of International Production: In Defense of the Eclectic Theory." *Oxford Bulletin of Economics and Statistics,* Vol. 41. 1979: 269-297.

Flong Wu. "Modeling Intrametropolitan Location of Foreign Direct Investment in Chinese City." *Urban Studies,* Vol. 37, No. 13, 2000: 2441-2464.

Hyun-Ji, Kim. "Determinants 2of FDI in Korea." *Industrial Research,* 11, 2000: 449-462.

Jin-Yong, Kim, and K. M. Chun. "Determinants of Foreign Investment." *BOK Monthly*, 2001. 4.

Jong-Don, Park. "Determinants of FDI in Korea." *Journal of Productivity,* 12-4, 1998, 12: 397-424.

MOCT site, www.moct.go.kr

Poon, J .P. H. and E. Thomson. "Effect of Asian Financial Crisis on Transnational Captial." *Geoforum,* 32(1), 2001: 121-131.

Se-Ku, Lee. *Attracting FDI in Seoul*. Seoul City Research Institute, 1997.

Si-Ryong, Park. "FDI: Trend and Policy." Korean Chamber of Commerce, 2000.

Sung-Hoon, Lim. "FDI Policy for Regional Revitalization." KOTRA, FDI Center(memeo), 2002. 8.

Sung-Woong, Hong. "FDI for All Seasons; in Boom and Bust." Paper presented at United Nations University Conference on "Globalization and Sustainability of Cities in Asian Pacific Region." June 24-26, Vancouver, Canada, 1998.

Sung-Woong, Hong. *Asset Deflation and Securitization*. CERIK, 1998. 11.

Yong-Chul, Park. *Industrial Estates as a Measure Attracting FDI*. MOCT, 2000. 1.

Yu-man, Yeung. *New Challenge for Development and Modernization*. Univ. of Hong Kong, 2002.

Yung-Do, Huh. "Entry Tactic and Outcome of FDI." *Global Management,* 9-1, 1998: 155-181.

Appendix

[Table 1] FDI in Asian Countries(Top 10)

(Unit: US$ 10 million)

Investment country	1988-1993 (Annual average)	1994	1995	1996	1997	1998	1999	Total
World	190,629	255,988	331,844	377,516	473,052	680,082	865,487	3,127,74
Industri-alized	140,088	145,135	205,693	219,789	275,229	480,638	636,449	2,803,461
Developing	46,919	104,920	111,884	145,030	178,789	179,481	207,619	1,209,237
SouthEast, East, East South	27,113	65,954	71,654	87,952	93,518	87,158	96,148	665,062
China	8,852	33,787	35,849	40,180	44,236	43,751	40,400	291,315
Hong Kong	3,689	7,828	6,213	10,460	11,368	14,776	23,068	95,847
Singapore	3,982	8,550	7,206	8,984	8,085	5,493	6,984	69,194
Malaysia	3,320	4,581	5,816	7,296	6,513	2,700	3,532	50,358
Thaiem bassy	1,899	1,343	2,000	2,405	3,732	7,449	6,078	34,401
Republic of Korea	956	991	1,357	2,308	3,088	5,215	10,340	29,035
Indonesia	1,269	2,109	4,346	6,194	4,677	-356	-3,270	21,314
Taiwan	1,160	1,375	1,559	1,864	2,248	222	2,926	17,154
Vietnam	319	1,936	2,349	2,455	2,745	1,972	1,609	14,980
Philippines	770	1,591	1,459	1,520	1,249	1,752	737	12,928

Source: UNCTAD, 2000: 286

[Table 2.a] FDI by Region

(Unit: US$ Thousand)

	Total	Seoul	Incheon	Gyeonggi	Gangwon
Construction	599,857	116,075(19.4)	4,124(0.7)	50,118(8.4)	525(0.1)
Mining	71,540	39,852(55.7)	504(0.7)	1,727(2.4)	15,861(22.2)
Metals	1,968,481	36,903(1.9)	9,278(0.5)	63,113(3.2)	30,749(1.6)
Financing	7,448,519	6,671,720(89.6)	0(0.0)	33,253(0.4)	1,000(0.0)
Machinery	4,196,590	420,797(10.0)	105,560(2.5)	1,832,730(43.7)	586(0.0)
Other service	11,316,841	6,423,222(56.8)	78,278(0.7)	1,668,987(14.7)	1,099,116(9.7)
Other manufacturing	1,649,726	551,529(33.4)	65,551(4.0)	303,208(18.4)	402,217(24.4)
Agriculture & Forestry	266,964	208,893(78.2)	32(0.0)	26,572(10.0)	770(0.3)
Wholesale & Retail	4,543,846	2,183,170(48.0)	4,952(0.1)	927,319(20.4)	0(0.0)
Trading	2,052,439	1,698,779(82.8)	27,592(1.3)	145,087(7.1)	9,170(0.4)
Insurance	1,638,154	1,638,154(100.0)	0(0.0)	0(0.0)	0(0.0)
Real Estate	662,324	508,527(76.8)	100,530(15.2)	30,712(4.6)	972(0.1)
Fertilizer	46,033	113(0.2)	0(0.0)	3,180(6.9)	0(0.0)
Petroleum	1,473,284	30,026(2.0)	4,991(0.3)	0(0.0)	0(0.0)
Textile & Clothing	453,523	247,739(54.6)	5,517(1.2)	63,609(14.0)	304(0.1)
Fishery	10,527	1,703(16.2)	0(0.0)	49(0.5)	337(3.2)
Hotel	10,153,756	1,946,357(19.2)	1,471,090(14.5)	1,037,959(10.2)	829,166(8.2)
Food	3,309,219	173,191(5.2)	148,822(4.5)	1,069,355(32.3)	73,882(2.2)
Ceramics	1,013,551	36,024(3.6)	92,514(9.1)	91,652(9.0)	118,800(11.7)
Transport equipment	3,409,285	6,617(0.2)	475,069(13.9)	721,892(21.2)	69,872(2.0)
Transport & Storage	1,129,552	238,126(21.1)	8,000(0.7)	785,770(69.6)	625(0.1)
Restaurant	187,223	155,246(82.9)	1,379(0.7)	3,420(1.8)	41(0.0)
Medicine	863,521	112,409(13.0)	48,470(5.6)	555,058(64.3)	27,106(3.1)
Electricity & Gas	1,828,631	50,425(27.7)	65(0.0)	614,985(33.6)	55,500(3.0)
Electricity & Electronics	10,416,528	1,431,462(13.7)	260,691(2.5)	2,974,497(28.6)	17,545(0.2)
Paper & Lumber	2,281,784	38,148(1.7)	13,152(0.6)	130,142(5.7)	0(0.0)
Chemicals	5,147,474	395,285(7.7)	158,741(3.1)	599,912(11.7)	5,039(0.1)
Total	78,139,172	25,817,492(33.0)	3,084,902(3.9)	13,734,306(17.6)	2,759,183(3.5)

[Table 2.b] FDI by Region

(Unit: US$ Thousand)

	Chungbuk	Chungnam	Daejeon	Jeonbuk	Jeonnam	Gwangju
Construc-tion	149(0.0)	100,200(16.7)	498(0.1)	19,388 (3.2)	1,776 (0.3)	188 (0.0)
Mining	371(0.5)	390(0.5)	0(0.0)	1,180 (1.6)	0 (0.0)	0 (0.0)
Metals	55,291(2.8)	912,376(46.3)	110(0.0)	85 (0.0)	188 (0.0)	368 (0.0)
Financing	51,508(0.7)	1,597(0.0)	34,155(0.5)	41,250 (0.6)	0 (0.0)	66,881 (0.9)
Machinery	123,845(3.0)	193,238(4.6)	144,887(3.5)	157,129 (3.7)	1,942 (0.0)	6,748 (0.2)
Other service	17,240(0.2)	178,444(1.6)	10,144(0.1)	101,340 (0.9)	12,152 (0.1)	11,591 (0.1)
Other man-ufacturing	25,847(1.6)	20,632(1.3)	1,245(0.1)	46,,038 (2.8)	19,504 (1.2)	16,646 (1.0)
Agricul-ture & Forestry	1,660(0.6)	20,059(7.5)	0(0.0)	7,737 (2.9)	0 (0.0)	57 (0.0)
Wholesale & Retail	2,995(0.1)	9,491(0.2)	1,328,495(29.2)	20,114 (0.4)	13,920 (0.3)	17,860 (0.4)
Trading	8,550(0.4)	1,179(0.1)	5,909(0.3)	44,491(2.2)	534(0.0)	865 (0.0)
Insurance	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0 (0.0)
Real estate	214(0.0)	2,339(0.4)	300(0.0)	186(0.0)	0(0.0)	0 (0.0)
Fertilizer	0(0.0)	0(0.0)	0(0.0)	0(0.0)	19,000(41.3)	0 (0.0)
Petroleum	36,807(2.5)	767,409(52.1)	0(0.0)	0(0.0)	121,399(8.2)	0 (0.0)
Textile & Clothing	0(0.0)	8,565(1.9)	0(0.0)	19,185(4.2)	1,619(0.4)	179 (0.0)
Fishery	5,160(49.0)	0(0.0)	0(0.0)	123(1.2)	503 (4.8)	0 (0.0)
Hotel	0(0.0)	268,728(2.6)	0(0.0)	44,874(0.4)	20,415 (0.2)	0 (0.0)
Food	336,088(10.2)	69,210(2.1)	880(0.0)	26,411(0.8)	37,832 (1.1)	10,080 (0.3)
Ceramics	6,293(0.6)	40,755(4.0)	0(0.0)	329,250(32.5)	124,812(12.3)	0 (0.0)
Transport equipment	45,553(1.3)	308,910(9.1)	49,530(1.5)	2,753(0.1)	8,038 (0.2)	180 (0.0)
Transport & Storage	39(0.0)	24,515(2.2)	0(0.0)	0(0.0)	750 (0.1)	1,000 (0.1)
Restaurant	0(0.0)	629(0.3)	460(0.2)	477(0.3)	0 (0.0)	428 (0.2)
Medicine	65,073(7.5)	16,160(1.9)	13,462(1.6)	0(0.0)	0 (0.0)	0 (0.0)
Electricity & Gas	395,946(21.7)	198,358(10.8)	0(0.0)	0(0.0)	11,053 (0.6)	0 (0.0)
Electricity &Electronics	0(0.0)	322,423(3.1)	143,579(1.4)	12,220(0.1)	17,496 (0.2)	1,624,106(15.6)
Paper & Lumber	175,644(7.7)	422,069(18.5)	1,107(0.6)	972,118(42.6)	453,838(19.9)	133 (0.0)
Chemicals	270,915(5.3)	234,564(4.6)	191,444(3.7)	253,647(4.9)	1,387,187(26.9)	3,033 (0.1)
Total	1,625,188(2.1)	4,122,240(5.3)	1,926,205(2.5)	2,099,996(2.7)	2,253,958 (2.9)	1,760,343 (2.3)

[Table 2.c] FDI by Region

(Unit: US$ Thousand)

	Gyeongbuk	Gyeongnam	Busan	Daegu	Ulsan	Jeju
Construction	0(0.0)	0(0.0)	306,705(51.1)	0(0.0)	66(0.0)	45(0.0)
Mining	11,146(15.6)	219(0.3)	90(0.1)	0(0.0)	0(0.0)	200(0.3)
Metals	371,771(18.9)	94,916(4.8)	2,734(0.1)	100(0.0)	390,499(19.8)	0(0.0)
Financing	79(0.0)	16,879(0.2)	475,478(6.4)	5,500(0.1)	0(0.0)	49,219(0.7)
Machinery	35,250(0.8)	942,283(22.5)	29,909(0.7)	197,091(4.7)	4,595(0.1)	0(0.0)
Other service	4,881(0.0)	37,108(0.3)	269,465(2.4)	7,610(0.1)	111,458(1.0)	1,285,805(11.4)
Other manufacturing	41,207(2.5)	41,607(2.5)	19,595(1.2)	9,149(0.6)	85,751(5.2)	0(0.0)
Agriculture & Forestry	718(0.3)	246(0.1)	127(0.0)	0(0.0)	0(0.0)	93(0.0)
Wholesale & Retail	94(0.0)	20,205(0.4)	14,739(0.3)	366(0.0)	126(0.0)	0(0.0)
Trading	1,220(0.1)	79,829(3.9)	24,457(1.2)	3,927(0.2)	684(0.0)	166(0.0)
Insurance	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Real estate	0(0.0)	0(0.0)	11,804(1.8)	3,300(0.5)	3,440(0.5)	0(0.0)
Fertilizer	0(0.0)	10,500(22.8)	0(0.0)	0(0.0)	13,000(28.2)	240(0.5)
Petroleum	4,470(0.3)	0(0.0)	21,604(1.5)	648(0.0)	485,930(33.0)	0(0.0)
Textile & Clothing	82,597(18.2)	5,135(1.1)	1,282(0.3)	1,527(0.3)	16,223(3.6)	42(0.0)
Fishery	827(7.9)	471(4.5)	1,272(12.1)	0(0.0)	0(0.0)	82(0.8)
Hotel	437,520(4.3)	120,487(1.2)	469,055(4.6)	15,200(0.1)	0(0.0)	3,492,905(34.4)
Food	22,396(0.7)	1,322,589(40.0)	10,165(0.3)	8,204(0.2)	0(0.0)	115(0.0)
Ceramics	94,815(9.4)	8,944(0.9)	3,246(0.3)	446(0.0)	66,000(6.5)	0(0.0)
Transport Equipment	273,509(8.0)	126,367(3.7)	592,340(17.4)	70,656(2.1)	657,999(19.3)	0(0.0)
Transport & Storage	0(0.0)	0(0.0)	64,765(5.7)	0(0.0)	5,962(0.5)	0(0.0)
Restaurant	159(0.1)	1,949(1.0)	17,996(9.6)	973(0.5)	70(0.0)	3,996(2.1)
Medicine	19,811(2.3)	0(0.0)	99(0.0)	5,873(0.7)	0(0.0)	0(0.0)
Electricity & Gas	45,000(2.5)	0(0.0)	299(0.0)	0(0.0)	0(0.0)	0(0.0)
Electricity & Electronics	2,982,005(28.6)	584,207(5.6)	36,930(0.4)	8,248(0.1)	389(0.0)	730(0.0)
Paper & Lumber	15,070(0.7)	49,074(2.2)	0(0.0)	11,289(0.5)	0(0.0)	0(0.0)
Chemicals	600,491(11.7)	243,105(4.7)	61,958(1.2)	17,446(0.3)	724,707(14.1)	0(0.0)
Total	5,045,035(6.5)	3,706,120(4.7)	2,436,114(3.1)	367,55(0.5)	2,566,899(3.3)	4,833,638(6.2)

7 Industrial Clusters and Regional Innovations in Korea

Dong-Ju Kim
Young-Sub Kwon

Introduction

Regional industrial clusters conventionally refer to the agglomerations of firms in one place for the primary purpose of reduction in transaction costs. Now it is understood that they are not only the origin of technological innovation and knowledge creation but also a stepping stone to the enhancement of regional competitiveness. Since Michael Porter asserted in his book, "The Competitive Advantage of Nations," published in 1990, that regional industrial clusters are the origin of national competitiveness, the regional industrial cluster has become an important subject of academic research and government policy. Industrialized countries including the OECD nations promote regional industrial clusters. Korea is not an exception. Research on regional industrial clusters is undertaken and the central and local governments promote regional industrial clusters to nourish regional industrial development.

The purpose of this paper is to identify several regional industrial clusters to suggest ways to promote the development of industrial clusters and regional innovation in Korea. To this end, this study will briefly review relevant theories on regional clusters and policies on regional cluster system development in Korea. Next, based upon a definitive framework to classify the types and innovative performance of clusters, regional industrial agglomerations in Korea will be identi-

fied. Then, cluster structure and characteristics of selected regional industries will be examined through in-depth case studies. The study concludes with several policy suggestions to set up innovative cluster systems in Korea.

Clusters and Competitive Advantage

As Marshall(1920) mentioned about the effect of agglomeration in economies, firms that cluster together can take advantage of access to specialized suppliers, skilled labor, and an environment enabling the spillover of technological knowledge from one firm to another. However, in an era driven by information with technologies of ever-increasing bandwidths, the geographical location of production remained a critical question. If technological knowledge can be completely codified in the form of patents, operation manuals, and so on, then all such codified information could be transmitted at very low cost, and geography would not matter. Ultimately this may be an empirical matter. Addressing this question, Pavitt(1987) observes that in reality most technology is specific, complex, and often tacit in its development. Such tacit knowledge is much harder, or even impossible, to transfer by wire: it requires geographical proximity and face-to-face contact to maximize knowledge transfer.

Therefore, companies tend to remain tied in close proximity to each other. Moreover, geographical concentration is of importance for technological innovation and competitive advantage. Concentration facilitates both interchange and cooperation among firms, universities and other research centers, customers and suppliers within a region. And a concentration of specific knowledge can also attract and develop more specialized human capital.

Swann(1998) noted that the motivations for clustering are to take advantage of strong local demand and acquire market share from rivals, and the benefits of access to a large pool of specialized labor. Models in the tradition of Hotelling(1929) generate clustering outcomes, because one firm stands to gain market share if it moves its location closer to another. Firms may choose to locate in a cluster because they are more easily located by customers. Another important

[Table 1] Advantages and Disadvantages of Clustering

	Demand side	Supply side
Advantages	Input-output multipliers Market share from rivals Reduction of search cost Information externalities	Technology spillover Specialized labor Infrastructure Information externalities
Disadvantages	Congestion and competition in output markets	Congestion and competition in input markets(land, labor)

Source: Swann. G.M.P., 1998

reason for clusters is the positive externalities: firms can exploit the information and technology spillovers from widespread tacit technology transfer by locating near related firms and universities and institutions and maintaining frequent contact. However, he pointed out that there can be disadvantages to clustering due to the congestion and increased competition in output markets which can detract from firm performance and the diminishing returns to additional firms relocating to a cluster.

In order to facilitate clusters, therefore, several cluster-based policies have been implemented by a number of governments in both industrialized and developing countries. Clustering is basically created and operated by bottom-up, market-oriented, and market-led processes. In order to facilitate industrial clusters in practice, cluster policy in most countries has been approached in two different ways (Roelandt and Hertog, 1999). A fundamental difference between these approaches relates to the distinction between a bottom-up approach, on the one hand, and a more or less top-down approach, on the other. The first approach focuses on fostering dynamic market functioning and removing market imperfections; the starting point lies in market-induced initiatives, with the government acting as a facilitator and moderator but with no establishment of national priorities. Policy tools are likely to be focused on knowledge sharing, such as network building, cooperative R&D, and strategic alliances. Examples are the United States and the Netherlands. In the second approach, government(in consultation with industry and research agencies) sets national priorities, formulates a challenging vision for the future and

chooses actors to be involved in the dialogue. Once national priorities have been set and the dialogue groups implemented, the clustering process becomes a market-led process, with little government intervention.

Although strategic approaches to foster innovative clusters may differ depending on country or industry specific conditions, most cluster policies are comprised of a basic set of policy activities: stimulation of and support for the emergence of networks; strengthening of linkages between the different parts of a network; and increasing the value added by their actions. A broad set of initiatives, ranging from cluster-mapping studies to inter-firm network brokerage, has been launched by national ministries, local governments, and business support organizations.

Cluster-based Policies in Korea

In order to boost industrial competitiveness and regional industrial clusters in Korea, cluster-based policies have been established at the central and local levels. At the central government level, the Ministry of Commerce, Industry and Energy(MOCIE), the Ministry of Science and Technology(MOST), the Ministry of Information and Communication(MIC), the Ministry of Construction and Transportation(MOCT), and the Small and Medium Business Administration(SMBA) are involved in facilitating clusters directly or indirectly. These policies are mainly focused on the physical and financial measures for stimulating business-university-research institute networks, strengthening technological innovations, and supporting the development of industrial estates. Local governments are at the same time attracting knowledge- based industries such as information technology or biotechnology for the purpose of strengthening regional economies.

1. Strengthening of Business-University-Research Institute Networks

To strengthen basic science and engineering research through encouraging links between research activities in universities and major

regional industries, the Ministry of Science and Technology(MOST) designates and supports several regional research centers, such as the Science Research Centers(SRC), the Engineering Research Centers(ERC), and the Regional Research Centers(RRC) at universities. The main activities of the Centers are to foster and support basic research and train high quality personnel for science and technology by utilizing the vast research potential of universities.

More specifically, the SRCs are designated for fundamental science research and development, and the ERCs for applied engineering research and development. Each center is eligible for up to 1 billion Korean Won in funding annually from MOST over a period of 3 up to 9 years. As of April 2002, a total of 90 centers have been designated as SRCs or ERCs, and 30 centers have been finalized and receive government support. The main functions of each center are research, training, and international cooperation in research and development, and promotion of joint research by businesses, universities, and research centers through active exchange of technology information. Most of the output from the operation of the centers is concentrated on patent registration, technical guidance, transfer of technology to local firms, and the commercialization of R&D results, etc. The RRCs mainly aim to establish a regional research network among research agents having a common interest in innovation in regionally specialized technologies, and to strengthen their technological capabilities. The process of establishment of an RRC is bottom-up(Lee, 2002). A university intending to obtain funds from the central government(MOST) builds a trilateral relationship among local firms, local governments, and local public research institutes, and submits a proposal. MOST then decides which proposals it accepts, on average six to ten a year, and offers financial support. MOST has provided support for a total of 45 RRCs, excluding Seoul, since the inception of the RRC program in 1995 up to April 2002. Once designated as an RRC, each center may received up to 500 million Korean Won per year over a period of 9 years from MOST. The Small and Medium Business Administration(SMBA) was established in 1996 for efficient implementation of Small and Medium-sized Enterprises (SME)-related policy and for on-the-spot support of regional SMEs supporting for industry-university-research institute consortiums to conduct joint technological research through the designation of the 'Venture Businesses Promotion Area'.

2. Supports for Spin-off Enterprises

The Ministry of Commerce, Industry and Energy(MOCIE) provides technical and financial support to spin-off enterprises through the Technology Innovation Center(TIC) and the Technology Business Incubator(TBI). The TIC program, initiated in 1995, is mainly geared toward supporting spin-off work, educational training, information dissemination, shared usage of high-tech research equipment, and related tasks. The TIC projects are supported by matching funds from the central government(MOCIE), local governments and universities. MOCIE pays for research equipment for the TIC, up to 1 billion Korean Won annually for 5 years(a maximum of 5 billion Korean Won), whereas local governments pay for or provide the land for the TIC, and R&D and operation costs. In 2002, a total of 35 TICs were operating at universities and research institutes. TBI projects have been established to secure support for spin-off enterprises with new, innovative technology. And MOCIE, along with venture capitalists, invests in these enterprises during their transition from the TBI projects to full-fledged companies.

3. Development of Industrial Complexes

The Ministry of Commerce, Industry and Energy(MOCIE) supports the development of techno-parks and high-tech-based industrial estates since 1997. The main objectives of techno-park development are to support technology-oriented business start-ups, to provide for information system infrastructure, and to promote regional economic development through the linkage of relevant projects including the Technology Innovation Center (TIC). Currently, six techno-parks are developed or under development at six locations in Songdo, Ansan, Daegu, Gyeongbuk, Gwangju-Jeonnam, and Chungnam. For example, the Gwangju-Jeonnam Techno-Park is designated at the Gwangju Science Industrial Complex with an area of 100 thousand square meters. This techno-park project is jointly mobilized by the Gwangju City Government, the Jeonnam Provincial Government, the Gwangju Institute of Science & Technology, and several universities in the Gwangju-Jeonnam region. Project costs of 65.4 billion Korean Won over 5 years will be financed by the national and local governments and participating universities.

The Ministry of Information and Communication(MIC) supports the

[Table 2] Techno-Park Projects in Korea

	Songdo	Ansan	Daegu	Gyeong-buk	Gwangju-Jeonnam	Chung-nam
Location	Songdo reclamation area (Incheon)	Hanyang Univ.	Kyungpook Nat'l Univ. Dongdaegu venture center	Yeungnam Univ.	Gwangju science industrial complex	Cheonan and Asan
Area ($1{,}000m^2$)	330	100	27	153	100	20
Cost (billion KRW)	122.6	96.9	76.1	84.5	65.4	76.5

Source: Ministry of Commerce, Industry and Energy(MOCIE)

development of "Regional Soft Towns" for supporting regional IT industries. As of March 2002, four Regional Soft Towns were designated in Busan, Incheon, Gwangju, and Chuncheon. The MIC has plans to designate three more Regional Soft Towns by the end of 2002.

The Ministry of Construction and Transportation(MOCT) designates "Urban High-tech Industrial Complexes" in urbanized areas to accommodate knowledge-based industry such as information & communication technology, biotechnology, nanotechnology, etc. To ensure that these industrial complexes are attractive, various tax incentives and supports are offered to investing companies. However, no area has yet been designated as an Urban High-tech Regional Center.

[Table 3] Policy Tools for Innovative Clusters by the Stages of Value Chain in Korea

Production stage	Application stage	Research stage
· Industrial complex · Apartment-type factory · Venture building · Urban high-Tech regional center	· Techno-park · Business incubator · Technology innovation center(TIC)	· University · Engineering research center(ERC) · Regional research center(RRC)

Source: Lee, 2002

[Table 4] Support Measures for Regional Technology Innovation

Projects	Projects	Purpose	Beneficiaries
Ministry of commerce, Industry and energy(MOCIE)	Techno-parks	Provide research complexes for promoting technological innovation, business incubation, trial production, etc.	Universities, enterprises
	Technology innovation center(TIC)	Develop region-specific technology and business	Small and medium enterprises outside of Seoul
	Technology business incubator (TBI)	Encourage spin-offs by various types of support-financial, information, research equipment, etc.	Universities, research institutes, enterprises
Small and medium business administration (SMBA)	Venture enterprises promotion area	Support small- and medium sized enterprises	New enterprises, planned enterprises
Ministry of science and technology (MOST)	Science research center(SRC)	Support fundamental science research and train high-level research personnel in relevant fields	Math., physics, chemistry, biology etc. at universities
	Engineer research center(ERC)	Support applied engineering research and train high-level research personnel in relevant fields	Material, computer, mechanics, etc. engineering, etc. at universities
	Regional research center(RRC)	Establish regional research networks among universities, local firms, research institutes, and local governments	Universities outside Seoul
Ministry of information and communication (MIC)	Regional soft town	Support IT-related start-ups at the regional level	New enterprises, planned enterprises
Ministry of construction and transportation(MOCT)	Urban high-tech industrial estate	Promote IT and culture-related industries in urban areas	

Source: Kwon and Hur, 2000

Most of the local governments are trying to develop knowledge-based industries such as information technology(IT) and biotechnology (BT). Some local governments are operating start-up business incubating centers through the expansion of venture business integrated facilities(BI)

In spite of the application of cluster-based policies by the central and local governments in Korea, more remains to be done to promote innovative industrial clusters to increase the knowledge capability of universities and research institutions, and to support spin-off enterprises.

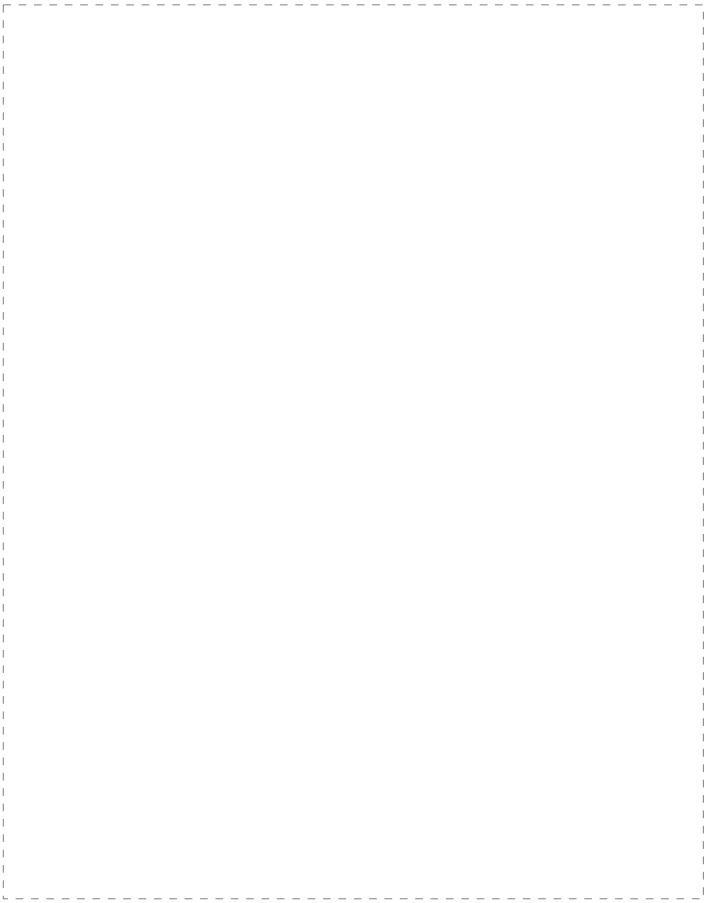
At the regional level, leadership of industrial clusters by competitive and specialized industries is not enough. Furthermore, the capacity for innovation at leading firms in agglomerations is not sufficient. Most institutional measures by the central government are focused on physical support such as provision of industrial estates and not on providing software support to facilitate innovation. Similar support systems for innovative clusters are fragmented across different government agencies. And national and local industrial complexes supported by the government for over 30 years have remained relatively isolated "islands" lacking appropriate linkages between them. In order to foster innovative industrial clusters, therefore, it will be necessary to expand the direction and measures of cluster-based policies, including technical and financial supports and provision of necessary infrastructure.

Regional Industrial Agglomerations in Korea

To study industrial clusters at the macro level, regional industrial agglomeration in Korea was analyzed. Industrial agglomeration in this study refers to a region in which firms from similar industries are located together in a certain area. Therefore, industrial agglomeration does not necessarily refer to a network among related activities which can bring technological innovation and knowledge creation.

Among the 9 major industries and 9 knowledge-based industries that were selected by the Ministry of Commerce, Industry and Energy in 1999, various types of domestic regional industrial agglomerations were identified. Analysis was based upon 232 local governments enti-

[Figure 1] Major Regional Industrial Agglomerations in Korea



ties at the city, county, and district levels. Based on the degree of industrial concentration, productivity and growth potential, representative industrial agglomerations were identified. In order to classify a region as a representative industrial agglomeration in Korea, the following three basic conditions had to be satisfied: the region's share of national production and employment in the industry exceeds 10 percent; the value added per employee is higher than the national average in terms of productivity; and the agglomeration is composed of at least five firms.

The analysis on regional distribution reveals that most industrial

agglomerations in Korea are located on the Seoul-Busan development axis, particularly in those regions where large enterprises are located. More specifically, regional industrial agglomerations are identified as follows: clothing in Seoul; machinery, electronics-telecommunication equipment, mechatronics, precision chemistry, biology, and environment in Gyeonggi Province; footwear and clothing, and new materials in Busan; textile in Daegu; home electric appliances in Gwangju; precision chemistry in Daejeon; textile, home electric appliances, and electronic and telecommunication equipment in Gumi; steel and new materials in Pohang; and machinery and mechatronics in Changwon(see Figure 1).

An interesting finding of the industrial agglomeration study is that they are mostly found in regions with national or local industrial complexes. In the Daegu area, which has a strong agglomeration of textile companies, for example, textile is the main industry of the local industrial complexes. Other examples are the Changwon National Industrial Complex for machinery in Changwon, and the Gumi National Industrial Complex for electronics.

However, in Seoul the clothing industry as the, the consumer goods industry usually prevailing in large cities shows a relatively high tendency to concentrate in Seoul, relatively high industrial agglomeration despite the absence of an industrial complex. The semi-conductor industry is largely concentrated in Yongin, Gyeonggi Province, industrial agglomeration is high since many large firms with a high large share of production are present.

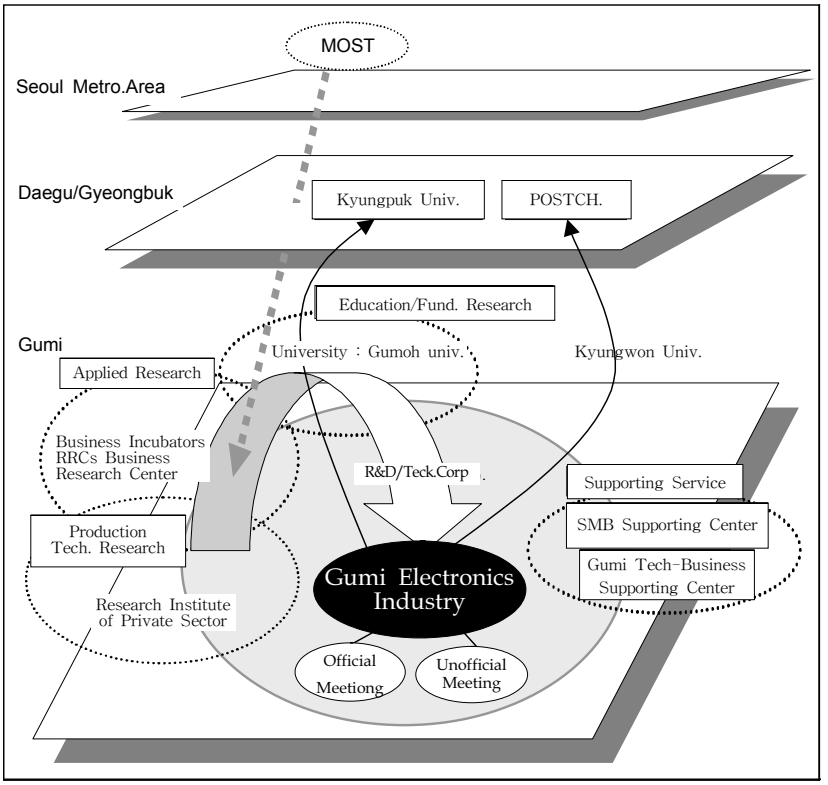
Case Studies of Regional Industrial Clusters in Korea

Three domestic regional industrial clusters were selected for case studies: the electronics industry in Gumi; the information and communication technology(ICT) industry in Daejeon; and the biotechnology/pharmaceutical industry in the southern part of Gyeonggi Province. The study surveyed 58 firms in Gumi, 137 firms in Daejeon, and 30 firms in the southern part of Gyeonggi Province, as well as innovation program supporting organizations such as universities, research institutes, and government agencies.

1. Gumi Electronics Cluster

Gumi, a hub of local development and transportation, has a population of 340 thousand and covers an area of 617km^2, or 3.2% of North Gyeongsang Province(slightly larger than Seoul). In Gumi city, the Gumi National Industrial Complex, developed in 1968, is now the biggest inland industrial complex in Korea(2.38km^2). As of 2001, the Complex had 520 companies and 68 thousand employees in total. The main products developed and produced in the Complex include various types of electronics parts(semiconductors, Braun tubes, and liquid crystal displays), advanced communications equipment(computers, portable radiophones, and electronic switchboards), textiles, and advanced new materials. It is one of the representative electronics industries in

[Figure 2] Structure of Gumi Electronics Clusters



Korea, leading the information society into the 21st century.

The Gumi electronics industry consists of large companies which are regional leaders in their industries, and small-and-medium companies. However, there are not enough supporting organizations which can lead in research and development and technical innovation. Universities relevant to local electronics industries are the Kumoh National Institute of Technology, Kyungwoon University, Gumi College in Gumi City, and Kyungpook National University and the Pohang University of Science & Technology(POSTECH) in outer Gumi City. Most of the financial and accounting services for the large companies in Gumi are handled in the Seoul Metropolitan Area. Support for promoting the Gumi industrial center is focused on the designation and operation of the Regional Research Center Project of the Ministry of Science and Technology(MOST) for the strengthening of the networks among business, universities, and research institutes. After completion of development of the estate, however, the central government did not provide sufficient financial and institutional support to firms, compared to that of the local governments. Official and unofficial meetings among firms, which can be an important source of innovation, are mostly initiated by large firms with related cooperative firms.

2. Daejeon ICT Industry

Daejeon Metropolitan City, located in the center of Korea, is the fifth largest city among Korea's top six cities, including Seoul, Busan, Daegu, Incheon, and Gwangju. It had a population of 1.39 million at the end of 2000 and covers an area of 539km. Daejeon is easily accessible from any place in Korea as it is a hub of national transportation, linking the whole country from east to west, and from north to south. Daejeon Metropolitan City is a center of knowledge and information, and is the second administrative capital of Korea. Daejeon is home to Daedeok Valley, a cradle for the high-tech industry, where the Daedeok Science Town, a major R&D park in Korea, is located. It houses Korea's leading science and technology think-tanks and research institutes.

Most of the ICT Industry in Daejon City is located in Daedeok Valley, which connects the growth axis with the Science and Industry Complex, the 3rd and 4th Industrial Complexes and the Dunsan/Yuseong regions in Daejeon. It is centered around the Daedeok Science Town that houses cutting

[Table 5] Status of Venture Businesses at the Daedeok Science Town

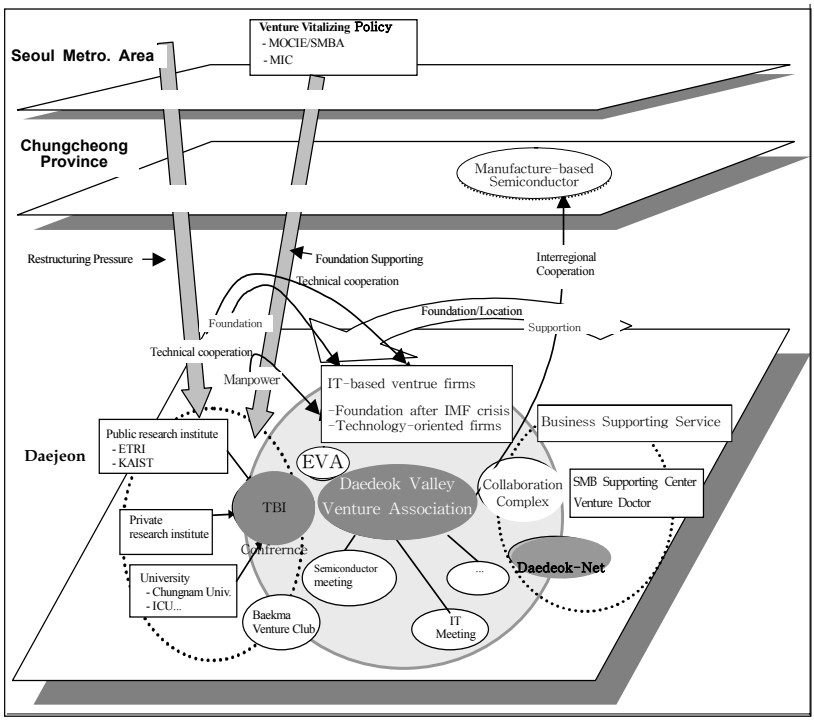
(As of Dec. 2000)

Total	Information/ Communication	Environment/ Machinery	Bio-Chemicals	Nuclear power/Semi-Conductors	Others
500 (100%)	241 (48.2)	117 (23.4)	661 (12.2)	31 (6.2)	50 (10)

Note: Share of total national venture businesses in Daejeon: 5.8%

edge technology with its 70-odd research institutions. It has a high concentration of first class human resources — 16,000 people hold masters or doctoral degrees(more than 40% are doctorate degree holders) — working in government or private corporation research, higher education research, venture businesses, and supporting institutions.

[Figure 3] Structure of Daejeon ICT Cluster



In Daejeon, there are several research institutions and universities in the fields of information and telecommunications, such as the Korea Advanced Institute of Science and Technology(KAIST), Information and Communications University(ICU), Electronics and Telecommunications Research Institute(ETRI), and Chungnam National University. For example, KAIST, as Korea's most renowned research educational institute, annually graduates 300 Ph.D's and 600 Masters degree candidates. ETRI, a non-profit government-funded research organization established in 1976, remains at the forefront of technological excellence in Korea. Since 1985, ETRI has acquired over 11,500 domestic and foreign patents, and about 60% of the patents held in the Daeduk Science Town are owned by ETRI.

Supporting infrastructure, in both software and hardware, such as venture capital, accounting, marketing, and law services are available in Daejeon. Official and unofficial meetings as a source of innovation are frequent among firms.

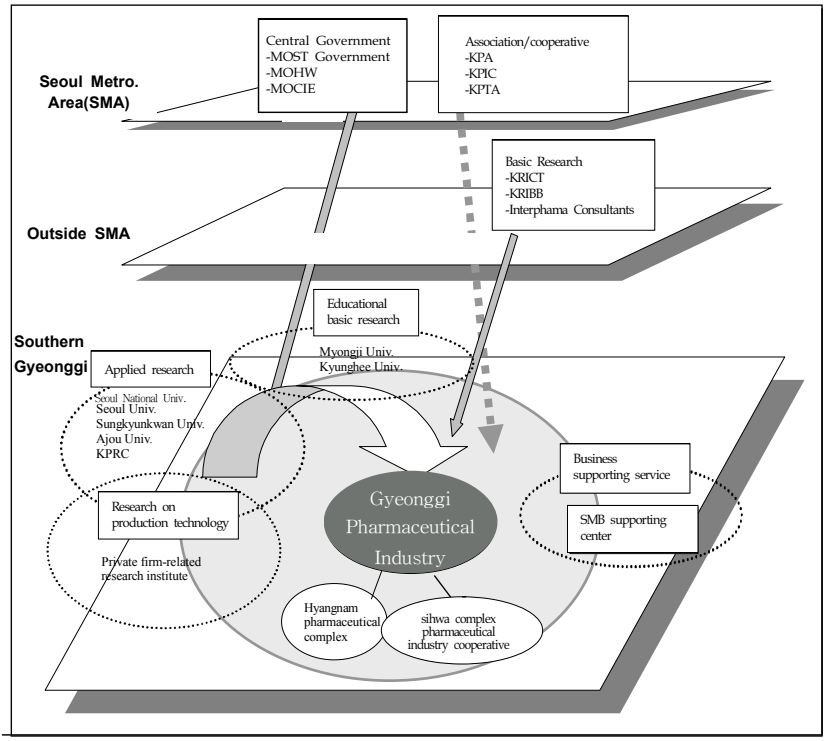
3. Biotechnology/Pharmaceutical Industry in Gyeonggi Province

The southern part of Gyeonggi Province, which belongs to the Seoul Metropolitan Area, has definite locational advantages and is dependent on Seoul for producer services. In this area, pharmaceutics manufacturing firms and relevant research institutes are agglomerated. As of 2000, 251 pharmaceutics-manufacturing firms are in business in the southern part of Gyeonggi Province, or 41% of the national total (614 firms). Most firms are located in the cities of Hwaseong, Ansung, Yongin, and Ansan.

Location quotients, which refers to the share of the region's industry to the national total for the industry, for the biotechnology/pharmaceutical industry in the southern part of Gyeonggi Province are relatively high. For example, the location quotient of Hwaseong is 3.9, Ansung 19.9, and Yongin 1.2.

Start-up business incubation-related infrastructures and a large labor pool for the biotechnology/pharmaceutical industry are also available. For example, business incubation centers are established in Seoul National University, Aju University, Myongji University, and Sungkyunkwan University. In addition, the Institute of Bioscience & Biotechnology of Myongji University, and Ansan Techno-park in Hanyang Univer-

[Figure 4] Structure of Biotechnology/
Pharmaceutical Cluster in Gyeonggi Province



sity are located there.

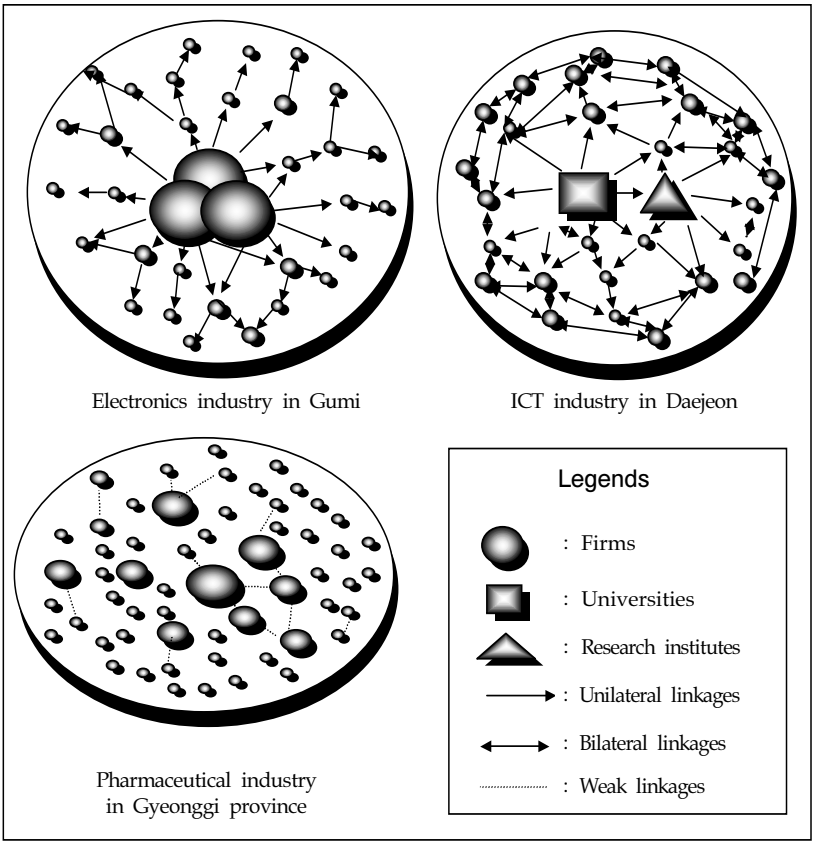
Networks among the government, the Gyeonggi Province government, research institutes, and relevant corporations are relatively active. Lastly, the biotechnology/pharmaceutical industry in Gyeonggi Province consists of the mix of large-, medium-, and small-sized firms for production.

4. Comparisons Between the Three Regional Industrial Clusters

The compositions of the major actors and the types of linkages between them in each of the three regional industrial clusters are illustrated in Figure 5. In the Gumi electronics industry, large firms, as the engine of clustering, maintain diverse linkages with small and medium firms, but small and medium firms, which are not linked to one another sufficiently.

In the ICT industry of Daejeon, spin-offs from universities and research institutes are actively creating linkages among themselves as well as to universities and research institutes. In the biotechnology/pharmaceutical industry in the southern part of Gyeonggi Province, many large, medium, and small firms are grouped together in this region, but networking and cooperation among related firms and institutions are weak. However, with the rise of the biotechnology industry, technologically specialized spin-offs from universities, research institutes and pharmaceutical firms are increasingly entering into technical tie-ups with other pharmaceutical firms.

[Figure 5] Composition and Linkages of Major Actors in the Three Regional Industrial Clusters

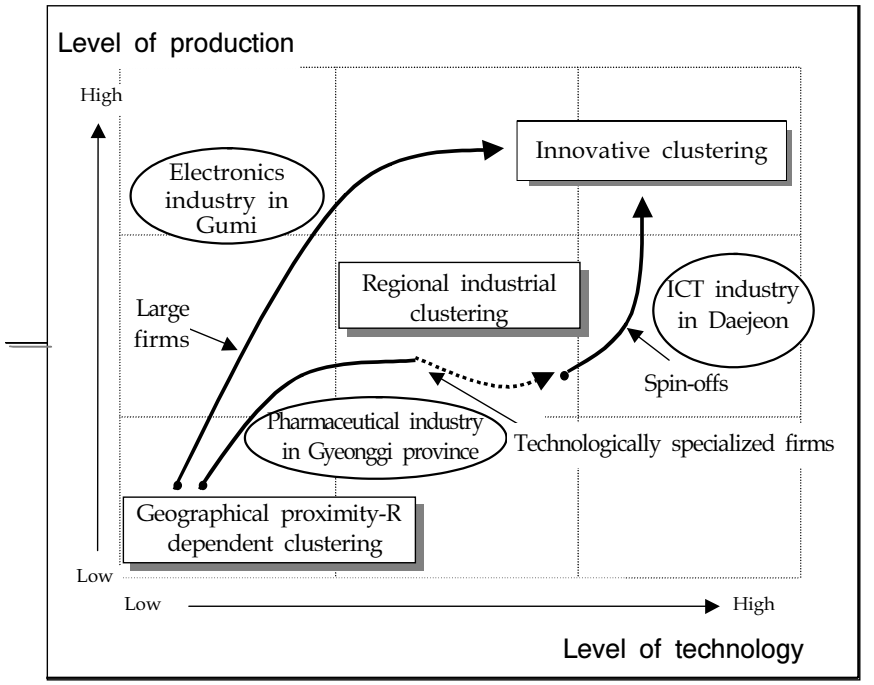


5. Evaluation of Clustering Stages of the Three Regional Industrial Clusters

Next, the three regional industrial clusters were analyzed in terms of clustering stage. In this study, the development of industrial clusters, similarly defined by Roberta Capello in 1999, may be responsible for(or identified by) five factors: localization, networking, institutional thickness and embeddedness, collective learning, and innovative synergies. These factors can be broadly classified into three stages of clustering: geographical proximity-dependent clusters, regional industrial clusters, and innovative clusters. When agglomerated firms are so localized that they can reduce transaction costs, they are considered geo-graphical proximity-dependent clusters. They can then develop into a regional industrial cluster when forward and backward linkages are established among firms and supporting institutions, and when institutional thickness and embeddedness enable informal and tacit transfers of information and know-how with trust. In the stage of innovative clusters, economic actors in a region create an interactive mechanism of collective learning to acquire innovative technologies and information and technical manpower, going beyond the level of solidarity. In this regard, synergy effects are created to convert potential innovative capabilities into actual profits.

Using the classification of clustering stages as defined above, the three regional industrial clusters were analyzed(Figure 6). The electronics industry in Gumi was found to have localized production networks but lack innovative networks. However, the level of industrial support services was quite high in consideration of its low level of innovative networking. Therefore, it was judged to be in the stage of regional industrial clustering past the stage of geographical proximity-dependent clustering. The ICT industry in Daejeon was highly evaluated in terms of innovative synergy effects, and institutional thickness and embeddedness. Accordingly, it was judged to be in the stage of innovative clustering past the stage of regional industrial clustering. Meanwhile, the biotechnology/pharmaceutical industry in the southern part of Gyeonggi Province featured localization of production networks at the inter-regional level stronger than technical support conditions. Therefore, it was judged to be in transition to the stage of regional industrial clustering from the stage of geographical proximity-dependent clustering.

[Figure 6] The Clustering Stages of the Three Regional Industrial Clusters



Conclusion

In the knowledge-information era, uncertainty and competition among firms are increasing. Therefore, innovation deriving from learning processes rather than cost reduction through mass production is a more critical factor for strengthening competitiveness. For boosting innovation, industrial agglomeration and specialization, networks of related activities, sharing of implicit knowledge, and collective learning are important. Cluster-based policies in Korea are therefore required to overcome policy oriented toward industrial complexes and infrastructure provision which does not reflect the innovative potential of regional industry.

Based upon a review of cluster-based policies, structure, and characteristics in selected cases of regional industrial clusters, this study

concludes with the following policy recommendations:

First, it is important to take a strategic approach to the development of regional industrial clusters at the national level. Toward this end, mapping of patterns of regional industrial clusters should be done, followed by the study of potential industrial clusters, and based on this, policy directions should be decided. In fostering innovative clusters, industrial linkages across administrative boundaries should be taken into account to avoid ineffective competition and investments among local governments.

Second, the roles of related firms, universities, government agencies and local governments should be clearly defined, and networking among these actors should be actively promoted. Universities and research institutes, which are the major sources of innovation, should be required to increase their capability for innovation and knowledge creativity and to transfer the outcomes of technological developments to relevant firms.

Third, fragmented support systems operated by different government agencies should be consolidated, and relevant regulations should be improved. Particularly, central governmental bodies such as the Ministry of Commerce, Industry and Energy(MOCIE), the Ministry of Science and Technology(MOST), the Ministry of Information and Communication(MIC), the Ministry of Construction and Transportation(MOCT), and the Small and Medium Business Administration(SMBA) which are involved in facilitating clusters directly or indirectly must network their support systems. Moreover, the main coordinators and supporters for promoting innovative clusters are required to improve their potential for innovation, and therefore to encourage endogenous industrial and economic development.

Finally, as identified from the selected cases of regional industrial clusters with respect to the composition of major cluster actors and types of linkages between them, it is necessary to differentiate support programs based on industry type, region, and clustering stage.

References

Asheim, B. T. and P. Cooke. "Local Learning and Interactive Innovation Networks in a Global Economy." P. Oinas and Malecki(eds.), in *Making Connections*. E. J: Aldershot: Ashgate, 1999: 145-178.

Audretsch, D. "The Role of Small Firms in U.S. Biotechnology Clusters." *Small Business Economics,* Vol. 17, No. 3, 2001: 3-15.

Capello, R. "Spatial Transfer of Knowledge in High Technology Milieux: Learning Versus Collective Learning Processes." *Regional Studies,* Vol. 33, No. 4, 1999: 353-366.

Cooke, P. Uranga, M. G. and G. Etxebarria. "Regional Systems of Innovation: an Evolutionary Perspective," *Environment and Planning A,* Vol. 30, 1998: 1563-1584.

Dong-Ju, Kim and Young-Sub Kwon, et al. "Industrial Agglomeration and Regional Clusters in Korea." Korea Research Institute for Human Settlements, 2001.

Duk-Hee, Lee. "Regional Industrial Growth through the Promotion of Information Technology Industry." Paper presented at the Seminar of Seongnam Development Institute, Kyungwon University, 2002.

DTI. *Business Clusters in the UK : A First Assessment*, DTI, 2001,

Hotelling, H. "The Stability of Competition." *Economic Journal,* Vol. 39, 1929: 41-57.

Joo-Sung, Hwang. "Locational Trend of Software Industry and the Formation of an Industrial District in Seoul." *Journal of the Korean Geographical Society,* Vol. 35, No. 1, 2000: 121-139.

Jung-Hyup, Lee et al. "Characteristics and Development Factors of Innovative Clusters in the Overseas Countries." STEPI Working Paper, 2001.

Keeble, D & F. Wikinson. "Collective Learning and Knowledge Development in the Evolution of Regional Clusters of High Technology SMEs in Europe." *Regional Studies,* Vol. 33, No. 4, 1999: 295-303.

Kongrae, Lee. "Development of Knowledge Industrial Clusters in Korea." *In Proceedings on Developing Knowledge Industrial Clusters in a Metropolitan Setting*. Anyang Korea, 2002.

Korea Industrial Complex Corporation and Korea Institute for Industrial Economics & Trade. "Mid- and Long-term Regional Industrial Promotion Plan." 2001.

Lagendijk, A. "From New Industrial Spaces to Regional Innovation Systems and Beyond: How and from whom should industrial geography learn?" *EUNIT Discussion Paper 10*. Newcastle: CURDS, 1997.

Marshall, A. *Principles of Economics*. London: Macmillan, 1920.

Mothe, J. and G. Paquet. *Local and Regional Systems of Innovation*. Kluwer Academic Publishers, 1998.

OECD. *Cluster Analysis and Cluster-Based Policy in OECD Countries*. 1998.

OECD. *Boosting Innovation: the Cluster Approach*. 1999.

OECD. *Innovative Clusters: Drivers of National Innovation Systems*. 2001.

Pavitt, K. "Sectorial Patterns of Technical Change: Towards a Taxaonomy and Theory." *Research Policy,* Vol. 11, No. 1, 1984.

Pavitt, K. *On the Nature of the Technology*. Brighton: University of Sussex, 1987.

Porter, M. E. *The Competitive Advantage of Nations*. Free press, 1990.

Porter, M. E. "Location, Competition, and Economic Development: Local Clusters in a Global Economy." *Economic Development Quarterly,* Vol. 14, No. 1, Feb

2000: 15-34.

Roelandt, Theo, J. A. and Pim. den Hertog. "Cluster Analysis and Cluster-Based Policy Making in OECD Countries." *Boosting Innovation: The Cluster Approach*. Paris: OECD, 1999.

Sam Ock, Park and A. Markusen. "Generalizing New Industrial Districts: a Theoretical Agenda and an Application from a Non-Western Economy." *Environment and Planning A,* 27, 1995: 81-104.

Sam Ock, Park. "Network and Embeddedness in the Dynamic Types of New Industrial Districts." *Progress in Human Geography,* Vol. 20, No. 4, 1996: 476-493.

Sam Ock, Park. "Innovation Systems, Networks, and the Knowledge-base Economy in Korea." in J. H. Dunning(ed.), *Regions, Globalization and Knowledge-Based Economy*. Oxford University Press, Oxford, 2000: 328-348.

Saxenian, A. *Regional Advantages: Culture and Competition in Silicon Valley and Route 128*. Harvard University Press, Cambridge, Mass., 1996.

Sun-Bae, Kim, "Industrial Policy Issues for Building a Regional Innovation System in Korea." *Journal of the Korean Regional Science Association,* Vol. 17, No. 2, 2001: 79-97.

Swann, G. M. P, Prevezer, M. and D. Stout(eds.). *The Dynamics of Industrial Clustering*. Oxford University Press, Oxford, 1998.

8 Assessment of Policy Instruments for Balanced Regional Development

Euijune Kim
Youn Hee Jeong

Introduction

Although the devolutionary shift of planning and implementation powers to local governments has been growing in dominance in Korea since the early 1990s, national spatial polices have continued to substantially affect regional economic growth and competitiveness. These policies cover a wide range of issues, from micro-policy instruments such as relocation of labor(occupational training, educational policies, and subsidies to costs of migration) and capital(loan agreements, relaxation of planning and regulations, and building grants) to macro-policy instruments, including regionally discriminating monetary, taxation and government expenditure policies(Armstrong and Taylor, 2000). The policies are designed to affect the location of economic agents through spatial changes in profitability, employment opportunity, and welfare, consequently reducing the income differentials between regions. One major issue that arises from the policy implementation is the size of impact on the regional disparity in Korea when compared to that of other countries. How can the government best utilize its financial resources to address the regional problem? For instance, does the development of three coastal corridors in the 4th Comprehensive National Territorial Plan(2000-2020) provide moderate national economic growth with a substantial decrease in the interregional income gap in the long run?

This paper is focused on the evaluation of investment priorities for

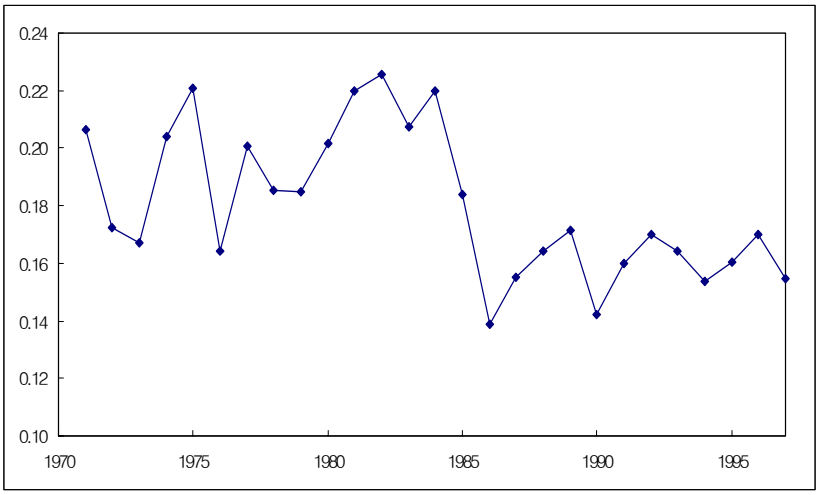
balanced regional economic development, analyzing previous research on the relationships between regional inequality and policy instruments. Section 2 reviews the evolution of regional income inequality and the decomposition of this inequality, both between and within the regions of Korea, using the results established by Kim and Jeong(2002). Meta-analysis was applied to assess the degree of the income inequality between the regions in order to determine whether the regional income disparity in Korea was significantly wider than the disparity within other countries. The evaluation of policies for the balanced regional development is divided into two parts: non-spatial policies and spatial policies. Section 3 discusses the assessment of non-spatial policies within the work of Kim et al.(2002). This study assumed that the regional income disparity could be determined by development factors, including both national economic growth and urbanization trend and resource-distribution factors such as information networks, transportation, employment opportunities, and educational service. Section 4 focuses on a discussion of research by Kim and Kim(2002) that could estimate the impacts of regional development policies on economic growth and income distribution. This study took into account the four development alternatives such as three coastal development corridors and the traditional Seoul-Busan corridor. The final section summarizes empirical research work on the relationship between regional policy instruments and regional income distribution.

Income Distribution and Regional Inequality

1. Trend of Regional Income Inequality

The dynamic evolution of regional income disparity in Korea has followed the second stage of Williamson's inverted U hypothesis since reaching its threshold point in the early 1980s. The regional inequality measured by the coefficient of variation for per capita regional Gross Regional Product(GRP) has exhibited a downward trend over the periods(Figure 1). The average coefficient of variation in the 1970s was 0.1908, decreasing to 0.1828 in the 1980s and then again down to 0.1619 in the 1990s. During this period, there were two turning points when

[Figure 1] Regional Income Inequality in Korea



Source: Kim and Kim. 2002b

the regional income distribution deteriorated substantially compared with the previous years; 1975 with 0.2208 of the coefficient of variation and 1982 with 0.2257 of the coefficient of variation inequality. These may have resulted from the economic recession caused by the oil crisis and political instability, implying less stability of economic structure of the less developed regions(Kim and Kim, 2002b).

The static aspect of the regional incomes is organized in Table 1. The income data is derived from the Korean Household Panel Study of Daewoo Economic Research Institute(1996), which is the first systematic panel data set on household incomes and expenditures in Korea, using a sample of 3,108 households. When the total income was adjusted in order to take into account the family composition and the number of income earners in the household, the average income per household in 1995 was 19,277 US$(Kim and Jeong, 2002). This income was disaggregated into five income sources: 7,359 US$ from wages and salaries(38.2% of total income); 5,291 US$ from business income(27.4% of total income); 4,877 US$ from asset income(25.3% of total income); 104 US$ from subsidies(0.5% of total income); and 1,645 US$ from other income(8.6% of total income).

Among the six largest cities(with populations exceeding one

[Table 1] Average Income of Households by Region of 1995

(Unit: US$)

Sub-region	Seoul	Incheon	Gyeonggi	Daejon	Gangwon	Chungbuk	Chungnam
Wages and Salaries	8984	7911	8625	8340	5844	7241	4235
Business income	6694	5516	5029	4718	6644	3621	5714
Asset income	6193	1556	5919	3773	5126	4519	4819
Subsidies	116	165	28	82	379	251	32
Other income	1840	1766	1367	1909	2475	1825	1876
Total income	23827	16914	20967	18822	20468	17457	16675
Sub-region	Busan	Daegu	Gyeong-buk	Gyeong-nam	Gwangju	Jeonbuk	Jeonnam
Wages and Salaries	7844	7837	5616	6443	6603	5637	3012
Business income	4978	4815	3734	5064	3340	3256	5070
Asset income	5108	4470	3434	2518	3358	3873	5922
Subsidies	72	118	12	91	198	129	126
Other income	1793	1698	1382	1499	1467	1919	531
Total income	19795	18938	14178	15615	14966	14815	14662

Source: Kim and Jeong. 2002

million) and eight provinces, Seoul attained the highest income level with 23,287 US$ in 1995, followed by Gyeonggi(20,967 US$), Gangwon (20,468 US$), and Busan(19,795 US$). In contrast, the income levels of Gyeongbuk, Gwangju, Jeonbuk, and Jeonnam were each below 15,000 US$. For most of the regions, the contribution of wages and salaries to the total income was above any other income sources; however, the proportions of asset income in Jeonnam and of business income in Gang-

[Table 2] Income Share of Region by Income Class

(Unit: %, US$)

Class	Seoul	In-cheon	Gyeong-gi	Daejon	Gang-won	Chung-buk	Chung-nam
1	2.3	2.6	1.5	2.4	0.5	1.4	0.9
2	4.7	4.9	4.1	4.7	1.6	3.1	2.2
3	5.6	5.8	5.9	6.1	3.8	4.4	3.4
4	6.7	6.3	7.2	7.3	5.1	5.7	4.7
5	7.8	7.1	8.4	8.6	6.5	8.1	6.5
6	8.9	8.1	9.6	10.4	8.0	10.6	8.0
7	10.5	9.1	11.2	11.2	10	12.2	9.8
8	12.1	11.2	13.1	12.7	12.7	15.2	11.9
9	15.7	14.1	16.3	13.9	16.4	19.2	15.6
10	25.7	30.9	22.7	22.6	35.5	20.1	36.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DDR	0.466	0.435	0.479	0.562	0.212	0.372	0.213
Average income	23,827	16,914	20,967	18,822	20,468	17,457	16,675
Class	Busan	Daegu	Gyeong-buk	Gyeong-nam	Gwangju	Jeonbuk	Jeonnam
1	2.1	1.5	1.0	1.0	1.8	1.2	0.9
2	4.3	3.8	2.0	2.6	3.7	2.4	2.1
3	5.7	5.5	3.5	4.3	5.2	4.1	3.3
4	6.7	6.6	5.1	6.5	7.0	6.1	5.0
5	7.8	7.4	8.0	8.0	8.3	8.2	7.1
6	9.4	8.2	9.9	9.4	9.4	9.8	8.3
7	10.8	9.7	11.9	10.7	10.4	12.4	10.4
8	12.7	11.9	14.1	12.8	12.3	15.7	12.8
9	16.3	15.6	19.7	16.7	15.5	18.4	17.0
10	24.3	29.9	24.8	28.0	26.3	21.9	33.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DDR	0.463	0.382	0.261	0.322	0.423	0.342	0.225
Average income	19,795	18,938	14,178	15,615	14,966	14,815	14,662

Note: DDR(Decile Distribution Ratio)

Source: Daewoo Economic Research Institute. 1996

won and Chungnam were larger than those of wages and salaries in respective areas.

The income distribution and income inequality of each region are summarized in Table 2. The inequality is measured by the decile distribution ratio(DDR) equal to the ratio of the income share of the low-income groups(decile 1 to 4) to the high-income groups(decile 9 to 10). Daejon had the highest DDR of 0.562, whereas Gyeongbuk and Jeonnam had considerably lower DDR values, showing income distributions biased toward the high-income classes. In terms of the relationship between the income distribution and income level by region, the regional incomes of Seoul, Gyeonggi, Daejon, Busan, and Daegu were all above the national average with better income distribution, while Chungnam, Gyeongbuk, Gyeongnam, Jeonbuk, and Jeonnam showed lower regional incomes with worse income disparity.

2. Evaluation of Regional Income Inequality

If the 14 regions are classified into four macro-regions,[1] the Gini index of total income in 1995(0.464) can be decomposed into the income inequality within the regions(0.149, 32.04% of the total) and the income inequality between the regions(0.315, 67.96% of the total)[2](Kim and Jeong, 2002). The inequality within the regions consists of 0.101 for

1) Those are the Seoul Metropolitan Area(Seoul, Incheon, and Gyeonggi), the Central Area(Gangwon, Daejon, Chungbuk, and Chungnam), the Southeast Area (Busan, Daegu, Gyeongbuk, and Gyeongnam), and the Southwest Area(Gwangju, Jeonbuk, and Jeonnam).

2) Kim and Jeong(2002) have decomposed the Gini index into the Gini index within the region and between the regions as the following equations.

① $$G = \frac{1}{2n^2\mu}\sum_{j=1}^{k}\sum_{h=1}^{k}\sum_{i=1}^{n_j}\sum_{r=1}^{n_h}\left|y_{ji} - y_{hr}\right|$$

② $$G_{jj} = \frac{1}{2n_j^2\mu_j}\sum_{i=1}^{n_j}\sum_{r=1}^{n_j}\left|y_{ji} - y_{hr}\right|$$

③ $$G_{jh} = \frac{1}{n_j n_h(\mu_j + \mu_h)}\sum_{i=1}^{n_j}\sum_{r=1}^{n_h}\left|y_{ji} - y_{hr}\right|$$

the Seoul Metropolitan Area(21.73% of the total), 0.032 for the Southwest Area(6.83% of the total), 0.009 for the Central Area(2.05% of the total), and 0.007 for the Southeast Area(1.42% of the total). In the sense that this income inequality measures the degree of the sub-regional income inequality in each macro-region, the Seoul Metropolitan Area holds less income disparity between the income groups with a much wider gap between the sub-regions such as Incheon, Seoul, and Gyeonggi. In particular, the income inequality within the Seoul Metropolitan Area accounted for more than 20% of the total income inequality in 1995, meriting as much attention as the regional income disparity in reducing the income inequality. In turn, the Gini index for the income inequality between the regions was also decomposed into six cases: 0.063 for the Seoul Metropolitan Area-Central Area(13.6% of the total), 0.116 for the Seoul Metropolitan Area-Southwest Area(25.0% of the total), 0.055 for the Seoul Metropolitan Area-Southeast Area(12.0% of the total), 0.035 for the Central Area-Southwest Area(7.5% of the total), 0.029 for the Southwest Area-Southeast Area(6.4% of the total), and finally 0.016 for the Central Are a-Southeast Area(3.5% of the total). Overall, more than half of the interregional income disparity is attributed to the income gaps between the Seoul Metropolitan Area and the rest of the nation. Surprisingly,

---

④ $G = \sum_{j=1}^{k}\sum_{h=1}^{k} G_{jh} p_j S_h$

⑤ $G_w = \sum_{j=1}^{k} G_{jj} p_j S_j$

⑥ $G_b = \sum_{j=1}^{k}\sum_{h=1}^{k} G_{jh} p_j S_h$

G: Gini index
G_{jj}: Gini index within region j
G_{jh}: Gini index between regions j and h
G_w: Gini index within regions
G_b: Gini index between regions
μ_j: the mean of the jth subpopulation
n_j: population size of group j
p_j: the relative size of the regions j
s_j: the regional income share

the share of interregional inequality between the Southeast and Southwest Areas was ranked as the second lowest one among the above cases(Kim and Jeong, 2002).

Is the regional income inequality of Korea a serious regional problem? Kim and Jeong(2002) have attempted to quantitatively assess the relative degree of the interregional income disparity using a meta-analysis of the previous research of Jonston et al.(1996) for the United Kingdom, Terrasi(1999) for Italy, Azzoni(2001) for Brazil, and Fujita and Hu(2001) for China. The meta-analysis is designed to determine structural causality from various research findings with common objectives, using econometric models such as the regression model, the discrete choice model, the quasi-controlled experiment, and the rough set theory(Nijkamp and Pepping, 1998a; Nijkamp and Pepping, 1998b). Kim and Jeong(2002) assumed that the income inequality between the regions would depend on per capita Gross Domestic Product(GDP), employment level, export, and foreign direct investments. The analysis revealed a negative relationship between the regional income inequality and the expansion of employment opportunities, and positive relationships with increases in per capita GDP and the share of FDI to GDP. For example, the interregional income inequality decreased with the increase in per capita employment. The income inequality index measured by the Gini index would go up by 0.001% point with 100 US$ in per capita GDP, ceteris paribus. This meta-analysis estimated the Gini index regarding the regional inequality of Korea as 21.20%, lower than the actual level in 1995 by at least 10.30%. From an international perspective, the regional income disparity has been worsening much more seriously in Korea than in other countries.

Assessment of Non-spatial Policies for the Balanced Regional Development

Several non-spatial policies have been instituted to influence regional inequality: the development of information networks, the provision of infrastructure facilities and high-quality educational services, the construction of industrial complexes, and so on. For example, the Ministry of Education has been devising a regional-based admission quota

system for universities to select a specified percentage of incoming freshmen based on their regional background. The Ministry has also provided the national, municipal and provincial universities with financial resources in order to specialize in a few competitive research areas, strengthening regulations on the number of universities in Seoul Metropolitan Area. Also, in order to promote the relocation of manufacturing out of Seoul, the government has set up several regional strategies: establishment of a three-tier zoning system(over-concentration restriction zone, growth management zone and preservation zone), imposition of development charges on construction activities, and restriction on the expansion of manufacturing factories in the Seoul Metropolitan Area. Additionally, it has introduced a loan preference system and government revenue sharing, exemptions from corporate taxes, and the provision of selective development projects with matching funds outside of the Seoul Metropolitan Area(Kim and Gallent, 1998).

What sectoral policy has been effective in achieving the regional planning goal? Since the 1990s, a few studies found that the inequality would depend on the spatial distributions of physical and human capital investments and foreign direct investments, employment growth rate, accessibility, the degree of mobilization of human capital, and agglomeration economies(Chen and Fleisher, 1996; Dunford, 1996; Cheshire and Magriri, 2001; Fujita and Hu, 2001; Lall and Yilmaz, 2001). But these studies failed to identify key policies for reducing the regional income gaps. Recently, the effectiveness of the policy instruments in reducing the regional income gaps for Korea has been discussed in Kim et al.(2002). In their model, the regional income disparity seemed to rely on per capita GDP, the urbanization rate at the national scale, and the spatial decentralization instruments including information networks, transportation and water supply facilities, employment opportunities, and educational services. The results on the regression model of regional income inequality are summarized in Table 3.[3)]

In the table, there are positive relationships of regional incomes with employment opportunities, educational services, transportation and

3) The period of lag length for the variables was determined as one to three years in length in terms of maximizing the adjusted coefficient of determination of the equation(Kim et al., 2002).

[Table 3] Estimations of Regional Income Inequality

$$\Delta INEQ_t = \beta_0 + \beta_1 \Delta INEQ_{t-1} + \beta_2 \Delta PGDP_{t-2} + \beta_3 \Delta EDUC_{t-6} + \beta_4 \Delta INFR_{t-6} + \beta_5 \Delta INFO_{t-2} + \beta_6 \Delta EMPL_{t-6} + \beta_7 \Delta URBN_{t-4}$$

	Model 1			Model 2			Model 3		
	Estimate	*t*-value	VIF	Estimate	*t*-value	VIF	Estimate	*t*-value	VIF
Inter-cept	0.0086[1)]	4.139	0.0000	0.0120[1)]	3.904	0.0000	0.0118[1)]	3.886	0.0000
β_1	0.1666[1)]	1.678	1.1307	0.1993[1)]	2.014	1.1296	0.1831[1)]	1.855	1.1467
β_2	-4.0343[1)]	-2.677	1.6335	-5.8727[1)]	-3.189	2.4510	-5.5644[1)]	-3.029	2.4897
β_3	1.3237[1)]	3.520	1.8704	1.3887[1)]	3.619	1.9581	1.4609[1)]	3.809	1.9972
β_4	1.0244[1)]	4.481	1.1758	0.8354[1)]	3.065	1.6805	0.8131[1)]	3.008	1.6869
β_5	0.5713[1)]	2.072	1.0797	0.6219[1)]	2.282	1.0603	0.5728[1)]	2.104	1.0797
β_6	0.1390[2)]	1.684	1.1211				0.1183	1.347	1.1529
β_7				-0.0027[2)]	-1.680	1.9406	-0.0023	-1.421	1.9957
R^2	0.6582			0.6599			0.6754		

INEQ: Gini coefficient of regional income inequality
EDUC: Gini coefficient of educational services
EMPL: Gini coefficient of employment opportunities
INFO: Gini coefficient of information networks
INFR: Gini coefficient of transportation and water supply facilities
PGDP: per capita GDP
URBN: urbanization rate
VIF: Variance Inflation Factor

Note: 1) indicates accepted at the 5% significant level.
2) indicates accepted at the 10% significant level.
Source: Kim et al., 2002

water supply facilities, and information network variables in terms of their spatial distribution, while per capita GDP and the urbanization trend had a negative impact on the regional income inequality. With respect to the time lag, the development of information facility had a short-term effect with a one-year lag on the reduction of regional income disparity, while the other three policy variables generated long-term effects with a three-year lag. Also, based on the size of the para-

meters, the educational policy instrument would be relatively effective in ameliorating the regional income distribution compared to the others if the same unit cost were paid for all of the decentralization policy instruments. The Gini index of the regional income inequality could decrease by 1.32(model 1) to 1.46%(model 3) with reduction in the Gini index for the spatial provision of high-quality educational services by 1%.

Based on the marginal change in the regional inequality in response to the change in the Gini index of policy instrument variables, it would be possible to set up the investment priorities of non-spatial(sectoral) policies for the balanced regional economic growth as follows:

1) Education(long-term policy)
2) Transportation and water supply(long-term policy)
3) Information(short-term policy)
4) Employment(long-term policy)

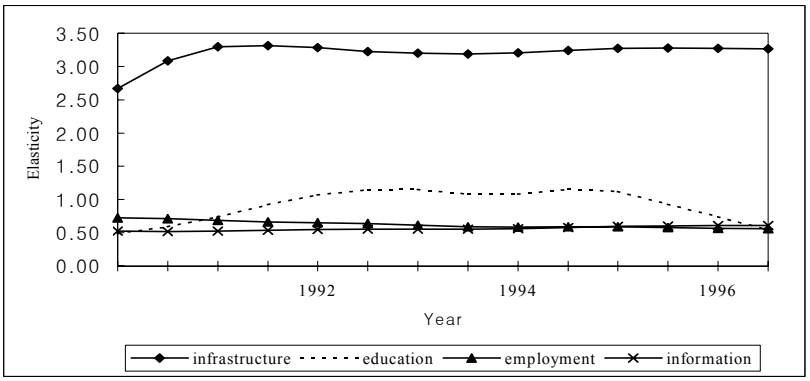
However, the critical drawbacks of this policy evaluation are to neglect the financial costs of policy implementation and dynamic changes in policy impacts. As shown in the income elasticity of the decentralization policy instrument from each rolling regression with 20 year-sample data,[4] the effects of the educational policy on the regional income equity are expected to decrease since the early 1990s(Figure 2). The variation in the parameter values of the education variable seems to be inverted U-shaped over the period, with the elasticities of other variables keeping almost constant.

Assessment of Spatial Investment Policies for the Balanced Regional Development

A considerable number of studies have addressed the causality between economic growth and public investments, calibrating the rate of returns from the production function and cost savings from the cost

4) The parameter was estimated separately for each different period with a fixed sample size, so it is possible to trace out the change of policy impacts on the regional equity issue over time(Kim et al. 2002).

[Figure 2] Elasticities of Regional Income Disparity with Respect to Decentralization Policy Variables



Source: Kim et al.. 2002

function(Costa et al, 1987; Keeler and Ying, 1988; Dufy-Deno and Eberts, 1991; Lynde and Richmond, 1992; Bergman and Sun, 1996; Nadri and Mamuneas, 1996; Park and Lee, 1996; Kim, 1998; Kim, 2002; Kim and Shin, 2002; Lakshmanan et al., 1997); however, these studies were not concerned with the linkages between the spatial distribution of investments and the regional disparity. One of the pioneer research projects on the regional issue is Poulicos and Romanos(1987). These researchers developed a multi-regional optimization model to explicitly identify the direct and indirect relationships between regional growth and investments in the transportation infrastructure of Greece. Recently, Kamada et al.(1998) examined the basic economic factors underlying government decisions on the regional allocation of the public investment in relation to the stages of economic development in Japan. They found that the improvement of dualism in regional income inequality and the growth-oriented economic policy could account for the regional allocation of public investment. Yamano and Ohkawara (2000) found that the marginal productivity of public capital recently declined in most depressed regions, whereas the productivity in developed regions increased slightly, describing the trade-off between the efficient and the equitable allocation of public investment. Kim and Ahn(2002) analyzed the relationship between the regional income dis-

parity and the allocation of investments using a dynamic multiregional SAM model. To sustain 5% annual economic growth for fifteen years with the objective of minimizing income gaps between the regions, the Seoul Metropolitan Area would require 37.74% of total investments; Daegu, Busan, Gyeongbuk, and Gyeongnam would require 18.83%; Daejon, Chungbuk, and Chungnam would require 15.92%; Gangwon would require 13.90%; and Gwangju, Jeonbuk, and Jeonnam would require 13.61% of total investments. Although it carefully traced the dynamic impacts of regional investments on both efficiency and equity, this study tended to overestimate the effects of investments on income and employment due to the neglect of price inflation in the short term and the accumulation process of capital stock in the long term. Another problem is the lack of linkage of changes in regional income levels with the degree of interregional labor mobility in the model.

In general, regional investment has a short-term effect during the construction period and a long-term effect during the operation period. The short-term effect is generated by the change in the regional investment expenditure, increasing the output of goods and services with price inflation. The long-term effect results from the promotion of the production activity through the improvement in the factor productivity. These short- and long-term effects can be regarded as demand and supply effects respectively in terms of the source of growth. This section discusses the priorities of the regional investment with Kim and Kim(2002a) that differentiated the short-term effect of the regional investment from the long-term effect. They identified how regional development strategies generate impacts on growth as well as on equity, including income distribution and interregional disparity. The paper developed a multiregional Computable General Equilibrium(CGE) model for 14 regions of Korea. The model estimated regional production, consumption, savings, investment, government revenue and expenditure, international and interregional trade, and capital mobility, specifying complete behavior of supply and demand in simultaneous non-linear equations of the real economy.[5] The CGE model consisted of three

5) The model was decomposed into two sub-models; a within-period model for solving static equilibrium and an inter-temporal model for capturing inter-period or dynamic variations of exogenous variables defined in the within-period model. The within-period kept balancing between supply and demand in each period, using the interdependent economic behavior of agents derived

modules(supply, demand, and market equilibrium) with three economic agents by region(producers, households, and the government). The supply module specified the regional producer's behavior in demanding factor inputs and supplying products, while each region was assumed to produce a single representative good under a constant return to scale and perfect competition. The demand module calibrated the final demands, and the market equilibrium module linked supply with demand in labor, capital, and commodity markets.

As discussed in Kim and Kim(2002a), it would be practical and interesting to assess the impacts of the four spatial development alternatives on income distribution and economic growth: three coastal area development strategies(Eastern Development Corridor, Southern Development Corridor, and Western Development Corridor), and the Seoul-Busan Corridor. This classification coincides with the development corridors specified in the 4th Comprehensive National Territorial Plan(2000-2020) of Korea. Of these development alternatives, the Western Development Corridor is most closely associated with the Asan Bay region, the Jeonju-Gunjang region, the Gwangju-Mokpo region, and the Daejeon-Cheongju region, while the Eastern Development Corridor is associated with the Busan-Ulsan-Gyeongnam region, the Daegu-Pohang region and the East Gangwon region(regions specified in Table 4).

Kim and Kim(2002a) found that the investment into the Western Development strategy of 75 trillion Korean Won would have the most substantial effect on GDP growth in the ten-year periods, increasing GDP by 2.82%. The second and third most effective would be the Seoul-Busan and Southern Development strategies, respectively. The highest rates of the annual GDP growth for all four development alternatives were expected to register seven to eight years after the implementation of the spatial development program. That is, the government would pursue the spatial development steadily with a long-term perspective in order to maximize the regional investment effects of the economic growth. On the other hand, the Eastern Development strategy would be the most effective in reducing the income gaps between the regions.

---

from their objectives and constraints. It was composed of 420 equations, with the exogenous variables including the foreign exchange rate, world market prices, population, and government expenditure(Kim and Kim, 2002b).

[Table 4] Development Strategies of Area-wide Regions

Area-wide Regions	Population (1,000 persons)	Area (Km^2)	Major development strategies
Asan Bay Region (1995-2011)	1,260	3,517	- To be secured as a beachhead for development along the west coast - To lead the decentralization of the Seoul Metropolitan Area - For Asan Bay to serve as a center of logistics in anticipation of increased trade with China
Jeonju-Gunjang Region (1999-2011)	1,894	5,315	- To be established as an international manufacturing base for the Yellow Sea economic sphere, featuring diversified industrial sites and support for 'image industries' such as film and animation
Gwangju-Mokpo Region (1998-2011)	2,200	4,977	- To be developed as a center for international trade with China and Southeast Asia - To work to attract advanced scientific and knowledge-based industries such as laser technologies and fiber-optic communications
Gwangyang Jinju Region (1998-2011)	1,360	4,544	- To be developed as Northeast Asia's key seaports and centers of aviation industry, eventually serving as a model zone of joint development between Yeongnam and Honam regions
Busan-Ulsan-Gyeongnam Region (1995-2011)	6,290	5,090	- To be developed as key points for international trade and logistics, as well as major seaports in Northeast Asia - To be revitalized through conversion into upscale information-based enterprises
Daegu-Pohang Region (1999-2011)	4,280	9,869	- To be strengthened as an international trading center for the East Sea economic sphere, with its textile and fashion industries enhanced through modernization of high value added-knowledge-based production
Daejeon-Cheongju Region (1998-2011)	2,610	6,768	- To accommodate some of the central administrative functions of the national government while acting as an inland base for international trade - To be specialized in science and high technology industries
Mid-inland Region (2001~2020)	709	6,350	- To lead the way in opening new avenues of growth for depressed regions; To develop growth centers for environment-friendly knowledge industries with promotion of latent cultural and tourist resources, and logistics capabilities
East Gangwon Region (1999-2011)	650	4,921	- To be nurtured as a key international resort and tourist area for a center for inter-Korea economic and cultural exchanges
Jeju Region	548	1,847	- To develop infrastructures for an international free city and tourism, logistics distribution, finance, and trading - To promote high-tech bioengineering industries and environment-friendly farming and livestock operations

Source: Ministry of Construction and Transportation and Korea Research Institute for Human Settlements. 2001

[Table 5] Income Elasticity of Spatial Development Investment by Region and Income Group

	West	South	East	Seoul-Busan
Seoul	0.710	0.523	0.493	0.755
Busan	0.598	1.153	1.110	0.873
Daegu	0.599	0.604	0.602	0.827
Incheon	1.073	0.338	0.308	0.480
Gwangju	1.196	1.230	0.674	0.785
Daejon	0.741	0.603	0.558	0.804
Gyeounggi	0.959	0.377	0.356	0.771
Gangwon	0.940	0.825	1.010	0.954
Chungbuk	0.688	0.540	0.526	0.897
Chungnam	0.251	0.526	0.498	0.945
Jeonbuk	1.254	0.627	0.551	0.651
Jeonnam	1.332	1.499	0.560	0.605
Gyeongbuk	0.451	0.520	1.485	0.870
Gyeongnam	0.462	1.733	1.685	0.972
decile 1	0.361	0.417	0.419	0.434
decile 2	0.840	0.846	0.878	0.906
decile 3	1.060	1.026	1.055	1.064
decile 4	0.956	0.982	0.990	1.034
decile 5	1.019	0.995	1.050	1.040
decile 6	1.126	1.101	1.086	1.069
decile 7	1.109	1.109	1.075	1.092
decile 8	1.138	1.106	1.115	1.106
decile 9	1.088	1.070	1.074	1.071
decile 10	1.195	1.159	1.107	1.112

Source: Kim and Kim. 2002a

The next most effective would be the Western Development program, which would decrease the coefficient of variation by 0.60% point on the ten-year period average. With respect to the income elasticity of the spatial development alternatives(investments) in Table 4, the income effects of the Western Development strategy are focused on Incheon (1.073) Gwangju(1.196), Jeonbuk(1.254), and Jeonnam(1.332), while those of the Southern Development strategy are focused on Busan(1.153), Gwangju(1.230), Jeonnam(1.499), and Gyeongnam(1.733). Also, Busan(1.110), Gangwon(1.010), Gyeongbuk(1.485), and Gyeongnam(1.685) would receive more benefits from the Eastern Development strategy, but the regional incomes would not change elastically in a response to the development of the Seoul-Busan corridor.

Summary and Implications

This paper is focused on the evaluation of investment priorities for balanced regional economic development, analyzing previous research on the relationships between regional inequality and policy instruments. First of all, the income inequality of Korea was more attributed to the income inequality between the regions rather than within the regions. More than 50% of the former inequality resulted from the income differentials of the Seoul Metropolitan Area with the rest of the nation, while this area had less income disparity between the income groups and wider income inequality between its sub-regions. In particular, the Gini index for the regional income distribution in 1995 would decrease to 67.3% of the current level in order to meet the international trend from the meta-analysis.

Also, among the sectoral or non-spatial policies for the regional economic equity, the top priority should be placed on educational policies such as the provision of high-quality educational services in the less developed regions, the regional-based admission quota system for universities, and financial resources for the specialization of national, municipal and provincial universities. If the government succeeds in reducing the Gini index of educational opportunity between regions by 1% point, it could decrease the Gini index of the regional inequality by 1.3237 to 1.4609%. The other investment priorities are as follows: the

development of transportation and water supplies(long-term policy), the expansion of information facilities(short-term policy), and the promotion of employment opportunities(long-term policy). However, this evaluation could not take into account financial costs of policy implementation and dynamic changes in policy impacts. For example, the effects of educational policy on regional income equity might be attenuated over the periods.

Finally, of the four major regional investment alternatives, including three coastal area development strategies and the Seoul-Busan Corridor, the development of the Western Corridor is regarded as a key development strategy in terms of its effects on economic growth and regional income equity. The development strategy could promote the GDP growth rate by 2.82% with 75 trillion Korean Won of investment for one decade. These growth impacts could be maximized at seven to eight years after the implementation of the program, concentrating on Incheon, Gwangju, Jeonbuk, and Jeonnam. The Western Development could also contribute to the reduction in regional disparity, as its impact in that area was the second highest among the four alternatives. The Eastern Development strategy generated the most substantial impact on the amelioration of regional income inequality, leading to increases in regional incomes of Busan, Gangwon, Gyeongbuk, and Gyeongnam.

References

Armstrong, Harvey and J. Taylor. *Regional Economics and Policy*. Oxford: Blackwell, 2000.

Azzoni, Carlos R. "Economic Growth and Regional Income Inequality in Brazil." *Annals of Regional Science,* 35(1), 2001: 133-152.

Bergman, E. M. and D. Sun. "Infrastructure and Manufacturing Productivity: Regional Accessibility and Development Level Effects." D. F. Batten and C. Karlsson(eds.), *Infrastructure and the Complexity of Economic Development*. New York: Springer, 1996: 17-35.

Chen, J. and B. M. Fleisher. "Regional Income Inequality and Growth in China." *Journal of Comparative Economics,* 22(2), 1996: 141-164.

Cheshire, P. and U. Magriri. "Endogenous processes in European regional growth: Convergence and policy." *Growth and Change,* 31(4), 2001: 455-479.

Costa, J. S. and R W. Ellson and R. C. Martin. "Public Capital, Regional Output, and Development: Some Empirical Evidence." *Journal of Regional Science,* 27(3), 1987: 419-437.

Daewoo Economic Research Institute. *Korean Household Panel Study*. Seoul: Daewoo

Economic Research Institute, 1996.
Dufy-Deno, K. T. and R. W. Eberts. "Public Infrastructure and Regional Economic Development: A Simultaneous Equations Approach." *Journal of Urban Economics,* 30(3), 1991: 329-343.
Dunford, M. "Disparities in Employment, Productivity, and Output in the E.U.: The Roles of Labor Market Governance and Welfare Regimes." *Regional Studies,* 30(4), 1996: 339-357.
Euijune, Kim. "Economic Gain and Loss of Public Infrastructure Investment: Dynamic Computable General Equilibrium Model Approach." *Growth and Change,* 29(4), 1998: 445-468.
Euijune, Kim. "Determinants of Optimal Level of Transportation Infrastructure." *Journal of Urban Planning and Development,* 128(3), 2002: 150-163.
Euijune, Kim and J. Ahn. "Spatially Optimal Allocation of Investments: An Application of the Dynamic Multiregional Social Accounting Matrix." *Review of Urban and Regional Development Studies,* 14(1), 2002: 41-58.
Euijune, Kim and Y. Jeong. *Assessment of Regional Income Disparity.* mimeo, 2002.
Euijune, Kim and K. Kim. "Impacts of Regional Development Strategies on Growth and Equity of Korea: A multiregional CGE Model." *Annals of Regional Science,* 36(1), 2002a: 165-180.
Euijune, Kim and K. Kim. "Impacts of the Development of Large Cities on Economic Growth and Income Distribution in Korea: A multiregional CGE Model." *Papers in Regional Science*(forthcoming), 2002b.
Euijune, Kim and H. Lee. "Special Integration of Urban Water Services and Economies of Scale." *Review of Urban and Regional Development Studies,* 10(1), 1998: 3-18.
Euijune, Kim and M. Shin. "Estimation on Regional Benefit and Optimal Level of Road Capital Stock." *Journal of Infrastructure Systems,* 8(3), 2002: 96-102.
Euijune, Kim, S. W. Hong and S. J. Ha. "Impacts of National Development and Decentralization Policies on Regional Income Disparity in Korea." *Annals of Regional Science*(forthcoimg), 2002.
Fujita, Masahisa and D. Hu. "Regional Disparity in China 1985-1994: The Effects of Globalization and Economic Liberalization." *Annals of Regional Science,* 35(1), 2001: 3-37.
Johnston, Richard, M. McKinney and T. Stark. "Regional Price Level Variation and Real Household Incomes in the United Kingdom, 1979/80-1993." *Regional Studies,* 30(6), 1996: 567-588.
Jin, Jang C. "Exports and Growth: Is the Export-led Growth Hypothesis Valid for Provincial Economies?" *Applied Economics,* 34, 2002: 63-76.
Kamada, Kimiyoshi, N. Okuno And R. Futagami. "Decisions on Regional Allocation of Public Investment: The Case of Japan." *Applied Economics Letters,* 5, 1998: 503-506.
Keeler, T. E. and J. S. Ying. "Measuring the Benefits of a Large Public Investment." *Journal of Public Economics,* 36(1), 1988: 69-85.
Kwang Sik, Kim. "High-Speed Rail Developments and Spatial Restructuring: A Case Study of the Capital Region in South Korea." *Cities,* 17(4), 2000: 251-262.
Kwang Sik, Kim and N. Gallent. "Regulating Industrial Growth in the South Korea Capital Region." *Cities,* 15(1), 1998: 1-11.
Lakshmanan, T. R., P. Nijkamp and E. Verhoef. "Full Benefits and Costs of

Transportation: Review and Prospects." D. L. Greene, D. W. Jones and M. A. Delucchi(eds.), *The Full Costs and Benefits of Transportation*. Springer, New York, 1997: 387-406.

Lall, S. V. and S. Yilmaz. "Regional Economic Convergence: Do Policy Instruments Make a Difference?" *Annals of Regional Science,* 35(1), 2001: 153-166.

Lynde, C and J. Richmond. "The Role of Public Capital in Production." *Review of Economics and Statistics,* 74(1), 1992: 37-44.

Ministry of Construction and Transportation and Korea Research Institute for Human Settlements. *The Fourth Comprehensive National Territorial Plan in Korea(2000~2020)*. Seoul, 2001.

Myung-Jin, Jun and J. Hur. "Commuting Costs of Leap-fog Newtown Development in Seoul." *Cities,* 18(3), 2001: 151-158.

Nadiri, M. I. and T. P. Mamuneas. *Contribution of Highway Capital to Industry and National Productivity Growth*. New York: New York University and NBER University of Cyprus, 1996.

Nijkamp, Peter and G. Pepping. "A Meta-Analytical Evaluation of Sustainable City Initiatives." *Urban Studies,* 35(9), 1998a: 1481-1500.

Nijkamp, Peter and G. Pepping. "Meta-Analysis for Explaining the Variance in Public Transport Demand Elasticities in Europe." *Journal of Transportation and Statistics,* January, 1998b: 1-14.

Poulicos, Prastacos and M. Romanos. "A Multiregional Optimization Model for Allocating Transportaion Investments." *Transportation Research,* 21B(2), 1987: 133-148.

Seung-Rok, Park and S. Lee. *Optimum Scale and Expansion of Infrastructure Provision*. Seoul: Samsung Economic Research Institute, 1996.

Sung Woong, Hong. *Building a Power House: Korean Experiences of Regional Development and Infrastructure*. Anyang: Korea Research Institute for Human Settlements, 1997.

Terrasi, Marinella. "Convergence and Divergence across Italian Regions." *Annals of Regional Science,* 33(4), 2001: 491-510.

Yamano, Norihiko and T. Ohkawara. "The Regional Allocation of Public Investment: Efficiency or Equity?" *Journal of Regional Science,* 40(2), 2000: 205-229.

9 Visions and Strategies of Logistics System

Gyeong-Seok Kim

Preface

The competition under the WTO system provides wake-up call for the importance of infrastructure as the basic asset for national competitiveness.

One of the key roles of infrastructure is to make the economic flow harmonious and transportation costs lower. Especially, logistics plays the key role in this economic flow. The establishment of efficient logistics system based on the logistics infrastructure will consolidate the competitiveness of countries and private firms.

The total logistics cost of Korea is about 16.5% of GDP, which is 1.5 times larger than that of USA and Japan. It causes the weakness of competitiveness. The causes of higher logistics cost are very various, for example, the shortage of logistics infrastructure, inefficient logistics industry system, strong regulations, etc.

The world-wide expansion of information technologies, highly developed transportation, communication and manufacturing technologies requests various changes in logistics such as e-commerce, SCM(Supply Chain Management), etc. Therefore, it is necessary to make efforts for the building-up of efficient logistics system and logistics infrastructure that can adapt itself to the change in its surroundings.

Many projects also have been tried for the reduction of logistics cost, which can be divided in three main parts: to establish logistics

network by the construction of logistics hubs and links, to make efficient logistics management system by standardization and information technologies and finally to make free market by deregulation.

In recent, the connection of land transportation network between South- and North-Korea provides opportunity to complete the multiple logistics network in Northeast Asia(NEA), including China and Russia. Also, it can be developed as world-wide logistics network connecting Europe in the long term.

History of Logistics System

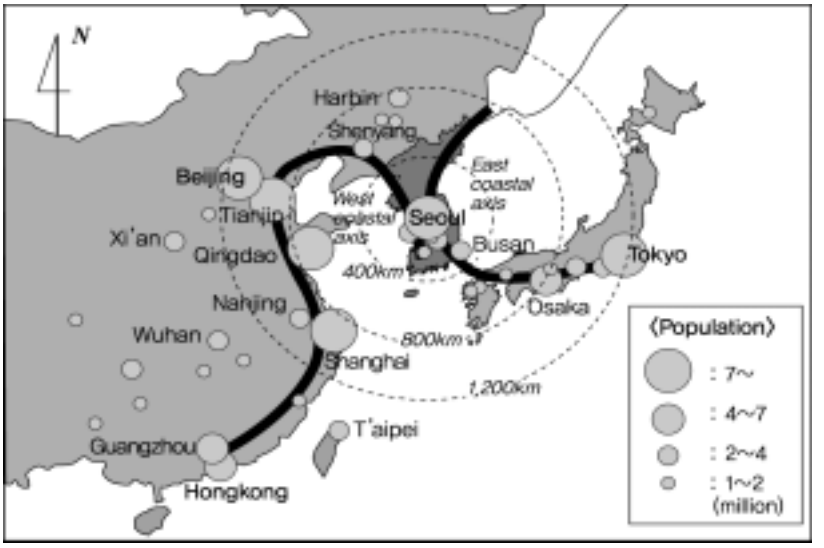
1. General Information of Korea and Surroundings

The characteristics of regional spatial structure are mainly determined by the location of Megapolis, whose deterministic factor is population. As a city changes into metro-polis and Megapolis, the main intra-urban logistics corridor and the characteristics of regional spatial structure are built up by large cities connected with small cities according to the urban growth.

Figure 1 shows the future Megapolis, the above million population city, in Asia and Pacific areas in the year of 2000. Northeast Asia can be divided by two corridors: one is the Tokyo-(Fukuoka-Kitakyushu) -Busan-Seoul(Incheon)-Dalian-Beijing(Tianjin)-Shanghai-Hong kong connector, what is so called 'Yellow Dragon West', the other Niigata-Ulsan -Donghae-Wonsan-Vostochini-Vladivostok connector, what is so called 'Yellow Dragon East.' The development of the logistics system in NEA is likely to occur along the above two main corridors and additional sub-corridor toward inland.

Table 1 is the summary of the population and economical index of above-mentioned countries which are located on the main corridor of spatial structure. About 25% of the world's population, i.e. 1.8 billion is living within 2,000km radius from Seoul and Incheon that are the geographical center of Northeast Asia.

[Figure 1] The Future Megapolis and Logistics Axes in Northeast Asia



[Table 1] Index of Main Countries in Northeast Asia

Nations	Population[1] (1000 pers.)	Areas (1000 ha)	GDP[2] (billion$)	GDP(per person $)	Trade-volume[3] (100 million$)
South Korea	47,343	9,937	457.5	9,664	2,915
North Korea	22,253	12,276	15.1	679	23
China	1,261,800	960,000	1,079.8	856	5,098
Japan	126,920	37,783	4,759.5	37,500	7,207

Sources: 1) Economist Intelligence Unit and National Sources
2) IMF World Economic Outlook Database, 2001; Trade-volume
3) KIEP(Korea Institute for International Economic Policy), 2001

2. Development of Regulations, Plan and Facilities in Korea

The active logistics development in Korea has started in the 1970s with "Five-year Plan for Modernization of Logistics." Before the 1970s, logistics in Korea could be defined as "Premodern Age of Logistics." At

that time, the concept of logistics was not seriously recognized. The first "supermarket" appeared in the late 1960s, and Gyeongin Expressway was constructed for logistics between Seoul and Incheon that was the largest international seaport.

Logistics sprouted in the 1970s with the Five-year Plan for Modernization of Logistics. Commercial distribution services began to change from production-oriented to consumption-oriented services. At that time, the department stores and chain stores were first introduced. New expressways were constructed including Gyeongbu, Yeongdong, Honam, Donghae, Namhae and Guma Expressways as the logistics infrastructure. The main events in this period are as follows:

1) 1971: An agricultural product depot established in vicinity of Expressway for the first time(Oksan in Chungbuk Province)
2) 1975: The first truck terminal was open(stimulated containerization) and National Agricultural Cooperative Federation(NACF) provided price information services
3) 1979: National Federation of Fisheries Cooperatives(NFFC) established marine products information center

The turn of the 1980s was "Enlightening Era" for logistics in Korea. The role and importance of logistics in business were widely recognized. Especially, the year of 1980 is the first year of logistics modernization in Korea. New laws were established such as the Promotion of the Modernization of Distribution System Act, Consumer Protection Act, Monopoly Regulation Act and Fair Practice Act. These new laws formed a foundation for modernization of Korea's logistics. The circumstances were matured for systematic connection between logistics and sales activities.

Logistics in the 1990s was in the early stage of take-off for new development. All efforts were directed toward improvements on institutional as well as physical structure of distribution system such as logistics information projects, the Act for Development of Logistics Center (1995), Comprehensive Plan for Development of Logistics Center(1977) and the Act for Development of Logistics Industry(1996). Major projects have been focused on standardization, containerization, palletization, information system, and logistics center.

In the last 40 years, many logistics-related plans and laws have

[Table 2] Development of Logistics in U.S., Japan and Korea

period	USA	Japan	Korea
1910 - 1920	Introduction of logistics concept		
1940 - 1950	Research on logistics		
1950s	Business logistics	Recognition on the concept of logistics	
1960s	Marketing logistics	Start of logistics & Unit Load, Cooperative transport, act for logistics centers, palletization, containerization	First supermarket
1970s		Introduction of the information system, Door-to-Door Service	Five-year plan for modernization of logistics, truck terminal, depot for agricultural products containerization
1980s		Multimodal transport	Start of modernization of logistics, recognition on the concept of logistics, laws for promotion of the modernization of distribution system
1990s		Development of logistics system to reduce transport cost	Logistics information system standardization, palletization, containerization, logistics center

been established and revised for the better and efficient support for logistics industry. In addition, a five-year plan for strengthening competitiveness of logistics industry and the Third Comprehensive National Physical Development Plan gave rise to the Development Plan of Five Freight Distribution Hubs in 1992. Also, 39 logistics hubs have been proposed by the National Development Plan of Distribution Center in 1995. Finally, the Five-year Plan of the New Economy(1993-1997) produced distribution facilities, EDI(Electronic Data Interchange), etc.

The empirical facts from these various plans and acts are the coordination of all parts including H/W and S/W. A biased policy is not available for the development of logistics.

Though these efforts for the development of efficient logistics system, logistics in Korea still lags about 20-30 years behind Japan and U.S..

3. Development of Logistics Network in Korea and Northeast Asia

Logistics network has been changed by the development of transport trunk lines and international ports. The first logistics axis was Gyeongin(Seoul-Incheon) and Gyeongbu(Seoul-Busan) lines in the 1960s. Gyeongbu line has been developed as the largest logistics axis in Korea in which 59.5% of all population and 81.6% of all industrial products are concentrated. It causes also the serious logistics problem because of congestion.

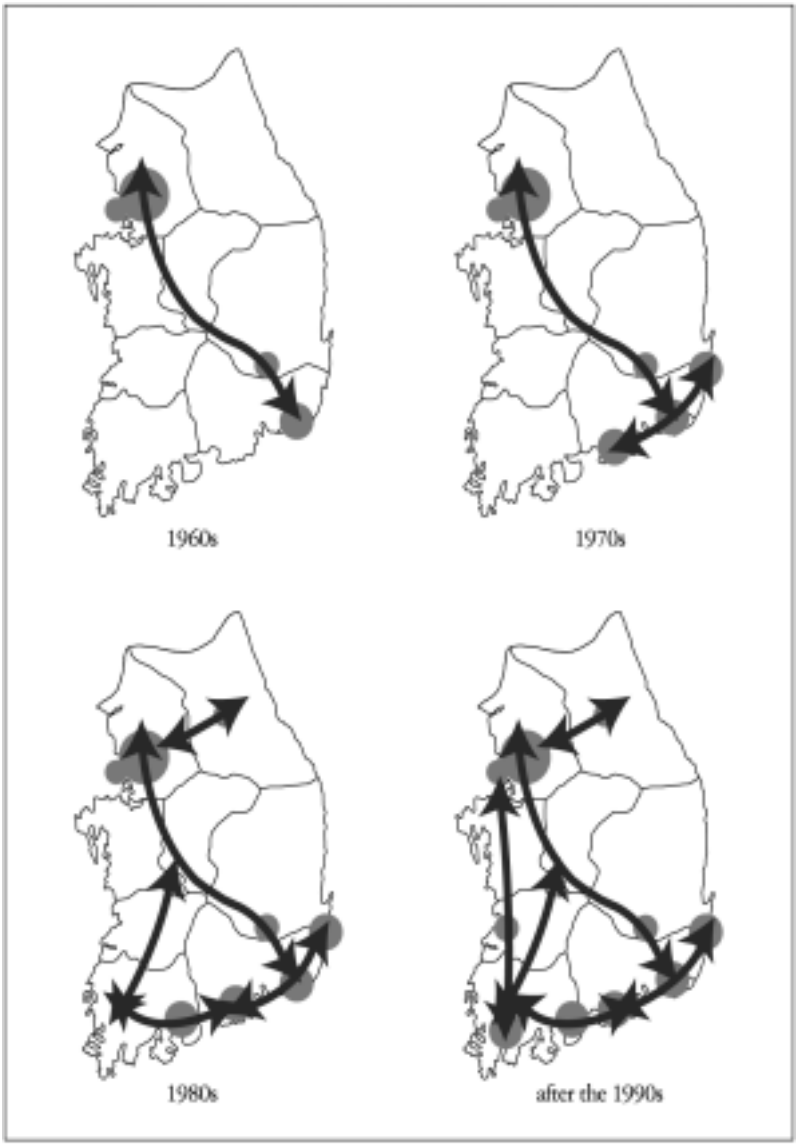
The logistics network was diversified by the development of Honam line(Daejon-Gwangju-Suncheon) and the development of industry along the Southeast Coast in the 1970s. The East-West connection was completed by the Yeongdong line(Incheon-Gangneung) in the 1980s.

The most dominant change of logistics network has appeared by the completion of the west-coast axis by the West-coast Highway and industrial complexes(Daebul and Gunjang complex) that play a role as the hub for trade with China in the 1990s. This trend of diversification of logistics network is accelerated by the new North-South corridors such as Jungang Highway(Daegu-Chuncheon) and Jeonju- Gwangyang Highway in the 2000s.

The change of logistics axis in NEA has appeared evidently from the 1970s. With the growth of world economy, global shipping network was consisted of a liner/break-bulk services connecting major ports in the world in the 1970s and 1980s. By the mid 1980s, the Europe-Far East and the Far East-US or trans-Pacific service network has structured a main corridor. Japanese ports, Hongkong and Singapore were key hubs with Busan and Kaohsiung developed somewhat later.

The container traffic in Chinese ports has increased since 1980 with growth of the economy of China, and these ports were included into new feeder shipping networks. Shipping linkages by feeder services

[Figure 2] Changes of Logistics Network in Each Period



from central China's regional ports(e.g., Shanghai) and northern region ports(e.g., Qinhuandao, Tianjin, Qingdao) were focused on Busan and Japanese ports.

Since the mid 1990s, the appearance of new regional ports has been particularly important. Hongkong and Singapore are high cost and high efficiency mega hub ports in the first level networks supporting high cost and high efficiency vessels and services. Busan and Kaoshung might be included in the first level networks with Hongkong and Singapore.

With the development of a new economical trunk line of Kaoshiung-Busan-(Tsugaru)-Los Angeles, Busan has a good locational advantage such as proximity to the main trunk line and also more absorption power for the trans-shipment cargoes from China's northern coast and south Japan.

Status and Problems of Logistics System in Korea

1. Increase of Logistics Cost

Because logistics likes a artery of economy, the congestion on logistics operations causes the arteriosclerosis of economy. The high logistics cost is the cause of weakness of price competitiveness due to the increasing of products cost.

The total logistics cost in Korea is 74.2 trillion won as of 1998, which is 16.5% of GDP and has increased 6.6% comparing to that of the year 1997. The serious problem of this logistics cost is the relatively high ratio of transport cost(67.7%), which is higher than that of U.S.(58.8%) and has increased continuously from 1995.

[Table 3] Comparison of Logistics Cost of Nations

Item	Korea	USA	Japan
National logistics cost to GDP(%)	16.5	10.7	9.5(1995)
Logistics cost of companies to GDP(%)	12.9	9.0	6.5

2. Status and Problems of Logistics Facilities

2.1 Shortage of Infrastructure

As of April 1998, the total length of roads is 84,968km. This figure is divided into 1,889km of expressway, 12,459km of national roads, and 70,602km of local roads. The ratio of 4-lane or above national roads is 24% as of 1997. The investments in road projects show overlap of investments due to the lack of integrated long-term planning. The inefficiency in project management stems from the divided funding sources(transportation tax and transferred budget). Therefore, in spite of the continued investment in transportation facilities, the traffic problems show little improvement. The total length of congesting roads is increased about 16.5times between 1986(262km) and 1997(4,323km).

The total length of railroads is 3,118km as of April 1998. The length of double-line railroad of the total is 901km and electric railroad length is 661km. Major railroads reached their maximum capacity and the inadequate facilities cannot meet the ever-increasing demand. There have been neither long-term plans for railroad system, nor the investment priorities. This problem has been further exacerbated by the delay in finalizing the proposed line for Seoul-Busan High Speed Railway.

Korean ports are under chronic overcrowding by missing the opportunities to invest. The demand for port facilities increased by yearly average of 11.3% during 1980 through 1995 period, while the port capacity only increased by 9.1% during the same period. The average stay-over time is 55 hours for Incheon, 41 hours for Busan, and 51 hours for Ulsan. In addition to the inadequate facilities to handle the load, the inefficiencies in manual labor oriented port systems are also found. Gwangyang Port has recently started to handle the cargo, which plays very important role with Busan Port. But, the long interrupted cargo at port has been increased 43 million tonnage as of 1986, comparing to 167 million tonnage as of 1997.

Currently Gimpo, Gimhae and Jeju Airports handle 79% of airline passenger traffic. The capacity of Gimpo Airport reached a saturation point. It is expected that there will be a continuing increase in air transportation demand in the Asia-Pacific region. Therefore, it is urgent to expand the air traffic handling capacity. New Incheon International Airport has been opened to play the role of hub airport for Northeast

Asia last year. But, they have not been equipped with enough cargo terminals.

[Table 4] Trend of Shortage of Port Facilities

(Unit: Thousand ton)

Year	Total volume of freight	Need of facilities(A)	Capacity(B)	Shortage	Ratio(%) (=B/A)
1981	148,995	101,397	82,261	19,136	81.1
1991	413,180	275,631	224,323	51,308	81.4
1997	774,178	462,090	295,257	166,883	63.9

2.2 Shortage of Logistics Centers and Their Networking

Truck freight terminals and distribution centers play the role of logistics hub in Korea. Now, there are 54 terminals under operating and 9 terminals under construction : four multi-function terminals, 24 general terminals and 26 container exclusive terminals.

Total area of these terminals is 3.1 million m^2 and average area of one terminal is 115,767m^2. The area of only six terminals(21.4%) is over 100,000m^2 and the area of 42.9% of all terminals is less than 33,000m^2.

The next problem is related to the function of terminals. Normally, 60-70% of total area is allocated for warehouses and distribution centers for the execution of the function of terminals. But, the rate of warehouse area in terminal is only 26.6% in average, and on the other hand, the rate of parking area is about 70% in average in Korea.

Another problem is the inefficient horizontal and vertical networking among logistics hub facilities.

3. Inefficient Operating System of Logistics Centers

The efficient operating of logistics facilities depends on the information system, standardization, automation and mechanization of equipments. In Korea, the government has invested continuously in this part, but the situation has not been improved evidently.

The government has developed the “total logistics information system” that includes various information systems of ports, customs,

trades, banks. Additionally, KL-Net(Korea Logistics-Net), KT-Net(Korea Telecom-Net) and KROIS(Korea Railway Operating Information System) are developed individually. Though this networking in hardware, the common use of information from each network is not available in every business. Therefore, most of small and middle-size companies are depending on the facsimile and telephone that cause the time loss and unnecessary traffics.

General rule for the unit-load-system is established for the systematic standardization in logistics in 1995. But, the coefficient of utilization of the standard pallet is only 16.5%(1,100×1,100mm) that is lower than that of advanced countries, and especially the standardization in equipment, machine and information system is more insufficient.

The next problem is the insufficient development of technology in logistics for the automation, mechanization and environment-friendly system. This inefficient management is concerned with the high ratio of vacant trucks and increase of traffic, thus causing high logistics cost.

4. Complicate Structure of Logistics Circulation

The advanced countries have introduced the third party logistics for the reduction of logistics cost and improvement of service for customers. It can reduce the logistics flow : from five phases in order of factory, logistics company, distribution company, logistics company, and consumer in the past to three phases in order of factory, logistics specialized company, and consumer at present. For example, 65% of all companies in U.S. and 76% of all companies in Europe are using the third party logistics.

The logistics flow in Korea is still underdeveloped. The high percentage of private truck(76.7%) shows the result of this situation. Another example is the low percentage(7.4%) of cooperative logistics between companies.

5. Lagging Logistics Industry

Road-oriented modal-split shows the underdevelopment of freight transport business. About 92.1% of total inland freight in 1997(2.5 billion tonnage) was transported by road, which caused traffic jam and high transport cost.

The second problem is the underdevelopment of storage and inventory management. Nowadays, warehouse has expanded its function to inventory management and manufacturing. However, the main function of warehouses in Korea is still storage. Most of them are not mechanized and modernized refrigeration warehouses, and also they are plane warehouses. Some statistics show this situation; automated warehouses are 10% of all warehouses, 51.9% of operating cost is personnel expenses, which means the deterioration of facilities.

The third problem is low productivity of unloading system, which 60% of all companies depend on manpower for the unloading of over 60% of all freight.

The last problem is the underdevelopment of packing industry. The world-wide trend in packing is the high-classed and functional packing(maintenance of freshness, protection of infection and heat-resistance) and environment-friendly packing.

The coefficient of utilization of KS(Korean standards) packing unit consists of only 7.7% and the dependence on hand-packing is very high in 30.6%.

Changes of Environment in Logistics System in the Future

1. Increasing Logistics Demand

The total inland freight volume will be increased 6.2 billion tonnage in 2020 that is twice as much as 2.5 billion tonnage in 1997. Especially, the increase ratio of air-cargo(3.2 times) and railway-freight(2.0 times) is higher than that of road-transport.

The international freight volume will be increased also very rapidly because of the growth of the Economic Zone in Northeast Asia and the trend of globalization. Additionally, international exchanges between Korea and China, Russia and North Korea will be increased steadily by the revitalization of South-North exchanges in the Korean peninsula.

[Table 5] Transportation Demand of Inland Freight

Division		1997	2006	2011	2020
1000 ton.	Sum	2,532,762	3,379,901	4,282,704	6,220,459
	Road	2,333,974	3,107,506	3,923,337	5,735,277
	Railway	53,828	66,425	88,169	117,187
	Airport	387	1,079	1,415	2,631
	Seaport	144,573	204,891	269,783	365,364
Million ton.-km	Sum	132,662	194,134	248,646	369,588
	Road	74,504	99,068	130,708	206,152
	Railway	12,710	27,566	37,432	56,582
	Airport	149	559	661	1,150
	Seaport	45,299	66,941	79,844	105,704

Source: MOCT. National General plan of logistics, 2000

[Table 6] Transportation Demand of International Freight

Division		1997	2006	2011	2020
Thousand ton.	Sum	486,663	724,319	869,195	1,265,563
	Airport	1,631	2,884	3,901	6,657
	Seaport	485,032	721,435	892,294	1,258,906
Million ton.-km	Sum	4,180,272	5,651,098	6,841,984	9,706,701
	Airport	10,512	15,863	22,470	47,414
	Seaport	4,169,760	5,635,235	6,819,514	9,659,287

Source: MOCT. National General plan of logistics, 2000

2. Changes of Inland Situations

The fast, JIT(Just-in-Time) and cheap logistics services are decisive for the competitiveness in the digital age, in which the space-time transcendental movement of information is possible.

Companies have to choose core businesses and to introduce the

[Table 7] Characteristics of Logistics Management

Items	Physical Distribution	Logistics	SCM
Term	Before the 1970s	In the 1980s	After the 1990s
Target	Efficiency of logistics in each logistics part	Efficiency of logistics in company	Supply chain efficiency of logistics
Object	Transport, storage, unload, and packing	Production, logistics, and sale	Supplier, maker, wholesale and retail, customer
Tool	System automation, and mechanization in each logistics part	Information system, POS, VAN, and EDI in company	Partnership, ERP, SCM, and information system, among companies
Slogan	Vision for automation	Total logistics	Total business system

outsourcing system for other surrounding-businesses.

SCM(Supply Chain Management) is the most dominant outsourcing system for the custom-oriented logistics and e-commerce. (Table 7)

The digital revolution makes the establishment of virtual logistics network possible. E-commerce also can rearrange economic activities by the coordination of virtual and actual(logistics) world. Additionally, strategic alliance between factory and transport company can change the mechanism of production: Change from the production system of small articles and mass products to that of many articles and small products, thus going finally into the order-mass products system.

The economic effects of e-commerce is estimated very effective: 34.6% of growth of economy, decline of inflation, 3% of increase in facility investment and creation of employees.

3. Trend of International Logistics

3.1 General Trend

The core factors of trend changes in international logistics are firstly the internationalization of business and the multinational corporation that accelerate the globalization of production-distribution-sale and

[Table 8] Basis of Logistics Policies of Foreign Nations

Nation	Basis	Details
USA	Market economy	· Free competition · Environment and safety-oriented
Japan	Nation-initiated	· Modernized logistics-technology · Information system · Environment and safety-oriented · Construction of hub-ariport and seaport
Netherlands	National development	· Introduction of foreign investment · Construction of hub-ariport and seaport · Information networking among companies and nations · European standardization
Singapore	National survival	· Construction of infrastructure before demand · Introduction of free trade zone

Source : MOCT. National General Plan of Logistics, 2000

the internationalization of logistics network among producing center, logistics hub and consumer center.

The second trend is appearing in Northeast Asia. A slow opening of North Korea and development of China, increase of possibility to use the TCR(Trans-Chinese Railway), TSR(Trans-Siberian Railway) and Asian Highway can influence the change of logistics network and the increase of transport volume.

The next is the expanding of value-added-logistics that includes assembling and manufacturing during the entire logistics flow. The position of logistics industry is growing up in the total industrial structure. U.S has emphasized also the importance of logistics industry in the future; warehouse for value-added logistics is the future plant.

The last is the safety- and environment-oriented logistics policy.

3.2 Advantages of the Netherlands and Rotterdam as the Gateway to Europe

The Netherlands has an excellent reputation as a logistics nation and also has been the gateway to Europe. The reasons that the Netherlands was able to grow as a logistics hub in Europe can be summa-

rized as follows:[1)]

1) favorable geographical location near the main living areas and industrial and economic zones in Europe and in particular Germany,
2) excellent hinterland connections by road, rail, inland water and(short) sea,
3) accessibility by sea : Rotterdam Mainport with deep water port facilities and located on the route of the main shipping lines,
4) accessibility by air : Schiphol Airport as the 4th largest airport in Europe
5) availability of highly developed logistics industry, such as integrated logistics service providers,
6) an internationally oriented population with high education level and competency in foreign languages,
7) a relatively stable and flexible labor climate compared to other members of the European Union,
8) favorable tax and custom procedures.

The most important port not only for the logistics hub of the Netherlands but for the Europe is Rotterdam. It is a mainport in Europe and is located at the connection of the busiest sea in the world. This port has no locks and its tide differences are small(1.5m). But, there is a fierce competition between the ports in the so-called Hamburg-Le Havre(HH)-range serving the same hinterland. Rotterdam clearly competes with Hamburg and Antwerp. The development in container shipping is favorable for Rotterdam; the size of the vessels is growing and these vessels want to call at only few ports. Rotterdam is located close to the main maritime route, which is an important factor for saving cost along shipping lines. Thus, the following factors are important for the competitive edge of the port of Rotterdam:[2)]

1) centrally located in Europe
2) capacity of handling the largest vessels
3) a hinterland of 350 million consumers

---

1) KRIHS, GEM, "Transforming Korea into a Logistics Centre for Northeast Asia," 1998.
2) KRIHS, GEM, "Transforming Korea into a Logistics Centre for Northeast Asia," 1998.

4) different container terminals(multi-user as well as dedicated)
5) excellent hinterland connections and multimodal transport facilities
6) specialized distribution companies and co-operative custom facilities
7) Logistics center in the port of Rotterdam(Distripark)

4. SWOT-Analysis for Logistics System in Korea

4.1 Advantages

Korea has many advantages to be a logistics hub in Northeast Asia by the development of national logistics system as follows: firstly, locational advantages could be considered. Korea is very close to the areas with high freight demand such as China and located on the primary sea routes for international freight transport. The second advantage is large service area. Major cities with population of 1.8 billion in Northeast Asia are concentrated within 2,000km radius of Korea. It has huge freight demand amounting 2.5 times as high as Singapore(serving population of 300 million) and the Netherlands(serving population of 330 million as the largest European logistics Hub). Especially, it is expected to attract approximately 20% of transferring freight from China if proper transfer facilities can be provided. Thirdly, modernized logistics hub facilities such as Busan and Gwangyang Ports including Incheon international airport are prepared for national and international service. Finally, harbor cost is relatively lower than others in Japan. It costs $75 in Busan and $228 in Osaka based on a 40-cubic feet container.

4.2 Weaknesses

The serious problem is the weak integration of transport systems. Singapore and the Netherlands have built transport systems integrating surface, sea, and air transportation. But Korea's transport system lacks the integrity due to insufficient feeder roads and limited capacity of harbors and airports. The next is higher freight transport cost and less developed logistics industry. Transport cost of Korea is rapidly increasing to be higher than that of Japan, Taiwan, and Hongkong. Another problem is a low proportion of freight transferring via Korea coming

from neighboring countries. 55% of freight dealt in Rotterdam seaports of the Netherlands is transferred to other European countries. But, the proportion of transferring freight through Korea is relatively low.

4.3 Opportunities

The rapid economic growth in Northeast Asia is the most important opportunity for the development of national and international logistics system. Secondly, the unification or revitalization of exchanges of two Koreas will provide the opportunity to reunite the population, land and economic capability of the Korean peninsula and build integrated transport systems in Northeast Asia. Consequently, Korea has the potential to become a logistics hub similar to Singapore or the Netherlands. Finally, logistics and feeder transportation facilities can be expanded as a part of the major infrastructure development projects currently in progress.

4.4 Threats

The first threat is the competition between neighboring countries including Japan, China and Taiwan for a Logistics Hub in Northeast Asia. The next is the delayed infrastructure development due to the economic crisis. Investments on port facilities and a new international airport(Incheon) is likely to be postponed due to the economic crisis. It is detrimental to Korea's competitiveness as a logistics hub.

Vision of Logistics System in Korea

1. Goals of Logistics in the 21st Century in Korea

The logistics network and efficient logistics system have to be completed for social benefit at national level and for international competitiveness. The final goal is the "construction of top-ranking logistics-developed country in 21st century." Three detailed targets have been proposed for this final goal as follows:

Firstly, powerful country in logistics that has the hub function of logistics in Northeast Asia, secondly logistics-intellectual country that

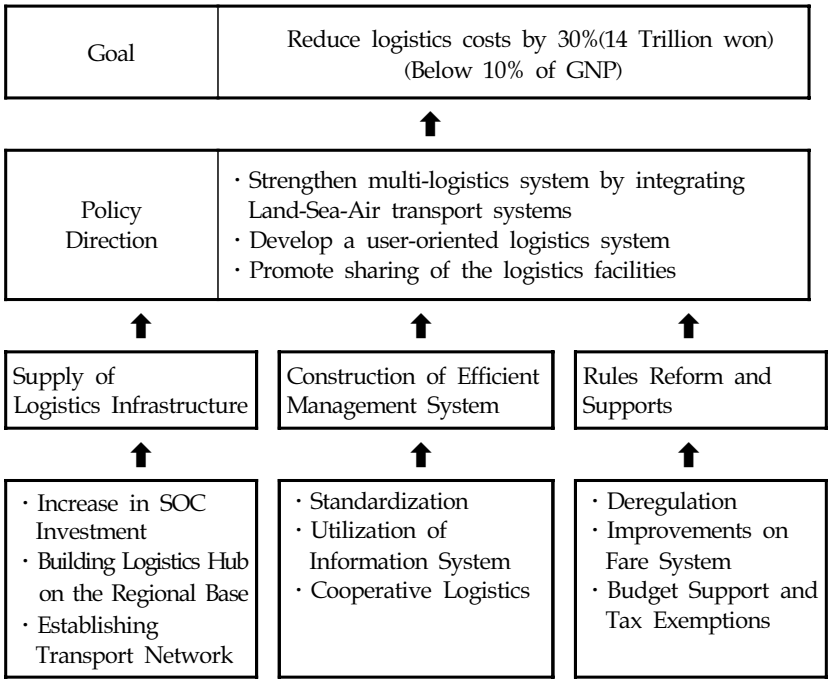
leads the knowledge-based economy by the advanced logistics, and finally logistics-industrial country that creates the wealth by the value-added logistics.

Many tasks have to be executed for these goals in the consideration of following six basic strategies: Global Logistics, Custom-made Logistics, Seamless Logistics, Cyber Logistics, Open Logistics and Green Logistics.

2. Main Projects

The most important goal of the vision of logistics in the 21st century in Korea is to reduce logistics cost. The government has proposed many projects in three parts: supply of logistics infrastructure, construction of efficient management system, and deregulation and establishment of support system for logistics companies.

[Figure 3] Basic Scheme of Korea's Logistics Policy



2.1 Supply Plan of Logistics Infrastructure

• Roads

The goal of road project in the future is the construction of basic national transportation network and the improvement of its efficiency to prepare for the coming 21st century. The basic national transportation network will be constructed in such a way to make Korea the central hub for Northeast Asia. The connections between road systems of two Koreas will be pursued in terms of integrated road systems for the Korean peninsula. To achieve this, a grid-type major road network consisting of 7 major axes in the North-South direction and 9 axes in the East-West direction will be built.

• Railroads

The goal of the railroad projects is the construction of regional wide-area rail systems and integrated railroad network for a unified Korean peninsula. The regional wide-area electric rail system will efficiently handle the demand within the region while integrated railroad network will ultimately connect the Korean peninsula rail networks to transcontinental railway systems such as the TSR and TCR.

The ratio of the double-line railroads to the total railroad length will increase from 29% to 35% by adding 1,251km of new double lines in coming 5 years. The ratio of electric rail will increase from 20% to 46% by adding 1,460km of electric railroads.

Improved efficiency in railroad investments can be achieved through the following means. First, the current project will receive a concentrated investment to finish the project earlier than planned. Second, the modernization of existing lines such as expanding the single line into double-lines as in the case of Jeolla Line(Iksan-Yeosu) will be emphasized. Third, new lines will be built in such a way to increase the connectivity to exiting lines, thereby improving the usability of railroads. Fourth, the express rail systems currently underway will be continued so that railroad network can cover the whole country with a half-day distance. Finally, investments will be made in terms of taking advantage of the geopolitical position of the Korean peninsula as a gateway into Eurasia, providing connections to transcontinental railroad and cross-Asia railroad systems such as the TSR and TCR.

• Seaports

The goal of port project is to minimize distribution cost while laying a foundation upon which Korea can play a major role as a center of maritime transportation industries in Northeast Asia. The locational advantage of the Korean peninsula as a gateway to continent and the Pacific will be fully exploited by constructing integrated port system. Increase in coastal shipping will be pursued and port facilities will be greatly expanded to handle the increasing international traffic.

To achieve this goal, 12,281 billion won will be invested in coming 5 years. A total of 6,636 billion won will be invested for 8 existing ports while 5,645 billion won will be allocated for 7 new ports including Gadeok, Mokpo, and Ulsan.

The expansion of the port facilities will help turning the Korean peninsula into a central distribution hub in Northeast Asia. Busan and Gwangyang Ports will be expanded to become international hub ports that will act as a trans-shipping point into Northeast Asian destinations. Gwangyang Port will be developed with the emphasis on the connections to Honam and Daejeon-Jinju Expressways.

Port management information systems will be integrated into a single information system based on electronic data exchange network. Dedicated yards for coastal shipping will be constructed.

• Airports

The goal of airport projects is to position Korea as an air traffic center in Northeast Asia and building regional hub airports. New Incheon International Airport is expected to play the role of a hub airport for Northeast Asia. There will be 5 regional hub airports, which will meet the domestic air travel. Existing facilities will be managed to maintain the maximum efficiency.

One of the focal points in airport investment is to position Incheon Airport as a hub airport playing a transfer point for airlines destined to U.S. and Europe. At the same time, feeder service system for air traffic for major cities in Japan, Southeast Asia, and China will be built gradually.

To increase the value of international hub airport, a hinterland city that can provide facilities for trade, port, telecommunications, distribution and leisure will be constructed.

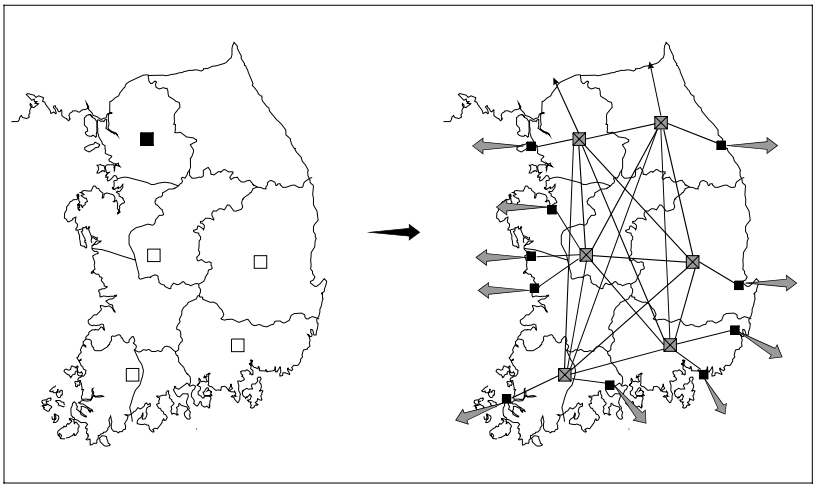
2.2 Development Plan of Logistics Industry and Infrastructure

All have a hope for the improvement of logistics system, and also the government and private firms make all efforts for the mentioned goals by the execution of tasks as follows:

• Efficient Allocation and Construction of Logistics Hub Facilities

The government will construct five multi-logistics centers including ICD(Inland Container Depot)(two under operating), 6 truck terminals,

[Figure 4] Construction of Logistics Center Networks in Korea



7 distribution centers(two under operating) with shopping center, distribution center and information center, 7 logistics centers including commercial facilities. Additionally, value-added distribution center, logistics center for agricultural, marine and stock raising products, railway freight handling center(CY, silo, and warehouse) and terminal for air-cargo will be constructed by 2005. Total investment including supporting is about 4,117.9 billion won.

• Construction of Urban Logistics System that Supports Urban Economy

Seven metropolitans will found the urban logistics basic plan by 2002. Government will support the construction of city freight terminal

and distribution center. Additionally, the government will improve the institutions for the improvement of urban logistics system such as the construction of truck exclusive roads, flexible operating time for suspension of traffic into city center and construction of parking lots for delivery trucks in city center.

- Governmental Control of Various and Doubled Plans of Logistics Facilities by Each Ministry

Six ministries have planed and constructed various logistics facilities that cause the inefficient logistics system in Korea because of double investment and the incomplete networking. The government has organized the committee for logistics policy from the related ministries. This committee will control all logistics-related plans completely such as infrastructure, logistics facilities, information facilities, etc.

- Construction of Advanced Total Logistics Information System

The Ministry of Construction and Transportation will complete the total logistics information network that connects individual information network of land-, sea- and air-transportation, and also related information network of customs and trade. This information network has been used already from October 2000 partially. It includes also EDI(Electric Data Interchange), CVO(Commercial Vehicle Operating System) and information network of export and import. This network will be connected with e-commerce and expanded in every logistics hub facility. Every related plan for information system from each authority will be controlled and rearranged in the level of government.

The Ministry of Agriculture and Forestry will also establish the total information network of agricultural products that connects all individual information systems from production to sale and consume.

The Ministry of Commerce, Industry and Energy will support the logistics information networking of private companies. It has a priority in standardized bar-code, SCM(Supply Chain Management) and electric catalog.

- Assist of Development Basis of Advanced Logistics Industry and Logistics Standardization

Standardization of logistics equipments, machines and information systems is necessary for the unit-load-system. The government will invest

993.4 billion won in standardization of packing unit of agricultural products, 22 billion won in standardization of logistics equipments such as standard pallet, palletizer, conveyer, and rack, and 71.1 billion won in supporting the purchase of the standard-unit machines.

The government will improve the institutions for the execution of standardization and cooperate internationally for the logistics standards.

• Development and Diffusion of the Advanced Logistics Technologies

The government will support 32 billion won for the development and research of new logistics technologies by private companies in technologies for efficient logistics and information system by 2005.

The Ministry Of Construction and Transportation will organize the committee of logistics technologies for the efficient execution of R&D of logistics technologies.

• Efficient Rearrangement of Freight Transport Structure

The most important restructuring is to establish free competition in logistics industry. The government has deregulated the option of truck transportation company for the reduction of rate of vacant trucks. On the other hand, regulation for the protection of consumers will be strengthened for the better service.

The next project is the improvement of modal-split from the road-oriented to railway-oriented structures. That will be concreted by the efforts from the Korea National Railroad such as ensuring of freight wagon for pallets, containers, bulk-transporter, and high-speed container transporter and establishing of railway delivery system. Additionally, high-speed container ships will be operated in a short time.

The storage system will be also rationalized by the support for the conversion from the simple storage to the total logistics warehouse. Automation system and its software will be developed for the warehouse including automatic sorting system.

The government will make efforts for the improvement of unloading system by the mechanization in port, standardization of packing unit, and automatic packing system.

• Execution of Customer-oriented Logistics Institutions and Procedure

Many projects will be prepared for the protection of consumers as

follows:

1) "Certification of best transportation company" for the protection of owner of freight to be moved and house-delivered freight
2) Providing of total logistics service
3) Stabilization of cheap, fast and comfortable house-delivery system

• Expanding of Environment-oriented Logistics System

The government will execute three main projects for the environment-oriented logistics system. One is the environment-oriented underground logistics system by pipeline for gas and petroleum. The other is the expanding of returnable pallets and container for the environment protection.

• Consolidation of Transport Management of Dangerous Freight

Firstly, "forbidden area of transport of dangerous freight" will be established in crowded urban areas and water reservation areas. The government will establish the monitoring system of dangerous freight vehicles by CVO. Additionally, basic institutions for this system will be improved for the systematic management of dangerous freight.

• Expanding of World-wide International Transport Network

International transport network can be proposed only by airports and seaports in Korea. Therefore, the expansion and improvement of air- and seaport are necessary for the handling of trans shipped freight from and to China and Japan. Especially, Busan and Gwangyang Port will be improved as a advanced Penta-Port(seaport, airport, teleport, business port and leisure port) that can create the high value of hub ports in Korea. The government has prepared the total logistics management system in the Korean peninsula along the step-by-step improvement of relationship between South and North Korea.

• Training of the International Standardized Manpower and Logistics Organization

All problems can be solved by man. Man is the most important factor for our survival. Korea will become logistics hub of Northeast Asia. One of the most important factors to make the Netherlands play

a role of a logistics hub in Europe is "internationalized Manpower." Logistics specialists will be trained for the competition with the world.

References

Government of the Republic of Korea. *The Fourth Comprehensive National Territorial Plan in Korea*. 2001.

Gyeong-Seok, Kim. "Analysis of Competitiveness for the Logistics of Port Cities in Northeast Asia." 24th. WCTR, 2001. 7.

Gyeong-Seok, Kim. "The Role of Logistics in the Networking of Free Zones in the Yellow Sea Region." International Conference on Korea-China-Japan Economic Cooperation and the Network of Free Zones in the Yellow Sea Sub-Region, 2001. 3.

Gyeong-Seok, Kim. "Strategy for Logistics Hub after the Reunification in the Korean Peninsula." Korea Logistics Academy, 2001.

Korea Transport Institute. *Visions and Strategy of National Logistics Policy in 21th Century*, 2000.

KRIHS. "Inter-city Networking Strategy in the Yellow Sea Sub-Region." 2000.

Ministry of Construction and Transportation. *The National Basic Transportation Plan in Korea(1998-2020)*. 1999.

PICKO/KRIHS. *PPI Program and Investment Projects in Korea*. 2000.

Part 3

Environment, Housing and Quality of Life

10 Environmentally Sustainable Urban Structure in Metropolitan Areas : Compact City or Decentralized Concentration?

Won Kim
Seungil Lee

Introduction

Since the UN Conference on Environment and Development, held in Rio de Janeiro in 1992, focused international attention on the need to promote sustainable development, it is commonly believed that sustainable development is the very concept to solve not only global but also local environmental problems. In particular, the debate on sustainable urban structure for enhancing the aggravated urban environment has intensively begun from the time at that the European Commission advocated the compact city as urban structure with energy efficiency and quality of life in its Green Paper on the Urban Environment(CEC, 1990).

The basic idea of the compact city as urban structure refers to the fact that high population densities reduce energy consumption for transportation, discourage urban sprawl, and therefore, protect rural and natural areas from development. The major argument of the compact city is concerned about environmental sustainability. However, draconian policies that reduce the quality of social and economic life in order to achieve environmental objectives are likely to be very unpopular and in consequences undermined(Breheny, 1992a). Thus the economic and social aspects of the compact city would have also to be discussed.

The most sustainable approach is one that achieves a balance

between urban economy, social equity, and the environment(WCED, 1987). Before seeking a balance of the three axes of sustainable development, it is rather desirable that each axis should be assessed with respect to its own functionality, i.e. environmental sustainability, economic sustainability, and social sustainability, respectively. However, almost every research on the compact city until now has explored its environmental sustainability with a few environmental indicators, so that mutually contradicting effects of several environmental indicators could not be considered. The environmental policies from such investigations are likely to hardly contribute to solve urban environmental problems in a practical manner. Therefore, it is very much necessary to totally examine the impacts of the compact city from the viewpoint of environmental sustainability.

In addition, there has been also intensive debate on the question, what is more sustainable between the compact city and the decentralized concentration. The decentralized concentration is a compromise to the compact city derived from doubts about the chances of reversing the current counter-urbanization trend and concerns about losses of open space, biodiversity and quality of living in urban areas(Wegener and Fürst, 1999). From much of recent research it has been argued that compactness alone cannot play the dominant role to determine sustainability. Thus it becomes more difficult to reply this question.

In order to contribute to current urban environmental debate, this study concentrated mostly on assessing the two typical sustainable urban structures with respect to the environmental sustainability. The environmental sustainability was here testified with the urban environmental indicators, which will differently be impacted by spatial development of the urban structures. This study was applied for the Gwangju Metropolitan Area in Korea. In order to identify environmentally more sustainable urban structure of the area, a complex computer model was employed to experiment with the urban structures. The model deals with a large number of important indicators to totally evaluate their mutually contradicting effects.

Problems of the Urban Environment

1. Urban Environment

The urban environment affected from the human activities and the land conversion for their purposes are very complex. For convenience of exposition, it can be considered under two headings: *urban ecology* affected by land conversion and *urban pollution* caused from the human activities(Table 1).

Urban ecology is a complex ecosystem in urban area, which is composed of many subsystems connected each other closely: air and climate, soil, water, flora and fauna, health of inhabitants, and energy (Wittig and Sukopp, 1993; Finke, 1993; Lee, 2001). Urban growth and land conversion affect the structure and function of urban ecosystem both directly, through converting land surface, and indirectly, by modifying energy flows and the availability of nutrients and water(Alberti, 2000). Land conversion from the landscape to the urbanized land cover deprives flora and fauna of their biotopes, threatening species survival and reducing biotic diversity. The increase in impervious land coverage associated with urban development affects urban hydrological system, reducing underground water reservoir and causing floods in the rainy seasons. By altering the nature of the surface and generating large amounts of heat, urbanized areas modify the microclimate and air quality, affecting the health of urban inhabitants.

Urban pollution of air, noise, water, and soil, generated by human socio-economic activities in urban areas, establishes negative effects on the health of citizens psychically, and affects urban eco-system as well (CEC, 1990; Wittig and Sukopp, 1993; Finke, 1993; Lee, 2001). Most air pollutants stem from three sources: industry, motor vehicles and the burning of fossil fuels for heating or electricity generation. The health effects of these pollutants, some of which are carcinogens, include respiratory diseases and eye and skin irritation. Air pollutants damage all subsystems of urban ecology. Noise, a typical urban pollution, stems from various means of transport and from building sites, affecting both the health and the quality of life of citizens. The pollution of ground and underground water is caused by an increasing volume and variety of effluent from households and industries, reducing water quality and

damaging urban wildlife. The soil contaminants in urban areas are caused mostly by indiscriminate tipping of toxic substances and also from air pollutants landed in the rain. They affect urban wildlife and contaminate underground water as well.

[Table 1] Urban Environment

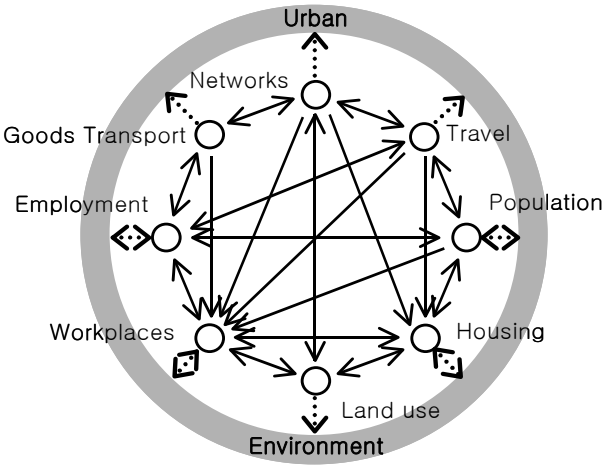
Subsystems	Environmental problems	Consequential impacts on	Causes
Air and climate	Air pollution	· Health of citizens · Flora and fauna · Water · Soil	· Households/industries · Transport
	Urban climate	· Health of citizens · Flora and fauna	· Land use · Urban density
Soil	Soil contamination	· Underground water · Flora and fauna	· Households/industries · Transport
	Land coverage	· Flora and fauna · Hydrologic system · Urban climate	· Land use · Urban density
Water	Underground water pollution	· Health of citizens · Flora and fauna	· Households/industries · Transport · Land use · Urban density · Road network
	Ground water pollution	· Health of citizens · Flora and fauna	· Households/industries · Transport
Flora and fauna	Loss of biotope	· Energy and material flow · Urban climate · Soil	· Land use · Road network · Transport
Health	Air pollution Noise emission	· Health of citizens · Quality of life	· Transport · Industries
Energy	Energy consumption	· Air pollution · Hydrologic system · Urban climate · Global climate	· Transport · Households/industries

2. Urban Environmental Problems in the Urban System

The urban environment is more complex than natural one, because it is extensively connected with urban system(CEC, 1990; Wittig and Sukopp, 1993; Lee, 2001). Both systems show complex cause-and-effect relationships influencing urban development and environmental conditions.

Wegener(1998) sketched out an idealized urban model as an interrelated whole system, which consists of eight types of major urban subsystem and a ninth subsystem as the urban environment. Figure 1 illustrates the main interactions of the eight subsystems and their multiple links with the urban environment. It can be seen, for instance, that the location of workplaces, i.e. non-residential buildings such as factories, warehouses, office buildings and shops depend on the location of other firms, clients and workers, on access to goods transportation and travel by customers and employees, and on the availability of land, utilities and housing. All eight subsystems affect the environment by energy and land consumption, air pollution and noise emission, whereas locational choices of housing investors and households, and firms and workers are co-determined by environmental quality, or lack of it.

[Figure 1] Urban System(Wegener 1998)



The overview of the interrelated urban system offers a better understanding about the urban environment. However, there is a lack of concrete information on the relationships, particularly for urban ecological subsystems. Because of scientific uncertainty and incomplete knowledge on the functioning of urban ecosystems, it is difficult in practice to evaluate the impacts of urban development on ecological conditions and vice versa. Therefore, future research on urban ecosystem is required to concentrate more on comparable and compatible data and interdisciplinary approach to urban system than else.

The urban environment, by its very nature of diversity and complexity, is related with a broad spectrum of natural and social science. Moreover, it would be much more complicate, if temporal behavior of the environmental components is to be considered. While the direct impacts of human activities such as transportation noise and air pollution are immediate, other effects such as water and soil contamination build up incrementally over time, and still others such as long-term climate effects are so slow that they are hardly observable(Wegener 1998). Hence, it is necessary for establishment of an environmentally sustainable urban structure to seek a pragmatic approach in which the function of environmental indicators can be defined as to convey relevant, recognizable information about complex interrelationships or theoretic constructs such as environmental quality that may not be immediately observable(LT et al., 1998).

Interrelationships Between Land Use, Transport and Environment

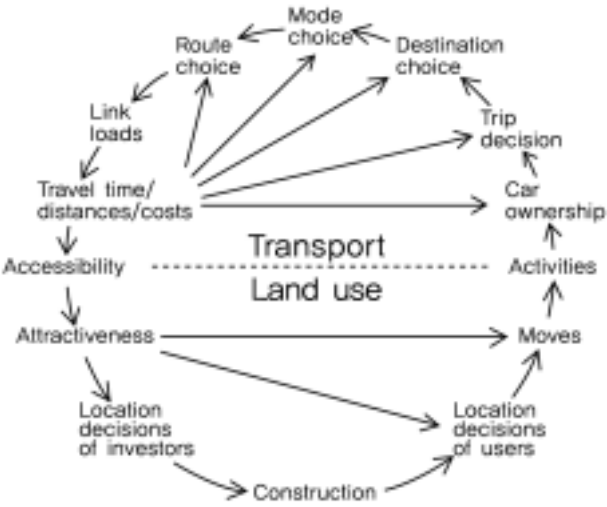
1. Urban Development and Land-use Transport Interaction

There exist a large variety of observations and partial hypotheses about individual phases and aspects of urban development, but there is still no general theory of why and how cities develop. From numerous observations and hypotheses, the recognition that urban land use and transport are closely inter-linked and change urban structure of cities is accepted most commonly by planners and the public as a principle of urban development.

Wegener(1996) summarizes the two-way interaction between land use and transport in urban areas by means of the 'land-use transport feedback circle'(Figure 2): "The distribution of land uses such as residential, industrial or commercial determines the location of households and firms and that of human activities such as living, working, shopping, education or leisure. The distribution of activities requires spatial interactions or trips to overcome the distance between them. These trips occur in the transport system in a sequence of choices: decisions to own a car, to make a trip and to select destination, mode and route. These decisions result in flows in the networks and congestion and increases in travel times, distances and costs. Travel times, distances and costs create opportunities for spatial interactions and can be measured as accessibility. The distribution of accessibility in space, together with other attractiveness indicators, determines location decisions of investors and so results in new construction, modernization or demolition, i.e. changes to the land-use system, which in turn determine the location decision of users and hence the location of activities."

This apparently two-dimensional land-use transport interaction is able to be multi dimensional, if all different temporal scales of indivi-

[Figure 2] The 'Land-use Transport Feedback Cycle'(Wegener 1996)



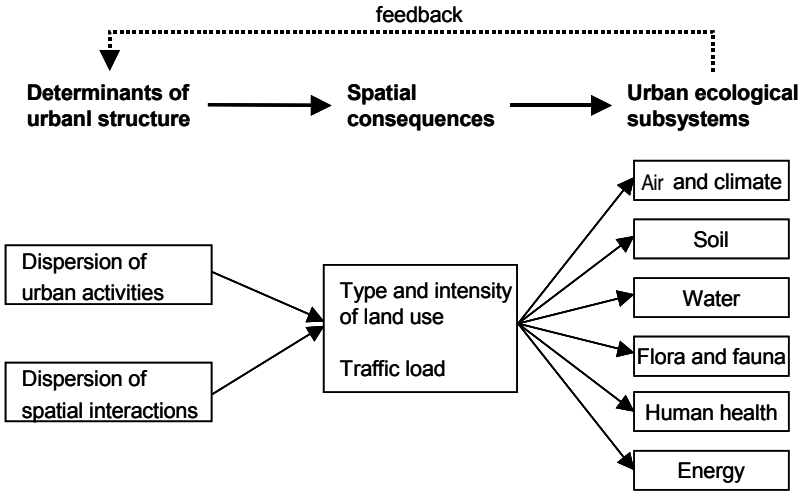
dual processes will be considered. Some processes, for instance the trips for working and shopping, occur immediately, whereas new construction for residential, industrial and commercial is long-term process. In spite of this huge difference, the immediate processes determine the location decisions of long-term processes. Eventually, they lead to a change of urban structure(Wegener and Fürst, 1999; Lee, 2001). With this it is clear that any planning policy of a process interrelated with land use or transport inevitably influences other processes in the system, even though they are not in the same temporal scale and therefore their immediate influences are hardly observable(Webster et. al., 1988).

2. Land-use Transport Interaction and Urban Environment

In the context of land-use transport interaction, the environmental problems in a city can be regarded as inevitable by-products from its spatial development processes, and possible solutions to the problems can be found by changing its spatial structure. Depending on Brotchie's assertion(Brotchie, 1984) urban structure can be determined by land-use and transport parameter; the land-use parameter measures dispersion of urban activities, while the transport parameter measures dispersion of spatial interactions, i.e. the average trip distances for conducting the activities. The function of the parameters is of course land-use transport interaction. The urban structure determined by the determinants has the distribution of land-use types and intensities and traffic loads in the region as its spatial consequence. In effect urban ecological subsystems are affected by the spatial consequence of urban structure(Figure 3)(Lee, 2001). From this, it is now obvious that environmental problems of a city are ecological consequences of its spatial development. Furthermore, there exit also two-way relationships between urban spatial development and urban environmental problems. Urban environmental problems negatively influence urban development(for instance, by decision of residential location), but this feedback process has been not obviously defined in planning practice yet.

As stated above, environmental problems of a city can be solved by changing its urban structure into environmentally sustainable one. For this purpose, urban environmental problems have to be evaluated

[Figure 3] Land-use Transport Interaction and Urban Environment



to decide an environmentally sustainable urban structure among numerous alternative urban structures. In order to assess urban environmental problems, their determinant factors have to conform to those of the results of land-use transport interaction, i.e. the urban ecological subsystems should be converted into environmental indicators which can measure their impacts. Lots of researches for the conversion have been conducted mostly for immediate urban pollution such as air pollution, noise, and energy consumption. However, the conversion of unobvious and long-term environmental problems such as water and soil contamination, urban climate, loss of biotopes, and land coverage has been rarely made. Table 2 summarizes the determinant factors of selective urban environmental indicators with two categories of land use and transport.

[Table 2] Determinant Factors of Selective Urban Environmental Indicators

	Environmental indicators	Impacts on	Determinant factors	Class of indicator
Land use	Land coverage	· Hydrologic system · Flora and fauna · Urban climate	· Type of land use · Distribution of land use · Intensity of land use	Descrip-tive
	Loss of biotopes	· Flora and fauna	· Open space · Type of land use · Distribution of land use · Intensity of land use · Distribution of road network · Traffic load	Descrip-tive
	Heat islands (urban climate)	· Health of citizens	· Type of climate-tope · Land coverage grade · Distribution of land use · Intensity of land use	Descrip-tive
Trans-port	Air pollution	· Health of citizens · Flora and fauna	· Traffic load · Vehicle type · Traffic flow · Driving speed	Perfor-mance
	Noise	· Health of citizens	· Traffic load · Vehicle type · Driving speed · Road type	Perfor-mance
	Energy consumption	· Energy scarcity · Long-term climate	· Traffic load · Vehicle type	Descrip-tive

3. Empirical studies on Land-use Transport Interaction and Urban Environment

Stimulated by increasing interests in environmental issues, there are a large number of empirical studies on environmentally sustainable urban development. However, there have been few studies to verify the theories of land-use transport interaction and the urban environment comprehensively. The majority of them are only concentrated on

parts of the whole. The most frequently investigated study field is the impacts of land use on transport with the expectation that the energy consumption of urban transport can be reduced in high-density cities (Owens, 1986; Rickaby, 1987; 1991; Newman and Kenworthy, 1989; Breheny, 1992b; Banister, 1992; Cervero, 1996). These empirical studies particularly investigated the following theoretical results of land-use transport interaction and urban structure with essential factors such as residential density, employment density, neighborhood design, location, city size, mixture of land use, and accessibility:

1) High residential and employment density can reduce average trip length;
2) Attractive neighborhood facilities can be seen as a pull factor for reducing trip length, whereas city size is negatively correlated with average trip length;
3) Residential and employment density as well as large agglomeration size and good public transport accessibility of a location tend to be positively correlated with the modal share of public transport, while neighborhood design and a mixture of workplaces and residences with shorter trips are likely to have a positive impact on the share of cycling and walking(Wegener and Fürst, 1999).

In these studies energy consumption, which is closely related to the fear of diminishing fossil fuels and the threat of long-term climate changes, is only an environmental indicator to exogenously evaluate the impacts of land use on transport; in some other studies(Schmitz, 1991; DoE et. al., 1993; EC, 1996) air pollution is adopted as an environmental indicator of urban transport instead of energy consumption. From this point of view it should be expounded that this class of studies, in fact, aims at securing a high level of accessibility for residents rather than at solving urban environmental problems(Lee, 2001).

Since the urban environment is affected by complex integration of various effects of individual environmental indicators, environmentally sustainable urban structure cannot be determined only by a specific environmental indicator such as energy consumption or air pollution. In fact there are some environmental indicators which have mutually contradicting effects from a factor. For instance, high-density cities re-

duce average trip length and consequently mitigate energy consumption of urban transport and the emission of air pollution and noise on the one hand, and they increase losses of open spaces leading to eliminating biotopes and enlarging heat islands on the other. Besides, the same amount of emission of air pollution and noise can affects larger number of inhabitants in high-density cities than in low-density.

Environmentally Sustainable Urban Structures

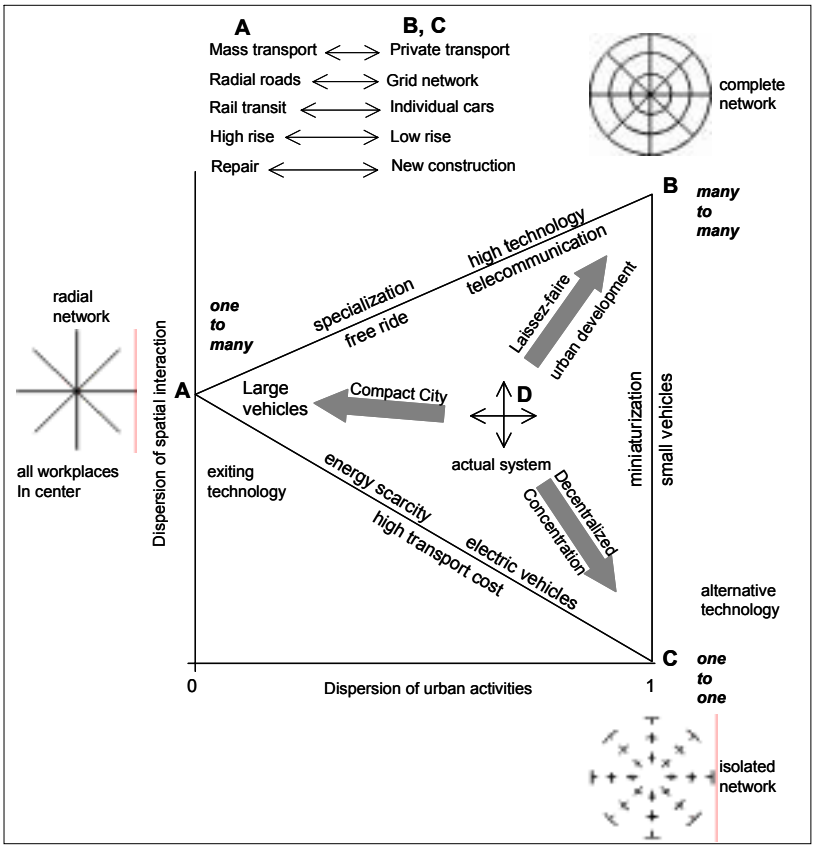
1. Brotchie Triangle and Urban Structures

According to the theory of urban life cycles(van den Berg, 1987), cities sequentially experience four different phases of urban development, i.e. urbanization, suburbanization, deurbanization and reurbanization. Since the last urban development phase is a rare phenomenon, the most likely trend of urban development is deconcentration. The continuing expansion of urban area resulted from deconcentration is attributable not only to growing space demands of urban land use but also to increasing travel demand and dependence on private cars. Synchronously it causes environmental problems. Therefore, it is clear that urban structure of deconcentration is environmentally unprofitable and needs to be changed.

Urban structure is spatial state of urban development process. As mentioned already, it can be determined by dispersion of urban activities and spatial interactions as the result of land-use transport interaction(Brotchie, 1984). Brotchie triangle represents the universe of possible constellations of the two elements of urban structure(Figure 4). Dispersion of urban activities is represented on the horizontal axis(for instance, mean travel distance of employment from the center of the region), dispersion of spatial interactions on the vertical axis as some measure of total travel such as mean travel distance to work. Any city will lie between three hypothetical points in the diagram. Point A represents a situation in which all workers walk to walk, point B is a situation in which they maximize travel. Point D is the actual urban structure of the real city and will move according to its urban development.

For a city, Brotchie triangle is applicable not only to define its actual urban structure but also to trace a transition of its urban struc-

[Figure 4] Brotchie Triangle and Urban structures(Brotchie, 1984; modified)



ture within a certain period. The latter means the very urban development of the city in that period. Also, hypothetical urban structures, which are to be set up aiming at environmentally sustainable urban structure, can be defined and compared in this format. The urban structures cannot be assessed in terms of environmental sustainability, because urban environmental indicators are affected by the very spatial consequence of urban structure. However, based on the theoretical results of land-use transport interaction, environmentally sustainable urban structure can be approximately recognized in the format(Figure 4). Presently two basic concepts of urban structure are concurrently being discussed, i.e. Compact City and Decentralized Concentration.

Compact-city urban structure inclines to point A with the most intensive grade of urban activities and medium grade of spatial interactions, while the decentralized-concentration lies close to point C with the most dispersed grade of urban activities but the most intensive grade of spatial interactions. In comparison with them the urban structure of suburbanization, i.e. the laissez-faire urban development, is located near point B which has the most dispersed grade of urban activities and also the most dispersed grade of spatial interactions.

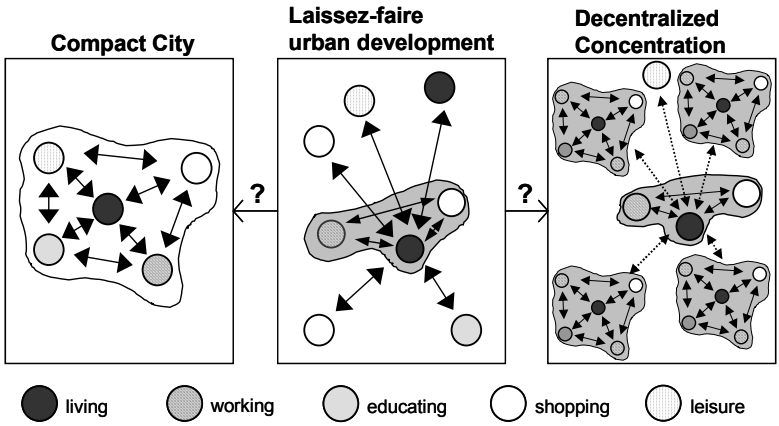
2. Compact City: Urban Structure of Monocentric Concentration

The basic idea of the compact city refers to the fact that high settlement densities reduce energy consumption for transportation, discourage urban expansion, and thus protect rural and natural environment from development. The compact city structure implies intensive land use patterns and predominantly monocentric urban macrostructure(all urban functions in a city center). The compact city is an intransigent countermeasure against the laissez-faire urban development of deconcentration and dispersion(Figure 5).

To achieve the compact city in the reality, the maintenance of urban densities, intensification of social, cultural and economic activities, and control of the urban size, form, location, mixed uses, and neighborhood design would be required. Besides, particularly to reduce traffic volume, it would be necessary to take measures to enhance the quality of living in inner-city residential areas and prioritize improvements in public transport service over investments in automobile infrastructure.

As a consequence of the high density and the high accessibility of all areas in the city region, reduction of total traffic volume and high share of non-car modes could be expected. However, compaction and land-use intensification policies require thorough analysis and sophisticated solutions regarding logistics and potential interferences of non-compatible land uses(Wegener and Fürst, 1999).

[Figure 5] Compact City versus Decentralized Concentration
(BfRBS, 1996; modified)



3. Decentralized Concentration: Urban Structure of Polycentric Concentration

Basically, the decentralized concentration is a compromised urban structure to the compact city in consideration of the universal tendency of urban expansion. It implies a spatial structure of polycentric concentration, i.e. a relatively high density around suburban employment and business centers. While retaining a kernel role for inner cities, development is ideally restricted to zones adjacent to subcenters thus ensuring high accessibility of central facilities by non-car modes and preserving open spaces within the urban region. The decentralized concentration is based on the assumption that environmental problems occur only in some areas of the city; because of its patch like settlements pattern, a polycentric concentration makes an allowance for the protection of ecologically sensitive areas in an urban region. Public transport infrastructure is likely to be more evenly used throughout the urban area in a polycentric city compared to a monocentric city(Wegener and Fürst, 1999). The ideal constellation of a polycentric city involves that distances between workplaces and homes are short enough to commute mainly by walking or cycling.

The measures to achieve the city of polycentric concentration do not

differ from those of monocentric concentration except an admitted expansion of urbanized areas. However, without a resolute density control this compromised urban structure is unlikely to generate any significant effects in the face of the current dominance for a rather dispersal spatial organization of land uses. Besides, inner city center and subcenters should be linked with public transport service to reduce automobile traffic.

4. Comparison: What is Environmentally More Sustainable?

Intensive debate on the effectiveness of environmentally sustainable urban structure has been actually initiated by the EC's advocacy of the compact city in its Green Paper on Urban Environment(CEC, 1990). Some researches have found in favor of the EC solution, following detailed analysis of urban structure and energy consumption levels(Newman and Kenworth, 1989; Rickaby, 1991; Banister, 1992; Jenks et. al., 1996). Particularly in the UK, the compact city policy is advocated in numerous land use planning policy and guidance documents, although many of the arguments underpinning these policies are only derived from assertion and theory(William, 2000).

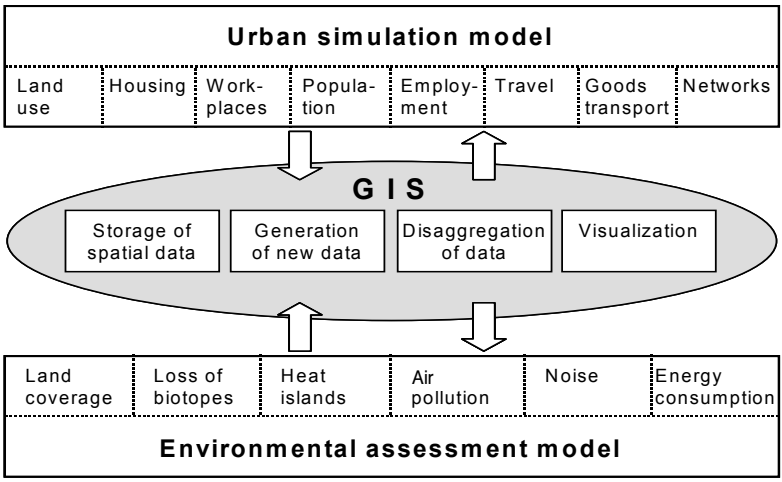
The decentralized concentration does not have its own theoretical foundation, rather, it is a compromise to the compact city derived from doubts about the chances of reversing the current counter-urbanization trend and concerns about losses of open space, biodiversity and quality of living in urban areas(Wegener and Fürst, 1999). Although this alternative urban structure is advocated by many researchers(Owens 1986; Rickaby 1987; Banister 1992; Breheny 1995; Holz-Rau et al. 1995; Kagermeier, 1998) and adopted in German planning practice as the sustainable urban structure(BfRBS, 1996), even its proper extent and level of decentralization and its adequate numbers of suburban centers have not been discussed yet.

Schmitz(1991) pointed out precisely this situation: "A settlement structure which is ideal with respect to transport is not known today. Planning paradigms such as small-scale mixed land use, promotion of inner cities through higher densities, decentralized concentration and development axes in regional planning or the development of balanced functional urban regions still have the character of catchwords. They require first to be specified in more concrete terms and second to be

assessed with respect to their efficiency and feasibility." To satisfy these requirements the environmental debate should not be handled by incremental or fragmentary approach. Instead, environmentally sustainable urban structure should be investigated in a comprehensive way with respect to urban development resulting from the relationship of land use and transport. Furthermore, all environmental indicators relevant with urban structure should be considered to totally assess their mutually contradicting effects, for example, energy efficiency versus ecological diversity.

This comprehensive view of cities as complex system requires inevitably a urban simulation model of urban land use and transport combined with a multi-criteria environmental assessment model(Wegener, 1996; Lee, 2001). Since locally important environmental indicators(for instance, open spaces, urban climate, air pollution, and noise) and their ecological and social implications(i.e. losses of biotopes and numbers of inhabitants impacted by pollutants and urban climate) require the exact spatial location of input information and output data, geographic information systems(GIS), which offer data structures for efficient linkage of coordinate and attribute data, are to be used for the model combination(Figure 6).

[Figure 6] Urban Simulation and Environmental Assessment Model based on GIS



Corresponding to the comprehensive view of urban system and its appropriate methodology, the environmentally sustainable urban structures as the alternatives of current or laissez-faire urban development should be established with concrete data specification for their land-use, transport and environmental configurations. To the data for a land use system, for instance, belong population, labor force, households, dwellings, employment and workplaces, public facilities, land use types, and topography. Their accuracies differ in various spatial units such as administrative districts, traffic zones, census tracks, and cadastral parcels. The smaller the spatial units become, the more precise the result of assessment would be, however, on the other side, the more difficult the analysis would be. To the data for a transport network system belong link type, from- and to-node, link length, link travel time, and base speed. Basic surveys of environmental indicators, such as biotopes, micro climate, air pollution, and noise emission, are necessary as a format of map to locally grasp the current state of the urban environment and to compare environmental impacts of the alternative urban structures on every location.

Compact City or Decentralized Concentration for Korean Metropolitan Areas

1. Environmental Situations in Korean Metropolitan Areas

Environmental problems have become a serious issue in the fast growing metropolitan areas of Korea. The most critical problems are the rapid expansion of built-up areas and the explosive growth in mobility. The ecosystem of these cities has become seriously damaged from the vast losses of open space and biotopes. The incessant growth in traffic demands a heavy toll in terms of air pollution, noise, energy consumption, traffic accidents, and time lost in road congestion. In comparison with other OECD countries, Korea indicates still relatively low level of traffic volume of passenger cars as a whole, although a passenger car in Korea travels absolutely longer distance(Table 3). However, Korea will certainly catch up with other developed countries in a short period, if its intensive use of cars and the rapidly growing

[Table 3] Traffic Volume of Passenger Cars and Car Ownership in OECD Countries

	Korea (1997)	Japan (1999)	USA (2000)	Germany (1998)	France (2000)
Average annual distance million vehicle-km	29,601	501,532	2,531,796	528,000	402,000
vehicle-km per car	23,433	9,802	19,118	12,700	13,800
vehicle-km per capita	626	3,950	9,202	6,428	6,826
Passenger cars per 1000 inhabitants	171	413	486	533	477

Sources: World Road Statistics(IRF), 2002; Automotive Market Data Book, 2000

[Table 4] Passenger Cars in use in Korea, 1960-2000

	1960	1970	1980	1990	2000
Passenger cars per 1000 inhabitants	0.4	1.9	6.5	48.4	171.9

Source: Ministry of Construction and Transportation, Korea

rate of car ownership would proceed continuously without any great changes(Table 4).

The urban development in Korea differs basically from that of developed countries(Kim, 1977). The cities of Korea, particularly big cities, have been expanded for the reason of housing shortage(for example, the current rate of housing supply in 1999 indicates Seoul Metropolitan Area occupying 83 percent and nationally 93 percent), while the cities of developed countries have been deconcentrated in pursuit of large residences and better living quality with nature. The suburbanization around metropolitan areas in Korea has proceeded, therefore, fast to efficiently supply new residences. This led to the poorly planned spread of scattered residential developments without the sufficient provision of public infrastructure. The leap-frogging patterns of development with small size residential land invaded agricultural land and destroyed natural environment in urban rural fringe

area. Many outer suburb residential developments, having a lack of workplaces, made commuting distance to inner city longer and aggravated road congestion. Overall, the consequence of urban sprawl results in more traffic congestion, longer commuting times, more pollution and a loss of agricultural land and biotopes.

Against this undesirable urban development in Korea many sectoral policies such as expansion of the transport network, improvement of public transport, construction of bicycle roads, and improvement of traffic and parking systems have been proposed and adopted in planning practice. However, these policies alone have not been enough to reduce the problems, because the expansion of urbanized areas and the growth in mobility reinforce each other and aggravate the environmental problems(Wegener, 1996; Wegener and Fürst, 1999; Lee, 2001). It can be rather expected that the environmental problems of the metropolitan areas in Korea may become worse in the near future in spite of these policies. Instead, it will be a more fundamental solution to alter current urban development through adopting an environmentally sustainable urban structure. Also for the metropolitan areas of Korea, there exists the question what is environmentally more sustainable: Compact City or Decentralized Concentration?

2. A Case Study for the Gwangju Metropolitan Area

In order to find a solution to the question, the feasibility of environmentally more sustainable spatial pattern of urban development for the Gwangju Metropolitan Area(GMA) was explored as a case study. In comparison with other Korean metropolitan areas(Seoul, Busan, Daegu, Incheon, and Daejon) GMA can be more adequate study area to simulate changes of urban spatial structure and its environmental consequences from its proper population size(Gwangju is the fifth biggest city in Korea) and its spatial isolation(Gwangju is the only big city out of Seoul-Busan growth axis).

For the task a transport simulation model was combined with a multi-criteria environmental assessment model. The model was used primarily to analyze the prevailing environmental problems of GMA resulting from its present urban structure. It was used further to construct three scenarios of urban structure in order to identify a sustainable spatial development for GMA: a trend scenario(toward

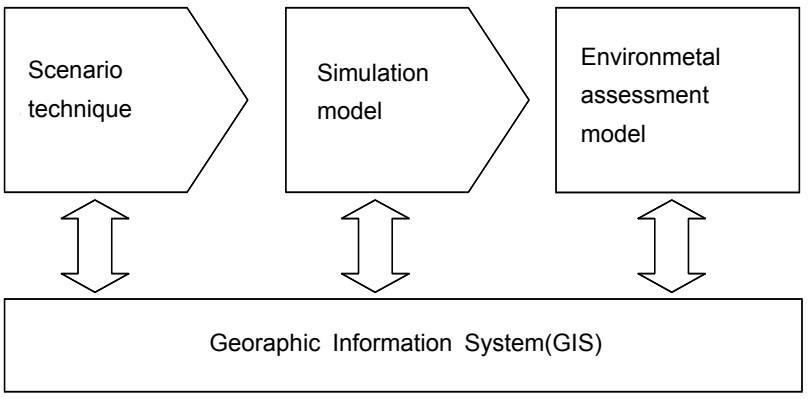
further deconcentration) and two alternative scenarios(toward Compact City and toward Decentralized Concentration). In this study the extent of spatial interaction and dispersion of location of the scenarios was represented using a format proposed by Brotchie(1984). The model was also employed to experiment with the scenarios and to compare the results with those of the scenarios in order to identify an environmentally more sustainable urban structure of GMA.

2.1 Model Description

The model used for the study is designed to experiment with different urban structure scenarios, to calculate environmental impacts of the scenarios resulting from built-up areas and vehicle mobility, and to compare the results in order to identify an environmentally more sustainable scenario. For this purpose the model consists of four components: a scenario technique, a simulation model, an environmental assessment model and a GIS. Figure 7 shows the components of the model and the exchange of data between them.

Each component of the model has a different type of database with a different spatial resolution. As an example the environmental assessment model requires micro spatial database for small-area simulation of environmental indicators. On the other hand, the zone-based transport simulation model used for the study calculates link loads based on zonal aggregate data. The model of the study takes a hybrid

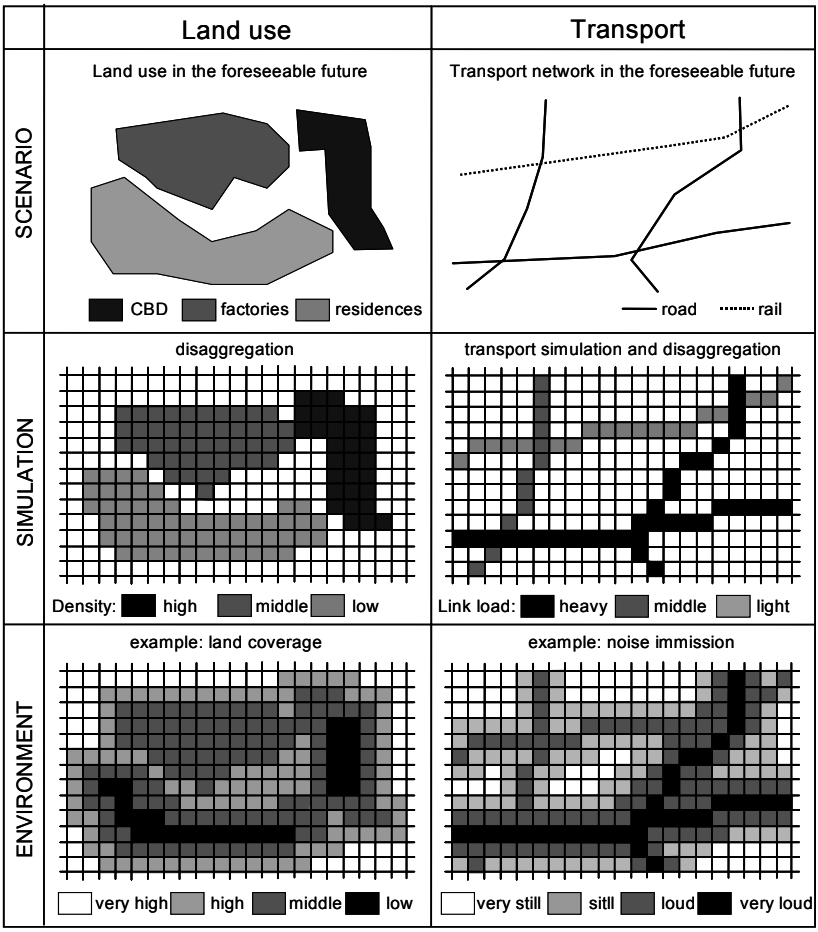
[Figure 7] Model Structure



approach using a GIS to combine these different scales. The GIS(Raster GIS) disaggregates zonal data as well as link loads to about 200,000 raster cells(size of a raster cell is 150 × 150m) of the study area. With this spatially disaggregate database the environmental submodel calculates the impacts on environmental indicators. For this purpose many intermediate programs should be developed. Each submodel subdivided into land-use and transport modul respectively has the following functions(Figure 8):

1) Geographic information system(GIS): The spatial data of the study area such as zoning system, land uses and transport networks are stored in GIS. This data can be used immediately by other submodels or processed to generate new data using analytical tools of GIS such as overlay or buffering. The raster GIS generates a disaggregate spatial data base for the environmental submodels. All other submodels display their input data and intermediate and final results using the visualizing function of GIS.
2) Scenario technique: This submodel prepares three urban structure scenarios with land use and transport modules. Three scenarios are created taking account of existing planning documents for the future of the study area, opinions of urban planning experts in GMA, and theoretical arguments on sustainable urban development. Each module of the submodel converts the assumptions of the scenarios into zonal and spatial database using a GIS.
3) Simulation model(Appendix): The transport simulation model used in this study is a zone-based model adopted from an existing urban simulation model, the IRPUD model(Wegener, 1996). This model calculates link loads in the road network based on the spatial distribution of residences, work places, schools and shops in 142 traffic zones for each scenario. The model also predicts the actual driving speeds of automobiles on each link as a function of its capacity. There is no submodel simulating the distribution and intensity of land uses. The land-use module uses external data which an authorized planning institution has already prepared for the future of the study area. These data are then modified for two alternative scenarios.

[Figure 8] Functions of Submodels



Simulation outputs are zonal aggregate data. Therefore, these data need to be disaggregated to raster cells for the environmental assessment model using a GIS.

4) Environmental assessment model: This model calculates environmental impacts resulting from link loads and actual driving speeds with respect to the spatial distribution and intensity of land uses in the zones. In contrast to some recent research on urban structure and sustainability with a few environmental indicators such as Rickaby's(1991) modeling of energy consump-

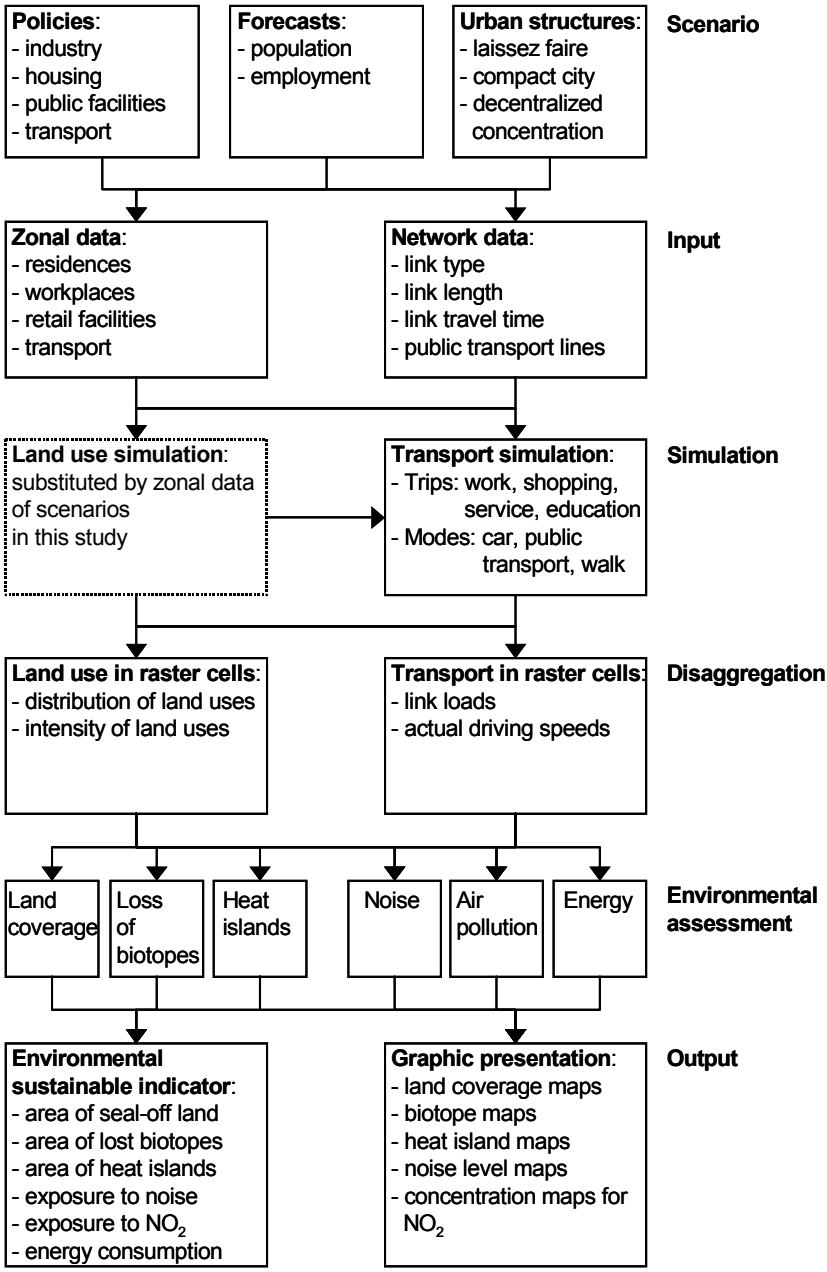
tion and urban structure, this model deals with a large number of important indicators to totally assess their mutually contradicting effects. The model calculates environmental impacts of the scenarios based on disaggregated simulation results. Its land-use module determines the amount of sealed-off land(land coverage; Appendix), effects on biotopes(loss of biotopes) and the urban climate(heat islands) resulting from the spatial distribution and intensity of land uses with respect to the existing ecological potentials of the area such as open space and biotopes. On the other hand the transport module predicts noise(Appendix), air pollution(NO_2)(Appendix) and energy consumption resulting from link loads and actual driving speeds. When calculating noise and air pollution, the spatial distribution and intensity of land uses are considered to estimate the percentage of affected population by the immissions after propagation of the indicators. For the calculation of noise and air pollution German guidelines were used(*RLS-90* for noise and *MLuS-92* and *TA-Luft* for air pollution). The calculated environmental indicators are displayed in tabular and graphic form using a GIS(visualization).

The model with the above functions is used to create different scenarios, to simulate their spatial distribution and intensity of land uses and link loads of road networks, and finally to evaluate them with respect to environmental indicators. The operation of the model is illustrated in Figure 9. In this study the model is used to analyze the prevailing environmental problems of the study area resulting from its present urban structure and to experiment with three scenarios to compare their environmental impacts in order to identify a more sustainable urban structure for the study area.

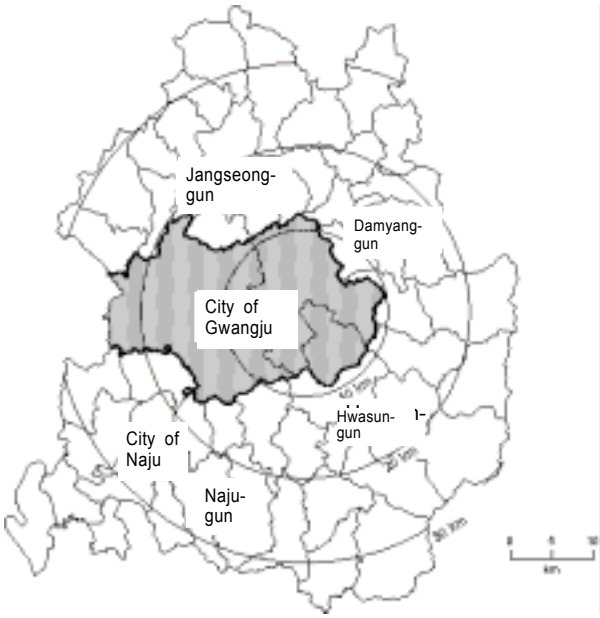
2.2 Study Area: Gwangju Metropolitan Area(GMA)

GMA is located in the south-western province of Jeollanam-do, and consists of the city of Gwangju and its five neighboring rural districts at the moment conducting the study(Figure 10).

[Figure 9] Operation of the Model



[Figure 10] Gwangju Metropolitan Area



The suburban area which is economically and culturally influenced by the city of Gwangju lies within a distance of 30km from the center of the city. This is equivalent to the 30-minute commuting-time isochrone by car from the center of the city. GMA is very compact in the core; the city of Gwangju had in 1990 a population of 1.1million and the suburban area a population of 0.4million. The whole study area is subdivided into 142 traffic zones for the transport simulation according to administrative districts.

Gwangju is the fifth biggest city in Korea. In comparison with other big cities in the country Gwangju has a relatively concentrated spatial urban structure. The central area of Gwangju contains the most important urban and regional functions such as work places, schools, hospitals, services as well as shopping centers. Many residences are located also in the central area. However, after the role of a growth pole in the province of Jeollanam-do has been assigned to Gwangju in the 'Second National Physical Plan for 1982-1991,' Gwangju has grown

fast not only in population but also in urban and regional functions.

For this reason many residents have had to move to outer suburbs because of scarcity of housing and high housing prices in the central area. This suburbanization process has been strongly reinforced by the introduction of a very compact residential form, 'apartment houses.' In addition, the service sector in the central area has been much more concentrated, while factories are more and more moving to sites in the outer urban districts of the city or in the suburban semirural districts. The rate of car ownership has increased radically. This deconcentrating spatial development together with the increasing car ownership generates much more traffic in the central area and inner and outer suburbs of GMA. Besides, GMA has currently a 'star network,' i.e. all roads and railways run to the center of the city Gwangju. This type of network aggravates the traffic congestion and transport conditions of the central area of Gwangju because of through traffic between suburbs. The transport simulation model is applied to examine all the traffic problems generated by the present urban spatial form and traffic network of GMA. According to the simulation results the main roads which connect the city center of Gwangju with the centers of suburbs are heavily loaded.

As the last step of the simulation of the present situation of GMA the environmental assessment model calculates the environmental problems resulting from the spatial distribution and intensity of land uses and link loads. According to the results the population severely affected by a noise level of more than 59dB(A) at daytime is about 5 percent (78,034 residents) of the total in the study area. The population affected by NO_2 concentrations of more than 0.16mg/m^3 for half a peak hour is about 12 percent(185,659 residents) of the total in the area. It can be seen from the graphic output of the results that the residents mostly in the city center are severely affected by the noise and NO_2. The gasoline consumption by cars for a day in the area amounts to about 49,800 liters(corresponding to 1.2tons of CO_2). The amount of land coverage is 5.7 percent(16,523ha). The ecologically valuable biotopes which are not disturbed by human activities amount to about 66 percent(191,277ha) of the area. Heat islands are areas which are scarcely ventilated and have high temperature; they amount to 0.4 percent(1,087ha) of the area.

2.3 Scenarios

According to 'The Master Plan of Gwangju for 2011' and also the opinions of the urban planning experts of Gwangju, GMA will be changed in 2011, so that the population in this area will be increased up to 2.5million and large amount of new transport infrastructures will be constructed. It can be expected that the urban structure of the future Gwangju will be much more expanded toward its suburbs. With respect to this a Trend Scenario of the most likely land use and transport policies of GMA for 2011 was developed. In contrast to this scenario, two scenarios were established: the Compact City(Scenario A) and the Decentralized Concentration(Scenario B).

Table 5 presents the combinations of land use and transport network for the three scenarios. In the Trend Scenario the accessibility within the city of Gwangju and between the city center and the centers in the inner and outer suburbs will significantly be improved. However, the accessibility of the outer suburbs will be changed only little. Corresponding to this, the residential areas will expand towards the boundary, where the accessibility is improved. In comparison with the present situation of Gwangju the residences will expand very much into the outer suburbs near the city, while new workplaces will remain

[Table 5] Urban Structure Scenarios

Scenario data	Current(1990)		Trend		Compact city		Decentralized concentration	
	Gwang-ju	Hinter-land	Gwang-ju	Hinter-land	Gwang-ju	Hinter-land	Gwang-ju	Hinter-land
Population (thousand)	1,139	381	1,595	977	2,170	402	1,595	977
Work places	336,245	20,181	851,515	102,185	924,492	29,210	576,693	377,007
Universities (students)	89,051	3,271	145,103	3,703	145,103	3,703	94,961	53,850
Hospitals (beds)	2,810	266	12,126	1,070	12,126	1,070	8,234	4,958
Transport policies	· Star road network · Lack of rail public transport		· 3 additional city ring roads · 2 additional subway lines		· 2 additional city ring roads · 5 additional subway lines		· 1 additional city ring road · 5 additional subway lines	

within the city of Gwangju except factories.

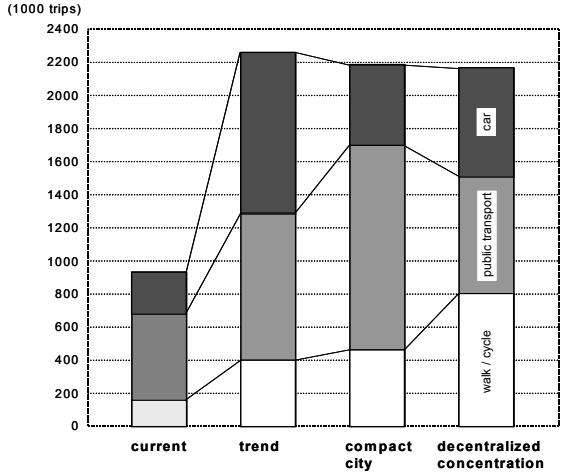
In Scenario A the accessibility within the city of Gwangju and between the city center and the centers in the inner suburbs will be remarkably enhanced. However, the accessibility of the outer suburbs and between the city center and the centers of outer suburbs will not improve much compared with the present. Only within the city the residential areas will expand especially in the inner suburbs. Therefore, the number of residences and workplaces within the city will significantly increase, while those of the outer suburbs will grow only little. This is the compact city scenario.

In Scenario B the accessibility between the city center and the centers of inner and outer suburbs will improve remarkably. Also the accessibility within the city will be enhanced but only in a limited area. The accessibility of the outer suburbs will change only little except for the centers. Corresponding to this the residential areas within the city center and the centers of inner and outer suburbs will expand significantly. Therefore, new residences and workplaces will expand mostly in these areas. This is the decentralized concentration scenario.

The transport simulation results in different numbers of trips and link loads in each scenario. The numbers of trips is also different for each transport mode(Figure 11). In the Trend Scenario the road links between the city center and centers of outer suburbs are most congested. The road links within the city, especially between the city center and the centers of inner suburbs, are also heavily loaded. In comparison with 1990, the number of trips is more than doubled. Car trips increase almost three times.

In Scenario A the road links in the entire urban region are less heavily loaded except those between the city center and the centers of inner and outer suburbs. Therefore, the number of trips in this scenario is much less than in the Trend Scenario. In comparison with the Trend Scenario walking and cycling trips increase significantly, whereas car trips increase much less. In Scenario B the road links between the city center and the centers of outer suburbs are congested as in the Trend Scenario. However the number of total trips is less than in the Trend Scenario and greater than in Scenario A. Car trips increase as in the Trend scenario. However, the mileage traveled by cars is much less than in the Trend Scenario. This means that most of the car trips in Scenario B are generated within the city.

[Figure 11] Comparison of Trips by Modes



[Figure 12] Comparison of Spatial Structures

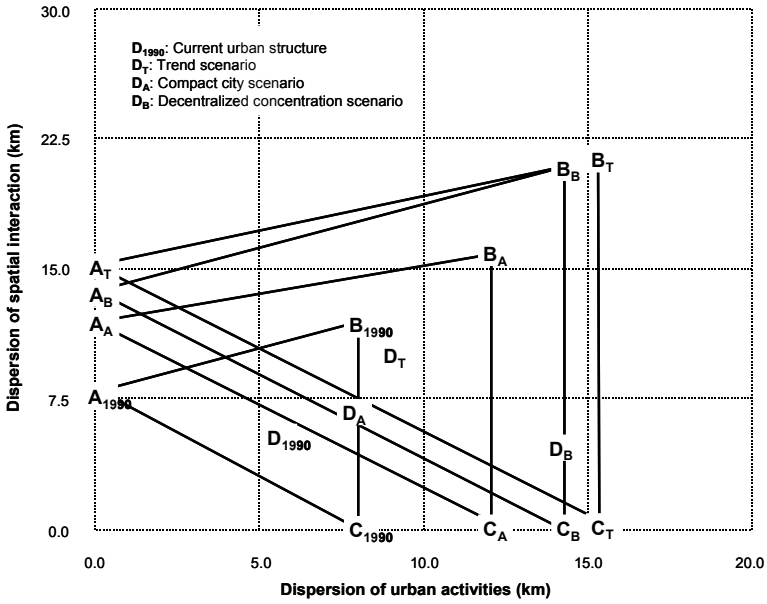


Figure 12 represents the spatial structure for the present situation of GMA and the three scenarios using Brotchie triangle. According to this the present situation of GMA(point D_{1990}) lies almost in the middle of the triangle. Point D_T of the Trend Scenario moves towards point B_T(more dispersed location and longer travel distances). The size of the triangle of the Trend Scenario is almost twice as large as in 1990. Point D_A of Scenario A moves also towards point B_T but lies on the left and below point D_T(less dispersed location and shorter travel distances than in the Trend Scenario). The size of the triangle of Scenario A is much smaller than that of the Trend Scenario. Point D_B of Scenario B lies on the right and below point D_T(more dispersed location and shorter travel distances than in the Trend Scenario). The size of the triangle of Scenario B is a little smaller than that of the Trend Scenario.

2.4 Results: Compact City or Decentralized Concentration?

Finally all scenarios were investigated by the environmental assessment model with respect to its environmental impacts on residents and local resources. As expected, the environmental problems of GMA in the future will be severely aggravated by the enormous expansion of built-up areas and the corresponding explosive growth in mobility. The results of the environmental calculations of the scenarios are summarized in Table 6. As an example, noise immissions are presented in Figure 13 comparing the three scenarios.

The differences between environmental impacts of the three scenarios are presented in Figure 14 by comparing them with the present situation. All environmental indicators will increase by the year 2011. However, the extent of change is very different for each indicator. For example heat islands increase very much in Scenario A because a large noise immissions do not change with a small difference of traffic loads, part of development takes places in compact high-density form, whereas they change only little in the Trend Scenario and Scenario B, which have a dispersed spatial structure. The reason for these extreme differences lies in the small amount of heat islands in 1990. Therefore, heat islands should not be given too much weight in the evaluation of sustainable urban structure of GMA. Noise and biotopes have a narrow spectrum of change. From the logarithmic function of noise emission whereas NO_2 concentrations change very much even with a difference.

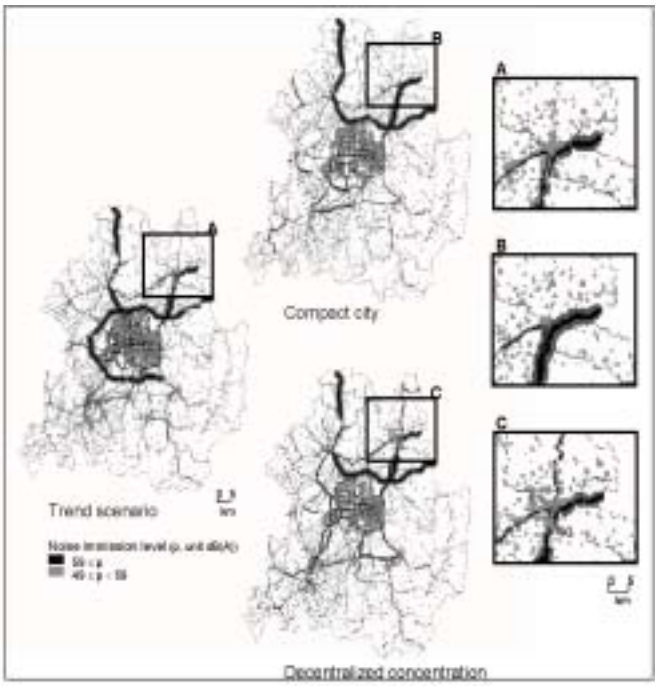
[Table 6] Summary of Environmental Calculation Results

Environmental indicator	Impact values	1990	Trend scenario	Compact city	Decentralized concentration
Noise	Exposure to noise(person): over 59dB(A) 6:00-22:00	78,034	137,214	129,626	128,576
Air pollution (NO_2)	Exposure to NO2(person): over 0.16 mg/m^3, 98% level, 30 min.	185,659	312,103	201,794	159,301
Energy consumption	Energy consumption from car traffic (litter/day)	49,766	122,575	76,498	57,180
Land coverage	Area of sealed-off land(ha)	16,523	28,084	25,598	27,380
Loss of biotopes	Area of biotopes(ha)	196,531	176,056	179,879	188,557
Heat islands	Area of heat islands(ha)	844	2,093	2,651	1,166

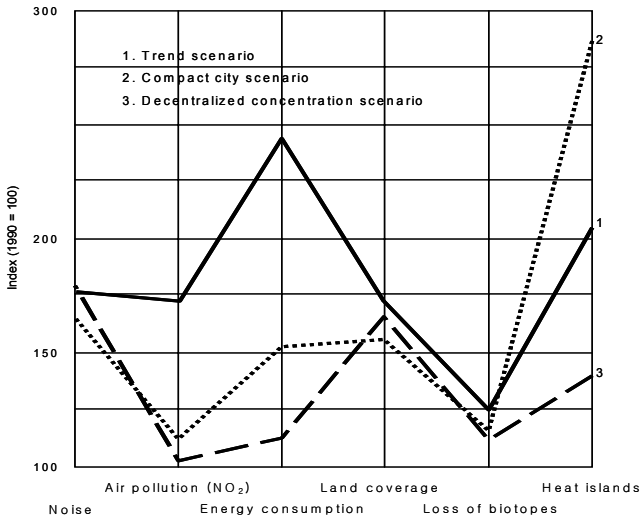
Loss of biotopes does not play an important role in this study area because the expansion of residential areas takes places mostly on arable land which is not an ecologically valuable biotope because of its chemical pollution.

The scenarios can be now compared with respect to the changes of the impacts on environmental indicators to find a more sustainable spatial urban structure of Gwangju. For this the curves of the environmental indicators of the three scenarios are compared in Figure 14. The figure shows the rank of the scenarios for the sustainable spatial development for Gwangju; Scenario B takes the first rank, Scenario A the second and the Trend Scenario the last rank. Thus, the urban structure of decentralize concentration is the most sustainable spatial development for GMA.

[Figure 13] Example: Noise immissions



[Figure 14] Comparison of Environmental Indicators



Policy implications

Since urban environmental problems occur from very complicate processes of urban development, a complex simulation model was required to investigate the impacts of urban environmental indicators from the urban development. The model described in this paper was used to analyze the prevailing environmental problems of GMA and to evaluate its environmental problems that will be caused by the increase in population and the changes in urban structure in the future. It was possible to analyze the environmental problems resulting from different combinations of land use and transport policies. The environmental assessment model calculates the impacts on six environmental indicators which could be affected by the policies of the urban structure scenarios. Therefore it was possible to compare the results of the scenarios in order to identify environmentally more sustainable urban structure for GMA. The result of the simulation can be adopted directly in the spatial development policies of Gwangju to reduce environmental problems and also can be used to define its ultimate sustainable urban structure in consideration of economic and social sustainability.

In the future, the urban development of GMA as well as its impacts on the environment should be monitored periodically, because urban structure is continuously changing from a new trend of urban development. To enhance its environmental sustainability the urban structure policies of GMA should continuously be adjusted according to the observation of its spatial development. The model can be used further for this intention. On the contrary, the observation can contribute to improving the model in its accuracy and efficiency.

In addition, the model used in this study is also applicable to the other metropolitan areas in Korea and to those in other countries as well. In this regard, the model should be modified in consideration of their urban development situations.

References

Alberti, M. "Urban form and ecosystem dynamics: Empirical evidence and practical implications." In Williams K., Burton, E. and Jenks, M.(eds.), *Achieving Sustainable Urban Form*. Spon Press, Taylor & Francis Group: London and New York, 2000.

Banister, D. "Energy use, transport and settlement patterns." In Breheny, M. J.(ed.), *Sustainable Development and Urban Form*. European Research in Regional Science 2, London: Pion, 1992: 160-181.

Breheny, M. J. "Sustainable development and urban form: An introduction." In Breheny, M. J.(ed.), *Sustainable Development and Urban Form*, *European Research in Regional Science* 2. London: Pion, 1992a: 1-23.

Breheny, M. J. "The contradictions of the compact city: a review." In Breheny, M. J.(ed.), *Sustainable Development and Urban Form*. European Research in Regional Science 2, London: Pion, 1992b: 138-159.

Breheny, M. J. "Counterurbanisation and sustainable urban form." In Brotchie, J. F., Batty, M., Blakely, E., Hall, P., Newton, P.(eds.), *Cities in Competition, Productive and Sustainable Cities for the 21st Century*. Melbourne: Longman, 1995: 402-429.

Brotchie, J. F. "Technological change and urban form." *Environment and Planning A* 16, 1984: 583-596.

BfRBS(Bundesministerium für Raumordnung, Bauwesen und Städtebau). *Raumordnung in Deutschland*. Bonn: BfRBS, 1996.

CEC(Commission of the European Communities). *Green Paper on the Urban Environment*. Luxembourg: Commission of the European Communities, 1990.

Cervero, R. "Jobs-housing balance revisited: Trends and impacts in the San Francisco Bay Area." *Journal of the American Planning Association,* Vol. 62 No. 4, 1996: 492-511.

DoE and DoT Reducing Transport Emissions through Planning. *Planning research programme*. Department of the Environment and Department of Transport, London: HMSO, 1993.

EC COST Action 616: "Land-use Planning for Urban and Regional Air Quality." *EUR 18327 EN*, Luxemburg: EC, 1998.

Hayashi, Y. "Economic development and its influence on the environment: Urbanization, infrastructure and land use planning systems." In Hayashi, Y. and Roy, J.(eds.), *Transport, Land-use and the Environment*. Dordrecht, Boston, London: Kluwer, 1996: 103-124.

Holz-Rau, C. and Kutter, E. "Verkehrsvermeidung, Siedlungsstrukturelle und organisatorische Konzepte." *Materialien für Raumentwicklung* 73. Bonn: BfLR, 1995.

Jenks, M., Burton, E. and Williams, K. *The Compact City: A Sustainable Urban Form?* E & FN Spon, an imprint of Chapman and Hall: London, 1996.

Kagermeier, A. "Siedlungsstruktur und Verkehrsmobilität." *Eine empirische Untersuchung am Beispiel von Südbayern*. Dortmund: Dortmunder Vertrieb für Bau- und Planungsliteratur, 1998.

LT, ME & P, MECSA, IRPUD and TRT SPARTACUS. "System for Planning and Research in Towns and Cities for Urban Sustainability." Final report, Helsinki: Commission of the European Communities DGXII, 1998.

Newman, P. and Kennworth, J. "Cities and Automobile Dependence." *An International Source-book*, Aldershot: Gower Technical, 1989.

Owens, S. *Energy Planning and Urban Form.* London: Pion, 1986.

Rickaby, P. A. "Six settlement patterns compared." *Environment and Planning B,* 14, 1987: 193-223.

Rickaby, P. A. "Energy and urban development in an archetypal English town." *Environment and Planning B,* 18, 1991: 153-179.

S., Lee. "Umweltverträgliche Stadtentwicklung für Gwangju: Alternative Strukturen der Nachhaltigkeit für eine Stadtregion in Südkorea." *Dortmunder Beiträge zur Raumplanung* 94, Dortmund: Universität Dortmund, 2001.

Schmitz, S. *Minderung von Schadstoff- und CO2-Emissionen im Straßenverkehr-eine Herausforderung für Raumordnung und Städtebau, Informationen zur Raumentwicklung* 1/2, 1991: 1-18.

Van den Berg, L., Drewett, R., Klaassen, L. H., Rossi, A., and Vijverberg, C.H.T. *Urban Europe: A Study of Growth and Decline.* Oxford: Pergamon, 1982.

W. A., Kim. "Locational Analysis of New Towns for Korea." *Journal of East and West Studies*, Oct. 1977.

WCED(World Commission on Environment and Development). *Our Common Future.* Oxford, New York: Oxford University Press, 1987.

Wegener, M. "Reduction of CO_2 emissions of transport by reorganisation of urban activities." In Hayashi, Y. and Roy, J.(eds.), *Transport, Land-use and the Environment.* Dordrecht, Boston, London: Kluwer, 1996: 103-124.

Wegener, M. "Applied models of urban land use, transport and environment: State of the art and future developments." In Lundqvist, L., Mattsson, L, and Kim, T. J., *Network Infrastructure and the Urban Environment.* Advances in Spatial Systems Modelling. Berlin: Springer, 1998: 245-267.

Wegener, M. and Fürst, F. "Land-Use Transport Interaction: State of the Art." *Berichte aus dem Institut für Raumplanung* 46. Dortmund: Universität Dortmund, 1999.

Webster, F. V., Bly, P. H. and Paulley N. J. *Urban Land Use and Transport Interaction: Policies and Models.* Aldershot: Avebury, 1988.

William, K. "Does intensifying cities make them more sustainable?" In Williams, K. Burton, E. and Jenks, M.(eds.), *Achieving Sustainable Urban Form.* Spon Press, Taylor & Francis Group: London and New York, 2000.

Wittig, R. and Sukopp, H. "Was ist Stadtökologie?" In Sukopp, H. and Wittig, R.(eds.), *Stadtökologie.* Stuttgart: Gustav Fischer, 1993.

Appendix

1. Transport Simulation Model

A combined spatial interaction and modal choice model is

$$t_{gijm} = \sum_{k} A_{gki} B_{gj} O_{gki} D_{gj} \exp[\beta_g u_{ijm}] \tag{1}$$

where

- t_{gijm} are trips made by household for trip purpose g from i to j using mode m
- O_{gki} is the number of such trips originating in i with car availability k(k=1: car available, k=2: no car available)
- D_{gj} are trip destinations for that kind of trips in zones j
- u_{ijm} are trip utilities as one single measure for costs and benefits of trips.

A_{gki} and B_{gi} are balancing factors ensuring that the origin and destination constraints are satisfied:

$$A_{gki} = 1/ \sum_{j, m \in M_k} B_{gi} D_{gj} \exp(\beta_g u_{ijm}) \tag{2}$$

$$B_{gj} = 1/ \sum_{ik, m \in M_k} A_{gki} O_{gki} \exp(\beta_g u_{ijm}) \tag{3}$$

where M_k is the subset of modes accessible with car availability k.

The trips t_{gijm} calculated above are assigned to links l of network m such that the flow volume v_{ml} of link l in m is

$$v_{ml} = \sum_{gij} \delta_{ijml} t_{gijm} \tag{4}$$

where

$$\delta_{ijml} = \begin{pmatrix} 1 & \text{if} \quad l \in r_{ijm} \\ 0 & otherwise \end{pmatrix} \tag{5}$$

and r_{ijm}={l_1, l_2, ..., l_R} is the current minimum path in network m from i to j.

To consider road capacity restraint road network link travel times

that correspond to link flow volumes v_{ml} are calculated. A speed-flow relationship is used to adjust link travel time of congested road links:

$$t_l = t_{ol}\left\{1+\rho\left[\frac{v_l}{q_l h_p o_c}\right]^{\phi}\right\} \tag{6}$$

where

t_l is the adjusted travel time on link l
t_{ol} is the uncongested travel time on that link
v_l is the volume of car trips on such link during the

peak period

q_l is its capacity per hour
h_p is the length of the peak period in hours
o_c is average car occupancy.

2. Noise Propagation Model

The model applied in a raster framework calculates the noise emission of a raster cell:

$$L_{Ei} = 37.3 + 10 \quad \lg[M_i(1+0.082P_i)] + D_{vi} \tag{7}$$

where

L_{Ei} is noise emission in dB(A)
M_i is traffic load in vehicles/hour
P_i is percentage of trucks
D_{vi} is speed correction factor in dB(A)
i is emission raster cell.

Traffic load, percentage of trucks and the speed for the raster cells are inputs from the transport simulation model. The speed correction factor D_{vi} contains the adjustments to other speeds than 100 km/h.

The resulting noise level at a receptor raster cell is calculated:

$$L_j = L_{Ei} + D_{li} + D_s + D_B \tag{8}$$

where

L_j is noise level at a receptor raster cell during daytime
D_{li} is correction factor for segment length(= cell length): $Dl = 10\ lg(l)$ in dB(A)
D_s is noise level change due to distance s and air absorption between emission cell i and receptor raster cell j in dB(A)
D_B is noise level change due to buildings causing multiple reflection and noise abatement in dB(A)
j is receptor cell.

The distance effect for noise level change is calculated:

$$D_s = 11.2 - 20 \quad \lg(s) - 0.005s \tag{9}$$

The correction factor for buildings is calibrated for combinations of land use categories as well as population and employment densities which are available for all raster cells.

For each emission cell, the noise levels at all potential receptor raster cells are calculated. For the cells the calculated single noise level from all emission cells is summed up to give the resulting noise level L_{tj}:

$$L_{tj} = 10 \quad \lg \sum_i 10^{0.1 L_{ij}} \tag{10}$$

3. Air Pollution Dispersion Model

The model applied also in a raster framework calculates the emission of an air pollutant(NO_2) of a raster cell:

$$Q_i = 0.001 M_i E_i l_i \tag{11}$$

where

Q_i is the amount of emission of the emission raster cell i in kg/hour
M_i is traffic load in vehicles/hour
E_i is the factor of the emission in g/car-km
l_i is segment length(= cell length) in km.

The air pollution dispersion model is a Gaussian model. The concentration of the air pollutant at a receptor raster cell coming from on emission cell is calculated:

where

C is concentration in mg/m^3
x,y,z are coordinates of the receptor raster cell, x points at the wind direction, y constitutes the horizontal coordinate perpendicular to the wind direction, z is the height of the receptor point. The emission source is at x=0, y=0 with the ground at z=0
h is height of the virtual plume axis at x in m depending on meteorological parameters
σ_y is horizontal dispersion parameter of the Gaussian distribution depending on meteorological parameters
σ_z is vertical dispersion parameter of the Gaussian distribution depending on meteorological parameters
u_h is wind velocity in m/s.

The dispersion model is applied sequentially to all emission raster cells. The concentrations in a receptor raster cell originating from different emission raster cells are summed up.

$$C(x,y,z) = \frac{10^6}{3600} \frac{Q}{2\pi u_h \sigma_y \sigma_z} \exp\left(-\frac{y^2}{2\sigma_y^2}\right)\left[\exp\left(-\frac{(z-h)^2}{2\sigma_z^2}\right) + \exp\left(-\frac{(z+h)^2}{2\sigma_z^2}\right)\right] \quad (12)$$

4. Land Coverage Calculation Functions

Based on the basic land use categories as well as population and employment in a raster cell, the percentage of sealed land g_i of the raster cell i is calculated according the empirical functions of land-use

densities d_i. These functions, for residential, mixed-use, and industrial areas respectively, are estimated by relating building types to typical densities and by using German sources on the relationship between building types and sealing.

For residential areas

$$g_i = \begin{cases} 10\, d_i^{0.418} \exp(-8.99\ 10^{-4.13} d_i) & \text{if} \quad 0 < d_i \leq 500 \\ 98 & \text{if} \quad d_i > 500 \end{cases} \tag{13}$$

For mixed-use areas

$$g_i = \begin{cases} 56.5(0.25 d_i)^{0.121} \exp(-2.322\ 10^{-4.41} d_i) & \text{if} \quad 25 < d_i \leq 600 \\ 98 & \text{if} \quad d_i > 600 \end{cases} \tag{14}$$

For industrial areas

$$g_i = \begin{cases} 60 & \text{if} \quad 0 < d_i \leq 20 \\ 18.1\, d_i^{0.419} \exp(-8.85\ 10^{-3.55} d_i) & \text{if} \quad 20 < d_i \leq 100 \\ 99 & \text{if} \quad d_i > 100 \end{cases} \tag{15}$$

백면

11 State-developed Housing Sector and Low-income Housing Policies

Seong-Kyu Ha

Introduction

Regardless of the political philosophy underlying housing provision, most governments face a relatively similar set of basic issues. The majority of countries agree that they share most, if not all, of the following types of housing issues: substandardness, inequitable distribution of supply, needs of special groups and the very poor, segregation and discrimination, affordability, and local market imperfections.

The resolution of these issues, in turn, mirrors each society's political and social philosophy. In Korea, the government recognizes three major purposes for public intervention in the private market, even if intervention is approached reluctantly: sufficient supply of housing; adequate quality of dwelling; and housing security.

One of the most common responses of governments in many developed countries to the apparent inability of the private market to produce housing for all, in sufficient quantity, quality and at reasonable prices, was to intercede directly by constructing public housing. In the late 1980s, comprehensive housing development planning by the central government of Korea was instituted to determine the extent to which national resources should be allocated to public housing development for the poor. A permanent public rental dwelling programme was launched in 1989, and represented the beginning of a social housing tradition directed to low-income households in Korea. But the social

housing policy has changed in line with the importance of market forces since the Kim Youngsam government took the power in 1993. Since the mid 1990s, the social housing programme has stopped and the emphasis of the public sector has been on state-developed housing for sale rather than the provision of rental accommodation.

The Korean government has played a large and increasing role in almost all aspects of housing production and consumption. The rationale for government intervention in housing has generated a lengthy debate on the relationship between political structures and the established housing system. The purpose of this paper is to examine the role of the state for the low-income group and to explore the state-developed housing sector[1] and the low-income housing policy issues. How has the Korean government reacted to urban low-income housing problems? Who benefits from the state-developed housing programmes and who loses? What are the alternatives?

Housing Situation in Urban Korea

It will be useful here to lay out some of major themes of the discussion involved. Three housing issues are readily identifiable: housing quantity, quality, and security. During the past four decades, rapid growth of income and urban population resulted in a strong demand for urban land and housing. On the other hand, the supply of developable land and housing did not keep pace with demand due to rigid regulatory system governing land use convertsion. Naturally, prices of urban housing and land rose much faster than other prices.

The imbalance between the total number of households and the total housing stock is often referred to as the great housing shortage in Korea. The quantity of housing has always been below the number of households(Table 1). The housing shortage has been particularly acute

1) Traditionally, 'state housing' has meant housing that was built, owned, and managed by national or local governments(or by a non-profit housing association). In Korea, the scope of the state-developed housing is somewhat different, and can be divided into three categories: housing owned and managed by the Korea National Housing Corporation or local governments; housing built by the corporation or local government for sale; and rental housing constructed by private companies with loans from National Housing Fund.

in the urban areas because of the accelerating urbanization ratio, which drastically increased from 50.9% to 87.4% in the period of 1975-2000. The housing stock in the cities increased annually by more than 5% in the 1960s and 1970s, but this was insufficient to meet the demand from the more rapidly increasing number of urban households. One of important demographic characteristics in Korea is the higher rate of household increase than that of population growth.

Certainly the most common concern expressed in the popular press is that of increasing housing prices and rents. This in turn raises the difficult question of the distribution or incidence of such increase: who suffers and who now has a problem in "affording" housing?

We have experienced a rapid increase in housing prices. The housing price index increased much faster than the wholesale price index between 1965 and 2000. In the 1980s, housing prices increased rapidly. Apartment prices in Seoul were more than doubled between December 1987 and March 1989(Daily Economic News, Dec. 12, 1987). The housing price to income ratio(PIR) measured for the Seoul metropolitan region was estimated at 6.3 in 1997, which is consistently higher than the worldwide average figure of 5.2. The rent to income ratio(RIR) is also extremely high, being measured at 27%, as compared to the world wide average value of 18%(Ministry Of Construction and Transportation and Korea National Housing Corporation, 1999: 29).

Considering that about 60% of citizens cannot own houses in Seoul, rents and housing prices are not always positively correlated in Seoul. The prices of the *Jeonse*[2]) had continuously increased even housing prices slowed down between 1991 and 1995. Owner-occupancy is the traditional form of housing tenure in Korea. The proportion of owner occupancy in the country as a whole has declined from 79% in 1960 to 54.2% in 2000. This decline was mainly limited to urban areas where it fell from 62% in 1960 to 46.4% in 2000. It is likely that financing problems have been an important cause of decreased owneroccupancy. As land values have skyrocketed, savings and other sources of finance for owner-occupied homes have become less adequate. The majority of the Korea Housing Bank's mortgage loans are tied to specific deposits.

---

2) Jeonse is a rent system in which the tenant pays a lump sum to the landlord and gets the money back when he/she leaves. The earned interest on the Jeonse constitutes the landlord's rental income.

[Table 1] Housing Supply Ratio and Housing Tenure in Korea(1975-2000)

(Unit: %)

		1975	1985	1995	2000[1]
Housing stock vs. households ratio(%)	Whole nation	74.4	69.8	86.0	94.1
	Seoul	56.3	58.3	68.0	71.7
Housing tenure type	Owner Occupied	63.1	53.6	53.3	54.2
	Jeonse	17.5	23.0	29.7	28.2
	Bojeungbu-wolse[2]	-	10.1	10.3	10.7
	Wolse and Sakwolse[3]	15.6[4]	9.7	4.2	4.1
	Others	3.3	3.7	2.5	2.8
	Total	100.0	100.0	100.0	100.0

Notes: 1) Advanced Report of 2000 population and Housing Census, National Statistical Office, 2002

2) This is a kind of security deposit with monthly rent. At the beginning of the contract period, the tenant makes a refundable deposit, but pays a monthly rent. In case of non-payment, the rent is deducted from the deposit

3) Wolse is the monthly rent system, which is the ordinary system, found in most countries. Sakwolse is a type of the declining Jeonse. The tenant makes a one-time deposit from which a given amount is deducted. Hence the total amount of rent is the deducted amount plus interest earned on the remaining deposit

4) included Bojeungbuwolse

Sources: Korea Housing Bank, *Housing Economic Data Book*, Seoul: KHB, 1990; Economic Planning Board, *Population and Housing Census Report*, Seoul: EPB, 1987; National Statistical Office, *Population and Housing Census Report*, Seoul: NSO, 2002; Ministry of Construction and Transportation & Korea National Housing Corporation, 2001

Despite many measures to improve housing supply and quality over the past several decades, housing remained a persistent and divisive social issue in Korea even before the International Monetary Fund(IMF) crisis period.[3] Prior to the crisis, this divisiveness arose

3) Korean economic growth stagnated and an International Monetary Fund(IMF) bailout was required in 1997. The impact of the crisis on the economy was

because the inequitable distribution of housing became even more prominent as overall prosperity increased. After the crisis the poor have suffered more than other group. In the wake of Korea's IMF crisis, and of a housing crisis that has persisted for years, the roles of the public and private sectors in housing should be clearly differentiated.

By almost any yardstick that one cares to use, the overall quality of the housing that we consume has increased substantially since the 1980s. As shown in Table 2, the sustained economic growth since the 1970s has been accompanied by improved housing quality. The average dwelling size increased rapidly, while the proportion of dwellings equipped with modern kitchens and flush toilets steadily increased. Average persons per room decreased from 2.2 in 1980 to 0.9 in 2000; and per capita floor space increased from 10.2m^2 to 20.1m^2 in 2000.

In 1980, only 18.4% of housing units in the country had internal flush toilets, while the ratio increased substantially as 86.9% in 2000. The conventional facilities, such as a private pit latrine, appear to be the commonest alternative in rural areas and substandard residential areas. On the other hand, bath facilities with hot water are popular in whole nation. About 87% of housing units in Korea equipped by a bath with warm water(Table 2).

Despite the overall improvement in housing quality, many substandard dwellings still remain. According to the Korea National Housing Corporation(KNHC), 34% of the housing stock in 1995 did not meet the minimum standard for housing[4](MOCT and KNHC, 1999: 140

---

severe. The won has depreciated dramatically. Many workers have lost their jobs and the number of homeless has increased. The standard of living has declined substantially and the situation portends a more difficult life for the majority of the population for years to come. The urban poor have suffered more than any other group(Ha and Lee, 2001). The economic contraction has affected the lives of the poor in many areas: falling incomes, rising absolute poverty and malnutrition, declining public services, threats to educational and health status, increased pressure on women, and social tension.

4) The housing minimum standard set by the government is based on three categories:
① minimum floor space(adequate space and privacy), for example, a dwelling floor space area for a household with 4 persons must exceed 37m^2,
② facilities(provision of basic services): housing lacking basic services and facilities such as water supply, electricity, sewerage, etc., are below standadard, and
③ structure and environment: housing with poorly built structures such as

[Table 2] Housing Service Level(1980-2000)

Characteristics	1980	1990	2000
Average Size of Dwellings(m^2)	68.3	80.5	81.5
Per Capita floor Area(m^2)	10.2	13.9	20.1
Persons per room	2.2	1.5	0.9
Households per housing unit	1.5	1.6	1.3
Modern Kitchen(%)	18.2	52.4	93.9
Flush Toilet(%)	18.4	51.3	86.9
Electricity(%)	98.0	100.0	100.0
Hot water(%)	22.1	34.1	87.4
Piped water(%)	56.1	74.0	86.1[1)]

Notes: 1) 1999

Sources: Economic Planning Board. *Population and Housing Census Report*, 1970-1990; E, Mills and B. N. Song, *Urbanization and Urban Problems*, Cambridge: Harvard University Press, 1970: 9

-142). Dwelling unit size is conventionally defined as the number of rooms or floor area. In one of the squatter settlements(a typical vinyl hut settlement) in 2000 the average number of rooms was 1.6 and the average floor area per dwelling was 29.2m^2, both of which were much smaller than the average for Seoul. These housing conditions fall below a level that most people would consider tolerable, or comfortable. These residents of squatter settlements endure a severe lack of basic services.

Since the early 1980s the urban redevelopment programs, particularly Joint Redevelopment Program(JRP), have dominated evictions. This program encouraged large construction companies, in cooperation with house-owners and national and local government officials, to clear and rebuild areas occupied by the urban poor. During the 1980s, many urban poor were evicted, but only 10% were admitted to the new housing that replaced their homes. The government usually justifies evictions in two ways: 'beautify' or 'improve' the city[5)] and 'redevelop-

tents, communal huts and barracks using inadequate building materials are below standard.

ment project.'

The justification for evictions is to clear substandard areas for new construction, such as public works projects and high-rise apartments. If settlements are judged to be illegal — even if they have been there many years — it is a convenient excuse to bulldoze them with no compensation paid to former inhabitants. Landowners or developers can make very large profits from redevelopment projects. The JRP has destroyed the poor communities and most of the renters in redevelopment districts are vocal in their complaints on oppressive physical removal and tenant eviction(Ha, 2001: 391-392). As a result of these evictions many people are forced to pay a higher price for a smaller space; communities are broken; family life suffers; people lose access to jobs and their children cannot attend schools. According to the Korea National Housing Corporation's survey of the urban poor as defined by the Poverty-Relief Program, over 18% of the urban poor in Seoul had one or more experiences of eviction as a result of demolition (KNHC, 1989: 30-56)

When evictions are unavoidable there must be available adequate alternative housing providing services and conveniences equivalent to the evictee's present housing, and the evictee should be part to the agreement on alternative housing. We shall seek the encouragement of the active participation of public, private and non-governmental partners at all levels to ensure legal security of tenure protection from discrimination and equal access to affordable adequate housing for all persons and their families.

The Role of State for the Housing Poverty Group

1. Why does the State Intervene?

According to classical economic theory, it was assumed that a free market regulated by the price mechanism would provide all the housing that was needed. Private builders supported this concept, arguing

5) For instance, a major eviction program in Seoul took place prior to the 1988 Olympics(UNCHS, 1996: 245).

that the less government involvement the more opportunity for freedom of choice; but the actual motivation was less complicated: *laissez faire* meant more profit. Free market theory economists continue to assert that purchase price and rent as regulatory devices maximize production and are conducive to a greater distributive justice than arbitrary decisions effecting the market made by deliberative bodies.

Since family size in the lower end of the income curve was larger than the upper end, the housing was not suitable for many poorer families. Actually with land prices out of control, with building labor protecting its interests and with costs rocketing, private enterprise construction of new housing at a price within the means of low or moderate wage-earners was impossible. The government intervention therefore became axiomatic in Korea, especially during the late 1970s and 1980s, and the only questions remaining in Korea were how much housing should be provided by government aid, of what kind, at what level, where would the money come from specifically, and who would control it?

Public housing programmes became popular with many governments in the North and South during the 1950s — although for different reasons. In Asia, where most countries had long had independence, public housing programmes were a response to rapidly growing city populations. During the 1980s, the scale of support for public housing programmes diminished in most countries with market or mixed economies. The reaffirmation of the importance of market forces influenced this in many countries — particularly in the United Kingdom, the United States, and East and Central Europe. The most dramatic declines in public-housing construction and in public-sector rental housing are evident in East and Central European countries. The privatization of the state housing stock may be the single most distinguishing feature of the transition in these countries.

Few governments now have large public-housing programmes building rental accommodation and in most countries where there had been large public-housing stock have been sold or at least the tenants of such stock encouraged purchasing it. In some countries, this change dates back to the late 1970s. For instance, a considerable proportion of the public housing in Singapore and Hongkong has been sold to meet the demand of the potential buyers.

On the contrary, a social housing(permanent public rental dwelling)

programme was launched in the end of 1980s. These efforts reflect not only the acute housing shortage in urban areas, but also as filling more of a welfare function for the low-income group. In the late 1980s, comprehensive housing development planning was instituted to determine the extent to which national resources should be allocated to public housing development for the poor.

We now explore the evolution of Korean housing policy briefly, considering how the government has coped with housing problems within a rapidly changing economic, social and political environment. As shown Table 3, the evolution of Korean housing policy broken into five-year sub-periods, which correspond, to a series of five-year economic development plans(K-H, Kim, 1998; KNHC, 1997; Ha, 2001).

During the period(1962-1972), housing policy can be characterized by the term *laissez faire*. The housing sector, however, was given a low priority in the allocation of financial resources. The housing authorities failed to tackle low-income housing problems until the early 1970s. It was clear that, given limited public spending and under the circumstances of massive in-migration, public intervention in housing was not only ineffective but also inefficient. During 1962-1972, the first priority in the national planning has been economic development rather than social policy, particularly housing for the poor.

The second period of housing policy(1972-1981) can be characterized by emergence of supply-driven housing policy and direct government intervention in housing market. Rapid urbanization and industrialization since the 1960s let to aggravated housing shortages, particularly in urban areas. The government began to recognize housing as a key objective of economic and social policy. The First Ten-Year Housing Construction Plan(1972-1981) set a target for the completion of 2.5 million housing units within 10 years, accompanied by slogan such as 'one house for one household.' Because of limited housing resources, private and public house builders could not supply enough houses to accommodate the increase number of households. As a result, housing prices increased continuously. In order to make housing affordable, the government introduced the price ceiling on new houses in 1977. The ceiling price and the Housing-Related Saving Scheme were first confined to the apartment units constructed by the public sector of 85 sq. m size or less in 1977, and were then extended to private sector apartments in 1982. The extension of the ceiling price increased effec-

[Table 3] The Evolution of Housing Policy

Period	Characteristics of polices	Housing programs & housing policy related laws
1962-1971	Low priority to housing & l*aissez faire*	· Establishment of KNHC(1962), Housing policy division, MOC(1963), Korea Housing Bank(1967)
1972-1981	Supply-driven policies & government intervention	· Housing construction promotion act(1972) · Ten-year housing construction plan(1972) · Urban renewal act(1976) · Anti-speculation measures
1982-1986	Housing renewal & ceiling price system	· Joint redevelopment project(1983) · Rental housing production act(1984) · Ceiling price on new apartments(1982)
1987-1992	Mass housing production & new town development	· 2 million New Dwelling Plan(1988-92) · 5 New Towns development in the SMR(1989)
1993-2001	Piecemeal deregulation & IMF impacts	· Deregulation of Housing Price Ceiling System · Rental Housing Act(1995) · Privatizing Korea Housing Bank(1997) · Restructuring KNHC, KNLC

tive demand, resulting in the explosive housing boom of 1978. Rules for allocating new houses were established in 1978 to define the criteria for selecting the beneficiaries to be offered new houses at below market prices. The major requirements were that eligibility should be granted to those who have subscribed to a contractual savings or deposit scheme for a specified amount of time.

The main goals of government housing policy during 1982 to 1986 were to stabilize housing prices and expand affordable housing to low-income families. With chronic housing shortages and limited budgets, the government introduced a new housing redevelopment method(JRP) which aimed at achieving not only the renewal of substandard houses,

particularly in squatter settlements, but also met quantitative objectives in terms of the number of housing units built. The JRPs are those in which the government designates the area and gives permission, large construction companies provide the capital, and the house owners form an association which contracts with the construction company and takes responsibility for the project. Redevelopment project is basically profit-oriented and regards housing as a commodity in the open market.

In the late 1980s, the government formulated a five-year housing supply plan for the purpose of constructing 2 million dwelling units between 1988 and 1992. For the first time, the government tried to address housing problems of different income groups with different packages of subsidies and finance. The 2 million housing construction plan proved to be success in terms of housing production and stabilization of housing price. The purchase price index took a downturn in late 1991 and it continued until 1995. On the other hand, the massive housing construction drive had some negative impacts on the economy.

In 1993, the new government announced the Five-year New Economy Plan was prepared and the greater emphasis was placed on the role of the private sector within the context of deregulation. The social housing system(permanent public rental housing) was abolished in early 1993 and financial support for the new program for the poor has continued to decline, however, compared to the previous five-year housing construction plan(1988-1992). On the other hand, the government lifted the price control on new housing in phases starting in 1995 in the regions except the Capital Region.

In late 1997, with the IMF crisis, however, the opposition party leader, Kim Dae-jung took office and had to grapple with overall restructuring of ailing industrial and financial firms. Massive layoffs were inevitable as Korea Inc. began the process of painful restructuring. Meanwhile, it was liberalized the sale prices of new houses built on private land sites in metropolitan areas beginning February 1998. Such a deregulation was aimed at helping prevent serial bankruptcies of house builders who were suffering financial difficulties in the wake of the IMF bailout program.

Housing is the area where the government is involved in every aspect. In every country the government may be involved in various housing markets in a different fashion within the social context in

which there are always acute choices between the well-being of the current generation and its heirs, and between the well-being of one social group and another. It may be very hard to choose the best mix of policies to achieve particular objectives. Under these circumstances, the government's policy or programme would inevitably be influenced by keen political competition for limited resources. Therefore, housing policies should not be isolated from the changing social structure. Direct government intervention in housing market of most countries focuses on the rental housing market for the low-income group through various support programmes such as rent control, housing allowance, and public housing. In Korea, existing housing policies have not been effective their purposes. The major goal of Korean housing policy has been to increase homeownership and housing construction policy has focused on middle-income households rather than on the most needy people. One important element in the future policy debate is the question of how large the public sector should be, and who should produce and who should receive that housing.

2. State-developed Housing

There are two kinds of the state-developed housing: one is the state-developed housing for sale, and the other is for rent. Unlike council housing in U.K., Korea has not any long history of social housing and the amount of rental housing is small compared with the state-developed housing for sale. Even limited rental housing provided by the public sector has been sold. In Korea, public housing authorities are not distributing housing according to individual and collective needs.

The housing authority undertakes to identify various sources of 'demand' for the state-developed housing. In most instances, the demand is expressed in the wish to start placing installment deposits in the Korea Housing Bank(KHB).[6] But there is no official registration or

6) Established in 1967 as a government mortgage lender, the Korea Housing Bank became the country's first mortgage bank in 1969. The bank revised its English name to Housing & Commercial Bank of Korea(H&CB). Upon privatization in 1997, the bank embarked on an aggressive expansion plan and successfully transformed itself into a full range of retail and commercial banking services. In line with its philosophy of maximizing shareholder value and

waiting list of people who have expressed their needs in this way.

The state-developed housing for sale is targeted to households who do not own a home. In selecting tenants, priority is given to those who have Housing Subscription Saving deposits. If there is a big demand, tenants are decided according to the total amount of money saved, and the period of time of not owning a home.[7] A crucial factor in program implementation is the adoption of the lottery system in the case of the state-developed housing for sale. The reason why the bank adopts the lottery system is that there are a large number of applicants who have opened installment deposits to purchase the state-developed housing.

As of December 2000, 319,249 households open the Housing Subscription Saving deposit(housing installment deposit). But the state-developed housing for sale by the KNHC was constructed only 20,024 units in 2000. The number of the state-developed housing units for sale is far behind the demand of applicants. One would ask why many households want to purchase the state-developed housing rather than direct from private developers? The answer is quite simple: there are little loans available for private housing and the price of the state-developed housing units is cheaper than that produced by private developers. The government provides for-sale public apartment(with a floor area of up to $85m^2$) for subscribers with the Housing Subscription Saving System. Since the provision of public rental housing imposes heavier burden on the government, the provision of public for-sale apartments has been the principal policy. Between 1962 and 2000, the KNHC had produced 761,240 units for sale, which accounted for 62% of total housing constructed by the corporation(Table 5).

The government provides housing loan(National Housing Fund[8])

---

its vision to become a world class retail financial services provider, H&CB signed a merger agreement on April 23, 2001 with Kookmin Bank, Korea's second largest retail bank.

7) The order of priority in deciding tenants
- 1st priority: One who has accumulated more than 24 monthly payments in the Housing Subscription Saving Deposit
- 2nd priority: One who has accumulated more than 12 monthly payments
- 3rd priority: Others than the above

8) The fund was established in 1981 in order to raise and supply funds to support people who did not have homes in obtaining one. The MOCT entrusted the Korea Housing Bank with its management and control. The funds are

to households who want to buy state-developed housing. As of the end of 2000, the amount depends on the floor area of housing to be purchased: up to 30 million won(24,000$) for 60m^2 or less(at an annual interest rate of 4%).

We now look at state-developed housing for rent. There are five types of the state-developed rental housing programmes. Permanent Rental Housing is targeted at people in the lowest income bracket, namely Residential Protection Target Group and Self-support Protection Target Group as defined in accordance with the Livelihood Assistance Act. They are households who are unable to make a living, due either to wage earners too young or too old. Entitled to the Permanent Rental Housing are also households displaced by urban redevelopment projects and relief recipients(normally families of patriots and veterans martyred for the nation). Rental prices are usually 25% of market prices.

Fifty-year Rental Housing is designed for relief recipients, the urban poor displaced from urban redevelopment projects and disabled persons who do not own homes. However, the government has no longer built this type of long-term rental units as well as Permanent Rental Housing since the early 1990s because of heavy financial burdens on the government.

Five-year Rental housing is the most popular public rental housing. It is designed for low-income households who do not own houses and has saved certain amount of money with the Housing Subscription Savings. Workers Rental Housing is built for household-heads who do not have his/her own homes and employed in companies with five or more employees. Industrial companies buy the houses at subsidized prices and then rent to their employees.

People's Rental Housing is newly designed by the new government(Kim, Dae-Jung Government) in 1998. This has two types: 20-year rental housing is provided for households in the lowest 20% income bracket while 10-year rental for those in the lowest 40%. The government has a plan to build 50,000 units of People's Rental Apartments between 1998 and 2002.

As shown in Table 4, public rental housing(688,000) currently ac-

---

raised from types of loans, such as the issue of national housing bonds, fiscal loans, housing deposits, mortgages, etc. The fund was raised to total of 36.7 trillion won(about 33 billion dollars) during 1981-1999.

counts for only 5.9% of total housing stock(11,493,000). They are mostly short-term rental houses(56% of rental housing stock): in case of 5-year rental housing, after five year mandatory rental period, they are sold off to the tenants. If we classify the permanent and 50-year rental housing as a social housing, the number of existing social housing stock was estimated at about 269,000 units, accounting for only 2.3% of total housing stock.

[Table 4] Rental Housing Stock by Types, 2000

(Unit: '000)

Total	Permanent	50-year rental	5-year rental[1)]	Workers rental
688(100.0)	190(27.6)	79(11.5)	384(55.8)	35(5.1)
Housing size (floor area in m^2)	45 or less	60 or less	mostly 60	mostly 60

Notes: 1) Included the 5-year rental housing construction by private companies with loans from the NHF

Source: MOCT, 2001

3. The Institutional Role

The Korea National Housing Corporation(KNHC) is the most important agency, which acts as a public housing construction institution for supplying some housing for low-income groups. This corporation was established in 1962 as a legal entity under the provision of the Special Housing Act. The main functions of the KNHC are to construct new, decent low-cost housing, to give low-income households priority in obtaining such housing, and to create housing sites in urban areas in order to stabilize the skyrocketing price of land.

The KNHC is the largest public housing development agency in Korea. It is distinguished from private developers. First the corporation is obliged to build housing for low-income families, which practically means small apartments(those with $60m^2$ in unit floor area) or public rental housing. Second, the KNHC was given the power to expropriate land when it builds housing for low-income families. The corporation had purchased land hitherto through direct negotiations with landowners. However, from the mid-1970s it had to face increasing difficulties in

purchasing land. The government entitled the KNHC to expropriate land of housing development in 1977.

The KNHC operates under the direction of the Ministry of Construction and Transportation(MOCT). It has neither real autonomy nor financial strength. Because of its financial and political constraints, the KNHC may not enter independently into the housing production field without coordination with the MOCT and local governments.

The KNHC and local governments have provided rental housing with financial support from the central government, and loans from the National Housing Fund(NHF). However, a considerable amount of capital input has had to be covered by their balance sheets and by rental deposits from tenants. Under these circumstances, the problem has been how to balance restricted rent-paying capacity among public rental housing occupiers while easing public housing authorities' financial problems. This financial constraint has crucially hampered rental-housing construction in the public sector and confined rented houses to those who can afford the deposit and rent to cover, at least, the cost.

Korea does not have any long history of public housing and the amount of rental housing is limited compared with the state-developed housing for sale. Since the early 1960s, the emphasis of the Korea National Housing Corporation was on the expansion of state-developed housing for sale rather than the provision of rental accommodation. The proportion of housing for sale to total housing constructed between 1962 and 2000 was 62%(Table 5). Even though the corporation produced rental dwellings, these houses were sold when five-year period passed. As shown in Table 6, private companies have played the most important role for producing public rental housing compared to the KNHC and local governments. Private companies constructed only 5-year rental housing with loans from the National Housing Fund.

In terms of the institutional role, the central government, as the key policy-making agent, plans the aggregate volume of housing supply and

[Table 5] Housing Construction by KNHC

Years	Total	Rental housing	For sale housing
1962-2000	1,229,707 (100.0)	468,467 (38.1)	761,240 (61.9)

Source: KNHC. Housing Handbook, 2001.

[Table 6] Public Rental Housing Construction, 1982-2000

Total units Constructed	KHNC	Local Governments	Private companies[1)]
1,265,298 (100.0)	427,528 (33.8)	117,250 (9.3)	720,520 (56.9)

Note: Private companies constructed only 5-year rental housing with loans from the National Housing Fund

Source: KNHC. Housing Handbook, 2001

possible partition between the public and private sectors. The H&CB carries out the role as the housing fund mobilizer for both public and private sectors, and the KNHC, utilizing the funds mobilized through the H&CB, puts forward implementation activities both as a planner of the state housing programmes and as a client to the private builders and contractors for the construction works. Local governments perform almost identical activities as those of the KNHC.

Even though the role of local governments is very important in the wake of decentralization of state power and local autonomy philosophy, most local governments have not pursued their role to make housing programmes for the low-income residents. One of the most important problems for local governments is the lack of funds, and trained and experienced government officials for the low-income housing programmes. With the respect to the public housing supply, the KNHC has played much more important role than local governments (Table 6). The KNHC operates under the direction of the central government, particularly the Ministry of Construction and Transportation.

There are several housing agencies and the lack of coordination and cooperation among them adds to the confusion. Inefficiency, duplication and even conflicts among the agencies are common. As a result, although Korea has a highly centralized government, current national housing policy has been criticized for the multiplicity of agencies involved and for the lack of a single, consistent and overall plan.

Although the Ministry of Construction and Transportation(MOCT) controls the overall housing policy, the Ministry of Planning and Budget(MPB), Ministry of Finance and Economy(MOFE) and Ministry of Health and Welfare(MOHW) also have roles in developing housing policy and housing assistance programmes; they are related to the

national economic plans as well as to fund management and social welfare at the national level. Accordingly, the housing policy and construction programme of the MOCT must be coordinated with resource allocation plan of the MPB and MOFE and welfare programmes of the MOHW. In addition, the Ministry of Government Administration and Home Affairs(MOGAHA) and local governments have a close relationship with the MOCT in its regional and urban housing programme. The Ministry and local governments have some roles in urban community development through its association with urban housing and renewal programmes.

In this situation, it is impossible for the central government and local governments to formulate a rational policy, especially low-income housing programmes. Moreover, the direct and indirect participation of the Korean government in the housing sector has over the years considerably increased through an impressive number of regulations, laws, and plans by the construction of dwellings, land development, and other activities.

Policy Issues

1. The State as a Market Controller?

Even if markets work well they can only be expected to provide an efficient allocation of resources and not necessarily a fair allocation. Government will be concerned with efficiency but they will also be concerned with equity. The latter concept involves considerations of fairness in the distribution of resources.

Since 1982 the government has set the sale prices of new apartment housing and housebuilders had to sell under the ceiling price. The aims of introducing this price control are as follows: first, to give new house buyers the chance to buy inexpensive apartments, and second, to stabilize the price of existing housing, which could be achieved by price control on new apartments. In this system, a flexible ceiling price system is based on construction cost determined by the material cost and labor. In January 1988 the ceiling price was set at two levels: 1,268,000 won per pyeong[9] for apartments whose size is less than 25.7

pyeong(85 square meters), and 1,340,000 million won per pyeong more than 25.7 pyeong apartments(medium and large apartments). In 1989, the government ad opted a flexible construction cost program instead of fixed cost, and set a ceiling price for bond-bids for both(small and large) apartment sizes, considering the market dynamics of the housing units and housing construction materials.

Since 1983 a bond-bid system has been added to the lottery system. The bond-bid system is applied to the limited number of private housing units whose controlled price is less than 70 percent of the market price. To buy in this case, people must purchase national housing bonds, type 2, which have a 20-year repayment period with 2 percent annual interest, in addition to paying the price of the housing in advance. The main aim of the bond-bid system is to channel a part of the 'premium' into the National Housing Fund(KRIHS, 1987, 33).

Many housing analysts in Korea have criticized this price control of new apartments. First, under the price control system, the profitability of housebuilders has not been assured. Therefore, the supply of new apartment housing has been reduced in Seoul and large cities. Second, in Seoul, the residential area has expanded to the outer rings, where land prices are relatively cheap. The expansion of the residential area around Seoul has been much affected by the production of new apartments. This can be explained by the housebuilders' strategy under the price control. As far as housebuilders are concerned, the cheaper the land they can get, the more profit they have. They have also built new apartments in other cities around Seoul where the land prices are cheap. Third, the sale price ceiling system would not necessarily contribute to stabilizing the market price; instead, it may have raised the housing price in the long run as it has impaired the financial position of the builders(Kim, 1990; Chung, 1990; Kim, 1989).

There have been many disputes over price control between the government and private housebuilders. Private housebuilders have continuously demanded the abolition of the price control since its introduction. In November 1989, the new apartment price ceiling system was replaced by a new type of price control, which is called the construction cost linkage system with new apartment price. Before the introduction of the construction cost linkage system, the sale price was

9) 1 pyeong is equivalent to approximately 3.3 square meter.

set and fixed by the government, while since November 1989, the sale prices have varied in accordance with land values. The sale price ceiling system was one of the main causes of housing shortages in the Capital Region. Since the International Monetary Fund(IMF) program, the government has removed the price control system.

The modern apostles of Adam Smith continue to argue that government intervention may do more harm than good. Smith argued that a freely competitive economy would automatically maximize satisfaction. And an Italian economist, Vilfredo Pareto demonstrated the symmetry between the conditions for an efficient allocation of resources and the equilibrium conditions of perfect competition. With a 'Pareto-efficient' allocation of resources, no one can be made better off without making someone else worse off(Rowley and Peacock, 1975; Oxley and Smith, 1996).

It would seem if the disciples of Adam Smith and Vilfredo Pareto are correct, that the best option for governments would be promote competition in all markets, including housing, for this would lead to an efficient allocation of resources. In practice, the Korean government does not do this. Instead they have policies such as 'ceiling price system' to directly affect the production and the distribution of housing.

2. Role of Public Sector and the Allocation Process

It is important to ask why the government concentrates on the policy of state-developed housing for sale rather than on expanding rental dwellings. The issue seems not to be a very important aspect of political debate in Korea. So it is very difficult to determine what is housing policy as regards state-developed housing sales.

The policy offering state-developed housing for sale now forms part of a policy package designed to lesson the financial difficulties of public sector housing. This policy aims at investing in public housing for sale and plowing back the profits into low-cost housing for the low-income group and other recipients in urban areas(Yoon, 1994: 55).

There are hundreds of state-developed housing tenants who would like to buy the house in which they live in. They wish to become or to remain owner-occupiers in state-developed housing estate. The housing authorities seek to encourage home-ownership through the state-devel-

oped housing for sale. There are huge numbers of households who want to be an owner-occupier. In fact, private sector cannot cater for all demand of various income strata, especially low-income households. Thus, the aim of state-developed housing for sale is to meet a demand for owner occupation, through providing the NHF loans.

The level of annual output of KNHC housing is shown in Table 5. Even when the KNHC has built rented housing, the period during which it is available for renting has been short: one year before and five years after 1982. After the renting period this housing has been sold to the tenants(lease with option to buy). In 2000, 55% of public rental housing stock was the 5-year Rental Housing(Table 4). Public housing except Permanent Rental and 50-year Rental Housing is mostly allocated to subscribers to the Housing Subscription Saving System. In order to subscribe with the saving system, one must be able to pay a monthly installment of 100,000 won(80-100$). And it is doubtful that those in actual housing poverty can save 100,000 won every month.

With respect to the state-developed housing for sale and 5-year Rental Housing, no investigation is made into the applicants' needs, or such factors considered as household size, present living conditions and condition of health. This system is administratively simple and easily understood by the public. But it ignores the principle that the state-developed housing should be allocated to those households in the most urgent need. The applicants for the state-developed housing are required to deposit a considerable amount of money in the H&CB. There are no subsidies for the poor who have no ability to pay a deposit in the H&CB. Only those who have the ability to save can obtain the state-developed housing. This prevents low-income people obtaining the bank's loans. Many homeless people and tenants do not deposit their money in the bank because of their extremely low level of income. It has been criticized that public housing nominally targeting low-income people have often been allocated to middle income households.

Moral weakness or lack of the political will of the government to directly address housing poverty of the urban poor has often been blamed for the unfairness. However it is not simply a matter of morality of the government. The problem is that the urban poor in housing poverty is increasingly marginalized as a social force influencing the government, and the government has an intrinsic limitation in

directly taking care of such diversified and marginalized groups. This marginalization of those in housing poverty requires a different housing system from the present one in which the government acts mainly as a direct housing provider or controller.

3. Evictions and Housing Security

Despite the improvements in housing supply and quality, housing remains a persistent and divisive social issue in Korea because the inequitable in the distribution of housing has become even more prominent as overall prosperity increased. The poor have probably suffered more than any other group. In Seoul, 720,000 people were evicted through urban redevelopment projects, often violently, just between 1983-1988(UNCHS, 1996: 246; ACHR, 1989: 23). The government usually justifies evictions in two ways: 'city beautification' and 'redevelopment.' It has known that the housing renewal project, such as Joint Redevelopment Project(JRP)[10] negatively affects lower income people, particularly renters(Ha, 2001). The JRP has destroyed the poor communities and people have lost access to jobs. As a result of these evictions many people are forced to pay a higher price for a smaller space. Under the circumstances of public housing shortage, many low-income settlements plunged into turmoil and the evicted squatters have tried to squat another corner of a city again.

Evictions should be limited to absolutely necessary cases, such as people living in areas where their lives are in danger or people directly obstructing very necessary public projects. When evictions are unavoidable there must be available adequate alternative housing providing services and conveniences equivalent to the evictee's present housing, and the evictee should be part to the agreement on alternative housing.

We see housing as more than four walls and a roof. It is protection from the sun and rain, but it is more. A decent home and commu-

10) The program has been described as joint redevelopment since the cooperative and the construction company share responsibility. Theoretically, the homeowners are urged to form a cooperative that will select a construction company and decide on the type of new apartments desired. The cooperative will also manage administrative and financial matters. Tenants are not eligible for the cooperative or an apartment in the new building. The cooperatives in practice are constituted largely of people from real estate companies and are controlled by the construction companies(ACHR, 1989: 27).

nity, that is, a decent place to live is a basic human right. In order to get progressive realization of the right to adequate housing of the poor disadvantaged groups in Korea, we shall seek the active participation of our public, private and non-governmental partners at all levels to ensure legal security of tenure protection from discrimination and equal access to affordable adequate housing for all persons and their families.

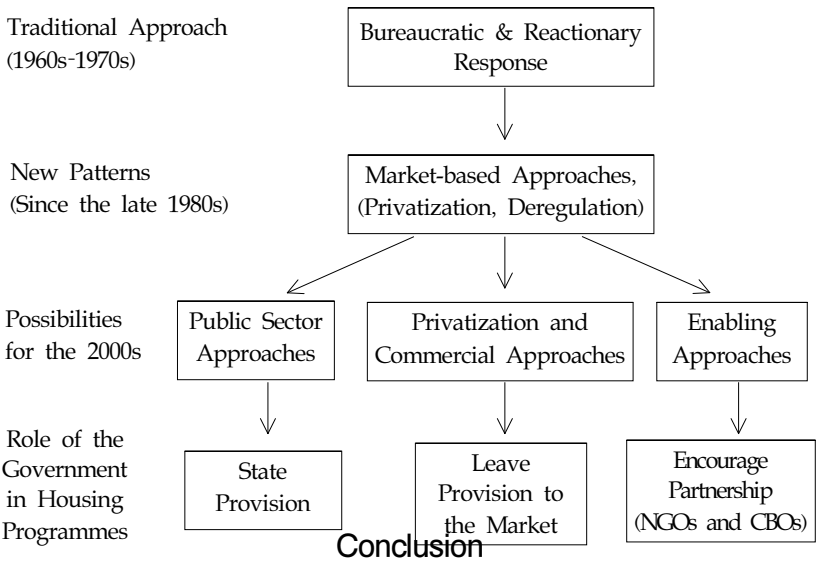
4. New Housing Policy Paradigm for the 2000s

During the 1960s and 1970s, housing policy can be characterized by the bureaucratic and reactionary response. It was rather *laissez faire* way of approach to low-income housing problems. But during the 1980s and 1990s, the government policy focused on the role of the private sector within the context of deregulation. In line with the privatization policy trend, particularly since the mid 1990s, the government lifted various housing related regulations such as the price control on new housing. Since the IMF crisis in 1997, the market forces in housing sector rather than the role of the state became regarded as of greater importance.

One important element of the future housing policy debate is the question of the role of the state and how the state can empower and cooperate with NGOs, community, and private sector. As shown in Figure 1, it can be projected the possibilities for the 2000s with respect to the role of state in housing policy for the low-income group. The role of the state in housing sector can be classified into three approaches: public sector approaches, privatization and commercial approaches, and enabling approaches. I suggest that the enabling approaches would be the most important and required approaches as a low-income housing policy paradigm in Korea(Ha, 2001). The enabling framework developed in response to housing problems and the failure of conventional public-sector responses(Turner, 1976). The origins of the idea that government actions in regard to housing should concentrate on 'enabling' and supporting the efforts of citizens and their community organizations to develop their own housing(UNCHS, 1996). Participation and enablement are inseparable since popular priorities and demand will be a major influence on the development of effective and flexible enabling policies.

The distinction between 'enabling' approaches and 'market-based' approaches becomes very significant. The enabling policies do not necessarily imply less government intervention. Governments intervene to help to those whose housing needs and priorities are not met by the 'market' or have particular needs that the market does not cater for, like vulnerable groups or the elderly. Its interventions usually center on ensuring that the resources needed for housing purchase, construction or improvement are available at the lowest possible price — especially land, building materials and finance. It also structures its intervention in ways to support the resources and skills that low-income individuals, households and neighborhood and community organizations can bring to housing construction or improvement. It is apparent that the need for more autonomous local authorities who can respond to the particular needs and priorities of their inhabitants and localities.

[Figure 1] A Projection Model of Low-Income Housing Policy in Korea



Conclusion

Many would still argue that the supply and distribution of housing should be left to the price mechanism. In a free market, the extent to which housing need will be met depends upon the population's capacity to pay and its preferences, and hence the relationship between the level and distribution of income and the cost of housing. The high cost of housing and the unequal distribution of income has meant that significant sections of the population have been unable, without assistance, to afford the full economic price of decent accommodation.

Even in the most market-oriented of economies, the role of the state in housing is pervasive. There are no pure markets for housing. In Korea, the government plays an expanding role in almost all aspects of housing production and consumption. Its acts as developer, regulator, administrator, builder, landlord and frequently destroyer.

Good governance means coping with conflicting goals and competing claims of different interests. The emphasis on 'enabling approaches' can receive considerable support from the growing recognition that democratic and participatory government structures are not only important goals of development but also important means for achieving such development, particularly in the early 2000s in Korea. The potential conflict in enabling shelter strategies between the need for liberalization to give private-sector incentives and the need for regulation to correct market imperfection and curb speculation is a particular illustration of the wider dilemma facing Korea's economies.

The role of the public sector in housing should be clearly different from that of the private sector. Not only from the point of view of efficiency but also from that of equity, it is highly desirable that the state-developed housing for sale programme should be switched to rental housing. In devising future social housing programmes, housing authorities have to clarify the ambiguity and define the target group, taking into account local housing situations and community-wide objectives relating to maintaining 'bottom-up' or popular participation in housing planning.

Government efforts alone are not sufficient to solve Korea's housing problems. Co-operative methods can play an important role in helping to solve housing problems. Though housing co-operatives are not new to developing countries, Korea does not have a history of such

co-operatives. Nevertheless, it should be possible for people to join together, pool their resources and provide themselves with good housing, through non-profit-making and non-speculative co-operatives. As an alternative low-income housing strategy in Korea, housing co-operatives can serve as vehicles to channel state assistance to urban low-income groups and as a basis for participation and close cooperation between public agencies and a low-income clientele.

References

Asian Coalition for Housing Rights. *Battle for Housing Rights in Korea*. ACHR, Bangkok, 1989.

Daily Economic News(Mai'il Kyungje Shinmun)(in Korean), Dec. 12, 1987.

Economic Planning Board. *Population and Housing Census*. The Republic of Korea, 1995.

Hee-Soo, Chung. € "Housing for low-income people and housing policies." Paper presented at the conference of planning and housing in Eastern Asia, September, Seoul, 1990.

I. S., Yoon. *Housing in a Newly Industrialized Economy*. Avebury, Alershort, 1994.

Jeong-Ho, Kim. "Korea housing policies: review and future directions." paper presented at the international conference on Korean housing policies, Seoul, November 1990.

Korea National Housing Corporation. *Housing Handbook*. Seoul. KNHC, 1997.

Korea National Housing Corporation. *Survey of Current Residential Conditions and Perceptions of the Urban Poor*(in Korean). Seoul: KNHC, 1989.

Kyung-Hwan, Kim. "Inefficiency in the Korean housing sector." *Monthly Economic Review*(in Korean), October 1989: 33-45.

Kyung-Hwan, Kim. "Government Intervention and Performance of the Housing Sector in Korea." *Housing Studies Review* Vol.6, No.2, 1998.

Lew, S. C. and Chang, M. H. "Functions and Roles of the Nonprofit/Nongovernmental Sector for Korean Social Development." *Korea Journal* 38(4), Winter 1998, 277-296.

Mills, E and Song, B. N. *Urbanization and Urban Problems*. Cambridge, Harvard University Press, 1970.

Ministry of Construction and Transportation & Korea National Housing Corporation. *A Study on the Stability of Low-Income Housing and Housing Minimum Standard*(in Korean). Seoul: KNHC, 1999.

Ministry of Construction and Transportation. *Yearbook of Housing Statistics*(in Korean). MOCT, Seoul, 2001.

Oxley, M. and Smith, J. *Housing Policy and Rented Housing in Europe*. London, E & FN Spon, 1996.

Rowley, C. K. and Peacock, A. T. *Welfare Economics*. London, Martin Robertson, 1975.

Seong-Kyu, Ha. "Developing a community-based to urban redevelopment." *Geo-Journal* 53, 2001: 39-45.

Seong-Kyu, Ha. "Substandard settlements and joint redevelopment projects in

Seoul." *HABITAT INTERNATIONAL* 25(3), 2001: 385-397.
Seong-Kyu, Ha and Lee, Seong-Woo. "IMF and the Crisis of the Marginalized Urban Sector in Korea." *Journal of Contemporary of Asia* 31(2), 2001: 196-213.
UNCHS. *An Urbanizing World: Global Report on Human Settlements*. Oxford University Press, Oxford, 1996.
UNDP. *Living in Asian Cities*. UN, New York, 1996.

12 Environmentally Sound and Sustainable Planning Guidelines for Public Housing in Greenbelt

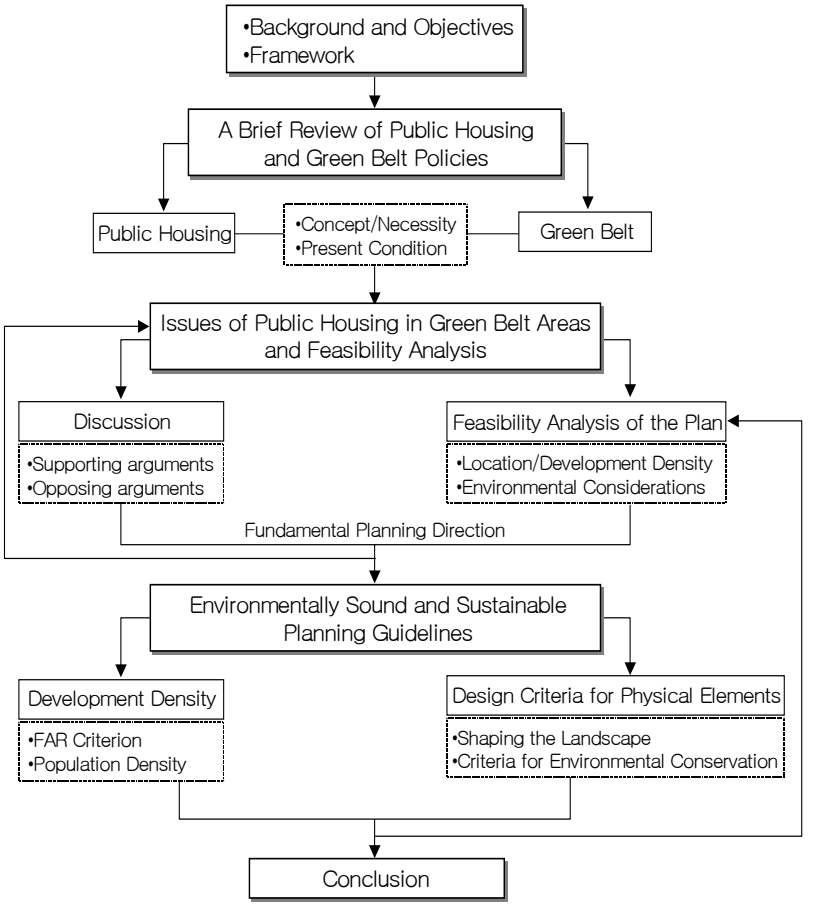
Woo Jong Lee

Introduction

The housing market in the Seoul Metropolitan Area(SMA) is characterized by shortage of supply and soaring price exacerbated by speculation. Consequently the housing problem deepens the social divide between the haves and the have-nots. Moreover, the lack of affordable public rental housing in Korea makes the cost of housing extremely burdensome for the low-income class. In response to this situation, the Korean government recently announced a plan for constructing public housing in greenbelt areas as means to acquire large-scale land, while minimizing fiscal burden. However, such a policy is generating much controversy for it involves doing away with greenbelt areas which have been absolutely restricted from development for the past 30 years.

What has been the role of greenbelt in Korea? At present 46.3% of the Korean population is living in the SMA which covers only 11.8% of the national land area. Such a high level of concentration has been inflicting tremendous social costs in multifaceted dimensions. To some extent, the greenbelt area surrounding Seoul has contributed to controlling the population increase in the Metropolis. Nevertheless, demands to readjust greenbelt areas have been strengthened recently, due to some inappropriate designations of greenbelt areas and pressures from developers and landowners in greenbelts. Amidst the heated debate on whether greenbelts should be readjusted, the announcement of the gov-

[Figure 1] Research Framework



ernment's plan to build public housing in greenbelt areas has heightened the controversy. The conflict between maintaining the greenbelt on one hand, and supplying public housing at low cost on the other hand, does not seem to be easily reconcilable.

In an effort to reconcile these two contending arguments, this study aims to seek how public housing in greenbelt areas can be justifiable, and thereby formulate environmentally sound and sustainable planning guidelines that can make public housing and greenbelts more

compatible. The flowchart summary of the analytical research framework of this study is in Figure 1. This study firstly examines the present conditions of public rental housing and greenbelts in Korea, along with the relevant government policies. Secondly, issues surrounding the government's plan to construct public housing in greenbelt areas are briefly examined, followed by a feasibility analysis of the plan. The project feasibility analysis on the 11 proposed construction sites in the SMA deals with the three aspects of location, development density and environmental considerations. Thirdly, based on the analysis, this study formulates planning guidelines with respect to development density and physical environment. Lastly, this study suggests guidelines according to the design criteria to make public housing construction in greenbelt areas environmentally sound and sustainable.

A Brief Review of Public Housing and Greenbelt Policies

1. Public Rental Housing in Korea

The need for public rental housing arises from the shortage of housing and rapidly rising housing price. In the past the Korean government considered that quantitative increase in the housing supply, whether for rental or for ownership, would be the major solution to the housing problem. However, the rapid rising tendency of housing price made housing an attractive means to increase wealth for the middle and high-income classes. Housing demand for speculative purposes prevailing in the housing market complicates the effect of government housing policy. Consequently there arose a need for housing policy specifically targeted to the low-income class, to which the government responded by a plan to provide public rental housing. While rental housing is well institutionalized and makes up a considerable proportion in the housing markets of developed countries, rental housing policy in Korea is only at an embryonic stage.

1.1 The Stock of Housing Supply

Compared to a number of developed countries, there is a shortage of housing supply in Korea as shown in Table 1. The rate of housing supply in the United States was 110.6% in 1995, and in Japan, it was 111.5% in 1993. France and Italy have housing supply rates of more than 120%. However, for Korea, even until 2000 the housing supply rate was only 96.2%, with 86.1% in the SMA where 46.3% of the nation's total population live. Within Seoul the supply rate is even lower, at 71.0%, there is a significant regional variation in the housing supply rates.

[Table 1] Comparison of Rate of Housing Supply and Ownership Housing in Some Countries

(Unit: %)

	U.S.A	U.K.	France	Italy	Japan	Korea
Rate of Housing Supply	110.6 (1995)	105.6 (1996)	121.8 (1996)	125.5 (1991)	111.5 (1993)	96.2 (2000)
Rate of Ownership Housing	65.0 (1995)	67.9 (1996)	54.3 (1996)	67.0 (1991)	59.9 (1993)	54.2 (2000)

Note: ( ) is a datum year

Source: Korea National Housing Corporation. *Year Book of Housing Statistics*, 2001

The rate of home ownership is 54.2% in 2000 which is also lower than some developed countries. Even though almost half of the households are tenants, public rental housing in Korea is at a negligible level compared to the advanced nations. Table 2 shows the proportion of public rental housing out of total housing stock during the ten-year period from 1990 to 1999. In 1990 the proportion was 1.4%, gradually increasing to 5.9% in 1999, most of which is rental for a limited period of time, transforming to ownership housing beyond that period. Considering the proportion of public rental housing in the United Kingdom and France was 24% and 17%, respectively, in 1995, the role of the Korean government in rental housing is extremely limited.

[Table 2] Proportion of Public Rental Housing to Total Housing Units in Korea

(Unit: Thousand, %)

Year	1990	1995	1996	1997	1998	1999
Total Housing Units(A)	7,160	9,570	10,113	10,627	10,867	11,181
Public Rental Housing(B)	98.6	352.3	406.9	463.4	592.8	659.8
B/A	1.4	3.7	4.0	4.4	5.5	5.9

Source: Korea National Housing Corporation. *Year Book of Housing Statistics*, 2001

1.2 Problems of the Existing Rental Housing

Locational problem: In a large metropolis where most of the land is already developed, it is not easy to acquire large scale housing site. One of the means to acquire land for housing is through redevelopment of deteriorated built-up areas. However, redevelopment provides only limited amount of land, which is insufficient for large-scale housing projects intended to make significant increase in the housing supply. As a result, sites for public rental housing were usually located in peripheral areas where land price is relatively inexpensive and land supply is relatively abundant.[1] Many low income households are reluctant to move into public rental housing in distant locations from the central city for such locations require long commutes with lack of public transportation and job opportunity. The recent government plan to build public rental housing in greenbelt areas was conceived partly to address this problem. By choosing a location in greenbelt, close to the built-up areas of the central city, with easy connections to public transportation, public rental housing would be much more beneficial to the livelihood of the low income class.

Development Intensity: Public rental housing for low income households should be provided in small scales near current built-up

1) Another reason for locating public housing for low income in peripheral areas had to do with the potential resistance against low income housing complex from the upper income residents of existing housing areas in the city. The social issue of whether mixing income classes are desirable or not remains unresolved and it is beyond the scope of this study which focuses on the physical aspects of public housing.

areas, so as not to disrupt their livelihood. However, in Korea, due to the difficulty in acquiring land, large public housing complexes have been built in locations distant from urban settlement areas. Out of the public rental housing constructed between 1971 and 1995, only 22.5% were in complexes less than 500 units and almost 50% were in very large complexes of more than 1,000 units. Public housing was provided according to the easiness of site selection and quantitative accomplishment based on suppliers' expediency, rather than reflecting the users' needs such as accessibility to public transportation and jobs. Fortunately some improvements with regard to development intensity can be seen in the 23 public rental housing complexes planned in 2000. They have an average of 519 units, floor-area-ratio(FAR) ranging 134-256%, with an average of 175%.

Public rental housing has a tendency to have high accommodation density due to the need to provide it at low cost. The government's plan for public housing in greenbelt areas also reflects this tendency of high density. Out of the 11 proposed construction sites in the SMA, the smallest size is 31ha with 3,060 units in Uijeongbu and the largest one is 230ha with 16,900 units in Siheung. Such a plan reflects the policy intention to provide large quantity of public housing in a short period of time. However it has the problem of overlooking the importance of preserving the community, making public transportation and jobs accessible, and minimizing damage of natural environment. In order to overcome this problem, a more comprehensive approach should be taken in formulating the appropriate design criteria of the plan.

2. Greenbelt Policy in Korea

Greenbelt[2] policy is one of the most sensitive issues involving heated debates in almost every presidential election in Korea. The greenbelt system was first implemented in 1971[3] and since then there

---

2) The greenbelt policy in Korea is based on legislation strictly prohibiting construction activities in the areas designated as Greenbelt, the legal term for the Restricted Development Zone(RDZ). In this sense, the term "greenbelt" in this study is distinguished from the general meaning of greenery area.

3) The urbanization rate in Korea exceeded 50% in the early 1970s. In this period as land speculation accelerated and urban sprawl expanded, greenbelt areas were designated as a presidential order to prevent aggravation of these

were a succession of mitigating measures over 40 times. Today the greenbelt system is undergoing an overall reexamination in response to much controversy raised by residents who demand the removal of restrictions, by environmentalists who oppose the mitigating measures and by specialists who are concerned about the rational spatial structure. A discussion on the greenbelt controversy is necessary to understand how the plan on public rental housing in greenbelts came about.

2.1 Designation of Greenbelts

The purposes of designating greenbelt areas in Korea are to control urban sprawl, preserve open space, conserve agricultural land and historical places, protect wild life habitats, and secure military needs. For the past 30 years, supported by police power, the greenbelt measure has contributed to efficient and rational use of urban areas and preventing excessive development in urban fringe. Since the greenbelt system was first institutionalized in 1971, there were eight designations till 1977 for 14 urban areas which had concerns about sprawl and needed protection of natural environment. As of 1998, a total of 5,397 sq. km was designated as greenbelts, amounting to 5.4% of the national territory. The greenbelts of the seven largest metropolitan areas made up 68.8% of the total greenbelt areas with 29.0% in the SMA alone. Only 2.3% of the greenbelt areas in SMA are in Seoul. There are more than 10 cities in the SMA which have 70-90% of the land as greenbelts. In these cities where developable land is extremely limited, there have been high demands to readjust the greenbelt, so that some of it can be utilized for development. In July 1999 the Korean government announced a readjustment plan, categorizing the greenbelt areas in the nation into the "first priority release area," "readjustable area," and "preservation area." In 2002 greenbelts of seven medium metropolitan areas were totally released and for the seven largest metropolitan areas 15-40% of the greenbelts are in the process of being released. When all the readjustments are implemented, 30-50% of total greenbelt areas are expected to be released.

---

problems(KRHIS. *50 Years of National Territory*, 1996: 456-457).

2.2 Evaluation of the Greenbelt System

Recently there has been much controversy on the greenbelt system in Korea. The controversy stems from the issue of inequity in development rights of the residents and landowners in greenbelt areas, the political pressure exerted by landowners and developers, and the need to increase housing supply in planning for population growth. The greenbelt system in Korea can be evaluated from diverse perspectives. Whether the evaluation is positive or negative, the greenbelt system is one of the hottest issues in the Korean society today.

The positive contributions of the greenbelt system are as follows:[4)]

1) Preserving open space around urban areas, and preventing land speculation thereby reducing uncertainty of development;
2) Facilitating development of new towns for housing supply through which housing and land prices are stabilized;
3) By retaining undeveloped land, making long-term planning possible in terms of space and time;
4) Preserving the natural environment in large metropolitan areas meeting the demands of environmentalists.

On the other hand, the negative aspects of the greenbelt system are as below;

1) Although it has prevented conurbation of adjacent cities, it cannot control population concentration, particularly in the SMA;
2) The existence of greenbelts has induced leap frog development, inflicting social costs such as increase in commuting distance and in cost of extending public facilities;
3) Areas outside greenbelts, which should have been environmentally preserved, have been used for development instead of more useable land in the greenbelt areas;

4) The positive and negative evaluations are based on the British Town and Country Planning Association(1999) and the Ministry of Construction and Transportation of Korea(1997).

4) Some areas being inappropriately included as greenbelt areas in the early period of designation have been obstacles to rational urban growth.

Despite of many problems associated with the greenbelt, it is undeniable that the greenbelt has played an important role in the Korean urban system for the past 30 years. If there were no greenbelts in the SMA and other major metropolitan areas during the period of rapid urbanization, there would have been much more repeated and uncontrollable urban sprawl.

Issues of Public Housing in Greenbelt Areas and Feasibility Analysis

1. Discussion of the Issues

In early 2002 the Korean government announced a plan to build public housing in greenbelt areas to expand the supply of affordable housing and stabilize the housing market.[5] Table 3 shows the supply specification of this plan which entails a total of 18 sites — 11 in the SMA and 7 in other large metropolitan areas — for about 100,000 units of new housing, 60% of which is to be rental housing and the rest is for ownership. Although the rationale offered by the government for including ownership housing is to make the project financially feasible, it will be subject to much social criticism in light of the fact that rental housing is in serious shortage and that the project involves the construction in greenbelt areas.

The site selection criteria applied by the government were compatible with the greenbelt readjustment criteria, minimum environmental damage, accessibility to urban centers and public transportation network, and balanced distribution of sites according to the sub-regional demand and supply of housing(Ministry of Construction and Trans-

5) This plan came out as a part of the policy launched in February 2001 to build 1,000,000 units of public rental housing for residential stability of low income class until the year 2012.

[Table 3] Specification of Government Plan

(Unit: m^2, Household)

Item		Seoul metropolitan areas	Other large metropolitan areas	Total
Number of sites		11	7	18
Area		8,992,50	3,313,200	4,212,450
Number of households	Sales	27,860	12,160	40,020
	Public rental	42,000	18,000	60,000
	Sub-total	69,860	30,160	100,020

Source: Ministry of Construction & Transportation of Korea. *Press conference news data for government public rental housing plan*, 2002. 2.

portation, 2002). Out of the 11 sites in the SMA, eight are located close to Seoul, and three are near the major transport routes on the outer rim of the greenbelt, as shown in Figure 2.

This plan for public housing in greenbelt areas has generated heated debates on social merits of the project. Supporting and opposing

[Figure 2] Location of the 11 Proposed Public Housing Sites in SMA

arguments are in contention today(News Data: Citizens' Movement for Environmental Justice, 2002).

1.1 Supporting Arguments

1) As indicated by an environmental evaluation report, the selected sites are those that no longer need protection of natural environment, such as already damaged areas, or areas with very little plantation. Without a specific plan these areas may be used disorderly and undesirably.
2) The greenbelts are distributed evenly within 20km from Seoul. Provided that sufficient public transportation is made available in the area as a means to overcome the distance from work places, it is relatively a good location for low-income housing.
3) Although public housing for low income tends to become slums, this tendency is not serious in Korea so far. Moreover, by mixing ownership housing and rental housing, a diversity of income classes can mingle in order to create a healthy living environment.

In short, supporters of the plan argue that rather than dispelling the idea of low income housing in greenbelt areas, more emphasis should be given to formulating guidelines from the beginning of planning stage, so as to ensure environmentally sound development with healthy social mix and good connection to public transportation and jobs.

1.2 Opposing Arguments

1) By building about 70% of public housing in the SMA, the project will aggravate the concentration of population in the SMA, resulting in more serious traffic congestion and worsening the imbalance with non-SMA region.
2) Rather than a public housing project initiated by the central government, a project in accordance to local governments' comprehensive plan is more desirable. Provision of public housing based on local governments' plan can be accomplished through redevelopment of existing settlement areas, without damaging the greenbelt.

3) Building up greenbelt areas will result in conurbation of adjacent cities, which will bring about environmental degradation and intensify urban concentration.
4) The proposed development density is unreasonably high, considering that the project sites are in greenbelt areas and even higher than the average density of nearby cities. Such high development density cannot be environmentally sound and sustainable.

In short, the opponents of the plan argue that without sufficient pre-examination or consideration of alternatives, the proposed plan has weak rationale for destroying the greenbelt areas to increase housing supply in overly concentrated metropolitan areas.

2. Feasibility Analysis of the Plan

With such contending arguments surrounding the public housing in greenbelt areas, can the plan be justifiable? Or not? It is uncertain whether the government's plan will be realized or not, but if it is to be realized, seeking appropriate and desirable planning directions is a necessary process to make the plan justifiable. In this study this process is undertaken by analyzing plan feasibility in terms of location, development density and environmental considerations. The analysis is focused on the 11 proposed sites in the SMA.

2.1 Locational Aspects

Locational aspects of the plan are evaluated with respect to accessibility to urban center, distance from Seoul city limits, transportation network in the vicinity and surrounding environment. As can be seen in Table 4, most of the 11 sites are evaluated to be reasonably sound with respect to the above three aspects except the surrounding environment aspect. In terms of accessibility, all the 11 sites are located nearby the urban center of the small cities in the SMA. Eight sites are located nearby Seoul, with distance from Seoul city limits within 7km, while three are rather far, ranging between 12km and 17km. Existing road network and public transit have been examined for transportation network, and as a result, five sites are evaluated as good since these

[Table 4] Location Aspects of the 11 Proposed Sites

Sites	Accessi-bility to urban center	Distance from Seoul city limits	Transportation network	Surrounding environment
Uijeongbu	2.6km	7.2km	Good	Forest, agricultural land
Namyangju	5.5km	3.0km	Good	Forest, village
Hanam	9.8km	0.8km	Good	Agricultural land
Seongnam	2.8km	5.7km	Fair	Regional green axis
Gunpo	3.7km	12.1km	Fair	Forest, urban district, agricultural land
Ansan	5.0km	15.6km	Fair	Village, urban district
Siheung	1.2km	16.9km	Fair	Urban district, forest, agricultural land
Uiwang	5.5km	6.8km	Good	Regional green axis
Gwang-myeong	3.0km	0.1km	Fair	Residential area
Bucheon	3.3km	1.0km	Fair	Forest, agricultural land
Goyang	1.8km	4.3km	Good	Regional green axis, residential area

sites are adjacent to the regional arterial roads and six as fair with sub-regional arterial roads. As for surrounding environment, most of them are surrounded by forests and/or agricultural land except for Gwangmyeong and Goyang which are located close to existing residential areas and Gunpo, Ansan and Siheung which are located near the urban district.

2.2 Development Density

That the government intends to build large-scale housing complexes in greenbelts which have been restricted from development for over 30 years is an oxymoron. In this sense development density of the project has been raised as the most sensitive issue. Therefore the development

density certainly has to be lower than any other housing projects for reasonable growth management of urban areas as well as protection of natural environment.

FAR, population density, accommodation density and others can be used as indices for acceptable development density. This study sets an appropriate upper limit for FAR and population density according to FAR. A detailed discussion on appropriate FAR is in Section IV of this study.

According to the government plan, the average gross population density of the proposed sites is 238 persons/ha and average net population density is 507 persons/ha. Compared to the gross population density in urban housing development areas in Korea of 200-300 persons/ha, the proposed density is quite high considering that the project is in greenbelt areas which are characterized by restricted development. Table 5 shows that the gross density in Uijeongbu site is planned to be 296 persons/ha which is higher than the average density of 272 persons/ha in the five existing high-density new towns of SMA. Such a high-density development in the greenbelt area is most certainly beyond feasibility. Environmentalists assert that population density higher than

[Table 5] Planned Population Density in the 11 Proposed Sites

(Unit: persons per hectare)

Sites	Gross population density	Net population density
Uijeongbu	296	580
Namyangju	264	556
Hanam	192	460
Seongnam	238	527
Gunpo	236	483
Ansan	228	485
Siheung	220	467
Uiwang	201	446
Gwangmyeong	244	531
Bucheon	230	480
Goyang	273	561

Source: Lee et al.. *Planning Criteria for Environmentally Sound and Sustainable Public Housing Development in Greenbelt Area*, 2002

200 persons/ha is unacceptable in greenbelt areas. In their point of view, only the Hanam site with 192 persons/ha would be acceptable. This study attempts to make the project more feasible by suggesting lowering the development density to a reasonable level and it will also be discussed in Section IV.

2.3 Environmental Considerations

The natural environment of the planned sites for public housing in greenbelts and their surrounding areas is an important factor for sustainable urban growth management and ecological system as well as for residential environment. Environmental consideration is one of the strongest arguments of the opponents of the plan. They believe that the proposed sites near industrial complexes are inappropriate for residential development and constructing housing in the sites will cut off the regional green axis.

In this study environmental considerations are analyzed by two categories of on-site and off-site considerations as shown in Table 6.

According to the on-site analysis, most of the sites have forest, brooks, streams, hillocks and hills. Gunpo and Uiwang sites have pond and swamps. Namyangju site is a frequent flooded area which needs the preparation for the rainy season. Siheung site is a wasted land which was used for earth and sand collecting area to reclaim land from the sea. It is needed for Siheung site to restore the natural environment and take advantage of it to construct the housing complex on it. Gwangmyeong site has an existing elementary school in the site which needs to be preserved for the newly coming students after constructing the housing complex.

According to the off-site analysis, Seongnam, Uiwang and Goyang sites are located within the regional green axis and Uijeongbu and Gunpo sites are in the sub-regional green axis. The greenbelt aids in cleansing the polluted air and supplying oxygen in the SMA. Therefore destroying the regional green axis by constructing housing complexes is detrimental to the protection of natural environment. Ansan and Siheung sites are undesirable as residential location for they are near large industrial complexes. Needless to say, any development activity in the greenbelt area requires a thorough evaluation of its environmental impact.

Thus it is undeniable that the 11 proposed sites have some problems with regard to environmental considerations. However, when developable land has been almost exhausted in the SMA, acquiring relatively large amount of undeveloped land where new construction would have no adverse environmental impact is very difficult. At the same time, it is as difficult to acquire inexpensive land in built-up urban areas so as to build affordable housing for low income households who have very limited ability to pay. As an alternative, the government proposed to utilize the greenbelt area since readjustment of greenbelt system is taking place today. In such circumstances, choosing sites in greenbelt areas for low income housing can be seen as a compromise. Therefore, in order to gain justification of such a plan it is

[Table 6] Environmental Considerations in the 11 Proposed Sites

Sites	On-site considerations	Off-site considerations
Uijeongbu	· Protective forest is located in the north part	· Sub-regional green axis
Nam-yangju	· The site is frequent flooded area · A brook streams in the center of the site	· Riverside view
Hanam	· Protective Forest is in the center of the site	· Riverside view
Seongnam	· Several small streams are in the site	· Regional green axis
Gunpo	· A pond is located in the south part · A brook and forest are in the site	· Sub-regional green axis · Migratory birds habitat
Ansan	· A hillock is located in the north-west part · A brook streams in the center of the site	· Large industrial complexes
Siheung	· The site is wasted land which was used for earth and sand collecting area · A hill is in the east of the site	· Large industrial complexes
Uiwang	· Protective forest in the north-east of the site · Swamps in the east and a hill in the west of the site	· Regional green axis
Gwang-myeong	· Elementary school is existing in the north · Forest in the west and streams in the east and center of the site	· Residential area
Bucheon	· A hillock is located in the center of the site	· Abundant natural environment
Goyang	· A polluted brook streams in the center of the site	· Residential area · Regional green axis

critical that the development in greenbelt areas is designed to be environmentally sound and sustainable.

3. Summary

As discussed above the government's plan to construct public housing in greenbelt areas is evaluated to be reasonably sound in terms of locational aspects but needs some adjustments in terms of development density and environmental considerations to make the project more feasible. As much as the government is committed to provide affordable housing in greenbelt areas, planning guidelines that effectively reconcile both the supporters' and the opponents' arguments are necessary to make the project more justifiable. The major challenge is how to make housing development environmentally more sound and sustainable in the particular context of using greenbelt areas that have been restricted from development for the past 30 years. To meet this challenge this study considers two important factors for planning guidelines: setting an acceptable development density and compatible design criteria for the physical elements of the environment.

Construction of public housing is undertaken because there is a strong need for public intervention in the housing market, whether it is to provide affordable housing for low income or to stabilize the market. Even though it is undertaken by a public authority, financial feasibility cannot be overlooked. There is a trade off between financial feasibility and environmental soundness. To make a project financially feasible, high development density is required. On the other hand, pursuing environmental soundness can involve high costs. This study focuses on formulating physical criteria for environmental soundness which may require higher financial burden on the part of either the government or the residents of low income housing. Financial feasibility analysis was conducted but it is not discussed in this study which focuses on the physical aspects of the project.[6] This study assumes that the government should make a stronger commitment to obtain sufficient funds for subsidy to alleviate the financial burden of the low-income residents, which may be incurred to make the housing project environmentally sound.

---

6) For financial feasibility analysis refer to Lee et al.(2002).

Environmentally Sound and Sustainable Planning Guidelines

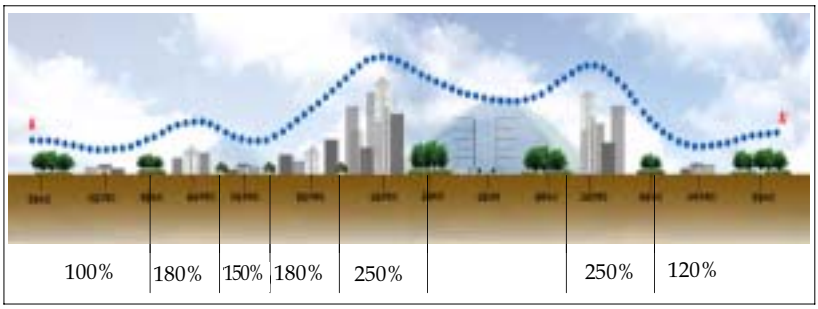
1. Acceptable Development Density

1.1 FAR Criterion

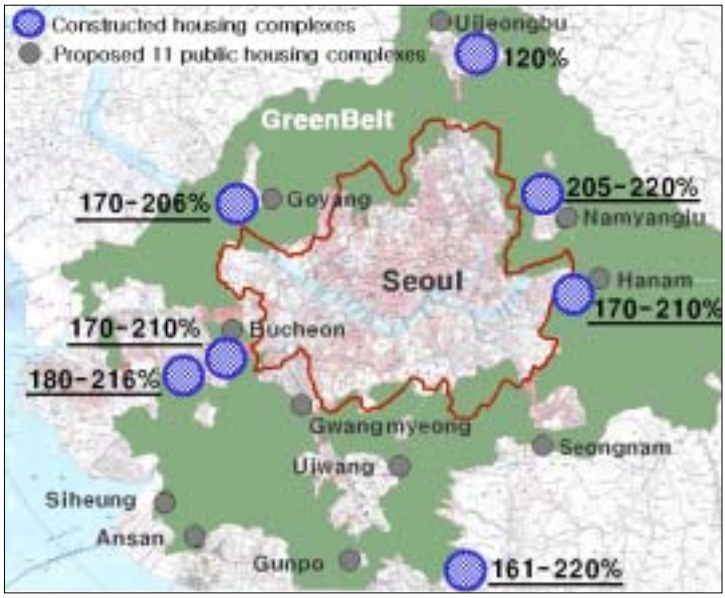
One of the elements that determine development density which takes into account planned population capacity and housing size is FAR. It is also a basic factor in determining the landscape which shapes the exterior forms and skylines of housing complexes. Figure 3 shows the changes in skyline associated with different FAR's. This study establishes an acceptable FAR for the public housing development in greenbelt areas of SMA, and based on the FAR derives appropriate population density.

The following circumstances were considered in establishing FAR acceptable for the proposed 11 housing complexes. First, the five new towns of SMA developed in the past 10 years or so, which have an average FAR of 196%, have been criticized for relatively high-density development. Taking into account this point that the proposed public housing is to be located in greenbelt areas, the acceptable FAR for the proposed public housing should certainly be lower than the five new towns. Second, housing complexes constructed in the vicinity of the proposed sites have FAR of 160-220% as can be seen in Figure 4. To have social justification developments in the greenbelt should have lower FAR than those complexes which are located outside of the greenbelt area. Third, the Urban Planning Act of Korea specifies FAR

[Figure 3] The Changes in Skyline Associated with Different FAR's.



[Figure 4] FAR of Housing Complexes Constructed in the Vicinity of the Proposed Sites



for Exclusive Residential District to be 80-150% and for Type I General Residential District 150-200%. Since these districts are for developable areas, FAR for public housing in greenbelts should be lower than that of Type I General Residential District, and at most should be equivalent to that of Exclusive Residential District. Consequently this study establishes the acceptable FAR for public housing in greenbelt areas to be a maximum of 150%.

1.2 Population Density

In this study population density is derived from the above FAR criterion and the number of housing units provided in the proposed sites. The capacity of the sites in terms of the number of housing units is calculated by applying the established FAR of a maximum of 150%. The household size of 3.0 persons per unit, which is the general standard for residential development in Korea, is used to set population density. Table 7 shows how the population density planned by the

government should be changed when the FAR of 150% is applied for five of the 11 proposed sites. With the FAR of 150%, even though the population densities of Namyangju and Ansan sites decrease from 264 persons/ha to 220 persons/ha and from 228 persons/ha to 215 persons/ha, respectively, they still remain above 200 persons/ha. Because the size of individual unit in public housing complex for the low-income class is relatively small, for a given FAR, population density in such complex tends to be higher than those of other residential complexes. In this sense, even if population density of public housing complex is slightly higher than those of other housing complexes, it actually has lower development density.

As for Seongnam and Uiwang sites, applying the FAR of 150% decreases the population density to 197 persons/ha and 189 persons/ha, respectively, satisfying the environmentalists' standard of below 200 persons/ha. Bucheon site shows negligible change in population density. Population densities derived from the FAR of 150% are 15-35% lower compared to 271 persons/ha of the five new towns and 290 persons/ha of the housing complexes in the vicinity.

In comparison to existing high-rise and high-density residential complexes, the desirable population density suggested in this study leads to medium-rise and medium-density collective housing in the proposed housing sites. Along with the desirable development density, compatible design criteria for physical elements of the environment should be established.

[Table 7] Comparison of Planned Population Density with Suggested Population Density

(Unit: persons per hectare, %)

	Nam-yangju	Seong-nam	An-san	Ui-wang	Bu-cheon	Five new towns in SMA	Constructed sites
Planned by the government	264	238	228	201	230	271 (FAR : 196)	290 (FAR : 197)
Suggested in this study (FAR : 150)	220	197	215	189	231		

Source: Lee et al.. *Planning Criteria for Environmentally Sound and Sustainable Public Housing Development in Greenbelt Area*, 2002

2. Design Criteria for Physical Elements

As discussed above, most of the arguments put forth by the opponents of the government plan are related to environmental issues. Most of the 11 SMA sites either are within the green axis or have rich natural environment. For environmentally sound and sustainable housing development it is fundamental to formulate specific design criteria for the site and its surroundings. For this purpose, this study suggests appropriate criteria for the following two aspects: shaping the landscape and conserving the environment.

Incorporating the development density criteria set as shown above, design criteria are established with the following four objectives: to create a high-quality built environment that satisfies the physical, emotional and visual needs and wants of the residents; to provide a residential environment in line with the existing regional green network and water system; to create a contextual district landscape that takes account of scenic resources around the site; and to make a residential environment that ensures diversity of natural species.

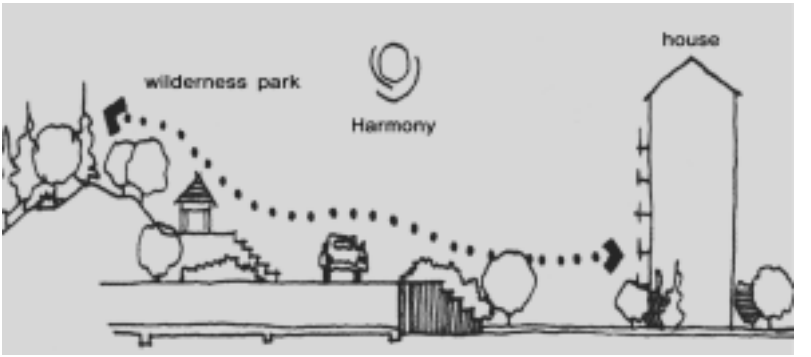
2.1 Criteria for Shaping the Landscape

• Conservation of Natural Landscape

To maintain and manage the existing natural landscape, one should identify and utilize the natural resources that have been preserved in the particular context of greenbelt. In land use planning and site planning these natural resources should be reflected for conserving the desirable landscape(Figure 5). The specific criteria are:

1) Give variation to skyline of buildings and blocks on the site by reflecting the contours of rolling hills, air flow and wind direction(Figure 6).
2) Provide visual corridors for quality enhancement of visions from streets, avenues and plazas by applying visual points, eye stops, visual axes and landmarks in site planning.
3) Create a buffer zone around the site edges so that there is a transitional lead-in between the green environment and the built environment(Figure 7)[7].
4) Preserve hillocks and avoid cutting out the hills to keep the exiting

[Figure 5] Housing Complex in Harmony with Natural Resources



[Figure 6] Variation of Skyline

[Figure 7] Green Environment
(Frankfurt, Germany)

configuration of the ground, which would bring about curvilinear streets and winding roads.

5) Protect the regional green axes in the upper level land use planning by connecting cut off areas and restoring damaged areas.
6) Utilize natural resources such as green space, water streams and others as amenity elements and historical and cultural resources as identity elements.

• Shaping and Managing the Landscape

To shape the new landscape the existing landscape should be

7) The photographs hereon are well-designed exemplary cases from abroad where the author visited for this study.

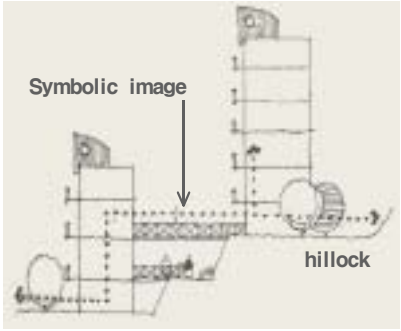
complemented by filling in the shortcoming aspects in harmony with the characteristics of the natural landscape with respect to pattern, morphology, continuity and texture. The following criteria are necessary for shaping and managing the landscape of the newly built residential complex:

1) Induce construction of landmark building in the center of the complex by controlling development density through FAR limit but allowing variable building heights(Figure 8-9).
2) A variety of building forms and layouts such as tower and complex-type layout should be used so that residential buildings do not form a flat-type layout and make a screen covering up the natural landscape when seen from major visual points.
3) To give distinct site identity, landscape objects can be constructed at the entrance and the edges of the complex as well as pedestrian streets and central plazas.
4) Do not change the natural ground form and avoid big differences in altitudes of building blocks and vertical passenger lift facilities should be installed where disparity in altitudes is unavoidable(Figure 10-11).
5) Adopt pedestrian oriented plan by excluding through-traffic, separating pedestrian from vehicles and designing speed reduction mechanisms such as humps and curved streets.
6) Create parks for outdoor parking which can be used as multipurposes area such as outdoor service yard.
7) In commercial districts provide incentives to put in design elements such as building set backs and arcades for public purposes to enhance the quality of pedestrian environment.
8) Give different angles between buildings to avoid simple linear layout and pursue a variety of compositions such as prominence and depressions of elevations and various building colors and shapes of roofs for hybrid formation of residential buildings (Figure 12-13).

[Figure 8] Landmark Building

[Figure 9] Various Building Heights
(Kobe, Japan)

[Figure 10] Different Altitudes of Building Block



[Figure 11] Vertical Passenger Lift
(Stockholm, Sweden)

[Figure 12] Diversity in Elevation
(Berlin, Germany)

[Figure 13] Variety of Composition
(Amsterdam, Netherlands)

2.2 Criteria for Environmental Conservation

• Conservation of Ecological Resources

The basic approach in setting the design criteria for conservation of ecological resources is by taking the development site as an organism, and upholding the characteristics of natural ecology, so as to harmonize the man-made environment with the natural environment. The criteria drawn from this approach are:

1) Compose a green network embodying the ecological resources within and out of the site with parks at nodes connected by green streets(Figure 14).
2) Link the green network with the blue network which is a circulating and connecting system of streams, brooks, ponds, swamps, and other water resources.
3) Integrate a white network to promote air circulation and to keep out polluted air by making ventilation corridor or windbreak forest on the site.
4) Compose a bio-top utilizing swamps or ponds for protecting index species such as dragonflies, frogs, fireflies, beetles, larks and so on(Figure 15).
5) Make ground surface suitable for natural growth of plants and use permeable material for pavements to avoid impermeable artificial surfaces as much as possible(Figure 16).
6) Utilize neglected and waste lands for educational ground

[Figure 14] Green Street Image

[Figure 15] Bio-Top
(Potsdam, Germany)

providing farming experience to promote environmental awareness and for community festivals(Figure 17).

• Creating and Managing Environment-friendly Facilities

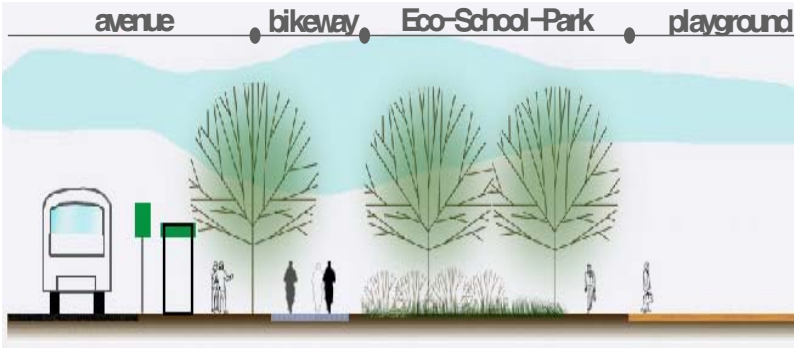
It is fundamental that natural and man-made environments are integrated through minimizing energy consumption and waste generation, maximizing recycling and restoring natural eco-system. The criteria for creating and managing environment-friendly facilities are:

1) Introduce the concept of eco-school park which is a learning ground with fenceless schools and environmental education facilities, connected to nearby parks and open spaces(Figure 18).

[Figure 16] Permeable Ground Surface(Berlin, Germany)

[Figure 17] Educational Playground (Copenhagen, Denmark)

[Figure 18] Eco-School Park Concept



2) Provide children's playground fabricated with natural materials for the safety and diversity of children's activities.
3) Create symbolic amenity space to give character to each site such as community centers, pocket parks and street corner parks (Figure 19-20).
4) Introduce fenceless residential complex with easy accessibility to green and water spaces to minimize spatial and social enclosure and segregation of public housing(Figure 21).
5) Change to positive the negative image of infrastructures such as sewages, waste disposal facilities, power transmission towers and so on, by planting or decorating the surfaces of the structures (Figure 22).

[Figure 19] Symbolic Community Space(Copenhagen, Denmark)

[Figure 20] Street Corner Park (Kobe, Japan)

[Figure 21] Fenceless Residential Complex(Stockholm, Sweden)

[Figure 22] Positive Image of Infrastructure(Kobe, Japan)

6) Make reservoirs for controlling the flood and separate rain water from waste water to recycle it for washing cars, watering plants, flushing toilets and others where recycled water can be used.

The relevant actions outlined in the design criteria for physical elements discussed above are categorized into those that are absolutely required, recommended, and strictly prohibited and are shown in Table 8. Absolutely required items are related to fulfillment of basic needs of the community while recommended items are related to secondary needs that arise from tastes, hobbies and inclinations of people. Strictly prohibited items are concerned with deterioration of natural environment.

Site planning in the proposed sites, when supported by creative ideas based on the criteria suggested above, will heighten the values of public interest. A variety of planning tools and strategies that can enhance the characteristics of each site should be employed. For example, an effective method is to subdivide a site into several blocks, for each of which outstanding plan can be selected through design competition. Another strategy is to designate a part of the site as a special zone which can be designed relatively free from regulations. Applying Planned Unit Development method or choosing one of the sites as a model site for ecological residential development is another effective tool. In addition, MD(master designer) or MA(master architect) system[8] can be adopted for creative site design which can enhance the sense of identity for residential complexes.

Conclusion

Recently the Korean government announced a plan to construct 100,000 units of public housing in greenbelt areas to stabilize the housing market and increase the supply of affordable housing in SMA.

8) MD or MA system is a planning and design system in which a master designer(s) or architect(s) takes total responsibility for the site in charge overseeing the whole process from building details to the general site plan. Recently in Korea, through adoption of this system, more creativity could be realized in large-scale residential developments, preventing monotonous and common designs.

[Table 8] Design Criteria for Physical Elements

Item	Shaping the landscape	
	Conservation of natural landscape	Shaping and managing the landscape
Required	· Preserve hillocks · Regional green axis · Utilize natural resources	· Variety of building forms and layouts · Pedestrian oriented plan
Recommend	· Variation of skyline · Visual corridors · A buffer zone · Curvilinear streets · Connecting cut off areas	· Landmark building · Distinct site identity · Parks for outdoor parking · Set backs and different angles · Various colors and shapes
Prohibited	· Cutting out the hills · Screening the natural landscape	· Changing the natural ground form · Big differences in altitudes · Simple linear layout

Item	Environmental conservation	
	Conservation of ecological resources	Creating and managing environment-friendly facilities
Required	· Green network · Blue network · White network	· Symbolic amenity space · Use natural materials · Reservoirs · Separate rain water from waste water
Recommend	· Bio-top · Permeable ground surface · Utilize neglected and waste lands	· Eco-school park · Natural materials · Fenceless residential complex
Prohibited	· Polluted air and water · Impermeable artificial surfaces	· Negative image of infrastructures · Spatial and social enclosure and segregation

It is difficult to acquire large-scale land in the inner city because most of it is developed in high density. On the other hand, land price is relatively low in greenbelt areas, which makes provision of public housing at low cost possible. However, for the past 30 years greenbelts in Korea have played an important role in preventing urban sprawl and protecting the natural environment. Consequently residential developments in greenbelts should not be undertaken in the same manner as those in other urban fringes. Greenbelts in Korea have been restricted from development and as a result they have preserved healthy natural environment. In this circumstance, the most important task is to prepare environmentally sound and sustainable planning guidelines in order to make public housing development in greenbelt areas justifiable.

This study undertakes this task by setting a desirable development density and establishing design criteria for physical elements. FAR as one of development density indices is set at a maximum of 150% based on the considerations that the site is in the greenbelt area and that FAR of nearby residential developments outside greenbelts are 160%. Population density is allowed to be flexible according to each site's land use planning. Such development density can generate mediumrise and medium-density housing complexes.

For the physical environment, criteria for shaping the landscape and for environmental conservation are suggested based on natural environment of on-site and off-site. In developing the criteria natural resources are identified and utilized and the subsequent land use plan and site plan are formulated. These criteria would enhance the characteristics of natural ecology so as to harmonize the man-made environment with the natural environment. This study also suggests these criteria categorized into three types of application to provide residential complexes that harmonize people, nature, and the built environment.

In the past housing construction in Korea was development oriented, resulting in substantial deterioration of the natural environment. For that reason, the government's plan at present to construct public housing in greenbelt areas should be a model in environmentally sound and sustainable housing development so as not to repeat the past mistakes. By applying the guidelines suggested in this study from the beginning stage of the plan, it is hoped that the public housing in greenbelt areas can be justifiable.

References

Ann Forsyth. *Constructing Suburbs: Competing Voices in a Debate Over Urban Growth*. Australia: Gordon and Breach Publishers, 1999.

Balchin, Paul and Maureen Rhoden(eds.). *Housing: The Essential Foundations*. London: Routledge, 1997.

British Town and Country Planning Association. *Commentary on Restricted Development Zone(RDZ) Policy Reform in Korea*. Korea Planners Association, 1999.

Citizens' Movement for Environmental Justice. *Press Conference News Data Against Government Public Rental Housing Plan*, 2002. 5. 13.

Ian L. Mcharg. *Design with Nature*. New York: Doubleday & Company, Inc., 1971.

Jee Byung, Park. "Study on the Rental Housing for Low-Income Household." Dissertation of Ph. D, Kyungwon University, 1995.

Korea Land Corporation. *Prior Review Report of Environmental Impact*. 2002.

Korea Ministry of Construction & Transportation. *Improvement Plan for Greenbelt System*. 1997.

Korea Ministry of Construction & Transportation. *Press Conference News Data for Government Public Rental Housing Plan*. 2002. 2.

Korea National Housing Corporation. *Year Book of Housing Statistics*. 2001.

Korea National Housing Corporation. *Prior Review Report of Environmental Impact*. 2002.

Korea Research Institute for Human Settlements(KRIHS). *50 Years of National Territory*. 1996: 456-457.

Korea Research Institute for Human Settlements(KRIHS). *A Study on the Residential Stability of Low Income Class and Achieving Housing Standards*, *Korea National Housing Corporation and Korea Ministry of Construction and Transportation,* 1999.

Kyonggi Research Institute(KRI). *Policy Reform and Land Use Management for Restricted Development Zone(RDZ) in Capital Region*. 1999.

Kyunghyang Newspaper. 2002. 1. 18

Partners for Livable Communities. *The Livable City: Revitalizing Urban Communities*. New York: The McGraw-Hill, Inc., 2000.

Richard, Harris and Peter J. Larkham. *Changing Suburbs: Foundation, Form and Function*. London: E and FN Spon, 1999.

Seong-Kyu, Ha et al. *House · City · Publicity*. Pakyoungsa Company, 2000.

Tom, Daniels. *When City and Country Collide: Managing Growth in the Metropolitan Fringe*. Washington, D.C: Island Press, 1999.

William, M. R. and Lauren B. G. *Planning with Neighborhoods*. The University of North Carolina Press. Chapel Hill and London, 1985.

Woo Jong, Lee et al. *Planning Criteria for Environmentally Sound and Sustainable Public Housing Development in Greenbelt Area*. 2002.

백면

13 Level of Quality of Life and its Discrepancies by City Size

Hyun-Sik Kim
Hyun-Soo Kang

Introduction

In Korean society, we have experienced the changeover to a qualitative growth-oriented era, in which the quality of individual life is well considered, from a quantitative growth-oriented era. In addition to this, urban planning has also given priority to the sphere of everyday life rather than the sphere of production. However, the current methodology in urban planning shows its limitation in accepting progressively the requirements of the times to create new value from qualitative growth since it still follows the quantitative research methodology. Therefore, It is necessary to search new theories and expand spheres in urban planning because it is expected that the demand for urban planning focusing on quality of life will increase and its role will change in the future. In this process, the concept of quality of life will have a significant meaning.

Influenced by this trend, we have had some studies concerned with the quality of life in recent years. Especially in the era of globalization, the quality of life becomes much more meaningful and important as Hall mentioned as follows:

> Since the sources of the new economic growth are so various and finally perhaps so fickle, the possibilities are endless. But one central element is quality of life. It is no accident that, as never

before, rankings of cities dominate the media.(Hall, 1995: 20)

The objective of this paper is to propose a set of key components and indicators of the quality of life in Korean cities, and to analyze the level of quality of life and the discrepancies among cities, so that we may raise policy issues and directions to improve the quality of life for Korean citizens.

In the midst of all kinds of variables, city size is an essential variable, which has a significant meaning for the establishment of policies. Most studies on city size have so far focused on estimating the optimal size of cities in order to guarantee the best quality of life in terms of benefit-cost analysis. In this study, we will not attempt to solely analyze the holistic city life in terms of benefit-cost analysis, but we will also analyze various mutual relationships between city size and quality of life, by classifying urban life into various elements of the quality of life. The analysis of these relationships will provide many suggestions for the establishment of urban policies geared towards improving the quality of life in cities.

For the purpose of this study, we have divided the paper into four parts. The first section is a very brief summary of the research project, its contents, and the applied methodology. Also included is a proposed set of key components and indices of the quality of life in Korean cities. In the second section, we analyze the discrepancies and changes of the level of quality of life among Korean cities, and also analyze the relationship between the size of the city and the level of quality of life. In order to analyze the change in quality of life in Korean cities in general and to examine the differences by city size, we introduce the concept of the Korean Dream City(KDC). In the third section, we attempt to compare the level of quality of life in Korea with OECD member countries. Finally, we discuss policy issues and directions to improve the quality of life in Korean cities.

Methodology: Indicator and Procedure

1. Defining and Classifying Quality of Life

Quality of Life(QoL) means the standard of welfare and the quality of the environment in general. However, we currently have no explicit agreement upon the definition of quality of life. Some consider it in connection with the individual welfare and satisfaction while others relate it to the living conditions of a place. In the research on the quality of life, it is usually divided into "subjective QoL" and "objective QoL" and measured by various indicators.

Subjective QoL is related to the individual's response such as satisfaction or preference in general. The indicators of subjective QoL shows the level of individual satisfaction with some aspects to life such as health, welfare and family life. There are specific examples of the indicators like satisfaction with marriage, family life, leisure time, and job and salary. Since these indicators are difficult to be defined and measured, they are commonly excluded from the QoL evaluation.

On the other hand, objective QoL depends on supplying social demands for material wealth, social status and physical well-being. It can be further classified into physical and non-physical types.

Thus, in this study, we can classify the components of QoL as four dimension; that is objective/physical(A type), objective/non-physical(B type), subjective/physical(C type), subjective/non-physical(D type)(Kim and Jeong 1996)(Table 1).

A type and B type among the indicators are the targets of this study. A type(objective/physical QoL) is the element represented by economic and physical aspects of life, which is considered important in developing countries such as Korea from the 1960s to the 1980s. Since its data have been accumulated throughout most countries, A type has

[Table 1] Components of Quality of Life

	Objective	Subjective
Physical	A type	C type
Non-physical	B type	D type

an advantage over the other types to be used for international comparative studies.

Otherwise, C type and D type are the elements that have limitations in comparing international data since these types focus on subjective factors, which depend on individual characteristics or experiences. In addition, if we want to measure these types, we must undertake large-scale surveys on the subjective satisfaction and psychological responses of people. Thus this study will focus on A and B types so that we may examine the changes in the objective quality of life in Korean cities.

2. Evaluation of Urban QoL

The first work in the study of quality of life is to extract and evaluate the components that reflect the quality of life. There exist various methodological approaches to evaluate the quality of life, for example, the personal well-being approach, the community trend approach, the market-residence approach, and the livability comparison approach(Myers, 1987). The livability comparison approach is the one that focuses on objective indicators and regional comparisons, and primarily intends to extract holistic perspectives of the quality of life.

Evaluation also has to be conducted at two levels: at a personal level, where each person assesses his or her own level of satisfaction with life; and at a city level, where urban features that contribute to satisfaction(or dissatisfaction) can be evaluated. This paper focuses on the second level of evaluation, which is concerned with urban features.

3. Selecting Indicators

This study divides quality of life into physical and non-physical types. Physical quality of life is composed of three elements: economy, convenience, and location attributes. Non-physical quality of life includes two elements: education and culture, and health and safety.

Under these five component groups, 35 indicators are selected to analyze the level of quality of life in Korean cities. These indicators are shown in Table 2 and Table 3.

[Table 2] Physical Types of Quality of Life Indicators

Type	Physical types of QoL indicators		
Compo-nents	Economy	Convenience	Location
Indicators	Budget of local governments per person(₩10,000)	Rate of roads(%)	Average Temperature(℃)
	No. of the lower income brackets per 10,000 person	Rate of paved roads(%)	Distance to Seoul(km)
	Financial inde-pendence of local governments(%)	Water supply per person a day(ℓ)	Site of a provincial government(=1)
	Diffusion ratio of house(%)	No. of Telephones per 100 person	Site of a airport(=1)
	Ratio of water supply(%) (water supplied population/total population)	Floor space of market per 10,000 person(m^2)	
	Ratio of sewage distribution(%)	No. of residents per civil servant	

The process of selecting each indicator for the urban quality of life in this study rests upon some principles as follows:

First, OECD Social Indicators is referred to under the premise that it will be necessary to compare the quality of life among cities by norms and standards, which are presently used globally, as Korea has become a member of OECD.

Second, we refer to the first survey in Korea conducted by Korean Media Research(KMR) on "the most interesting quality of life to Koreans" to understand characteristics unique to Korean.

Third, we select the objective indicators, which are commonly used in some pre-researches and easily measured. We also select variables

[Table 3] Non-physical Types of Quality of Life Indicators

Type	Non-physical types of QoL indicators	
Compo-nents	Education and culture	Health and public safety
Indica-tors	No. of students per class at elementary schools	No. of employed medical personnel per 10,000 person
	Prescribed no. of students at universities per 10,000 person (exclude colleges)	No. of beds in medical facilities per 10,000 person
	Cultural and sports expenditure per person(₩10,000)	No. of pharmacies per 10,000 person
	No. of volumes in libraries per 10,000 person	Social welfare expenditure per person(₩10,000)
	No. of seats in theaters per 10,000 person	The area of parks per 10,000 person(m^2)
	No. of cultural facilities per 100,000 person	No. of traffic accidents per 10,000 person
	The floor space of gymnasiums per 10,000 person(m^2)	No. of criminal occurrences per 10,000 person
	The floor space of sports complex per 10,000 person(m^2)	No. of violent offences per 10,000 person
	The area of swimming pool per 10,000 person(m^2)	No. of fire incidents per 10,000 person
		No. of fire equipments per 10,000 person

from statistics at two points in time, 1995 and 1998, which reflect shifting conditions, such as globalization, information, and localization.

Fourth, we add indicators related to the locational condition of cities closely concerned with the quality of life of citizens. As it has an ontological meaning in urban social structure and human life, and the

quality of life is given significance only in the 'real place,' where we live everyday. we should emphasize the locational attribute especially in this study of quality of life, whose research object is the spatial scale of cities.

Finally, because a limited number of indicators are used in this study, it is necessary to develop various indicators related to the spatial elements of quality of life to be used in a later study.

4. Object of Survey and Data Collection

In this study, the targets of investigation include all the cities in Korea. In order to create indicators, we collect data from 72 cities, except 9 cities that changed their administrative status or jurisdiction area. The time frame of this investigation is between 1995 and 1998.

We make use of data provided by The JoongAng-Ilbo's *The data book on the quality of life in Korean Cities: The comparison and appraisal between 74 cities(in Korean)*, for 1995 data, and from The Ministry of Government Administration and Home Affairs(MOGAHA), *1998 Municipal Yearbook of Korea*, for 1998 data.

In addition, we refer to the two statistics reference books from the Korea National Statistical Office(KNSO): *The Social Indicator in Korea, and, Statistics on OECD member countries and Korea.*

5. Nissan's Method

Among the various methodological approaches to evaluate the quality of life, the livability comparison approach has an advantage in focusing on objective indicators and regional comparisons as discussed above. This approach can be used for some analytic methods as well. The most remarkable one is the distance index method by Nissan(1989). Nissan's method utilizes the concept of Euclidean distance and computes differences and similarities to be expressed as n-dimensional distances from a composite ideal, where the ideal is chosen as the best score for each factor.

We can assume that there are n cities to be ranked according to k factors. Let X_{ij} be the value that city i takes for factor j. Since the component factor X_{ij} is expressed in different and incomparable units, it is standardized by using a conventional transformation

$$z_{ij} = (x_{ij} - x_j)/s_j$$

where

$$\overline{x_j} = (\sum_{i=1}^{n} x_{ij})/n \quad \text{and} \quad s_j = [\sum_{i=1}^{n} (x_{ij} - \overline{x_j})^2/n]^{1/2}$$

The n-dimensional distance, d_{i0}, for city i from the hypothetical model city 0 is computed as

$$d_{i0} = [\sum_{j} (z_{ij} - z_{0j})^2]^{1/2}$$

By definition of it, the cities with the lower scores provide higher quality of life.

In this study, we try to apply this statistics method and introduce the concept of Korean Dream City(KDC), which is a hypothetical model city with the highest value of each indicator involved.

The Level and Changes of QoL in Korean Cities

In this section, we try to analyze the changes in the level of quality of life among Korean cities from 1995 to 1998, and also analyze the relationship between the size of city and the level of quality of life. In order to do this, we calculate the statistical value of mean and standard deviation of each indicator and examine the difference in mean and the comparison of deviation between 1995 and 1998. And we verify the statistical significance about the difference in mean and the comparison of deviation. If we place significant statistically on the difference in mean and the comparison of deviation, it means that we can reject the hypothesis that there is no difference between the value of mean or the value of standard deviation.

1. Changes of Physical Types of QoL

The most important indicators related to economic components in physical aspects of QoL are average income and the gross local produc-

tion per person. But it is very difficult to obtain average income data and the gross local product data at local unit in Korea. Therefore, this study uses the three alternative variables that can be easily collected: the budget of local governments per person, the number of low-income residents per tens of thousands of people, and financial independence of local governments.

As shown in Table 4, the overall economic components of QoL have slightly improved from 1995 to 1998. But financial independence of local governments in Korean cities, which is one of the economic indicators, has declined during the same period. There was a sharp increase as well in the budget of local governments per person and thus the gap between cities in this indicator has widened. Also we can see that the number of low-income residents has slightly dropped and the gap between cities for this indicator has narrowed.

We selected nine indicators to represent the convenience element in the physical aspect of QoL(Table 2). In general, these indicators in convenience have increased from 1995 to 1998. But most of them have increased only very slightly and thus they are statistically insignificant, except for the ratio of sewage distribution and the number of telephones per 100 people.

The indicator of distance to Seoul was selected as the evaluative indicator of quality of life with the assumption: the nearer the city is to Seoul, the more convenient and beneficial it is for its citizens, considering the fact that most of economic, social, cultural and political activities are concentrated in Seoul.

Generally it is impossible for us to improve the quality of life that depends on the geographical conditions and locations of cities. But with the development of traffic and communication technology, and the expansion of basic urban facilities, we can improve the related conditions of location toward the improvement of citizens' quality of life. In this study, some locational indicators of quality of life, for example, distance to Seoul or average temperature, are given and fixed conditions which can not be changed by our will or by planning. However, if we consider that the time distance or psychological distance can be changed with the accelerated informatization and the development of traffic and communication, the indicator of the distance to Seoul is not unchangeable. But as it is difficult to measure these elements, we select physical

[Table 4] Changes of Physical Types of QoL

Components	Indicators	1995		1998		Mean difference (C-A)	Comparison of deviation (D/B)
		Mean (A)	Standard deviation (B)	Mean (C)	Standard deviation (D)		
Economy	Budget of local governments per person	93.71	31.47	143.16	47.89	49.45[1)]	1.52
	No. of the lower income bracket	346.32	254.57	261.57	206.48	-84.75[2)]	0.81[3)]
	Financial independence	58.14	21.07	51.60	24.98	-6.54	1.19
	Diffusion ratio of house	78.40	11.70	82.78	13.42	4.38	1.15
	Ratio of water supply	89.56	8.90	81.22	17.03	-8.34	1.91
	Ratio of sewage distribution	58.47	19.82	66.59	27.01	8.12	1.36
Convenience	Rate of roads	16.85	8.94	17.47	8.89	0.62	0.99[3)]
	Rate of paved roads	93.50	10.53	95.09	10.22	1.59	0.97
	Water supply per person	359.01	72.03	362.39	75.78	3.38[1)]	1.05
	No. of Telephones per 100 person	42.62	9.71	52.85	13.17	10.23[1)]	1.36
	Floor space of market per 10,000 person	2,575.73	2.135.11	3,262.82	2,844.57	687.09	1.33[2)]
	No. of residents per civil servant	139.72	56.10	204.94	87.65	65.22	1.56
Location	Average temperature(℃)	13.56	1.31	13.78	1.32	0.22	1.01
	Distance to Seoul(km)	232.97	168.90	232.97	168.90	0.00	1.00
	Site of a provincial government(=1)	0.16	0.37	0.18	0.39	0.02	1.05
	The site of a airport(=1)	0.19	0.39	0.19	0.39	0.00	1.00

Notes: 1) indicates significance value of $p<0.1$
2) indicates $P<0.05$ 3) indicates <0.01

and spatial distance, which cannot be changed artificially, as evaluative indicators.

In the locational indicators of quality of life, though the average temperature has risen by 0.22 in cities of Korea, it is not significant statistically.

2. Changes of Non-physical Types of QoL

People usually regard our life affluent when their needs and wants are fulfilled. To meet their desires, the various preferences must be adequately supplied and non-physical values must be well considered, such as culture, health, public safety and education especially in Korea. In this study, 19 indicators representing the non-physical aspect of QoL are selected(Table 3).

First, as shown in Table 5, the majority of indicators of QoL related to education and culture have slightly improved from 1995 to 1998, but most of them are not statistically significant. But considering that most of the high-quality educational and cultural facilities are centered in Seoul and the larger cities in Korea, the results of the analysis on the quality of life in education and culture mentioned above seem to conceal the reality that most of Koreans have experienced in their everyday urban life. Because we could not include qualitative variables of the quality of life in education and culture, a follow-up study should focus on qualitative variables rather than, or in addition to, quantitative ones. For example, the indicators related to quantitative variables such as the number, or the floor space, of physical facilities should be substituted for qualitative ones such as the frequency of outstanding public performances per year in these facilities.

In addition, the indicators correlated with health have worsened, while indicators correlated with safety, for example, accidents and crimes, have improved from 1995 to 1998, most of which are statistically significant.

In general, the analysis of the changes of the level of QoL in Korean cities shows that the physical aspect of QoL indicators has improved more than the non-physical aspect of QoL indicators. But in relation to discrepancies between cities, the gap among cities in the physical aspect of QoL has widened, while the gap for non-physical aspects has narrowed.

[Table 5] Changes of Non-physical Types of QoL

Components	Indicators	1995		1998		Mean difference (C-A)	Comparison of deviation (D/B)
		Mean (A)	Standard deviation (B)	Mean (C)	Standard deviation (D)		
Educational & cultural	No. of students at elementary schools	36.91	6.41	34.77	6.57	-2.14	1.02
	No. of students at universities	120.55	257.92	125.87	128.18	5.32	0.50[2)]
	Culture and sports expenses	3.37	3.62	4.46	5.21	1.09[1)]	1.44[3)]
	No. of volumes in Libraries	3,380.81	2,822.71	5.219.53	3,537.45	1,838.72[2)]	1.25[3)]
	No. of seats in theaters	73.73	45.61	47.96	28.71	-25.77	0.63
	No. of cultural facilities	1.12	1.31	1.29	1.26	0.17	0.96
	Floor space of gymnasiums	243.09	447.43	318.23	323.42	75.14	0.72[2)]
	Floor space of sports complex	1,977.43	3,342.87	1,902.17	2,476.82	-75.26	0.74
	Area of swimming pool (m^2)	78.04	178.04	112.13	143.80	34.09	0.81[3)]
health & safety	No. of employed medical personnel	48.24	22.93	45.04	14.68	-3.2	0.64
	No. of beds in medical facilities	54.33	29.25	56.18	28.48	1.85	0.97
	No. of pharmacies	4.40	0.89	3.45	0.77	-0.95[2)]	0.87[3)]
	Social welfare expenses	7.54	2.41	9.62	3.18	2.08[3)]	1.32[3)]
	Area of parks(m^2)	131.33	386.15	96.21	348.85	-35.12	0.90
	No. of traffic accidents	136.60	101.17	79.44	35.70	-57.16[2)]	0.35[3)]
	No. of criminal occurrences	333.43	360.16	274.86	157.90	-58.57[1)]	0.44[3)]
	No. of violent offences	4.29	2.83	3.15	1.36	-1.14[2)]	0.48[3)]
	No. of fire incidents	5.49	5.27	7.47	2.96	1.98	0.56[2)]
	No. of fire equipments	1.98	1.96	1.99	1.31	0.01	0.67[1)]

Notes: 1) indicates significance value of $p<0.1$
2) indicates $P<0.05$
3) indicates <0.01

Size of Cities and Level of QoL

Regarding the optimal city size, the point in question is open to further discussion. We have currently no agreement upon defining the optimal city size. Some believe that larger scale of city leads to greater efficiency, less social costs and better quality of life. This opinion is based upon economies of scale. However, diseconomies of scale also should be considered like increasing costs and disadvantages resulted from higher density of population. For example, surplus population usually requires higher costs per person to maintain clean water and safe refuse disposal. In addition, we could experience much more criminal accidents, the risk of personal safety and deviant social behavior in larger cities. The rates of robbery and property crimes show the sharpest rise with larger urban size.

Therefore, there appears to be no consensus on an exact optimal value for city population. Some researchers have tried to estimate the optimum city size in order to guarantee the best quality of life in terms of benefit-cost analysis. But we do not expect to arrive at a single type of urban settlement that is optimal or ideal for all persons as we attempt to analyze the various mutual relationships between city size and the quality of life.

In this study, in order to explore the relationship between city size and the level of QoL, we classify the cities into five population groups: Seoul, a population of more than 1 million, a population of 0.5 to 1 million, a population of 0.1 to 0.5 million, and a population of less than 0.1 million.

The first step is to compare the average value of individual indicators by city size. For the second step, this study applies the distance index method by Nissan(1989).

Nissan's method utilizes the concept of Euclidean distance and computes differences and similarities to be expressed as n-dimensional distances from a composite ideal, where the ideal is chosen as the best score for each factor.

For instance, if Seoul occupies the best position as to the quality or safety of roads, then this score is incorporated into the ideal. On the other hand, if another city has the lowest incidence of traffic accidents, then this score is taken as the ideal.

1. Comparison of the Average Value of QoL Indicators by City Size

In general, the larger a city size is, the greater the improvement of the economic indicators is in QoL as shown in Table 6 and Table 7. However, there is one exception: the diffusion rate of houses, in which Seoul shows the lowest score. In addition, the smaller a city size is, the higher score it shows in the diffusion rate of houses. It means that the cities with less than 0.1 million citizens are in the level of the highest score.

There is a remarkable finding that a city with population of 0.5 million marks a critical turning point in the relationship between physical QoL and city size in Korea.

As the indicators related to location have an attribute that cannot be changed, they show few changes and minor significance by city size.

In the case of non-physical QoL consisting of education and culture components as shown in Table 8, Table 9, cities with a population of 0.5 to 1 million people were in lower score than those with more than 1 million citizens and those with less than 0.5 million. Cities with a 0.5 to 1 million population recorded the worst score in five of nine related indicators and showed the greatest gap between other city size groups.

On the whole, cities with less than 0.5 million people displayed higher levels in the fields of education and culture than cities with more than 0.5 million, and cities with a population of less than 0.1 million achieved the best results. It seems that these outcomes are a result of the fact that small cities have exerted remarkable efforts with exploring all possibilities in order to raise the level of quality of life, since local governments acquired considerable, though not complete, autonomy in the early 1990s. However, considering that the indicators related to education and culture were measured based on a population scale, small- and medium-sized cities, including those with decreasing populations, have an opportunity to achieve a good score, that is to say, their level in QoL can be overestimated. In addition, we should recognize the limitation that quantitative indicators cannot grasp qualitative attributes in the fields of education and culture and thus the level of the quality of life in large cities tends to be underestimated.

While small cities were better than large cities in education and

[Table 6] Comparison of Physical QoL Indicators by City Size: 1995

Components	Indicators	City size (M = 1 million)					
		KDC	Seoul	Over 1M	0.5 to 1M	0.1 to 0.5M	Under 0.1M
Economy	Budget of local government per person	230.68	93.16	113.07	64.63	84.34	104.31
	No. of the lower income bracket	48.41	118.62	267.94	142.35	280.86	459.70
	Financial independence	100.00	98.00	82.34	85.17	61.36	45.52
Convenience	Diffusion ratio of house	100.00	67.85	70.81	70.59	76.71	82.78
	Ratio of water supply	100.00	99.88	96.14	94.82	92.07	85.75
	Ratio of sewage distribution	100.00	96.30	68.20	82.38	60.77	49.48
	Rate of Roads	19.58	19.58	16.97	17.70	18.03	15.55
	Rate of Paved Roads	100.00	92.09	95.46	99.51	93.82	91.87
	Water supply per person a day	681.00	476.00	419.00	341.33	369.17	340.67
	No. of Telephones per 100 person	79.61	46.05	38.68	39.01	44.74	41.91
	Floor space of market	12,794.21	3,400.96	2,481.45	3,108.55	2,647.50	2,405.07
	No. of residents per civil servant	46.00	110.00	177.60	223.00	165.21	97.33
Location	Average Temperature(℃)	17.10	13.50	14.40	13.58	13.53	13.41
	Distance to Seoul(km)	0.00	0.00	257.60	128.67	238.66	250.27
	Site of a provincial government(=1)	1.00	1.00	1.00	0.33	0.14	0.00
	Site of a airport(=1)	1.00	1.00	0.60	0.17	0.31	0.00

Note: Figures in this tables indicate the average value.

[Table 7] Comparison of Physical QoL Indicators by City Size: 1998

Components	Indicators	City size (M = 1 million)					
		KDC	Seoul	Over 1M	0.5 to 1M	0.1 to 0.5M	Under 0.1M
Economy	Budget of local government per person	283.00	126.30	145.47	96.44	139.88	221.21
	No. of the lower income bracket	39.88	87.35	159.35	92.56	313.10	268.49
	Financial independence	98.80	98.80	83.15	84.45	41.73	39.00
Convenience	Diffusion ratio of house	100.00	71.00	77.84	71.04	86.45	82.81
	Ratio of water supply	100.00	99.98	94.28	93.42	74.92	90.88
	Ratio of sewage distribution	100.00	98.62	81.52	89.96	59.31	58.53
	Rate of Roads	20.30	20.30	17.59	18.35	18.69	16.12
	Rate of Paved Roads	100.00	88.88	96.41	96.22	81.38	84.09
	Water supply per person a day	599.00	444.00	388.00	361.70	355.57	373.88
	No. of Telephones per 100 person	99.40	50.60	41.53	40.97	42.51	48.65
	Floor space of market per 10,000 person(m^2)	12,958.00	8,410.00	5,080.50	6,337.50	2,224.15	3,515.00
	No. of residents per civil servant	87.00	212.00	236.50	343.00	186.81	114.38
Location	Average Temperature(℃)	17.50	13.80	14.58	14.01	13.73	13.14
	Distance to Seoul(km)	0.00	0.00	257.60	128.67	238.66	250.27
	Site of a provincial government(=1)	1.00	1.00	1.00	0.40	0.04	0.00
	Site of a airport(=1)	1.00	1.00	0.67	0.10	0.11	0.00

[Table 8] Comparison of Non-physical QoL Indicators by City Size: 1995

Components	Indicators	City size (M = 1 million)					
		KDC	Seoul	Over 1M	0.5 to 1M	0.1 to 0.5M	Under 0.1M
Education & culture	No. of students at elementary schools	24.35	40.95	40.61	43.75	38.49	33.59
	No. of students at universities	1,994.94	61.01	72.08	57.24	101.16	158.24
	Culture and sports expenses	29.32	4.11	4.08	0.95	2.49	4.47
	No. of volumes in Libraries	16,560.68	2,483.82	3,194.13	1,954.58	3,009.45	4,021.95
	No. of seats in theaters	208.31	58.60	53.75	63.02	77.83	75.56
	No. of cultural facilities	7.71	0.95	0.51	0.32	1.18	1.31
	Floor space of gymnasiums	3,175.42	155.23	128.75	86.21	256.52	282.51
	Floor space of sports complex per 10,000 person(m^2)	19,875.81	270.74	595.10	679.63	1,424.16	3,023.53
	Area of swimming pool(m^2)	1,550.96	231.74	108.53	214.72	70.61	50.44
	No. of employed medical personnel	158.81	63.25	52.29	44.58	48.58	47.53
	No. of beds in medical facilities	121.02	43.19	42.27	36.89	53.63	60.28
	No. of pharmacies	10.52	6.52	4.68	4.69	4.28	4.35
Health & safety	Social welfare expenses	17.25	7.37	9.63	5.41	6.89	8.19
	Area of parks(m^2)	2,857.80	55.60	38.75	50.27	96.94	192..60
	No. of traffic accidents	35.06	43.35	52.47	66.01	112.91	185.83
	No. of criminal occurrences	43.70	323.18	252.09	231.09	299.14	394.81
	No. of violent offences	0.39	2.95	3.04	3.06	3.45	5.47
	No. of fire incidents	1.99	5.67	4.51	4.09	4.43	6.82
	No. of fire equipments	13.63	0.54	0.66	0.77	1.29	3.05

[Table 9] Comparison of Non-physical QoL Indicators by City Size: 1998

Compo-nents	Indicators	City size (M = 1 million)					
		KDC	Seoul	Over 1M	0.5 to 1M	0.1 to 0.5M	Under 0.1M
Educa-tion & culture	No. of students at elementary schools	21.80	37.27	39.83	41.43	32.94	33.10
	No. of students at universities	769.12	72.65	75.91	46.13	158.51	145.54
	Culture and sports expenses	38.80	5.44	5.37	1.26	3.30	5.92
	No. of volumes in Libraries	22,761.00	6,145.09	4,259.24	2,944.31	4,825.76	10,981.47
	No. of seats in theaters	133.00	53.02	43.24	45.97	50.05	42.86
	No. of cultural facilities	36.08	7.08	7.68	8.04	13.87	24.15
	Floor space of gymnasiums	1,513.00	163.76	117.16	154.34	349.96	596.08
	Floor space of sports complex per 10,000 person(m^2)	11,340.00	209.16	163.53	335.31	1,985.50	5,539.93
	Area of swimming pool(m^2)	774.00	227.10	111.87	64.71	124.44	84.35
Health & safety	No. of employed medical personnel	77.38	66.56	53.48	48.13	44.05	37.37
	No. of beds in medical facilities	138.29	51.41	50.46	45.26	58.60	60.44
	No. of pharmacies	5.89	5.89	4.04	3.62	3.25	3.64
	Social welfare expenses	22.01	8.40	12.29	6.90	8.79	10.45
	Area of parks(m^2)	2,807.87	81.63	60.78	54.67	53.32	417.80
	No. of traffic accidents	21.65	40.87	49.89	58.67	85.77	95.14
	No. of criminal occurrences	67.16	364.33	324.62	294.14	240.82	400.94
	No. of violent offences	1.32	2.58	3.47	2.93	2.93	4.67
	No. of fire incidents	3.30	7.28	6.00	6.29	7.53	9.75
	No. of fire equipments	7.80	0.64	0.89	0.79	2.02	4.32

culture, large cities were better than small cities in the health and safety components. Table 9 reveals that cities with less than 0.5 million residents attained very low scores in most of the indicators correlated to health and safety, with a few exceptions such as in the area of parks and social welfare expenditures.

One of the interesting findings of the study is the fact that the population size of 0.5 million is a kind of dividing line in the relationship between the quality of life and city size in Korea.

2. The Korean Dream City and Comprehensive Index of QoL

In an earlier part of this study, we defined the concept of the Korean Dream City(KDC). Here we would also like to define the Comprehensive Index of Quality of Life(CQoLI) for each city in Korea, which is measured by the multi-dimensional distance between KDC and each city. The Comprehensive Index of Quality of Life(CQoLI) can be calculated in the same way as Nissan's n-dimensional distance which we have already reviewed in this paper(for a more detailed account, see the earlier parts in this paper: Chap 2. Methodology). CQoLI, for city i from the KDC 0, is computed as

$$\text{CQoLI} = [\sum_j (z_{ij} - z_{0j})^2]^{1/2}$$

Under this definition, a statistical examination of CQoLI is undertaken.

First of all, Table 10 shows an overall downward trend in quality of life in Korean cities from 1995 to 1998. Looking at the trends within average CQoLI in the whole Korean cities, this index rose slightly from 29.682 to 29.714 between 1995 and 1998, which means that the comprehensive quality of life in Korean cities declined during the same period.

But we cannot conclude definitively that the quality of life deteriorated in Korean cities during this time period because our research method has a vulnerable aspect in that we do not weigh each indicator statistically.

[Table 10] Changes of CQoLI in Korean Cities

Year	Average	Standard deviation
1995	29.682	1.389
1998	29.714	1.411

Secondly, we examined the change of CQoLI by city size in 1995 and 1998. In both of these two points in time, the order of QoL in Korean cities, from the highest to the lowest, was the same as follows: Seoul, cities with a population of more than 1 million, cities with a population of less than 0.1 million, cities with 0.1 to 0.5 million citizens, and cities with 0.5 to 1 million citizens. Cities with more than 1 million people including Seoul, as well as those with a population of less than 0.1 million, improved from 1995 to 1998 while cities with 0.1 to 1 million residents deteriorated.

In brief, cities with a population of 0.5 to 1 million showed the lowest level of quality of life and the slowest improvement. The small cities with less than 0.1 million people exhibited the greatest progress.

[Table 11] Changes of CQoLI in Korean Cities by City Size[2)]

City size	1995	1998
Over 1 million[1)]	29.107(0.692)	29.011(0.663)
0.5-1 million	30.198(0.725)	30.339(0.738)
0.1-0.5 million	29.910(1.258)	30.015(1.231)
Under 0.1 million	29.341(1.632)	29.172(1.723)

Notes: 1) Seoul is included in cities with more than 1 million population.
2) Figures in parentheses indicate standard deviation.

Thirdly, we examined the change of CQoLI by components and by city size. As seen from Table 12, both physical QoL and non-physical QoL reflected the same order: from the highest to the lowest, cities with a population of more than 1 million, cities with a population of less than 0.1 million, cities with 0.1 to 0.5 million people, and cities with 0.5 to 1 million people. Looking at the trends between 1995 and 1998, physical QoL improved in all cities, while non-physical QoL

improved only in cities with more than 1 million and those with less than 0.1 million people, and declined in cities with a population of 0.1 to 0.5 million and 0.5 to 1 million. Furthermore, as shown in Table 12, cities with a population of 0.5 to 1 million worsened in education and culture, and cities with less than 0.5 million people worsened in health and safety.

In summary, the results of the analysis of CQoLI are consistent with the findings in the first stage of the study: the overall level and the quality of life of Korean cities did not improved and the gap between the cities either was not reduced between 1995 and 1998.

[Table 12] Changes of CQoLI in Korean Cities by City Size and by Components[2)]

City size	Year	Physical QoL			Non-Physical QoL	
		Economy	Convenience	Location	Education & culture	Health & safety
Over a million[1)]	1995	5.471	10.224	2.963	20.681	14.902
	1998	4.632	9.547	2.915	20.372	14.723
0.5-a million	1995	6.215	10.469	4.214	21.728	14.618
	1998	6.183	9.812	4.103	21.863	14.329
0.1-0.5 million	1995	5.864	11.127	4.642	20.832	15.164
	1998	5.529	10.924	4.719	20.354	15.217
Under 0.1 million	1995	5.710	10.816	5.011	20.519	15.627
	1998	5.136	10.503	5.023	19.786	15.892

note: 1) Seoul is included in cities with more than one million population.
2) By definition of CQoLI, cities with the smaller scores provide a higher QoL.

Comparison with OECD Members

In this section, in order to roughly compare the level of quality of life of Korean cities with that of cities in other countries, a comparative analysis of quality of life among OECD member countries is attempted. It is a national comparison under the premise that the national quality of life is the total sum of the quality of life in cities.

First, in the economic components of QoL, it may be shown that

Korea stood comparatively in a good position, especially in the distribution of national income, though it could not achieve the highest ranking in the world.

Second, in the convenience aspects of QoL, Korea is still inferior to other OECD members. The worst indicator is the diffusion ratio of house, even though it has achieved a record-breaking improvement over the last ten years. On the other hand, the best indicators are ones related to informatization. In particular, since the Internet has spread remarkably throughout the entire nation, the diffusion ratio of Internet was superior to Japan, Germany, and France, and marked the highest diffusion speed in the world.

However, Korea is no better than average in OECD in the field of education and culture. Particularly, the number of students per class in elementary schools is ranked the lowest. Under the components of health and safety, Korea also occupies a subordinate position, but scores very high in social welfare expenditures, the number of traffic accidents, and other indicators related to health and medical services.

On the whole, it is found that the overall level of quality of life in Korea is correlated with the level of national income and ranked lowest with the exception of Mexico, Czech Republic, Hungary and Poland. The level of income distribution, informatization, education, and Human Development Index(HDI) ranks better than average, but health, especially the safety aspect of quality of life, appears to be the worst among all indices considered.

Conclusion

1. Summary

This study divided the quality of life into physical and non-physical types. Physical QoL was composed of three components: economy, convenience, and location attributes. Non-physical QoL included two components: education and culture, health and safety. Under these key component groups, 35 indices were selected to analyze the level of QoL in 72 cities. It was found that there was no statistically significant improvement of the level of quality of life in general between 1995 and

1998 and the gap among cities was not reduced during the same period.

To explore the relationship between the size of the city and the level of quality of life, the study classified the cities into five population groups. The result was as follows: cities with a population of 0.5 to 1 million showed the lowest level of quality of life and the slowest improvement. The small cities with less than 0.1 million people exhibited the greatest progress. One of the interesting findings of the study was that the population size of 0.5 million marked the critical point in the relationship of QoL and the city size in Korea. Other than Seoul, cities with less than 0.5 million showed better physical QoL than those with more than 0.5 million. In the case of non-physical QoL, cities with less than 0.5 million displayed higher level in education and culture component, whereas cities with more than 0.5 million were better in health and safety component.

The study also introduced the concept of Korean Dream City(KDC) and the comprehensive index of QoL(CQoLI) for each city by measuring multi-dimensional distance between KDC and each city. The results of the analysis of CQoLI were consistent with the findings in the first stage of the study: the overall level of Korean cities did not improve and the gap between the cities was not narrowed between 1995 and 1998.

In addition, it was found that the overall level of QoL in Korea was still inferior to other OECD member countries except some East European countries and Mexico. The level of income distribution, informatization, education, and Human Development Index(HDI) ranked better than average, but health and especially the safety aspect of quality of life, appeared to be the worst among all indices considered.

2. Implication and Concluding Comments

Monetary measures for goods and services, as exemplified by per capita GNP, often are inadequate for measuring human well-being. An important reason is that such measures exclude natural and social amenities derived from the place of residence. The quality of life indices can be used to fill this gap.(Nissan, 1989: 79)

Recently the concept of quality of life has grown closer to the heart of urban planning, given that the major purpose of urban plan-

ning is to promote the well-being of the general public. Since quality of life is a multi-disciplinary issue concerning many different aspects of city policies and work, enhancement of quality of life requires a comprehensive and integrated approach.

The views and analyses as contained in this study are intended to stimulate public discussion and provide input to the planning process of QoL of Korean cities.

The future development of cities will have to be structured around new service activities(telecommunications, biotechnology, international trade, etc.), with the environment and quality of life broadly influencing the locational aspect of new activities. Especially cities in the world would compete with each other for their residents in terms of the quality of life, and improve their own quality of life in order to attract residents and investment.

Further, at a time when under the tendency towards globalization capital is fragmenting into many parts with considerable volatility in the demands of capital, the quality of life within its relative ubiquity provides an important anchor attached to which those involved in shaping the visions and trajectories of cities can build.(Rogerson, 1999: 983)

The quality of life is a concept that covers all spheres of everyday life, including the various conditions of production, collective consumption, social welfare, and culture. It is more important at the personal and everyday life than at socio-structural levels, such as socio-economic class and sex. Therefore, the social demand on the quality of life means that qualitative approaches will propel the entire development process of society. In other words, the enhancement of the quality of life means that our society must be converted qualitatively, and now the level of development of Korean cities is positioned at the forefront to accept the increasing social demand on the quality of life. This is why the quality of life should be considered the key term for the 21st century urban planning.

Finally, this study suggests several macro-level policy issues to improve QoL in cities. There is a need to establish an evaluation system of local administrations' performances in order to improve QoL. It is necessary to develop new comprehensive indices, especially for subjective elements and non-physical types of QoL, and to accumulate an internationally compatible database through collaborative researches and exchange programs.

In order to improve the quality of life for people in our city, it is required to give integrated efforts with local governments, that is, a regional partnership among individuals, businesses, governments and other organizations. The role of civil society, NGOs, and the private sector should especially be articulated, and micro-level coordinating measures and organizations, whose goals are to enhance the quality of life, should be instituted to better implement what has been traditionally performed by the central government.

References

Alonso, W. "The Economics of Urban Size." *Papers and Proceedings of Regional Science Association,* 26, 1971.

Byung-Doo, Choi. "Economy and quality of life: Typology of space as quality of life and communities." *Journal of the Korean Geographical Society,* Vol. 35. No. 2, 2000(in Korean).

Campbell, A. *The Sense of Well-Being in America: Recent Patterns and Trends*. New York: McGraw Hill, 1981.

Duncan, Dudley. *Toward Social Reporting: Next Steps*. New York: Russell Sage Foundation, 1969.

Grant, Gerald. "Advances in telematics and their implications for urban governance and the democratic process." *Proceedings -OECD-Greece workshop on Governing Metropolitan Areas: Reinforcing Local Democracy*. 1998.

Gun-Hyuk, Ahn,. "A study on the optimum size of self contained new town." *The Journal of Korea Planners Association,* Vol. 32. No. 4.(Series No. 90), 1997(in Korean).

Hall, P. "Towards a General Urban Theory." in J. Brocthie, M. Batty, E. Blakely, et al.(eds.), *Cities in Competition*. Melbourne: Longman, 1995.

Hye-Soo, Ha. *The study on the production appraisal model of the local government policy*. The doctoral dissertation in Seoul National University, 1996(in Korean).

Holcombe, Randall. *Public Policy and the Quality of Life: Market Incentives versus Government Planning*. Westport, CN: Greenwood Press, 1995.

Hyun-Song, Lee. "The quality of life for Korean: focus on the objective dimension." *The Journal of Korean Sociological Association,* Vol. 31, 1997(in Korean).

IMD. *The World Competitiveness Report*. 1995.

JoongAng-Ilbo. *The JoongAng-Ilbo The data book on the quality of life in Korean Cities: The comparison and appraisal between 74 cities*. 1995(in Korean).

Jin-Ho,Choi,. *The life in the provinces: measuring quality and the way for improvement*. 1995(in Korean).

Korea Media Research. *The Report on the survey of public opinion about quality of life*. Seoul: Media Research, 1995(in Korean).

Kyoung-Soo, Lim & Kim, Jae-Ik "The quality of life in the five new towns of the Capital region." *The Journal of Korea Planners Association,* Vol. 33, No. 2(Series No.94), 1998(in Korean).

Liu, B. C. *Quality of Life Indicators in U.S. Metropolitan Areas*. Kansas City: Midwest

Research Institute, 1980.
M. L., Lee and Liu, B. C. "Socio-economic effects when using income as quality of life indicator." *American Journal of Economics and Sociology,* 47(2), 1988.
Mukherjee, Ramkrishna. *The Quality of Life, Valuation in Social Research.* New York: Sage, 1989.
Myers, D. "Community-relevant measurement of quality of life." *Urban Affairs Quarterly,* 23, 1987.
Myrdal, G. *Economic Theory and Underdeveloped Regions.* London: Gerald Duckworth & Co. Ltd., 1957.
Myung-Han, Jo & Cha, Gyung-Ho. *The Comparison between national states about quality of life.* 1998(in Korean).
Nissan, E. "An alternative index for quality of life in urban area." *Review of Regional Studies,* 19(1), 1989.
OECD. *Living Conditions in OECD Countries: A Compendium of Social Indicators.* Paris: OECD, 1986.
Okun, M. A. "Life Satisfaction." In G. L. Madddox(ed.), *Encyclopedia of Aging.* New York: Springer, 1987.
Olsen, M. E. and D. J. Merwin. "Towards a Methodology for Conducting Social Impact Assessments Using Quality of Life Indicators." In K. Finsterbusch and C. P. Wolf(eds.), *Methodology of Social Impact Assessment.* PA: Dowden Hutchinson & Ross, Inc., 1977.
Pyo-Hwan, Han. *The study on the development and application of urban indicators.* Korea Research Institute for Local Administration(KRILA), 1995(in Korean).
Richardson, H. W. *The Economics of Urban Size.* Hampshire: Saxon House, 1977.
Rogerson, R. J. "Quality of Life and City Competitiveness." *Urban Studies,* Vol. 36, No. 5-6, 1998.
Sang-Kyun, Kim and Jeong, Jae-Moon. "Establishment of indicators on quality of life and position of Korea." *Policy Discussion,* Vol. 3. No. 2, 1996(in Korean).
Sassen, Saskia. *Global City: New York, London, Tokyo.* Princeton: Princeton University Press, 1991.
Seed, Phillip and Greg Lloyd. *Quality of Life.* London, Jessica Kingsley, 1997.
Slottije, D. J., G. W. Scully, J. G. Hirshberg, K. J. Hayes. *Measuring the Quality of Life across the Countries.* Westview Press, 1991.
Suk-Nam, Moon. *Local community and quality of life.* Seoul: Nanam Publish Co., 2001(in Korean).
Sung-Ho, Park. *21st century and quality of life.* Seoul: The Research Institute for Informational Environment, 1994(in Korean).
Tae-Joon, Kwon. "Challenges of Korean Cities at a turning point in history." Paper Presented to the 1st anniversary symposium for the foundation of the Korea Center for City and Environment Research(KOCER), 1995(in Korean).
The Korea National Statistical Office(KNSO). *The Social Indicator in Korea.* Seoul: KNSO, 1998(in Korean).
The Korea National Statistical Office(KNSO). *Statistics on OECD member countries and Korea.* Seoul : KNSO, 1998(in Korean).
The Ministry of Government Administration and Home Affairs(MOGAHA). *1998 Municipal yearbook of Korea.* Seoul : MOGAHA, 1998(in Korean).

14 Construction Market and Globalization of Construction Economy

Myeong-Soo Kim

Policies & Strategies for Sustainable Recovery and Upliftment of Construction Industry

1. Construction Market Review

1.1 Construction Investments

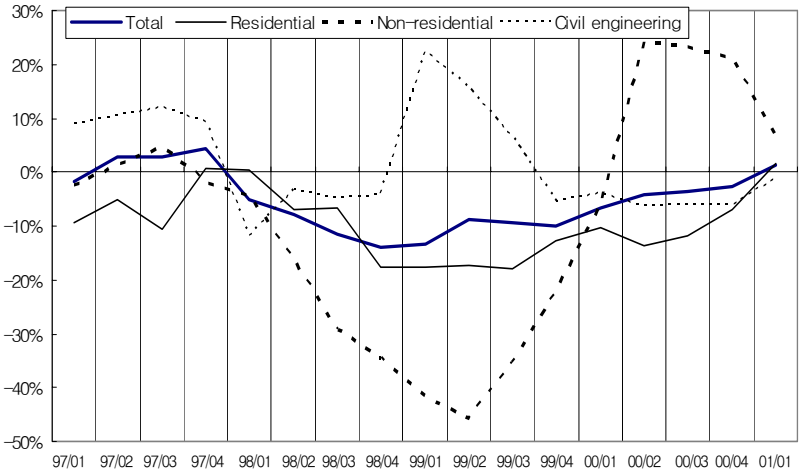
The construction sector, by its nature, has felt deeper impact from the nation's economic situation than any other industry. As evident in the past trend, the construction industry enjoyed healthy growth during the 1990s with the increase in housing demand and then infrastructure demand.

But activities in all construction industrial sectors were more adversely affected by the financial crisis in 1997. There was a marked decline in construction activities caused mainly by the deferment of selected new infrastructure projects, slow implementation of existing infrastructure projects and postponement of non-residential projects.

Figure 1 shows that construction investments continued to climb until 1997 as the demand from the private sector spurred the industry's growth. The government has continued to encourage private participation into public infrastructure, but construction investment has declined since 1998.

The construction market situation has completely changed from

[Figure 1] Construction Investment Change Ratio(quarterly)



1998. The growth of the construction sector plunged down to 10.23% in 1998(2.3% in 1997) after recording a drastic growth for ten consecutive years since 1989. However, the economic recovery action plan implemented by the government is showing a result with an improvement in the performance of the construction sector in 1999. From 1999, construction market shows a symptom of little recovering due to the recovery action plan implemented by the government but it shows a slow recovery in the long term. Construction investment growth rate recorded 0.9% in 1999, although it recorded -4.1% in 2000, and 5.4% in 2001. Now, 6.7% growth rate recorded for the half of 2002.

Table 1 shows that sectoral trends of construction investments. According to this, the growth rate of the residential building investments has improved from 11.1% for 2000 to 11.7% for 2001 and 28.4% for the half of 2002. But nonresidential building construction was more adversely affected by the financial crisis in 1998. There was a marked decline in the nonresidential building construction activities caused mainly by the deferment of selected new projects and slow implementation of existing projects. The investments continued to decline until 1999. However, it is recorded that the growth rate of the nonresidential

[Table 1] Trend of Construction Investment

(Unit: billion won= 1995 year fixed price)

Year \ Type		Total	Residential	Nonresiden-tial	Civil(SOC)
95	Actual value	82,197.6	28,026.9	23,262.5	30,908.1
	Change ratio(%)	7.96%	8.26%	11.80%	4.97%
96	Actual value	87,247.2	28,448.8	22,441.3	36,357.1
	Change ratio(%)	6.14%	1.51%	-3.53%	17.63%
97	Actual value	89,284.8	26,667.8	22,544.5	40,072.6
	Change ratio(%)	2.34%	-6.26%	0.46%	10.22%
98	Actual value	80,295.3	24,548.2	17,793.7	37,953.3
	Change ratio(%)	-10.23%	-7.64%	-21.22%	-5.78%
99	Actual value	72,059.5	20,506.3	11,125.5	40,427.7
	Change ratio(%)	0.89%	1.13%	-17.68%	9.47%
00	Actual value	69,130.8	18,280.6	12,766.7	38,083.6
	Change ratio(%)	-4.1%	-10.9%	14.8%	-5.8%
01	Forecast	73,123.5	20,910.6	13,747.6	38,465.3
	Change ratio(%)	5.4%	11.7%	4.6%	2.3%
02. 2/4	Forecast	33,894.4	12,344.9	7,285.9	14,263.6
	Change ratio(%)	6.7%	28.4%	8.2%	-7.5%
02	Forecast	78,310.0	23,850.0	14,820.0	39,530.0
	Change ratio(%)	6.6%	12.3%	7.2%	2.7%

building investments has improved to 15.2% in 2000 and 4.6% in 2001. Currently 8.2% of the growth rate is recorded in the first half of 2002.

The economic recovery action plan of the government is showing result with an improvement in the performance of the civil construction sector in 1999. The growth rate of the civil construction has improved to 9.5% for 1999. Although it was recorded to -7.6% for 2000, 2.6% growth rate is recorded for 2001 and 2.7% growth rate is expected for 2002. The government continues to encourage private participation into public infrastructure.

1.2 Construction Companies

As the government grip on the industry loosened from 1989, license began to be issued to eligible contractors, first in regular intervals and then now whenever upon request. Therefore, during the last decade the number of general contractors increased by more than sixteen fold numbering up to 11,971 firms now, and likewise, specialty contractors increased almost five times to around 28,000 firms. As time goes on, inevitable competition inside the industry has intensified. Some newcomers held on to their threshold but in general large firms got larger.

In 1996, 196 general contractors and 595 specialty contractors went bankrupt, resulting in the bankruptcy ratio of 5.6% and 2.8% respectively. In 1997, the bankruptcy figure increased to 291 general contractors and 1,058 specialty contractors. In 1998, the bankruptcy ratio more than doubled from 1997 and many more firms, 524 general contractors and 1,579 specialty contractors went bankrupt in the restructuring process. However, in 2000 and 2001, 132 and 78 general contractors and 449 and 430 specialty contractors were bankrupt. At the end of June 2002, only 20 general contractors and 145 specialty contractors are reported to be bankrupt.

Increased participation from foreign companies is also a notable fact. Even before the Uruguay Round negotiation, there already existed a few small specialty contractors as joint ventures. They came to the market on the urge of Korean partners rather than to actively take part in the market. However, recently, 100% of foreign entities began to apply for general construction licenses. They were showing interests in such mega projects as Incheon Airport and High Speed Railway Projects. In the fields of engineering, architecture and supervision, where Korea's competitiveness is rather weak, we have witnessed much more active foreign entrance into the market.

[Table 2] Number of Bankrupt Construction Companies

	1996	1997	1998	1999	2000	2001	2001. 6
General contractor	196	291	524	112	132	78	20
Constructor	595	1,058	1,579	354	449	430	145

1.3 Employees and Construction Labor

In 1970, the construction industry employed 280,000 workers, that is, 2.9% of total employment. The number of workers increased steadily in the industry. For the first quarter of 2002, more than 1.6 million employees are working in the construction field, 7.4% of total employment. If we compare the share of employment ratio of construction industry with its share of value added in GDP, we can safely conclude that the industry productivity has consistently improved as well.

[Table 3] Main Indices in the Construction Industry

Classification \ Year	1997	1998	1999	2000	2001	2002.3
Value of construction orders(trillion won)	79	48	51	60	67.8	18.3
Number of general contractor	3,896	4,208	5,155	7,978	11,961	11,971
Average contractor amount(100 million won)	202	114	99	75	57	15
Number of employees in the construction industry(thousand persons)	2,004	1,578	1,476	1,581	1,575	1,656
Construction permission square(thousand m^2) (growth rate, unit:%)	113,374 (-0.39)	50,965 (-55.05)	72,534 (42.32)	81,059 (11.75)	97,717 (17.04)	31,599 (50.53)

Source: Korea Construction Association

2. Property Market Review

The property market has been struck by the financial crisis and the ensuing structural reforms. During the developmental era, the property price increased sharply outpacing the economic growth rate. Even though the property market somewhat calmed down with the introduction of the drastic measures of 'public concept of land,' it was never doubted that the price would go up sooner or later. This expectation of the price trend settled in, and many companies stocked up

property in their investment portfolio far above what was directly needed. After economic crisis, property was pouring into the market as firms, pressured by the financial institutions, were trying to convert them into cash. Thus, the 'myth of property speculation' collapsed along with the bubble in the property value.

The property average price fell by 30-40% from 1997 and the market function of matching demand and supply was not working properly. The situation was much worse for the land than the building. The flow of the Korean economy was being strangled at the bottleneck of the property market, impeding the economic restructuring process. This created a vicious cycle of depressed economy causing depressed property market and vice versa, or so called complex depression. However, the trend has been changed completely since 1999, by showing positive growth rates in land price and rent.

2.1 Land Prices in Major Cities

Land price has dramatically decreased since the economic crisis. In 1998, overall land price decreased 13.06%, especially residential land price decreased 14.68% and industrial land price 14.03%. Comparatively commercial land price was less changed. But this situation has changed from 1999. Currently, most prices are related with land record positive growth rates as shown in the table.

[Table 4] Land Price Changes

(unit: %)

	1995	1996	1997	1998	1999	2000	2001	2002. 6
Commercial land	0.37	0.80	-0.07	-17.07	1.56	-0.26	0.70	1.27
Residential land	0.30	0.71	0.15	-14.68	2.07	0.03	1.26	1.39
Industrial land	0.76	0.77	-0.17	-14.03	2.53	0.43	1.64	1.01
Average	0.55	0.96	0.31	-13.06	2.94	0.67	1.32	1.28

2.2 Average Rents in Major Cities

Housing price decreased 18.44% in 1998. Apartment price was outstandingly decreased 20.18%. Average rents for office space showed the same behavior. Relatively the rents for office space in bigger cities decreased more. However, currently the level of housing price and rent recovers completely or is more than those before the IMF regime, especially around the Seoul area.

[Table 5] Average Rent Changes

(unit: %)

	1995	1996	1997	1998	1999	2000	2001	2002. 6
Total	3.62	6.5	0.85	-18.44	14.37	11.14	16.44	17.3
Detached dwelling	2.67	3.2	-0.10	-16.59	3.37	8.2	10.90	12.2
Row house	4.38	5.4	0.66	-18.28	13.30	13.4	14.72	13.1
Apartment	4.71	10.2	1.63	-20.18	21.09	12.18	19.98	21.2

Enhancement and Development of Construction Industry

The construction industry played a major role in the rapid economic growth of Korea. To support economic development, the construction market grew faster than the average, increasing its share in GDP. From the late 1980s more than 20% of GDP was invested in the construction industry, a very high figure by any standard. We believe that the high construction investment ratio is one of the main reasons for the compact economic growth in Korea.

The construction industry was also one of the most favored recipiets of the fruits of economic growth. Entry into the market was regulated by the licensing system such that existing contractors could increase their size and efficiency. The wage of construction workers and the price of construction materials were also held low by the government guidelines. These measures helped the industry to maintain its competitiveness in both domestic and overseas construction markets.

However, the wind of change in the political arena and the talks at

Uruguay Round and joining of OECD in the 1990s brought about a completely new business environment. The construction market has been gradually opened up and rules and regulations related to the industry have been revised to conform to the international business practices. In addition, the unprecedented depression has caused a havoc in the construction industry.

[Table 6] Value-added Products

(Unit: billion won=at 1995 price)

Industries		1995	1996	1997	1998	1999	2000	2001	2002. 3
Construction		42,564.1	45,513.3	46,137.4	42,161.3	38,305.8	37,125.3	39,220.2	7,555.5
% change		8.8	6.9	1.4	-8.6	-9.1	-3.1	5.3	8.2
Manufacturing		110,826.9	118,342.7	126,117.2	116,734.8	141,295.1	163,733.1	166,506.2	41,330.3
% change		11.3	6.8	6.6	-7.4	21.0	13.7	1.6	3.4
Services		157,564.2	169,337.1	180,316.6	171,776.5	182,772.0	205,535.9	216,359.9	57,345
% change	Wholesale & retail trade, restaurants & hotels	8.4	7.8	4.0	-10.9	14.1	9.4	3.88	5.50
	Transport, storage & communication	11.1	10.6	13.4	-0.8	14.5	16.7	6.84	7.95
	Finance, insurance, real estate & business service	10.4	7.2	5.9	-1.9	5.5	4.7	4.38	8.46
	Community, social & personal services	10.3	5.3	5.5	-5.9	11.1	4.5	6.80	10.41
Primary sector		25,129.8	25,895.3	26,993.2	24,907.0	26,242.3	26,299.2	26,762.2	2,610.9
% change	Agriculture, forestry & fishing	6.6	3.3	4.6	-6.6	5.4	0.1	1.4	6.7
	Mining & quarrying	-0.6	-0.1	-0.9	-24.0	5.3	2.2	0.5	16.5

Note: Primary sector includes agriculture, mining, etc.

1. Productivity

1.1 Value-added per Employee

The growth rate of construction products recorded 37,125 in 2000, which decreased 3.1% compared with 1999. This growth rate is remarkable, since other industries show positive growth rates such as 13.7% in the manufacturing sector and 9.4% in the services sector. Construction products increased 5.3% in 2001 and 8.2% in the first half of 2002. Compared with the manufacturing growth rate, 1.6% and 3.4% in the same period, these rates are remarkable.

1.2 Physical Measurement of Construction Productivity

Physical measurement of construction productivity recorded 47,856 sq.m of residential, 25,888sq.m of nonresidential, 13,538sq.m of industrial construction last year. Now, 13,583sq.m and 11,410 sq.m are recorded in residential and nonresidential construction respectively in the first quarter of 2002.

[Table 7] Physical Measurement of Construction Productivity

	1998	1999	2000	2001	2002. 3
Residential	31,156	44,606	41,283	47,856	13,583
Commercial	8,751	11,746	18,882	25,888	11,410
Industrial	2,797	7,824	11,646	13,538	3,507
Others	8,259	8,359	9,247	10,435	3,099
Total	50,965	72,534	81,058	97,717	10,259

Note: Area(sq.m) refers to total built-up area.

2. Construction Cost

2.1 Average construction Material Prices

During the early 1990s, we experienced a severe shortage in construction materials because of the overheated construction business cycle. The

construction sector was fingered as the culprit for inflation and trade deficit. As the construction boom cooled down since then, the demand and supply of construction materials more or less could be matched domestically. However, we still experienced seasonal shortage, especially in the spring season during which ordering of projects intensified.

Currently, around 62 million tons of cement and 11 million tons of iron beam are produced and consumed internally. Now, we worry the excess of capacity rather than the shortage. The official prices of major construction materials are influenced by the government guideline but actual transaction value changes according to the market conditions. In the mid and late 1990s, the price of construction materials remained stable as shown in the table.

[Table 8] Average Construction Material Price

	Cement in bulk (won per 40kg)	Steel bars #16 ($ per ton)	20mm aggregates ($ per m^3)	Concreting sand(won per m^3)	Common Bricks ($ per thousand pieces)	RMC[1] 210㎏/cm^3 (won per cm^3)
1995	2,100	315,250	9,208	9,417	37,000	35,015
1996	2,200	302,333	9,666	9,841	40,000	39,857
1997	2,300	295,333	10,000	10,333	43,000	43,974
1998	2,350	316,100	10,000	10,458	49,000	46,555
1999	2,600	297,916	10,000	9,333	43,000	45,532
2000	2,728	301,666	10,000	9,000	42,000	45,560
2001	3,000	313,333	10,916	9,125	43,000	47,768
2002. 6	3,300	335,000	12,000	10,000	45,000	50,930

Note: 1) RMC(ready mix concrete)

2.2 Construction Industry Salaries and Wages

The average wage has also increased but in more erratic fashion. Up to Seoul Olympic in 1988, the wage mildly increased under the government guidelines. After the Olympic, however, the changed political

atmosphere and implementation of 2-million housing construction plan caused the wage to go up very rapidly. In 1987 the average wage was 12,903 won. Five years later, in 1992, the wage more than tripled. For the next five years till 1997, the trend of wage hike calmed down. In 1999, we experienced negative wage growth due to decreased construction demand, which was same as in 1998. But, in 2000, the salary and wage mildly re-increased. Then average salaries and wages have been increasing steadily.

[Table 9] Construction Industry Salaries and Wages

	1996	1997	1998	1999	2000	2001	2002. 5
Chief worker	59,935	60,544.5	55,777.5	56,294.5	56,598.5	61,280.5	64,905
Special daily wage	54,451	54,713.5	49,166.5	49,578.0	51,861.0	54,379.0	62,902
Normal daily wage	34,476	36,845.5	33,926.5	33,841.5	37,267.5	39,927.0	45,031

2.3 Average Sectoral Wages

The construction and manufacturing sectors went down from 1997 to 1998. However, average sectoral wages increased both the construction and manufacturing sectors in 1999, 2000, and 2002.

[Table 10] Average Sectoral Wages Per Month

(Unit: won at 1995 constant price)

	1996	1997	1998	1999	2000	2001	2002. 3
Const-ruction	1,501,257	1,623,638	1,502,275	1,690,873	1,839,844	1,834.683	1,915,788
Manufa cturing	1,261,168	1,326,241	1,284,477	1,475,500	1,601,468	1,702,350	1,693,183
Services	1,549,282	1,667,299	1,631,334	1,726,280	1,860,78	1,893,929	1,783,995
Primary sector	1,379,913	1,534,912	1,524,520	1,581,067	1,702,280	1,779,553	2,059,925

3. Policy and Initiatives on Construction Quality

3.1 Enhancement of Quality Assurance

The number of firms with ISO 9000 certification increased until 1999, but since 2000, it has decreased. In 1999 the number of companies with ISO9000 certification increased 2,639 while it has decreased in 2000 and until now.

[Table 11] Number of ISO 9000 certified construction companies

1995	1996	1997	1998	1999	2000	2001	2002. 6	Total
17	152	631	1,472	2,645	881	370	274	5,981

3.2 Enhancement of Construction Safety

To secure quality in construction works, contractors, sub-contractors, and relevant technical personnel responsible for minor faults in construction works, other than suspension of business and other administrative measures pursuant to construction related regulations, shall be penalized. Further, those penalized will be restricted from participation in tenderings or receive lower scores on PQ inspections.

All efforts of construction works are made towards securing safety of facilities and laborers. The following table is showing one of the signs of safety of laborers.

[Table 12] Safety Record

	Accident frequency rate (accidents/ million man-hours worked)
1995	5.40
1996	4.69
1997	4.33
1998	3.32
1999	3.17
2000	2.56
2001	0.69

The accident frequency rate goes down. In 2000 and 2001, accidents per million man-hours worked rate decreased to 2.56 and 0.69 respectively, while the rate was 5.40 in 1995.

4. Development of New technology in the Construction Sector

It is not easy to document new developments in technology. It can get either too technical or too broad to convey any meaning. We will opt for the second option rather than risk getting lost in the maze of technical details. In the last year of Five-Year Construction Technology Development Master Plan(1998-2002) carried out by Ministry of Construction and Transportation, it delineates major technology fields to be focused in the coming years as follows:

1) Increase productivity, and reduce construction costs: mechanization and automation
2) Promote efficient land use: super high rise building, and utilize mountainous terrain and underground space
3) Introduce environment friendly construction: energy saving and recycle technology
4) Adopt construction management and life cycle cost approach for mega-projects
5) Further develop GIS(geographic information system), ITS(intelligent transport system) and CALS(continuous acquisition & life-cycle support)
6) Water supply and treatment, and management of ground water
7) Upgrade engineering and architectural technology: standardization of materials, rehabilitation and redevelopment of existing structures, repair and maintenance

5. Research and Development

The expenditure of research and development has never been a priority issue. In 1996, the construction industry invested 0.74% of their sales, MOCT(Ministry of Construction and Transportation) did 0.54% of its budget, and the four public corporation(Highway, Water, Housing, Land Corporation) did 2.0% of their total sales on R&D. The figures

[Table 13] New Technology in Automation, Mechanization and Prefabrication

Technology & brief description	Developer
• Semi-automatization of bulldozer 1) A computer-controlled semi-auto equipment for bulldozer 2) It manipulates blade to control the digging resistance 3) Unskilled workers are able to operate the equipment in difficult digging condition	2000. Korea Institute of Construction Technology
• The development of high performance robot for concrete floor finishing 1) Small-sized advanced omni-directional robot for concrete floor finishing 2) It enables easy cooperation of the operator and the robot for maximizing the floor finishing capabilities 3) It can be used at apartments and office buildings with the small floors	1998. Korea Institute of Industrial Technology
• Automation of the steel frame construction of buildings 1) Automation of the steel frame construction of buildings 2) Control system monitors the states of the mechanism, displays them for the operator and drives the mechanism safely and efficiently according to the commands from the operator	1997. Hanyang University, Halla Engineering & Construction Corp
• Semi-automatization of tower crane 1) It develops the distance measuring device to the target object 2) It develops the scope measuring device of the sight at the driver seat of tower crane 3) It develops the controller managing these apparatuses and controlling the operation of motor automatically to improve the operating speed of tower crane	1997. Korea Institute of Construction Technology

were meager amounts compared with the domestic industry average of 6.8%, not to mention the foreign examples. The R&D expenditure for construction industry was recorded 701.6 billion won 2001 and is expected 752.4 billion won in 2002.

[Table 14] Research & Development

	National expenditure on R&D	R&D expenditure by construction industry (billion won)	% of annual construction volume
1995	9,440,606	467.6	0.97
1996	10,878,051	437.6	0.72
1997	12,185,807	433.5	0.65
1998	11,366,602	N.A.	N.A.
1999	11,921,893	N.A.	N.A.
2000	13,848,893	509.1	1.26
2001	14,236,451	701.6	N.A.
2002. 3(expected)	15,291,593	752.4	N.A.

6. Environmental Conservation

The number of firms with ISO 14000 certification has continuously increased. In 2000, the number was 68, and then the total number reached to 186. As of June 2002, 43 construction companies acquired ISO 14000 certification and the total number is 272.

[Table 15] Number of ISO 14000 Certified Construction Companies

1996	1997	1998	1999	2000	2001	2002. 6	Total
3	11	12	39	66	96	43	272

Globalization of Construction Services

In 1996 the Framework Act on the Construction Industry was enacted in place of the Construction Business Act. The substitution is aimed at deregulation and simplifying construction related acts and also to promote the construction industry. The Act states that MOCT must draft and execute a basic plan for the promotion of the construction industry every five years. The plan must include fundamental policy direction, measures regarding technology and manpower, ways to secure the quality of construction works, and policies to encourage small and medium construction businesses. The first plan is being drawn up currently by MOCT with the assistance of KRIHS.

Our diagnosis on the policy environment and present situation is two folds. Due to the IMF crisis, the construction industry is in great difficulty but this will be of short term effect that can be overcome in future. A long term underlying current is that of globalization, localization and informatization, which translates into increased competition, forming of buyers market and elevation of importance for the R&D investment for construction industry. There is no conflict in the short term and long term factors. Both are pressuring the industry to restructure.

Major tasks envisioned in the plan are as follows: establishing fair competition rule, raising productivity, securing environment friendliness and quality of the construction works, setting up a new harmonious role between general and specialty contractors, strengthening production factors such as technology, manpower, material, and finance capacity, and encouraging both inbound and outbound overseas construction. Through these and other detailed implementation measures, we hope to build a construction industry that can compete with top-level construction companies shoulder to shoulder in the 21st century.

1. Government Policy on Liberalization

Foreign participation in the Korean construction market is still in its initial stage. The number of companies applying for license is slowly increasing and many specialty contractors are already active in government procurement projects as well. In the architectural and engineering fields, cross border supply of services has been on going

[Table16] Liberalization in the Construction Field

Name of policy	Content	Implementation date(perio)
Lifting regulations on alien ownership of land	· Restrictive measures on foreign ownership of land will be lifted allowing in principle all types of foreign ownership.	June 26 1998
Other market opening(all construction related markets are opened)	· Building rental and marketing services · Land rental and land development & supply services	April 1998 May 1998
Deregulation measures for effective market access	· License issued upon request · Obligatory membership to construction association and bond company relaxed · Setting ceiling amount on one contractor can take through company evaluation abandoned.	1994 1997 1997
Reform of 'Private Sector Investment Inducement Act'	· Accept unsolicited private sector proposal · Make evaluation and selection process more transparent · Ensure higher profit margin lower risk · Establish specialized organization · Change process to accommodate foreign investments	September 1998
Enactment of 'Foreign Investment Promotion Act'	· Attitude change from restriction/management to promotion/assistance · Provide free foreign investment zone Increase tax incentives · Simplify investment process · Establish one stop information and service center	September 2002

for quite sometime and now several joint ventures are being formed as well. In the supervision and consulting fields, 13 companies have participated in projects such as Seoul-Busan High Speed Railway, Incheon International Airport, West Sea Highway, Gayang Bridge, etc.

2. Rules and Regulations for Participation of Foreign Construction and Professionals

In Korea, it is no difference between domestic and foreign companies in enrollment, that is, same condition, and there is no special regulation in construction.

The following table shows foreign companies as general contractors in Korea. The number of enrolled inspection companies is 12, for example, DB-consult, Systra-sofretu-sofrerail, Luhmeyer Internation Ombh and so on.

[Table 17] Present Foreign Companies of General Contractor License in Korea

Company name	Country	Acquired date of license
Hugita	Japan	1996. 10. 14
Becktel International Inc.	U.S.A	1996. 10. 14
Huruwar Daniel Eastern Ink	U.S.A	1996. 10. 14
China Construction Process Company	China	1996. 10. 14
Daesung Construction	Japan	2000. 12. 11
Iconcorporation International Limited	Singapore	2000. 12. 13
Cosmopolitan Construction	U.S.A	2000. 12. 19

3. Impact of Liberalization under the World Trade Organization

Liberalization and Globalization of business activities are a worldwide phenomenon with no exception in the construction industry after establishing WTO. Korea accepted the trend by participating in many related international treaties and by opening up of its construction market. Our overseas construction has been very active and perhaps in this sector we may prove to be a beneficiary of the liberalization measures. We are now prepared to welcome foreign presence in domestic market so as to fully utilize the comparative advantage. We would like to learn advanced technology, procure better materials, augment invest-

ments, and improve production system with the help of foreign companies. Based on the cooperation in domestic market, we would also like to assist other nations in building up their construction stock if possible. The government is now adopting more practical and balanced approach rather than ceremonial and one-sided diplomacy in the overseas construction.

Asia is being the most active construction market in the world, with mutual endeavor. We see a bright future for the Asian construction industry. Asia has risen one of major construction markets since the 1990s. With exchange and international cooperation, the Asian countries will be able to improve their construction technology level. In addition, they will have chances to develop construction management and other advanced skills in the construction area. Like developed countries, eventually, the pattern of the construction industry in the Asian countries will be shifted from simple construction work to technology-intensive work.

References

Bank of Korea. Quarterly Bulletin, Each year.

Degoff, Robert A, & Howard A, Friedman. *Construction Management : Basic Principals For Architects, Engineers And Owners*. John Wiley & Sons, 1985.

Edward, R. Fisk, Pe, F, Asce, Csi, Julius Calhoun, Esq. *Contracts And Specifications For Publics Projects*. John Willy & Sons, Inc., 1991.

Ha-Joon, Chang. *The Political Economy Of Industry Policy*. Oxford University Press, 1994.

Johnson, C.(ed.) "The Idea Of Industrial Policy." *The Industry Policy Debate*. San Francisco: Institute For Contemporary Studies, 1984.

Jeffery, S. Russell. *Constructor Prequalification*. Ascpress, 1997.

Korea National Statistical Office. Statistical DB(KOSIS).

Marsh. *1999 Insurance Market Review and Forecast : Trends And Strategies*. 1999.

Meier, Kenneth J. *Regulation: Politics, Bureaucracy, And Economics*. 1985.

Mmc. *Annual Report 1998*, 1999.

Murdoch, J. & Will Hughes. Construction Contracts. F & Fnspon, 1996.

National Association Of Credit Management. *Bonds On Public Works*. 1996.

Richard, H. Colugh And Glenn, A. Sears. *Construction Contracting*. A Willy-Interscience Publication, 1994.

Seymour, Howard. *The Multinational Construction Industry.* London: Macmillan, 1987.

Part 4

Land Use, Urban Planning and Governance

15 Improvement of Land Use Control and Zoning System*

Jae-Gil Park

Introduction

Land use control in Korea is based on the traditional Euclidean zoning system. As of 1998, about 15 percent of the national territory was controlled by the zoning system of the Urban Planning Act, and the remaining 85 percent was regulated by that of the National Land Management Act. All development activities, in principle, have to correspond with the provisions of development control by zoning. In general, the Korean land use control system dependent on the traditional zoning has fulfilled its role until the 1980s. After the 1990s, however, the system began to reveal serious problems, especially in terms of planned development and social equity.

In spite of the advent of metropolitanization resulting from the rapid increase of automobile ownership, the land use control in non-urban planning areas was too rigid to meet the development demand for urban land use. However, piecemeal deregulation measures resulted in a rampant development, which became a social problem. The existing zoning system, which has been used mainly to respond to urban ex-

---

* This article was rewritten based on the subject paper presented by the author at the International Workshop on 'New Approaches to Land Management for Sustainable Urban Region' held at Tokyo University in Japan from 29th to 31st October. in 2001.

pansion for the last three decades, showed a limited efficiency in the effective improvement or management of urban areas. In addition, change of zoning from undevelopable land to developable land resulted in a big increase of land value. This kind of zoning change is faced with the resistance of land owners whose land is still designated as undevelopable land. Land owners would not follow land use regulations that are imposed on them under the name of public necessity unless there are clear principles and fair criteria.

There have been lots of discussions on the improvement of zoning since the mid 1990s. In 2000, the Urban Planning Act was revised to readjust regulations about zoning. In addition, the consolidation of the Urban Planning Act and the National Land Management Act was done in the year of 2002 and it is going to be executed from the year of 2003 to meet land development demand and improve the land use control system in non-urban planning areas.

However, social inequity between land owners resulting from zoning is not discussed in detail. In fact, we cannot achieve more improved land use regulation system without regulation properly dealing with social inequity. Sustainable urban development requires both technically and socially improved regulations.

This paper discusses irrational technical and social aspects of the Korean zoning system, and suggests the ways to reform land use regulation system for a better urban planning.

Problems of zoning system in technical aspects

1. Zoning System Differing in Urban Planning Areas and Non-urban Planning Areas

Urban planning areas are designated for the purpose of proper management of urban growth, and administered by land use regulations prescribed in the Urban Planning Act. Since the enactment of the Urban Planning Act in 1962, two types of land use zone might have been available within urban planning areas: development promotion zone(e.g., residential, commercial, and industrial) and development holding zone. It is presumed that there is no development demand

outside the urban planning area, so that land development in non-urban planning area was strongly restricted. The development was confined to agricultural and forest production, and nature conservation.

However, from the mid 1990s, the supply of developable land within the urban planning areas became more limited due to the high land price. With an expanded urban activity due to the increase of automobile ownership, pressure for land development spread to non-urban planning area. The need for deregulation of undevelopable land has increased.

Non-urban planning areas had come to confront deregulation pressure in which land use changes had been strongly controlled. Before the amendment of the National Land Management Act in 1994, the land use regulations applied to non-urban planning areas of this Act were compiled from related individual laws managed by the Ministry of Agriculture and Fishery, the Ministry of Environment, etc.. Through the 1994's revision of the National Land Management Act under the Ministry of Construction and Transportation, the Semi-urban Zone and the Semi-exclusive Agricultural Zone were introduced for deregulations of development control in non-urban planning areas.

Various side effects began to emerge after five years of the revision that allowed for more development by partial deregulation in non-urban planning areas, not by expanding urban planning areas. Examples include high-rise apartments construction in urban fringe and rural areas with inadequate infrastructures, and ribbon development by cafes, restaurants, motels, and warehouses along roadsides in suburban areas. All these created severe environmental problems such as traffic congestion and water pollution, and deteriorate the area's landscape.

Two policy issues could be pointed out: The first issue is a strict and inflexible land use regulation, which simply divide planning area into two types; urban planning area and non urban planning area. The second issue is an abnormal and piecemeal approach that revises provisions of permittable developments in zones instead of the normal operation of rezoning that changes non-urban planning area to urban planning area to respond to the demand of land development.

2. Zoning within the Urban Planning Area

There are three issues related to zoning for the urban planning areas. First, land use regulation lacks the consistency due to the dual system of zone designation and zone management. The designation of zone has been prescribed in the Urban Planning Act and building codes to specify different developable activity for each designated zone has been prescribed on the Building Act. Thus the requests for the adjustments of the location or floor area ratio(FAR) of specific buildings inappropriate to the zoning regulations have been responded simply by the modification of building codes to avoid the procedural complicatedness and the long-term period required to do rezoning and the difficulties in subdividing zones. As a result of these temporary and expedient approaches during the past three decades, the role of zoning as a proper land use regulator has weakened.

Second, a few zones are actually designated and operated. Although there are 13 kinds of zones prescribed in the Urban Planning Act and building codes, only a few zones are actually designated and operated. The designated areas of the Holding Zone(72.9%) and the General Residential Zone(12.4%) comprise 85.3% of the whole urban planning areas at the national level. The sum of the General Residential Zone (63.5%) and General Industrial Zone(17.2%) comprises 80.7% of the whole Urbanization Promotion Zone. The General Residential Zone comprises 95.7% of the whole Residential Zones designated, although it is only a kind of Residential Zone similar to the Exclusive Residential Zone and the Semi-residential Zone. The designation and operation of only a few zones imply that the land use regulation in the urban plan-ning area is so relaxed and has a weak role.

According to a recent case study of Anyang-si, which is located in the Capital Region of Korea, the proportion of commercial facilities in the General Residential Zone appears to reach a significant level and the proportion of the detached houses in the General Commercial Zone is not small to ignore. For example, four to six story commercial buildings are found along the arterial road in the General Residential Zone and small commercial facilities are also found in the Residential Zone for Detached Houses. The mix of commercial facilities with the residential use deteriorates the residential quality of life.

Third, the contents of land use regulation based on zoning are so

[Table 1] Area of Zones within Urban Planning Area(as of 1998)

Classification		Area(km^2)	Ratio(%)	
			Within urban planning area	Within urbanization promotion zone
Total		14,176.25	100.0	
Urbanization promotion zone		2,772.90	19.6	100.0
Residential zone	Sub total	1,838.78	13.0	66.3
	Exclusive residential zone	7.15	0.1	0.3
	General residential zone	1,759.55	12.4	63.5
	Semi residential zone	72.08	0.5	2.5
Commercial zone	Sub total	236.01	1.7	8.5
	Central commercial zone	18.84	0.2	0.7
	General commercial zone	205.34	1.5	7.4
	Neighborhood commercial zone	8.23	0.0	0.3
	Circulation commercial zone	3.60	0.0	0.1
Industrial zone	Sub total	698.11	4.9	25.2
	Exclusive industrial zone	71.86	0.5	2.6
	General industrial zone	477.43	3.4	17.2
	Semi industrial zone	148.74	1.0	5.4
Urbanization control zone		11,403.35	80.4	-
	Sub total	11,403.35	80.4	-
	Conservation zone	306.13	2.2	-
	Holding zone	10,340.87	72.9	-
	Agricultural zone	756.35	5.3	-

[Table 2] Existing Land use in Case Study Area of Anyang-si

Existing land use		Case area designated as general residential zone		Case area designated as general commercial zone	
		Area(m^2)	Ratio(%)	Area(m^2)	Ratio(%)
Total		331,227	100	116,226	100
Residential use	Detached house	48,874	15	32,463	28
	Row and apartment house	173,008	52	13,020	11
Commercial use	Commerce	47,264	14	18,454	16
	Business	-	-	6,672	6
	Mixed use of residence and commerce	27,260	8	13,194	11
Road and public facility use		8,618	3	2,646	2
School and other use		26,203	8	29,777	26

[Figure 1] Existing Land use in Case Area Designated as General Residential Zone

[Figure 2] Existing Land use in Case Area Designated as General Commercial Zone

relaxed that its effects are weak. The excessive relaxation of land use regulation might be revealed through the level of the permitted FAR on buildings in the General Residential Zones. The permitted FAR on buildings in the General Residential Zone which was 300% at maximum before has been relaxed to 400% in 1988. According to the survey of the FAR of 900 apartment complexes(400,000 households) constructed during the period between 1995 and 1998, the average FAR reaches 270% and 160 apartment complexes(58,000 households) exceed FAR of 350%. High-rise apartment complexes of 16 stories or more are constructed in the neighborhood of single detached residential areas or in the riverside through the renewal or rebuilding process. This resulted in a deteriorated residential environment and urban landscape. Existing zoning regulation has been losing its regulatory role for directing different of land use activity by zone except the designation of newly urbanizing areas.

3. Relationships between Zoning and Urban Planning

3.1 Urban Comprehensive Plan

The land use zones in the urban planning area should be designated in concurrence with the Urban Comprehensive Plan. This means that after establishing the Urban Comprehensive Plan which sets the overall frameworks for the entire urban development, the zoning regulation will be implemented according to this rule. In reality, the Urban Comprehensive Plan has been used as a tool for legitimating rezoning. For example, the land use changes of the urban built-up areas are tentatively decided before the urban comprehensive plan is updated. This process mainly results from regarding the Urban Comprehensive Plan as a blueprint plan.

And, once the vast newly development areas are designated through this Urban Comprehensive Plan, it means rezoning of those areas. As a result, the land price of those areas soars. And it becomes very hard to develop the area consistent with the original urban plan because of the increased burden of land acquisition. This also results from the blueprint oriented application of the Urban Comprehensive Plan.

The Urban Comprehensive Plan assigns the locations of the future

main urban infrastructures like roads, parks, etc. But the locations of these facilities are often hastily determined without feasibility studies or without agreement process between interested groups. The land use zones and the location of urban infrastructures are designated consistent with inconsiderate Urban Comprehensive Plan.

Owing to these tendencies of the Urban Comprehensive Plan, i.e., legitimating zoning changes, raising land prices, and determining urban facilities without full consideration, urban planning does not get the public trust and it delays the technical advance of the urban planning field.

3.2 Development Project and Development Activity

Two types of urban development projects have been implemented in the urban planning area. One is the urban development project based on the predesignated land use zones, the other is non-urban development project based on the special development acts(e.g., Land Development Promotion Act) which allow for changes of the zones when the project is being permitted.

The urban development project involves so many problems. Before project implementation, land use zones might need to be changed to allow for the development project. The procedure of zoning changes requires considerable time because it takes several steps for approval. So, it is very difficult to meet the development demand at the right time. Furthermore, this time consuming process raises the land prices before launching the development project.

Since 1980, the land development promotion project based on the Land Development Promotion Act has been introduced and widely applied to many development projects. This land development promotion project automatically changes the land uses of the project areas appropriate to develop when the development plan gets approval. So, the developer can save times by skipping several processes for zoning change and can supply the land at a relatively short time and low price. But this approach disregards the overall frameworks of the Urban Comprehensive Plan, because the project areas are determined without looking at its relationship with the Urban Comprehensive Plan. And this method, being mainly implemented by the public agencies, uses the Eminent Domain in purchasing land for project development, and

causes conflicts between developers and landowners.

Small size development by the landowners can be implemented when they get the development permission according to the Urban Planning Act. The purpose of the development activities should conform to the zoning regulations. But, most of the development activities, such as warehouses in Holding Zone, residential buildings in Commercial or Industrial Zone, have been permitted because of the loose regulation of the current zoning system.

In summary, the current zoning system of Korea, which has little relationship with the Urban Comprehensive Plan, development project, and development activity, causes various side effects and social conflicts in the Korean society.

Problems of Land Use Regulations in Views of Social Equity and Rationality

1. Formation of Bubbles in Land Price

If planned land use is rezoned from the Holding Zone to the General Residential, Semi-residential or General Commercial Zones, then land price increases by 2.8 to 4.2 times than before. The land price increase generally occurs even without any development activities in those areas. Although rezoning for those areas actually does not mean land use changes, development potentials for the floating values of those areas shifts into the land price before development project starts. However, there is no regulatory tool for charging this exceptional land price increase.

Due to increased land price, development costs and eventually the social costs will be increased. There exists a widely spread phenomenon for people to achieve the windfall from the zoning change. The more information related to future planning decision a person has, the more probability to get a windfall he or she has. The current zoning regulation has provided such windfall opportunity for some people and helped to deepen social inequities.

[Table 3] Comparison of Land Price before and after the Changes of Zone

After / Before	Holding zone	General industrial zone	Semi-industrial zone	General residential zone	Semi-residential zone	General commercial zone
Holding zone	1.00	2.07	2.49	2.77	3.19	4.19
General industrial zone	0.48	1.00	1.20	1.34	1.54	2.02
Semi-industrial zone	0.40	0.83	1.00	1.11	1.28	1.68
General residential zone	0.36	0.75	0.90	1.00	1.15	1.51
Semi-residential zone	0.31	0.65	0.78	0.87	1.00	1.31
General commercial zone	0.24	0.49	0.59	0.66	0.76	1.00

Source: MOCT & KRIHS. Land Price Reference Indices, 2000

2. Absurdness in the Delineation of Land Area by Zoning

Zoning inevitably allows for different type of land use regulation for different zones. During the designation and delineation process of zones, however, it is almost impossible to reach consensus among landowners. A typical example is the partial relaxation work of the Restricted Development Zone(RDZ) (i.e., the Greenbelts) in Korea.

For the last three decades, building construction and erection of structures after designation of RDZ have been very restricted except the expansion or rebuilding of houses which have already existed before the designation of RDZ. Therefore, the landowners in RDZ broadly regard the current relaxation works as the last chance to recover their property rights. Mayors or county supervisors who have to elaborate urban plans will try to make their best efforts to the relaxation works of RDZ with proper decision making criteria. However, landowners who have not benefited from the relaxation of RDZ will be definitely

unsatisfied with the results of the zoning.

If current zoning regulation were a factor for causing the social conflicts, then the system should be improved for social integrity and sustainable urban developments.

3. Development and Decision-making Procedures in Zoning

Zoning system plays a role in both regulating the land use and constraining the property rights of landowners. Zoning as tools for regulating land uses is to be matched for the purpose of sustainable land use as ends. Therefore, zoning system is required to play a role of suitable tools for the future urban land use as in the urban comprehensive plan as well as correcting current land uses.

In order to get the understanding of landowners who will have the disadvantages from rezoning, the decision-making processes of zoning are required to be transparent by participating with related landowners. Compared with other advanced countries, however, it has not been provided sufficient opportunities to offer the opinions of concerned parties decision-making process.[1] In conclusion, the concerned landowners may not accept the city plans if the public opinions are not sufficiently accepted. Furthermore, since proceedings of the Urban Planning Commission are treated as a confidential, it is difficult to regard that the procedures of the planning process is transparent.

Issues for the Sustainable Urban Development: Improvement of Planning Function through the Fundamental Reform of Land Use Control System

1. Trends in Land Use Control System Change and Defects of System Improvements

The improvement of land use control system, which has been dis-

1) In Korea, once rezoning plan is developed, then the related documents and maps should be announced to the public for 14 days. Then the acceptance or rejection of the proposed public opinion should be notified to the public within 60 days after the public announcement of the plan.

cussed since the mid 1990s, was accomplished through the revision of the Urban Planning Act and steadily carrying out National Land Management Act to revise as well.

Development control by zoning system which has been regulated in the Building Act was unified by the revision of the Urban Planning Act in the year of 2000. Simultaneously the Residential Zone was reclassified and subdivided from three kinds to six and density ceiling has been down-scaled as well.[2] Also newly changed Unitary Detailed District Plan[3], which was operated in limited areas such as redevelopment project area, new town project site, and etc., allowed to implement most needed areas including urban built-up area.

While, permitted FAR in the Semi-urban Zone and the Semi-exclusive Agricultural Zone under the National Land Management Act scaled down to 200% and 80%, respectively, besides revision of the Urban Planning Act. Additionally the Semi-urban Zone cannot be easily changed due to the stricter regulations. All these efforts made it possible to prevent disordered rebuilding and redevelopment projects in urban area and rural areas, which have been oriented for high-rise apartment developments.

The government now considers a consolidation of the Urban Planning Act and the National Land Management Act after the revision of the Urban Planning Act. The main purpose of the consolidation is to apply urban planning tools to an entire administrative area by including non-urban areas of the municipal boundary in the urban plan. Also existing Semi-urban Zone and Semi-exclusive Agricultural Zone would be revised to the Control Zone. Simultaneously, the Control Zone would be designated to three different classifications such as the Agricultural Control Zone, Conservation Control Zone, and Planning Control Zone. Under this process, the Unitary Detailed District Plan can be implemented to areas needing developments.

Although there has been and will be a regulatory improvement of technical aspect of urban planning, zoning regulation will remain a

---

2) The maximum floor area ratio possible in the General Residential Zone was down-scaled from 400% to 300%.

3) Unitary Detailed District Planning established by consolidating Urban Designing in the Building Act(1980) and Detailed District Planning in the Urban Planning Act(1991) through the amendment of the Urban Planning Act in 2000, deals with contents similar with those of B-plan in Germany.

major tool for urban land use control. Fundamental problems in land use control system are still overlooked as stated in technical and socieal aspects. Side effects of blueprinted urban comprehensive plan remain an unsolved issue from both the technical perspective as well as the social perspective. Future tasks for regulatory improvements need to focus on a few issues such as forming bubble price of land caused by zoning regulation; incomplete designation of zone; and administrative convenience based decision-making process. In order to solve the above issues, it is necessary to review the land use control system without the fixed idea that zoning regulation equals the land use control system.

First of all, it is necessary to discuss a statutory foundation of development right for rearrangement of land use control system based on the societal rationality perspective. The next step would be to improve the urban comprehensive planning system and land use control system based on the above discussion.

2. Societal Rationality of Development Rights

In Korea, development right is recognized as an exclusive right of landowners for using their property, and it is especially prescribed in the legislation for the purpose of limiting land use for public use.[4] While land use regulation through zoning is considered as an element for shaping development rights. Profits and relative losses of landowners accruing from the designation of zone are considered to belong to landowners without any recapture or compensation.[5] This implies that society approves a windfall profit as well as increased land price accruing through zoning change(e.g., from the Green Zone to the Residential Zone or Commercial Zone), even though there is no change in

4) Refer the Article 23 in the Constitution of Korea:
-The right property of all citizens shall be guaranteed. The contents and limitations thereof shall be determined by the Act.
-The exercise of property rights shall conform to the public welfare.
-Expropriation, use or restriction of private property from public necessity and compensation, therefore, shall be governed by the Act, and provided that in such a case, just compensation shall be paid.

5) In the case of the restriction by designating RDZ, the constitution court of Korea decided that elimination of development opportunities and the resulting decrease in the land price or the relative slowing of the land price increase does fall under the social restriction that the land owners must endure(December 24, 1998).

actual land use.

But zoning simply indicates that a certain area might have a development potential as pointed out above. Nevertheless, current land use control system, recognizing bubble land price resulting from zoning, cannot be accepted as a reasonable system. Even though zoning change would occur in a certain area, it is reasonable to realize that the betterment of land owners' development right generates at the time of actual development or at the time of getting approval for development project. The floating value accruing through zoning should not shift to corresponding land before development occurs, because zoning is no more than an increase of development potential certified by the public. Profits of land owners accruing though the implementation of a development project should be recaptured through the acquisition tax for current land use change and the betterment levy fee for development project. Land use control system ultimately needs to be rearranged with a proposition that the development right is born at the time of a development project approval.

There might be two alternatives of permitting development. The first alternative is that the government possesses the development right itself, examines land development plan submitted by landowners, and approves of the land development plan. But this alternative requires a revolutionary system reformation, for instance, the government acquires development rights of all land of the nation, or temporarily freezes up development rights of all land owners. It is actually impossible to implement this alternative.

The other alternative is that the public gives a conditional permission just in case of submitting a detailed development plan on the premise of "no development plan, no development approval." This one can be implemented with the premise that the Unitary Detailed District Plan should be prepared for development permission. However, additional regulatory requirements for areas without the Unitary Detailed District Plan will be needed.

3. Land Use Control by Development Permission

To make a transition into the land use control system based on development permission, four regulatory improvement measures are suggested. First, the scope of development for development permission

is redefined. The current Urban Planning Act only embodies building construction and erection of structures, change of land form, earth and stone quarrying, land subdivision, and heaping for development permission. In addition to the above, the change in the land use category on the Land Register Act should be included as individual land use change. Especially, change into urban land use, such as residential, commercial, industrial, school, road, and railroad, should be made through the development permission. So far the change in the land use category is simply a certification process after development is implemented. However, permission of the change in the land use category should be made beforehand. Second, development permission should be made in conjunction with the Unitary Detailed District Plan. Building construction and erection of structures, change of land form, and change of land use category are allowed when they conform to the existing Unitary Detailed District Plan. With classification of zones in more detail, zoning is dealt as an element of land use control system in preparing the Unitary Detailed District Plan. For area that does not have the Unitary Detailed District Plan, temporary Unitary Detailed District Plan is prepared and modified later. If development permission is required in the area without the Unitary Detailed District Plan, exceptional permission can be made as long as it conforms to the existing use of surroundings. Third, urban development project and land development promotion project, which occupy most of urban development, are included in development prescribed in the law. However, these are considered as special cases approved by prior development plan and excluded from development permission. Fourth, systematic solutions for recapturing betterment accrued from the Unitary Detailed District Plan and development permission are devised. The shift of betterment to the land occurring before actual development is implemented should be prevented.

4. Assuring Liberalization in Planning

It is possible to assure liberalization in planning by introducing development permission based on land use control system. Regulation and planning are interconnected as means and ends for achieving sustainable urban development. Planning separated from regulation includes not only statutory plans but also various non-statutory subject

plans and district plans. Among these plans, fundamentals are the Urban Comprehensive Plan, Urban Infrastructure Plan, and Unitary Detailed District Plan. The Urban Comprehensive Plan has so far been only a blueprint plan to confirm proposed zoning system. It should be a strategic plan that establishes main strategies about urban development, renewal, and conservation and enforces policy and action programs. District plan and subject plan can be reflected on the Urban Comprehensive Plan, if necessary. Also, the Urban Comprehensive Plan specifies areas for Unitary Detailed District Planning and includes criteria for development project and development permission. The Urban Infrastructure Plan devises and decides plans for public infrastructure, such as arterial roads, water supply system, and sewer system. It targets relevant urban planning facilities but excludes elementary schools, parking lots, and parks that are dealt in the Unitary Detailed District Plan. It deals with all other urban infrastructure and decides location and scale of facilities in conjunction with annual implementation plan. The Unitary Detailed District Plan manages current land use, presents future land use plan, and regulates new development. Even though it gives permission on development suitable for existing land use, it makes conditions for permission and assesses betterment for recapturing. At the same time, it also facilitates public participation in the planning process. In this sense, the current Unitary Detailed District Plan should be improved. As planning is not confined to the present land use control, it leads sustainable urban development and becomes future-oriented plans.

Conclusion

Land use control system in Korea, which has been based on zoning regulation for more than four decades, should be thoroughly reexamined. Partial modification based on zoning system cannot solve the issues mentioned in prior chapters. To solve the problems, improvement of whole system is urgent. This paper focuses on the transition from zoning system to development permission for land use control system. New land use control system will be made possible when planning system, recapturing of betterment, and compensation for loss are examined all together. In

addition, in-depth analysis of the issues and case study of foreign experiences are also required, as well as efforts to draw national consensus among people about the necessity and direction for the improvement.

References

Cullingworth, J. Barry · Vincent, Nadin. *Town and Country Panning in Bittain*(11th ed.). Routledge, London and New York, 1994.

Harada, Sumitaka · Seigo, Hirowatari · Katsumi, Yoshida · Michiatsu, Kaino · Syunichi, Watanabe. *Urban Planning Law in Germany, France, England and United States*. Univ. of Tokyo Press, Tokyo, Feb. 1993.

Hukukawa, Yuich. *Planning and Control of Land Use in the United States*. Gakugei Pub., Tokyo, May 1997(in Japanese).

Heon-Joo, Park · Suh, Soon-Tak. "A Study on the Separation of Development Right from Landownership for the Effective Management of National Territory." *The Korea Spatial Planning Review,* Vol. 32, Korea Research Institute for Human Settlements, Seoul, Oct. 2001: 1-14.

Jae-Gil, Park. "A Study on the Restructuring of Zoning System for Urban Land Use Control." Korea Research Institute for Human Settlements, Seoul, July 2000(in Korean).

Jae-Gil, Park. "A Study on the Improvement of the Statutory Urban Planning and Development System." Korea Research Institute for Human Settlements, Seoul, Dec.1997(in Korean).

Kun-Hyuk, Ahn. "A Study for the Improved Zoning System and Building Control." Korea Research Institute for Human Settlements, Seoul, July 1987(in Korean).

Nakai Norihiro & Miki Muraki. *Master Plans in the British Urban Planning System*. Gakugei Pub., Tokyo, March, 1998(in Japanese).

Simon, Eisner · Gallion, Arthur · Eisner. *Stanley. the Urban Pattern*(6th ed.). Van Nostrand Reinhold, New York, 1993: 415-437.

Town and Country Planning Association. "Commentary on RDZ Policy Reform in Korea." the Korean Ministry of Construction and Transportation, Seoul, April 1999.

백면

16 Ecological Characteristics of Land Use Transition in Central Urban Area of Korea

Hee-Yun Hwang
Byungseol Byun

Introduction

An ecological approach, which has established the foundation of an empirical tradition in urban studies and has been mainly applied in the United States, has been a tool for probing the phenomena of the city for the last half a century. This approach also justifies the application of environmental determinism and ecological analogy to the planning process. In addition, the ecological approach stimulates the study of social conflicts through introducing a concept of competition. Furthermore, urban ecologists provide diverse information, analyzing and criticizing the facts related to the city. In short, the ecological approach has been regarded significant to urban study.

In the early stage, an ecological theory was widely applied in order to interpret urban areas from the central area to the residential area of the city. In the middle of this century, as automobiles became more popular in the United States where a human ecology was actively studied, a lot of business located at the urban central area has moved to the new sites along expressways and into the suburbs. As a result, the competition for business in the inner city lessened as supposed by the ecologists.

Classical ecology puts the fundamental nature of land use transition as competition between individuals and groups: the ecological approach explains the phenomena of this kind of competition. From this

viewpoint, the classical ecology cannot fully be applied to the downtown areas of American cities.

In contrast, Korean cities expose very different situation. The land size of Korea is relatively small. Most people use public transportation. And most cities have greenbelt areas enclosing themselves to prevent over-expansion. Severe land use competition for sites in urban business centers has not yet diminished. In a sense, the competition is becoming more critical. Therefore, central urban areas in Korean cities are fundamentally different from American cities.

This paper is interested in commensalism and competition among functions in the central urban areas among Korean cities. It investigates the dynamics of commercial uses versus residential uses as well as the struggle between successful and unsuccessful businesses. It also illuminates the basic characteristics of land use transition in the central urban area. In addition, this study provides the empirical data to set up an ecological model intended to demonstrate the internal urban structure of Korean downtown areas.

To achieve these purposes, this paper develops an ecological principle based on land use transition in the central urban area. The ecological principle is devised through a deductive approach which tests the hypothesis based on the existing studies with empirical materials in the Korean cities.

Dynamic Balance of Land Use Transition

1. Hypothesis

1.1 Trends in Urban Ecology Study

Up to the present time, there have been three approaches to urban ecology study. First, it applies the general concept of plant and animal ecology to the human community. Second, it interprets the characteristics of natural areas and the social, economical and demographical characteristics of residents. Third, it also includes analysis of statistics based on observable social phenomena like crime.

Applying the general concept, the ecologists have been interested

in the social and cultural factors of urban space, especially at the neighborhood unit. They concentrated their research on the development of a social system based on the evolutionary adaptation of the population to the environment. The study on land use transition of early residential areas in the cities focused on the migration of people to the cities, and the social and economical pattern of the neighborhood. Research dealing with urban commercial areas was pursued by techniques of stratifying commercial areas through examining commercial characteristics or concentric theory.

In the ecological approach, the concept of biological ecology was applied to the study of the urban spatial structure without a clear ecological principle. The main subject was to analyze the social structure of the community. Commercial land use was investigated by a static method to probe the classification of commercial areas.

Therefore, construction of an ecological principle that can be applied to urban land use transition is still untouched: both investigating the dynamics of the commensalism and competition of functions in the city and searching for the process of penetration of businesses into residential area have not yet considered together. This paper intends to develop the principle interpreting mutual dynamic transformation of the uses in the central urban area.

1.2 Dynamic Balance of Land Use Transition in the Central Urban Area

Human society, though separated by space, is organized by individuals who move independently. This spatial relationship, which is the product of competition and opportunity costs, exists through a process of transformation(McKenzie, 1925: 65). The urban center is also a settlement with continual replacement of more evolved groups according to ecological way of thinking(Alihan, 1938: 122-123). The spatial organization of this area is being transformed continually; land owners and users change, so do land patterns.

A free market system, these transformations commonly occur when a region is expanding or when functions are moving to other regions(McKenzie, 1926: 141-154), because the owners and users of land attempt to adapt themselves respectively to the transition to maximize profit. The adaptation process in the central urban area is usually based on a supply and demand mechanism which is inclined to keep

the balance of maximum usage of the land versus existing usage. This provokes reorganization in the inner city, which is achieved when the use of an existing parcel of land is changed or an existing building is replaced by a new building. In the process, the rent for a lot also goes up if the demand for it increases. Some land users are expelled to make place for higher order usages(Goodall, 1978: 205-206).

The creation and adaptation of urban space is a long and unending process. The existing buildings and facilities may lead to further development over the generations, so the present usage is formed through past development. As a result, variation comes continually from the accumulation of small transformations of the existing establishment.

From the viewpoint of urban activities, the present land use pattern is founded on continuity and readjustment by these reasons. However, this transformation is only possible through the order of existing establishments(Goodall, 1978: 85-89). So urban land use transition is a dynamic process through adapting to transformation and this is also the process of a dynamic balance to pursue a way toward adjustment though the adaptation.

Founded on the facts stated above, this study abstracts a principle of ecological dynamic balance of land use transition in the central urban area. A hypothesis of the principle is formed by presupposing two assumptions.

Assumption 1

The region that can be applied by the principle meets the following conditions, for this study is based on a classical model of urban ecology(Janelle and Millward, 1982: 209-221).

1) The city must have population growth and regional expansion.
2) The city should be representative of the region that has a mature land use pattern and a relatively large size, as it has a urban structure divided into sub-areas with combined functions.
3) Land use transition in the city is based on the competition in the free market.
4) The land in the city must be treated as private property.

Assumption 2

The functions existing in the region which can be applied by the principle should have the following two ecological phenomena.

1) Central business uses are aggregated to increase the efficiency through a high degree of accessibility, and to increase the safety and complementarity through a high degree of relationships among the related uses.
2) Central business uses occupy their own spatial territories respectively; the territories are formed by a functional segregation of zones and a homeostasis to preserve the segregated zones.

Under the assumptions above, this study builds a hypothesis as follows.

"The aggregation and the spatial territory to be formed by population and facilities in a human community are maintained in a continuous transition. This transition is only possible in an existing order. Therefore, the process of land use in the central urban area is a dynamic process that adapts to the changes of the environment. And it is also a balanced process that adjusts to the change based on the status quo. Consequently, the spatial structure of the central urban area maintains a dynamic balance which is the combined product of adaptation through competition and balance through adjustment."

2. Application to a Logistic Model

2.1 Initial Steps

• Area Identification

This study, selects the regions that satisfies both 'assumption 1' and 'assumption 2' established in chapter Ⅱ-1 in the Korean cities. Two areas are selected from pilot studies: Insadong District[1] in Seoul

1) Insadong District historically was a residential area, which was developed when Hanseongbu of early Joseon kingdom was constructed and where the middle and upper class people mainly lived. It was next to administrative functions of palaces and Yukjo street: and to commercial functions of the Yukuijeon and Ihyeon areas. Although this place has maintained the original characteristics

and the central area in Cheongju.

Insadong District(study area-1) has maintained a traditional cultural inertia since it was built in the early fifteenth century. Because of strong historical characteristics, this area has undergone a relatively gradual transition during the rapid growth of Seoul. No large scale public development projects like urban renewal did not occurred in this area. Most of this area has been built by the private sector. This area was also used as a residential area for a long time after it became a built-up area in the beginning of the Lee dynasty. Starting from this century, the current land use pattern began to shape. That is, spatial structure of this area was mainly formed by a free market under a capitalistic economic system. Based on these facts, this study considers study area-1 to meet 'assumption 1.'

The central area of Cheongju(study area-2) also has a long historical tradition. However, the modern land use pattern actually began to form in the early twentieth century when the capitalistic system was accelerated in Korean peninsula. The city, Cheongju, has experienced rapid growth since the beginning of this century, but no large scale public development projects were enforced except development of new residential areas and an industrial complex on the suburban fringe. In the central area of the city, we cannot find evidence of any large scale public development like urban renewal except for expanding some streets around the central business districts. That is, urban spatial structure of Cheongju was also formed primarily under a capitalistic economic system and a privately owned open land market. Based on these facts, study area-2 meets 'assumption 1.'

Also, through related researches(Hwang, 1987; Yoon & Hwang, 1987; Yoon & Hwang, 1986) it become obvious that both study area-1 and study area-2 satisfy 'assumption 2.'

---

of location as a residential area during the 500 years of continuous growth and changes after the first days, it has transformed into a transitional area, where spatial structure has been rapidly changing since all kinds of commercial functions started growing from the 1970s. In other words, Insadong District is an intersection where a traditional residential area around the palaces and Hanoks(traditional houses) and central business areas like Jongno, Gwanggyo, and Gwangwhamun meet; and it is located in a transitional area in view of the urban spatial structure.

[Figure 1] Insadong District(study area-1)

• Framework for the Case Study

Space Unit; The area of study area-1 has about 200,000m^2, which includes 900 and some land parcels. This study subdivides the area into 13 blocks for more efficient analysis(Figure 1, Table 1 & Table 2). The area of study area-2 involves about 1,000,000m^2, which includes 4,100 and some land parcels. This area is subdivided into fifty two blocks in the second phase(Figure 3, Table 1 & Table 2). The block is

[Table 1] Ratio of Number of Lots Occupied by Each Function to a Number of Total Lots in Each Study Area(Dec, 1986)

	Functions	Insadong District		Central area in Cheongju	
		Number of lots	%	Number of lots	%
Central business uses	Retail	367	39.3	1,605	38.9
	restaurant	230	24.7	503	12.2
	Others 1[1)]	56	6.0	174	4.2
Non central business uses	House	234	25.1	1,476	35.8
	Others 2[2)]	46	4.9	386	8.9
Total		933	100.0	4,124	100.0

Notes: 1) General Office, Bank & Finance, Clinic, Theater, Museum, etc.
2) Inn, Gas Station, Light Industry, School, Church, Park, etc.

[Table 2] Framework for the Case Study

Space unit			Time unit		Ecological unit	
Study Area-1	Insadong District	13 Units	Before 1935	1 Unit	Unit 1	Retail
			1936/1980	Unit/5YS	Unit 2	Restaurant
Study Area-2	Central area in Cheongju	52 Units	1981/1986	Unit/3YS	Unit 3	Others-1

basically bounded by roads. Each block has 40 to 120 lots, with a few exceptions.

Time unit: An analysis of the ecological phenomena in the study areas is generally carried out between 1920 when records were first kept and the end of 1986 when the last field survey was carried out. The analysis further subdivides the time period into 12 time frames; before 1935 is one unit, each five years is a basic unit between 1935 and 1980, and each three years is a unit between 1980 and 1986. These time divisions are based on the fact that land use transition was static before 1935, land use adjustments gradually progressed from 1935 to 1980, and rapidly progressed from 1980 to 1986(Table 2).

Ecological unit: In this study, retail establishments and restaurants

are set as ecological unit-1 and ecological unit-2, and central business uses(offices, clinics, cultural centers, etc.) except for retail and restaurants are designated as ecological unit-3. The criteria for the division is that retail and restaurants occupied high percentage of lots in the study areas.

This study also considers that the uses located at first floor are representative of the functions of buildings on each lot.

[Table 3] Functional Classification of study area

	Classification of functions		Unit
City center functions	Retails	Shops, Market, Department store, Drug store	Ecological unit 1
	Restaurants	Restaurant, Coffee shop	Ecological unit 2
	Administration	Administration	Ecological unit 3
	Offices	General office, Bank & Finance	
	Clinics	General hospital, Clinic	
	Cultural	Theater, Art gallery	
Transitional functions	Accomodation	Hotel, Inn	Ecological unit 4
	Transport	Bus terminal, Parking lot, Gas station	
	Light Industry	Mechanic shop, Service station, Print shop, Factory	
Neighborhood facilities		School, Church, Social welfare, Wedding hall, Hair shop	Ecological unit 5
Housing		House, Apartment	Ecological unit 6

• Basic Survey

Investigation and analysis of the basic data of each lot in the study areas, and a thorough field surveys were carried out. The basic data of study area-1 are derived from a house registration records and a building registration records. The basic data of study area-2 are

collected from a building registration record, a house tax registration record, and a commercial permit registration record.

The records of both study areas are not complete; some lots did not have complete records and some have records only after new development. To encompass the full records of study area-1, the first field survey was done in June and July, 1986 and second field survey done in April, 1987. For study area-2, the first field survey was done in October and November, 1986 and the second field survey in April, 1987. The field survey was done thought observations on all the lots in study areas, and through discussions with long-time residents, building users and architects.

2.2 Application to a Logistic Model

The process of an ecosystem shows variation from a state of growth to state of stability. The progress of an ecosystem and the ecological succession represent the orderly process of the development or a biological population.

The most typical process of an ecosystem is the growth pattern of its population. In the early stage of the process of an ecosystem, population growth has been slow as it is adapting itself to new circumstances. Once it adapts to them, population grows at a rapid pace. The speed of growth decreases gradually due to consumption of more energy when it reaches the maturation stage. The growth stops when it reaches balances between total production and total consumption of energy. An ecosystem maintains the order through a transition which is from the evolution of species in their territory or the mutual action and reaction among them. Consequently, a dynamic balance is preserved between the growth and the stability of an ecosystem.

For these reasons, the growth pattern of population is one of orderly progresses achieved through dynamic balance. This study attempts to ascertain the truth of dynamic balance of land use transition in the urban central area, whether or not the transition pattern coincides with the growth pattern of the population.

Under ecological phenomena, the growth rate of a population at a centain time is $dN/dt=rN$(r=natural growth rate at a certain time t, N=size of the population during t). Therefore, $N=N_0 e^{rt}$(N_0 = size of

population when *t*=0, N=size of population after *t*).

When a certain population meets circumstances under which it cannot maintain further increases beyond a fixed number, it has a ceiling value. The value is a potential capacity, namely, K value. The growth rate of a population is exponential when the size of the population is far from the K value, but if the number comes close to the K value, growth meets with resistance. So a factor which represents the maximum possibility of an increment at the growth rate at a certain time, acts as a control element. The factor is growth realization factor, the value is K-N/K(Kimball 1985: 795-800). If we introduce it as an exponential growth function, it reads as follows.

dN/dt=rN(K-N/K) In this function, the total size of a population after *t*, N*t*=K/1+ e^{a-rt}(a=log $_x\frac{k_1-No}{No}$, No=density of population when t=0). Growth stops when the growth realization factor, K-N/K becomes zero(Hyun, 1986: 206-207).

This logistic growth curve represents the principle of dynamic balance achieved by all living beings in the natural world. This study accepts the logistic growth curve as a model that represents the principle of dynamic balance. This study attempts to discriminate whether or not the process of land use transition by the central business uses coincides with the theoretical function of a logistic growth curve.

The transition process of central business uses is defined as a transition pattern for time, ecology, and space unit, respectively. The transition pattern is defined as a change on the ratio of the number of lots occupied by each ecological unit to the number of total lots in each space unit with the lapse of time unit.

The facts that a transition pattern of each ecological unit in each space unit is applied to a theoretical function of logistic growth curve are visually observed in the first stage. As a result, it is obvious in the study areas that the transition pattern coincides with a logistic growth curve function(Figure 4).

To show more objective testimony, this study calculates a correlation between the value from survey data and the estimated value of a theoretical function of a logistic growth curve. The correlation is calculated from a standard error value. In view of the outcome, the number of space units in which the standard error value of each ecological unit is less than 5%, accounts for more than 90% of all the space units is the

study areas. The standard error value of the sum of all the ecological units is also less than 5% in the greater part of space units, the value is over 10% in very few space units(Table 4).

As shown, this paper proves that a transition pattern of each ecological unit and space unit in the study areas coincides with the theoretical function of the logistic growth curve. It is validated that land use transition in the study area is a dynamic process adapted to variation. This is the process of a dynamic balance to pursue a way toward an adjustment based on existing situation.

[Table 4] Ratio of Number of Space Units in Which Standard Error Value[1)] of Each Ecological Unit Is Less Than 5% to Number of Total Space Units in Each Study Area

Ecological unit	Study Area-1		Study Area-2		Total	
	Number of lots	%	Number of lots	%	Number of lots	%
Ecological unit 1	112/133	84.6	452/473	95.7	56/60	93.3
Ecological unit 2	13/13	100.0	47/47	100.0	60/60	100.0
Ecological unit 3	9/9	100.0	29/32	90.6	38/41	92.7
Total	33/35	94.3	121/126	96.0	154/161	95.7

Note: 1) · Standard error value between survey value and estimated value of theoretical function of logistic growth curve
· Number of space units in which standard error value of each ecological unit is less than 5%
· Number of space units in which each ecological unit is more than one in each study area

Evaluation on the Forecasting of Land Use Transition

1. Results of Preceding Research Forecasts

1.1 Spatial Patterns of Location

We focus on the study area-1(Insadong District) for evaluation on

the forecasting of land use transition. Based on the analysis tool proposed earlier, the preceding research showed spatial patterns of location for respective ecological unit of the district as follows.

First, the ecological unit 1(retails) tended to form, in most cases, linear pattern of community alongside the main streets that guaranteed the continued flow of pedestrians. There was no doubt how crucial accessibility played a role here. Though many new shops opened right next to older ones in the initial stage of community, as time went by even the ones built their nests some distance away ended up in linear pattern due to newer ones that had filled in the in-betweens.

The ecological unit 1 was generally located along the main streets in the research district. However, some old shops, which had been there providing the community with daily necessities or laundry services, some others, which were forced to retreat due to rising rental fees and other competitive costs, and others which required peaceful ambience, could be found forming one or small groups of community inside the blocks. But these kinds of shops reached only about 10 percent of the whole retails. Consequently, the preceding research evaluated the geographical mode of ecological unit 1 to be constituting the linear pattern.

On the other hand, most of the ecological unit 2(restaurants & others) took up the space inside the blocks well over one lot away from the main streets. In case of pubs, clubs, and other casual bars, conflicts often rose, as expected, with occupying residential functions. Hence the tendency to select the more manageable lots adjacent to the preoccupied bars was very apparent. In consequence, the general rule was that the ecological unit 2 showed plane spreads around the preoccupied shops within the blocks.

In the process of expansion, it often happened that the same kind of shops as a preoccupying shop penetrated into the area some lots away when the penetration ran into strong resistance from the land owner of the adjacent area. In many cases though, the space between those two lots were sooner or later taken over by other restaurants or bars constituting successive plane group. In some cases, shops were found separated from others by the enclosing ecological unit 1. Nevertheless, the scarcity of them did not influence the general pattern. In fact, as restaurants & others predominated over retails as well as residential functions. The preceding research forecasted restaurants &

others would reinforce the plane characteristics of pattern.

1.2 Spatial Ratio of Occupation

The research presupposed that the land use transition of city would undergo the same process as ecological change of population. In other words, it hypothesized that the land use growth of city would show gradual increase in the beginning, sharp increase tendency at certain intervals, and then slowdown in the late stage maintaining the stability of factorial state. For that reason, the research selected the logistic growth curve as a model that would best represent the characteristics of land use transition. According to the outcome of the research, the logistic growth curve successfully represented the phenomena wherein, despite the continuous changes, each function adapted to the competition and maintained the balance through adjustments. Namely, the curve clearly captured the principle of dynamic balance that each function reached in the environment. In preceding research(1987) Hwang accepted

[Table 5] Each Ecological Unit's Location State and the Forecast Results by the Time Frame

(unit: %)

land use / type		1 (retails)	2 (restaurants & others)	1+2+3 (city center functions)
location state	1935	1.8	0.1	2.2
	1940	2.9	0.3	3.7
	1945	4.5	0.4	5.4
	1950	7.6	0.5	8.6
	1955	10.5	1.3	12.6
	1960	14.5	1.4	18.2
	1965	18.0	4.4	24.6
	1970	26.9	5.7	36.4
	1975	31.3	9.0	45.1
	1980	36.1	17.6	58.8
	1985	39.8	22.6	67.7
forecast results	1990	41.5	26.9	76.7
	1995	42.5	29.9	83.8
	1998	42.9	31.1	87.1

the logistic growth curve as the ideal model for explaining the principle of dynamic balance. By applying the theoretical formula of the logistic growth curve, he verified the fact that the land use transition in the given area followed the principle of dynamic balance. In addition, the research predicted, by applying the formula of the logistic growth curve, the research areas coming land use of 1990, 1995, and 1998. Forecasts on each ecological unit claimed(at the time) that the ecological unit 1(retails) would show slow growth as compared to relatively rapid one for the ecological unit 2(restaurants & others). It also predicted central city functions including ecological unit 1 and 2 would reach 90 percent of the whole in the area(Table 5).

The above outcomes of the forecasts can be summarized as follows.

The growth rate of the ecological unit 1(retails) from 1985 to 1998, according to the forecast(based on the logistic growth curve), was 42.9 percent, by 3.1 percent points up from that of 1985, thus suggesting the stable factorial. That is to say, the 1985's share of ecological unit 1 in the given area was evaluated as having reached near 40 percent, almost the limit of marginal capacity. In comparison, ecological unit 2(restaurants & others) in the area was forecasted to reach 31.1 percent by 1998 because the areas strong cultural characteristics was expected to attract a lot of visitors thereby raising the demands for more restaurants & others. On the other hand, the growth rate of the overall city center functions including the ecological units 1 and 2 was forecasted to maintain growing up to 87.1 percent by 1998.

Now let us see how close the forecasts came to meet the actual results of given years.

2. Evaluation on the Forecasted Values of the Preceding Research

2.1 Steps for Research and Analysis

To see if the actual land use transition progressed according to the forecasts, we needed the following scientific research and analysis as follows.

The first step was to come up with the basic research based on the field survey. Through the research we acquired the present land uses of each lot, the years when the present uses began, the nature of usage and years in case the lots had been used for different purposes other

than residence. Concerning the buildings under construction, we marked out those lots according to the plan about their future uses.

The second was gathering statistical information of each land uses. It proceeded by adjusting each lots land uses marked on the cadastral map to fit the framework of analysis and then counting the state of each spatial units transition according to the respective ecological unit. The spatial units were made up of 13 subdivisions in the area. The aggregation of each land use in those subdivisions was conducted according to the time frames of ecological units.

The third was to grasp the state of land use transition. We analyzed the spatial pattern in which each lots use would change under the given time frames by using GIS technique and marking the results on the map.

The final step consisted of comparing the surveyed results of land uses with those from the forecast. We were able to verify whether or not the share of each ecological unit concurred with forecasted values.

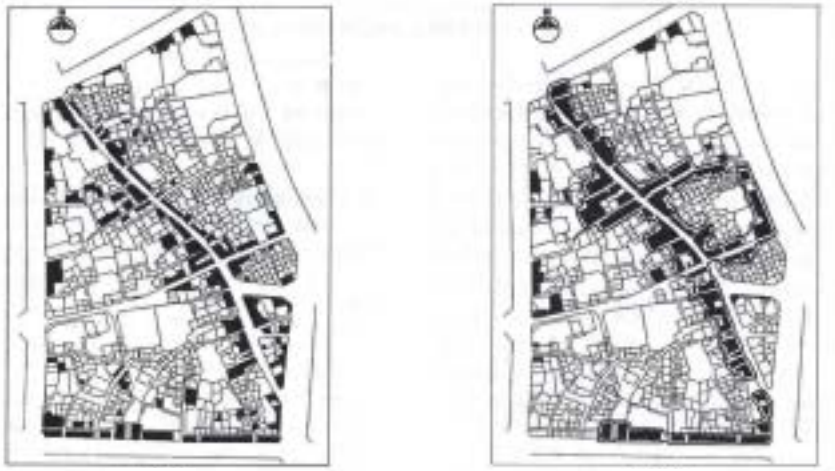
2.2 Evaluation

• Evaluation on the Spatial Pattern of Location

When we analyzed the changes of location pattern of land use 1 during the 12 years from 1986 to 1998, we found that the number of retail shops decreased due to the number of redevelopment projects that had been conducted in the research area. However, this kind of change was apparent at the margin of the community forming the linear pattern; the retail shops within blocks were substituted for different functions. On the other hand, retail shops along the main streets continuously expanded their domain thus maintaining the original linear pattern. Particularly in the spatial unit(subdivision) 4, they showed strong predominance by extending solid linear community along the streets that had good accessibility. It became clear therefore that the transition of the location pattern of retails was progressing as it had been forecasted from the preceding research(Figure 2).

Either to avoid the burden of high rent or to minimize the exposure to passing onlookers, most of the shops of ecological unit 2 preferred the space inside the blocks. For this reason, restaurants, pubs, and other casual bars had found their way into areas behind from main

[Figure 2] Spatial Pattern of Ecological Unit 1(retails)



1986 1998

[Figure 3] Spatial Pattern of Ecological Unit 2(restaurants & others)

1986 1998

streets. As the result, they came to share 42.5 percent of the areas. In particular, they were expanding dominance while forming solid plane community in spatial units 3, 4, 9, 10, and 11. As these predominating areas were not likely to face main streets, they well reflected the reclusive characteristics of many restaurants & others. In this way ecological unit 2(restaurants & others) expanded its domain of plane patterns in the blocks. This showed the plane pattern of location forecasted at the preceding research.

• Evaluation on Occupancy Rate of Space

① Evaluation

The surveyed and forecasted values in each ecological unit as of April 1998 are in Table 6.

[Table 6] The Forecasted Values and the Surveyed Values as of April 1998 Regarding the Share of Ecological Units

(Unit : %)

Land use type / Year	1 (retails)		2 (restaurants & others)		1+2+3 (city center functions)	
Forecast and verification	Forecasted values	Surveyed values	Forecasted values	Surveyed values	Forecasted values	Surveyed values
1985 (started year)	39.8	39.8	22.6	22.6	67.7	67.7
1990[1)]	41.5	38.7	26.9	30.3	76.7	75.3
1995[1)]	42.5	37.6	29.9	38.0	83.3	82.9
1998	42.9	36.9	31.1	42.5	87.1	87.4

Note: 1) The values of 1990 and 1995 in the surveyed values columns are calculated by using interpolation with the surveyed values of 1985 and 1998.

Although the ecological unit 1(retails) was forecasted, as shown in Table 6, to form a stable factorial growth starting 1990, it turned out to be declining. In comparison, the ecological unit 2(restaurants & others), forecasted to grow 0.65 percent each year after 1985, turned out to be growing about 1.53 percent each year. Nevertheless, the surveyed values of the city center functions including the ecological units 1 and

2 were found within the range of 1 percent error. We calculated each unit difference between forecasted and surveyed values with MAPE (Mean of Absolute Percentage Error); and those two units MAPEs calculated were as big as 10.75 percent for the ecological unit 1(retails) and as 25.46 percent for the ecological unit 2(restaurants & others) respectively. In contrast, the MAPE of ecological units 1+2+3(the whole function of city center) was 0.996 percent showing little difference between the two values. Therefore, considering the range of error, logistic model proved less adequate in forecasting the transition tendency of ecological units. The model, however, was highly adequate in forecasting the transition tendency of the whole city center functions.

Besides, to make a statistical analysis and verification on between the forecasted values and the surveyed values, we established a hypothesis as follows: namely, H0 : There is no difference between the two groups and H1: There is the difference between the two groups. If the P value, through the T-test analysis, is less than 0.01's level of significance, H0 is rejected. As retails' P value — 0.0024 as a result of analysis — is less than 0.01, H0 is rejected. Therefore, retails turn out that there is the difference between the two groups of forecasted values and surveyed ones. However, as the P values of restaurants & others and the whole city center function — 0.1132 and 0.8936 respectively — are higher than 0.01's level of significance, H0 is accepted. Consequently, restaurants & others and the whole city center functions prove that there is almost no difference between the two groups of forecasted and surveyed values.

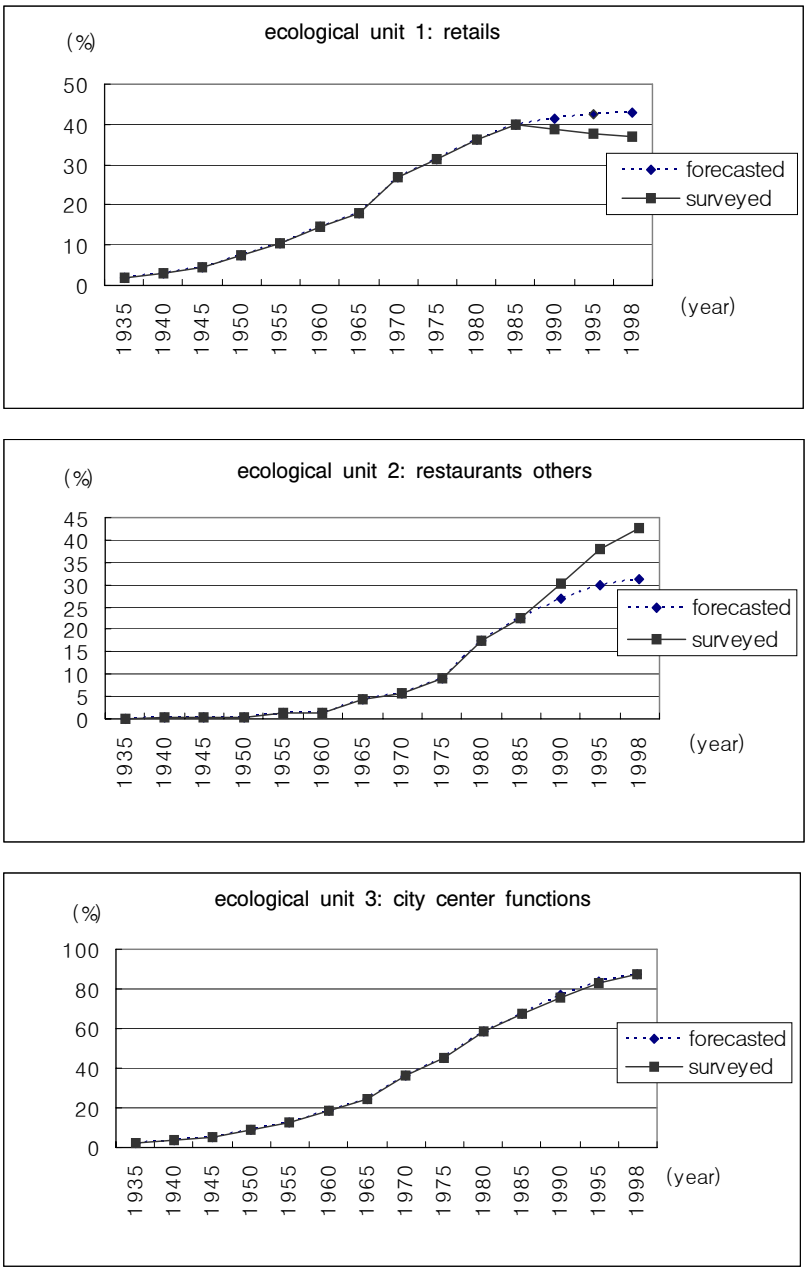
After we fit the transition state of land use into the theoretical formula of the logistic growth curve, we earned the results as in Figure 4. On behalf of comparative analysis, we also presented the diagram with graphs for the surveyed and forecasted values respectively.

As shown in Figure 4, each ecological units transition mode was made sure as corresponding as within 15 percent of MAPE range to center is a dynamic process adapting to changes and thus a process of dynamic balance seeking the equilibrium based on the status quo.

② Forecast

The framework for forecasts: To grasp the transition tendency from 1998 by applying the model of logistic growth curve, we set the framework as follows.

[Figure 4] Comparative Graphs for Forecasted and Surveyed Values of Each Ecological Unit by using a Logistic Model



{Table 7} Forecasted and Surveyed Values as of April 1998 Regarding the Share of Ecological Units

(Unit : %)

Ecological unit / Year	1 (retails)			2 (restaurants & others)			1+2+3 (city center functions)		
Forecast and verification	Forecasted values	Surveyed values	Difference	Forecasted values	Surveyed values	Difference	Forecasted values	Surveyed values	Difference
1985 (started year)	39.8	39.8		22.6	22.6		67.7	67.7	
1990[2]	41.5	38.7	2.8▽	26.9	30.3	3.4△	76.7	75.3	1.4▽
1995[2]	42.5	37.6	4.9▽	29.9	38.0	8.1△	83.3	82.9	0.9▽
1998[1]	42.9	36.9	6.0▽	31.1	42.5	11.4△	87.1	87.4	0.3△
mean*	42.30	37.73		29.30	36.93		82.53	81.87	
(STD)	(0.72)	(0.90)		(2.16)	(6.17)		(5.31)	(6.12)	
t-value	6.8245[1]			-2.0223			0.1425		
(P value)	(0.0024)			(0.1132)			(0.8936)		

Notes: 1) 0.01's level of significance

2) The surveyed values of 1990 and 1995 are calculated by using interpolation with the surveyed values of 1985 and 1998.

First, ecological unit 1, according to Table 3 of chapter II, is the whole city center function totaling ecological units 1, 2, and 3.

Second, the time and the space frames are from 1998 to 2005; and the whole research area is divided into 13 spatial units(subdivisions).

Third, every unit used in this process of forecasts is basically indicated as the percentage(%) of each ecological unit's lots occupying in the total ones concerned.

And the fourth, in case the surveyed values of relevant ecological unit increase enough to turn decreasing, the ecological unit is to be considered having hit the critical point which we will select as the K value(the marginal capacity of environment) as a rule. And for the convenience of calculation, the value would be earned by rounding up and then adding 1 percent point up. When the critical point is not reached, there would be no reasonable ground to determine the K value. Hence, such K value should be estimated by examining the internal and external environment of each ecological unit considering its past, present, and future. However, as the future is uncertain and

also an evaluation on environment cannot avoid subjectivity, to settle such problems is raised as another task. Confronted with these difficult problems, the present research expects the future growth rate of city center functions in the area would gradually slow down because the city center functions in the area have already reached beyond 80 percent and the urbanization of the whole country has also went beyond 80 percent. And this research regards, according to circumstances but in principle, the value added by 10 percent point to 1998's as the upper limit. Based on this principle, in case the critical point has never been reached, the K value in the concerned spatial unit would be earned by rounding off the numbers in decimal place and then adding 10 percent point up. When the whole city center functions(the total values of ecological units 1, 2, and 3) considered, the K value is assumed 100 percent in every spatial units because the whole research area is expected to be occupied by city center functions.

Forecast: When we calculated the value of marginal capacity(the K value) on the basis of the above framework of analysis, it appeared that the ecological unit 1(retails) had already reached the critical point since it had been decreasing from the peak of 1985 in the graph. Therefore, the K value shall be 41 percent by rounding up the 1985's value(39.8 percent) that reached the highest occupancy rate and by adding 1 percent point up.

On the other hand, the marginal capacity value of ecological unit 2(restaurants & others) still maintains growing until now by 1998; and it shall be 52 percent by omitting decimal place of the 1998's value(42.5 percent) and by adding 10 percent point up.

After we fit these marginal capacity values and the surveyed values until 1998 into the logistic model, we predicted the future land use transition modes by 2005 as in Table 8. According to(Figure 4), on can assume that the ecological unit 1(retails) located along the main streets in the area is decreasing by influx of the business and the administrative offices. Restaurants & others located one or two lots inside the blocks are expected to be continuously increasing while forming plane domain pattern.

Forecasted occupancy rate of restaurants & others by 2005 is 44 percent that is by 9 percent point bigger than the retails forecast 35 percent. In view of the whole city center functions, they are so forecasted as to

[Table 8] Forecasted Future Lland use Transition(each ecological unit's occupancy rate) in the cased Research Area

Land use type	1 (retails)	2 (restaurants & others)	1+2+3 (city center functions)
Surveyed values (1998)	36.9	42.5	87.4
K values	41	52	100
Forecasted values (2005)	35.0	44.0	93.0

increase close to the marginal capacity by the influx of office functions.

3. Interpretation on the Results of Evaluation

The reason why the shops of ecological unit 1(retails) have decreased is closely related with the fact that office functions have expanded its domain by encroaching on retails in the form of integrating several lots. Particularly the small retail lots in spatial units 1, 5, 6, 8, 12, and 13 were, by this integration, changed into large office functions. It is not hard to assume that this kind of phenomenon is because of the areas good accessibility that has attracted large scale of office functions.

Another reason why ecological unit 1 has decreased seems to be due to the fact that some of art galleries and traditional art shops in the area have moved to fast-flourishing Gangnam district. This also is closely related with the fact that actual demands for such works of art are concentrated in Gangnam district.

In this manner, total number of shops of the ecological unit 1 in the area has decreased; but, as analyzed earlier, most of the shops disappeared were located inside the blocks or in the margin of communities forming linear patterns. When these tendencies considered, the future ecological unit 1(retails) in the area is forecasted, if not a new turning point provided with, to maintain decreasing: however, the linear pattern of community continuing for a while.

On the other hand, the reason why the ecological unit 2(restaurants and others) has sharply increased of late is that residence and

neighborhood functions have been rapidly replaced by restaurants & others because inside of the blocks are no longer fit for those functions conditions of location. One can assume that this kind of phenomenon has been accelerated since Insadong district is a unique place that has strong cultural characteristics, a lot of visitors, and thus causes growing demands for restaurants & others.

Continuous growth of city center functions(ecological units 1, 2, and 3) is possible because the growth of restaurants & others(ecological unit 2) and business and administrative functions(ecological unit 3) was big enough to overcome the slowdown of retail functions(ecological unit 1).

Conclusion

Ecological theory for the last half century has attempted to explain many aspects of land use evolution from the basic pattern of urban spatial structure to the segregation of residential areas in the city. Nonetheless, it has mainly applied the concept of biological ecology in explaining the urban areas without a clear ecological principle about urban land use transition.

This study has abstracted a principle of ecological dynamic balance to interpret land use transition in the urban central area. The main points of the principle which was developed as a hypothesis, are as follows.

"Land use transition in the urban central area is a dynamic process to adapt to the change of circumstances and it is a balanced process to adjust the change to the status quo. In consequence of this process, the spatial structure of the urban central area maintains a dynamic balance through the adaptation from competition and through the balance from adjustment."

To verify the hypothesis, this study attempted to discriminate whether or not the land use transition process of Insadong District in Seoul and the central area in Cheongju coincides with the theoretical function of a logistic growth curve. The verification was achieved by calculation of a correlation between the value from survey data and the estimated value of the function. As a result, it was verified in this study areas that the correlation was close.

This study was carried out through interpreting the past and present facts in two limited urban areas. The model derived in this paper may be further applied and to cover a wider region and future development pattern.

The present research evaluated on the results of Hwang's forecast in 1987 that had verified the process of dynamic balance for the land use transition of city center functions in the cased Insadong district; predicted the future land use modes; and made forecasts on the future land use transitions.

After we evaluated on each land units distribution of location, it turned out to be that, in the aspect of location pattern, retails had maintained linear one: and restaurants & others plane. In the aspect of spatial ratio, retails slightly decreased in contrast to the forecasts and restaurants & others increased rather than the forecasts. However, regarding the whole city center functions, the forecasted value was within 1 percent range of error. Therefore, when evaluated as a whole, it is found out that the spatial location patterns of retails and restaurants & others have been maintaining; and the logistic growth curve is feasible for predicting the whole growth tendency of city center functions, although it showed, in consequence of forecasts on the land use transition of city center based on the logistic growth curve, less degree of fitness for predicting the growth tendency of detailed functions.

Besides, the present research provided a ground and a central theme to the coming researches on land use transition at Insadong district performing forecasts on the future ecological tendency of land use at city center in accordance with the theoretical formula. Since this research was conducted for a single district and based on the limited resources, it has limitations on objectivity. We hope the results of this research will be applied to other cities and thus will be an objectified model for the forecasts on land use transition of city centers.

References

Alihan, M. A. *Social Ecology*. .New York: Columbia University Press, 1938.

Alonso, William. "A Theory of the Urban Land Market." *Papers and Proceedings of the Regional Science Association,* 6, 1960.

Berry, B. J. L. "Commercial Structure and Commercial Blight." *Department of Geography Research Paper,* 85. Chicago: The University of Chicago, 1963.

Byungseol, Byun. "An Urban Ecological Analysis of Land Use Transition in an Urban Center of Seoul." *The Korean Association of Professional Geographers The Geographical Journal of Korea,* Volume 35, No.1, March 2001: 75-90.

Chung-Sup, Yoon and Hwang, Hee-Yun. "Urban Ecological Analysis on the Permeating of the Business into Insadong—Districts in Seoul." *The Journal of Korea Planners Association,* 46, 1986: 129-149.

Chung-Sup, Yoon and Hwang, Hee-Yun. "Urban Ecological Interpretation on Land Use: The Case of Central Cheongju City." *The Journal of Korea Planners Association,* 47, 1987: 121-148.

Cohen, Y. A.(ed.). "Culture as Adaptation." In *Man in Adaptation, The Culture Present*. Chicago: Aldine, 1968.

Goodall, Brian. *The Economics of Urban Areas*. Oxford: Pergamon Press, 1978.

Hee-Yun, Hwang. "An Ecological Interpretation of the Land Use Transition in the Urban Center." Ph.D. Dissertation, Seoul National University, 1987.

Hee-Yun, Hwang and Byungseol, Byun. "Evaluation on the Forecasting of Land Use Transition for the District of Insadong and Surrounding Areas, Seoul." *The Journal of Korea Planners Association,* 100, 1999: 41-50.

Hurd, R. M. *Principles of City Land Values*. New York: The Record and Guide, 1903.

Jae-Sun, Hyun. *General Ecology*. Seoul: Giphyn Co., 1986.

Janelle, D. G. and H. A. Millward. "Locational Conflict Patterns and Urban Ecological Structure." In L. S. Bourne(ed.), *Internal Structure of the City* (2nd ed.). New York: Oxford University Press, 1982: 209-221.

Ju-suk, Koh. "An Ecological Theory of Architecture." Ph. D. Dissertation, University of Pennsylvania, 1987.

Kimball, J. W. *College Biology Educational Inst.*(tr.) Kimball Biology(5th ed.), Seoul: Tamgudang Co., 1985.

McKenzie, R. D. "The Ecological Approach to the Study of the Human Community." In R. E. Park and E. W. Burgess(eds.), *The City*. Chicago: The University of Chicago Press, 1925.

McKenzie. "The Scope of Human Ecology." *Publications of the American Sociological Society,* 20, 1926: 141-154.

Odum, E. P. *Fundamentals of Ecology*(3rd ed.). Philadelphia: W. B. Saunders Co., 1971.

17 Rhetoric and Reality in Spatial Planning in the Seoul Metropolitan Area

Soon-Tak Suh
Patsy Healey

Introduction

The Seoul Metropolitan Area(SMA)[1] is one of the most dynamic and rapidly urbanizing regions in the world. From the 1960s, Seoul has served as a growth engine to propel the industrialization of Korea. During the 1960s, industrial activities were heavily concentrated in Seoul and its suburbs. The population of Seoul increased from 2.4 million in 1960 to 10.3 million in 2000, while almost a half of the nation's population lives in the SMA. The concentration of population and industry in the SMA is expected to continue for some time.

The concentration of population and economic activities in the Seoul area has been a focus of national policy concern for many years. A firm policy to limit this growth has been in place since the 1960s. In the 1990s, however, this was modified by policies encouraging a more liberal planning regime and a devolution of responsibilities to local government. Recently, the issue of growth management has returned to the policy agenda in Korea. This is partly due to the rapidly growing

1) The SMA can be defined as follows: It is generally said in Korea that the physical boundary of the SMA means Seoul and its adjacent local governments. In other words, the SMA includes Seoul, Incheon and Gyeonggi Province. It acquired an official position as an administrative area in the early 1980s. Oneof th controversial issues among planners and policy-makers is how to shape this region whose physical make-up and socio-economic fabrics are still fluid and volatile for the future.

scale of the well-known urban problems of rapid urban growth-housing shortages, environmental pollution, traffic congestion and so on. But a further reason is a response to the recent disordered development in the SMA and re-delineation of the restricted development zone(RDZ) in metropolitan regions. In particular, the relaxation of greenbelts caused big debates on spatial management strategy in the latter half of the 1990s. This debate has attracted the interest of both policy-makers and academics in the planning field and in the social sciences generally.

There have been a variety of spatial plans and policies used to control or manage fast-growing metropolitan areas in Korea. These include spatial plans, zoning regulations, the restricted development zone, development fees and so on. But some have argued that spatial management strategies for the SMA should be changed mainly because of the change of environment surrounding the Capital Region(Choe, 2000; Park, 2002; Suh, 2002). This reflects an acknowledgement that previous spatial plans and policies were not in accord with tendencies in de-regulation, globalization, and the increase in environmental concerns.

The case examined in this chapter is the making of a spatial plan for the SMA, in the Capital Region of Korea. This illustrates both key spatial issues and provides an account of the context of governance and the planning system in the SMA. The chapter first introduces the general context of planning debate and the planning system in Korea. It then discusses the main issues addressed in spatial planing in the SMA. This is followed by an outline of the relation between the governance context and the institutional relations of spatial plan-making. Finally, it emphasizes the importance of 'planning culture' and shows that the Korean planning culture may impede the possibilities of building new forms of policy articulation and coordination, although vigorous efforts are being made in this direction.

1. Context

Spatial management of the SMA during the 1980s was seen as an instrument to achieve the goal of spatially balanced national growth. Therefore, plans and policies for spatial management in this period focused on mitigating the excessive concentration of population and industry into the SMA. During the 1990s, however, the main concerns

in spatial management shifted from a focus on over-concentration to the issue of urban sprawl.

The phenomena of sprawling peri-urban growth was a response to the consequences of the wave of new liberalism which rushed into public policy in Korea in the early 1990s. Land-use deregulation was encouraged as a response to the globalization of the Korean economy. In the sector of land-use management, the concept of efficiency was emphasized. The Korean government reformed the land-use management system at the national level within this context. The basic idea of the reform was to increase land supply through the deregulation of land-use. In doing so, the Semi-Agricultural-Forest Zone(SAFZ) was introduced in 1993, where development activities are freely permitted when compared with other zones. The total size of the SAFZ amounts to about 27% of the whole country.

However, this supply-side land policy resulted in disordered developments, which mean the encroachment of urban development onto agricultural land and the natural scene, environmental degradation in an ad hoc way, as well as rapid development without providing public facilities. This kind of urban sprawl is salient particularly in the fringe area of metropolitan cities in the late 1990s. This phenomenon of sprawl generated debates on the spatial management system, particularly in the SMA. In these debates, it was argued that the previous approaches to spatial planning and land use regulation had some problems. In particular, there was a critique of the segregation of urban and rural areas, the limitations of the zoning system as a means of land-use control, and the issue of 'concurrency,' or the phasing of new development with appropriate infrastructure and facilities.

Firstly, the planning and land control system was dualistic in its area coverage: city planning areas and non-city planning areas. However, it is no longer possible to artificially delineate urban and rural areas in this way, because more than 90 percent of the nation's population lives in the city planning areas. In addition, as the means of transportation has improved, a greater number of people live in the suburbs of metropolitan cities. The Korean planning and land use control system is now changing from this dual system to a unitary system, covering urban and rural areas. This allows an approach which accepts an urban-rural continuum.

The second criticism related to the limitations of the zoning

system. In Korea, zoning regulation has been one of the most important spatial management policies since the introduction of the modern planning system in 1934. However, zoning regulation in the city planning areas, which applies uniformly across the whole country with very little local discretion, is very generous to the extent that a developer cannot use the maximum 'floor area ratio(FAR)[2]' and 'lot coverage ratio(LCR)[3].' This has resulted in overcrowding in the city planning areas. Accordingly, the form of zoning regulation has been criticized on the grounds that it should be more adapted to changing needs and evolving growth patterns(Choe, 2000).

Third issue concerns the phasing of development, or 'concurrency'. The Korean planning system is characterized by a weak linkage with implementation. There are no explicit statements about the timing and sequencing of development and public facility provisions. Apart from large-scale urban developments, there is no mandatory requirement for development to take place concurrently with appropriate facilities. As a result, most developments tend to be permitted as far as they conform with zoning regulations. This is well illustrated in the case of Yongin city located in the south of the SMA, where high-rise apartments are concentrated without adequate provision of infrastructure and public facilities.

The reform of the planning system is aimed at managing non-city planning in an orderly way by 'unitary' planning system. The reform establishes a strong principle that no development should be permitted without a plan. In doing so, two key laws, the National Land Use and Management Act and the Urban Planning Act are integrated. The integrated law is now called the 'National Land Planning and Use Act.' This integrated law provides a basis for a more plan-led spatial management system(Figure 1).

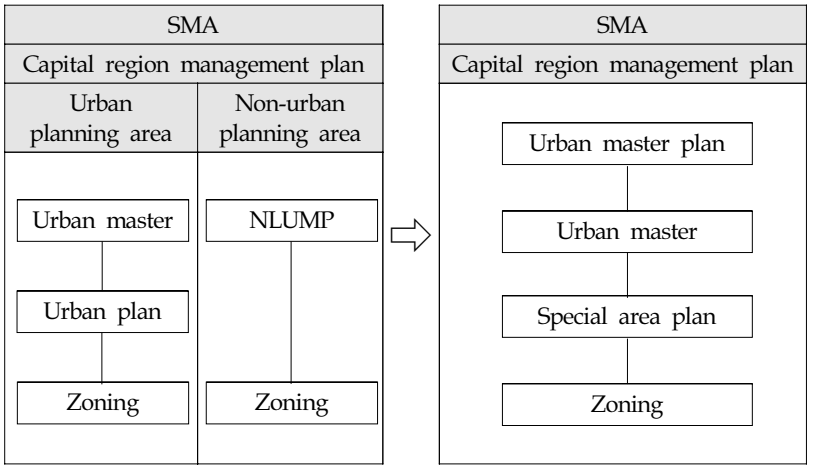
The reform focuses on the conversion of land-use and requires the specification of land-use categories. According to the newly integrated law of 2001, the whole country is divided into four zones with different spatial management strategies(Table 1). The basic strategy is to preserve the agriculture and forestry areas and to develop the management area to absorb the development pressures dispersed from the city planning

---

2) FAR(%) = floor area/ land area

3) LCR(%) = building floor area/ land area

[Figure 1] Changes in the Planning System for the SMA



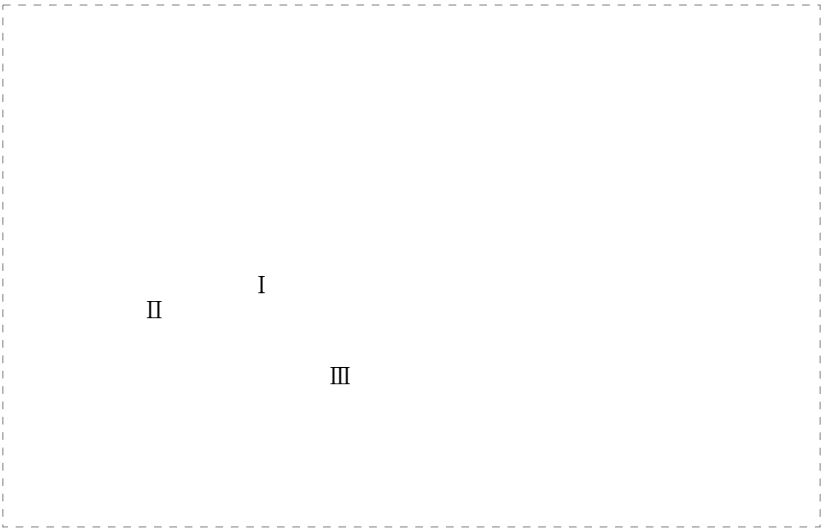
Note : NLUMP refers to the National Land Use and Management Plan

area. The management area is again divided into three subareas, as shown in Table 1, which are preservation, production and planning areas(MOCT, 2002).

The new planning system suggests three main instruments to inhibit developments without infrastructure and public facilities, that is, the second special area plan, the development impact fee system and the development permit system. Of these, the development impact fee system and development permit system are both aimed to ensure adequate standards of public facilities and to check non-planned small developments. The second special area plan is mainly to encourage phased developments. The new system encourages more explicit statements as to the hierarchy of planning, growth phasing programs and the concurrent provisions of public facilities with development. In this sense, the Seoul Metropolitan Area has now a more systematic spatial management system.

[Table 1] Reform of Land-use Category(2002)

<table>
<tr><th colspan="2">Before</th><th colspan="2">After</th></tr>
<tr><td rowspan="4">Urban planning area</td><td>Residential area</td><td rowspan="4">Urban planning area</td><td>Residential area</td></tr>
<tr><td>Commercial area</td><td>Commercial area</td></tr>
<tr><td>Industrial area</td><td>Industrial area</td></tr>
<tr><td>Green area</td><td>Green area</td></tr>
<tr><td colspan="2">Semi-urban planning area</td><td rowspan="3">Management area</td><td>Preservation area</td></tr>
<tr><td colspan="2" rowspan="2">Semi-agricultural-forest area</td><td>Production area</td></tr>
<tr><td>Planning area</td></tr>
<tr><td colspan="2">Agricultural-forest area</td><td colspan="2">Agricultural-foerst area</td></tr>
<tr><td colspan="2">Natural environment preservation area</td><td colspan="2">Natural environment preservation area</td></tr>
</table>



[Figure 2] Seoul Metropolitan Area

2. Trajectories of Spatial Management Strategies in the SMA: Past, Present and Future

Spatial management in Korea goes back to the early 1960s when population was concentrated into the Seoul Metropolitan Area, named the 'Capital Region.' There was no formal policy program initiated by government until the late 1960s. The 1960s were the decade of set up of the policy direction for managing the growth of Seoul.

During the 1970s, various policies have been introduced to reduce the excessive growth of Seoul. One of the most noticeable changes was the adoption of greenbelt strategy espoused with new town development. By designating a greenbelt around Seoul in 1971, the Korean government intended to limit the physical growth of Seoul. And by the development of new towns, it was expected to relocate population from Seoul. The relocation of central government agencies to beyond the Seoul Metropolitan Area was a good example. The 1977 population redistribution plan was also established within the same context. However, the rapid growth of the SMA has continued in spite of a variety of growth control measures in this period. Rather explosive growth spread around Seoul. Thus, the Seoul Metropolitan Area ex-

Notes: (I) Seoul
(I+II) Seoul Metropolitan Area in the 1980s
(I+II+III) Seoul Metropolitan Area after 1990s

tended continuously. The 1970s saw the designation of the Restricted Development Zone(RDZ), which is widely referred to as a zone of greenbelts. Such an urban growth limit program was designed to contain urban sprawl, and designated 14 cities across the country.

In the 1980s, a kind of phased growth program was introduced to regulate land use at the regional level. The Capital Region Rearrangement Plan was the first to be established in this period. The overall planning strategies are focused on city-wide land use control. For instance, the RDZ surrounding Seoul had been maintained until the late 1990s, despite the rapidly increasing demand for housing land. In the Capital Region Rearrangement Plan, the Capital Region was divided into five sub-regions with different growth management strategies to cope with the issue of decentralization. The basic strategy was to reserve the special development and environmental protection sub-regions as open space for future use and to develop extensively the southwestern part of the Capital Region to absorb the population and industries dispersed from the restricted and controlled development sub-regions(Kwon, 1995).

However, the principle was not respected from the early 1990s. There were endless cases of expansionist schemes. Urban renewal, the 1988 Olympic-related projects, residential complexes, intro-metropolitan highways, new towns, a new international hub airport and other mega-projects have been implemented in rapid succession, eroding the principle of growth limitation.

There are growing signs that the trend of expansionist schemes did not subside during the 1990s. On the contrary, public investment will increase within the Seoul Metropolitan Area. Such a movement is popular among national companies, private developers, and ordinary citizens. The 1990s also experienced new metropolitan governance arrangements, promoting decentralization and deregulation. Particularly the enforcement of local autonomy in this period has led a change of relationship between the central and local governments. This change influenced growth management in the 1990s. In addition, an increasing popular concern with environmental quality has influenced growth

management in the period. Concerns about environmental degradation in the face of economic growth have come to dominate the public agenda. The period witnessed the rapid increase of voluntary civic associations including various environmental associations. The civic associations exercise their influence over the policy-making of the government by active lobbying. Thus the environmental lobbies now challenge the 'expansionist' interests.

In this context, there was a significant change in the planning and management policy for the Seoul Metropolitan Area in 1993. The formerly five categories of sub-regions were streamlined into three subregions with different growth management strategies. The basic strategy is to reserve the natural environment preservation sub-regions and to develop extensively the southern and northern part of the Capital Region to absorb the population and industries dispersed from the restricted and controlled development sub-regions. The revision of the zones was intended to relax the formerly strict imposition of rigid regulations in the SMA.

Two key measures were introduced in the revised system. The first is the 'total volume management system.' By this, colleges, firms, industrial estates, housing site developments would be exempt from the deliberation by the Capital Region Management Committee(CRMC). There would be a pre-determined ceiling for different types of development. They would be flexibly allocated to different localities. Another is the development charge system. This is an indirect control measure. Before this, offices and commercial buildings were forbidden in principle in Seoul and the SMA, but permissible when approved by the CRMC. This caused much criticism on the grounds of being unfair(Park, 1995). Under the revised system, any office and commercial buildings are free to be built wherever they choose in Seoul, so long as they pay the development charge, a kind of congestion tax. This orientation has, in part, reflected the national policy trends towards deregulation and reinforcement of market mechanism.

However, the locally promoted and market-led approach is both reinforced and challenged by the regional approach, which emphasizes competitiveness of a region. The Korean government seeks to position Seoul as a new millennium world city in the 21st century. Many governmental officers and planners argue that the function of Seoul as the capital of South Korea should be revised in line with globalization.

International competitiveness of the city should be enhanced by changing the current business climate, which impedes attracting international corporate headquarters and international convention centers(MOCT, 2000).

The 4th National Plan suggests that the SMA should establish a new regional management agency which formulates and executes a detailed urban management plan covering major development issues, such as land use, industry, transportation, environment and communication on a regional base. A broader regional transportation system should be built to facilitate urban activities, and to underlie the development of technically advanced industrial districts capable of leading national innovation.

The Korean government also tries to position Incheon as a center of information technology and international trade. Incheon International Airport should be renovated and enlarged to serve as one of Northeast Asia's principal aviation hubs. Seaports and facilities of information and communication should be expanded to create an international center of information and trading, as well as tourism. A world-class teleport should be planned and developed in the new town of Songdo to attract and host enterprises.

By developing tourism with a distinct character, it is hoped that Incheon can evolve into a pivotal city for marine tourism in the Asia-Pacific region. The National Plan suggests the development of a theme park, diverse entertainment venues, and enhanced waterside spaces oriented to urban and marine tourism, etc. In particular, a marine and eco-tourist zone should be developed in the insular region of Ongjin county, which is still largely under developed.

Gyeonggi-do, a province surrounding Seoul, has various and high quality labor forces to accommodate knowledge-based industries such as software design, advanced animation and cinematic production, and information-technology services. The National Plan suggests developing

Notes: 1) MOC: Ministry of Construction(the predecessor of Ministry of Construction and Transporttation)

2) MWP: Minister without Portfolio

3) MOCT: Ministry of Construction and Transportation

and preserving the northern part of Gyeonggi Province. Particularly, the Demilitarized Zone in this region has valuable ecological and

[Table 2] Key Spatial Management Policies in the SMA

Period	Year	Policies	Government
Problem recognition	1964	Anti-concentration policy of population in the SMA	MOC[1)]
Policy enforcement	1970	The 1st Comprehensive National Territorial Plan(1972-1981)	MOC
	1972	Population decentralization in the SMA	Presidential secretariat
	1977	Population Relocation Plan	MWP[2)]
	1982	The 2nd Comprehensive National Territorial Plan(1982-1991)	MOC
	1984	The 1st Capital Region Rearrangement Plan(1984-1996)	MOC
	1991	The 3rd Comprehensive National Territorial Plan(1992-2001)	MOC
Policy transformation	1997	The 2nd Capital Region Rearrangement Plan(1997-2011)	MOCT[3)]
	2000	The 4th Comprehensive National Territorial Plan(2000-2020)	MOCT

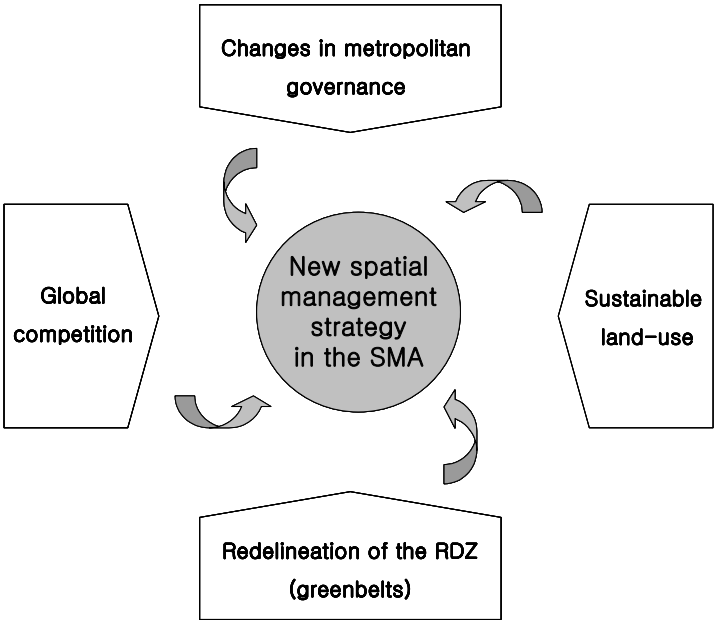
historical assets even for international tourists and scientists. The desirability of the SMA should be enhanced by constructing a radial network of highways. In addition, cooperation between local governments is critical to establish and manage greenbelts in the province. Also, a control system should be installed to maximize the efficient use of water from the Imjin River.

Spatial management policies in the SMA are thus continually affected by two conflicting tendencies. One seeks to constrain growth and manage it with firm regulations. Looking into the history of Seoul and the SMA, it is an irony that the very base for Korea's industrialization has been subject to rigid regulations designed to constraint its growth. The other tendency aims to liberate market initiative and promote development zones in the SMA to allow the country's strongest economic zone to flourish. For this reason, the metropolitan containment policy for the SMA will continue to witness contradictions in working

out how a city or a metropolitan area can thrive without social costs and economic burdens on the national economy. These dual tendencies related to growth management seem to threaten the future of spatial management in the metropolitan area.

The Seoul Metropolitan Area has entered into a new era of global competition and cooperation. Spatial management strategies for the SMA will be continuously challenged by newly emerging structuring forces. Recently it is challenged by global competition, new metropolitan governance, and the emphasis of sustainable land-use, which means an environmentally-friendly land use and development in Korea. In consideration of these changing contexts, Seoul is now preparing a new master plan and several inner-city regeneration programs. Also the Korean government will designate the western part of the SMA as an enterprise zone, called the 'Special Industrial District,' through which the region seeks to take up a global position in Far-East Asia. Such an ambitious effort will change the existing spatial management strategy of the Seoul Metropolitan Area. Figure 3 demonstrates the various structural constraints surrounding the spatial management of the SMA.

[Figure 3] Structural Constraints of Spatial Management in the SMA



3. Policy Discourses on Spatial Management Strategies in the SMA

The uncurbed growth of the SMA during the last thirty-five years has generated two kinds of problems, which are different but related. One is the problem of increasing inequality between the SMA and other regions, and another is the overgrown metropolitan area itself. Since the early 1960s when the Korean government declared a commitment to fight against the growth of Seoul, various policy measures based on the greenbelt, the new town strategy and the concentrated decentralization strategy to handle those problems have been formulated and implemented. In spite of governmental efforts, there have been big gaps between the reality and policy intentions.

Many indices show that the SMA has continued to generate problems of unbalanced growth, such as the housing shortage, traffic congestion, high land price, degrading quality of urban amenities and environmental pollution. The housing issue has been one of the major

problems in the society. The chronic housing price inflation mainly due to the severe shortage of supply has annoyed non-homeowners in the SMA. Despite the government effort of investing 6 percent of the gross national product per year since the 1970s, the situation has not improved. The shortage rate of 42.5% in 1990 was unfavorably compared to 41.1% in 1980 and 42.1% in 1970. It is still the case that much of the country's population and economic activity concentrate in the SMA (Table 3).

Traffic congestion is the second worst problem. Car registration in Seoul has increased at an average rate of 31.5 percent per year since the 1970s. Over 1.7 million cars were registered in 1993 in contrast to merely 76,303 in 1973. In the last two decades there was more than a twenty-fold increase in car ownership in Seoul, while the road space only increased 22.1 percent. As a result, there are streets and highways packed with snarling traffic. The travel speed by car in Seoul at the peak hour has dropped to 19.5km/h in 1990 from 30.8km/h in 1980. The subway system could not ease the situation, in spite of the tremendous expansion since 1974. It currently carries 32 percent of the daily trips with a total length of over 150km. Air pollution, noise, water contamination and other environmental issues have grown as many other serious

[Table 3] Centrality of the SMA(2002)

Indicators	Nation(A)	SMA(B)	B/A(%)
Area(km^2)	99,801	11,753	11.8
Population(million)	48.3	22.5	46.6
Universities	162	66	40.7
Manufacturing industry	98,110	55,874	57.0
Service industry	794,095	360,102	45.3
Savings(billion)	404,661	275,394	68.1
Cars(thousand)	12,914	5,983	46.3
Medical facilities	42,082	19,471	46.3
Public institutions	276	234	84.8

Source: Ministry of Construction and Transport(MOCT), 2002

problems, including the loss of green areas.

On the other hand, the problem of growing regional inequality has incurred other repercussions. The gap between the thriving metropolis and the stagnant regions across the country in income and living standards has never been bridged, but has rather widened. Apart from the southeastern coastal area that has been the primary beneficiary of the industrialization policy of the government since the 1960s, the rest of the country generally is lagging far behind. In terms of personal income, Seoul and the leading industrialized area have income levels 10% to 30% higher than the lagging areas. In terms of health and social services, there are more striking gaps. When it comes to rural areas, the picture is bleak. The rural income per household has fell consistently behind urban in general and the SMA in particular.

As a matter of fact, there have been many criticisms of the past policies. Two groups of criticism can be identified. One, which belongs to mostly idealist planners and politicians, is more concerned with the effectiveness of the implementation of the policy and problem of the growing inequality. The other group, consisting mostly of economists, is more concerned with the validity of the policy and the problem of the overgrown metropolitan area. The idealist planners and politicians attribute the failure of the policy to the government and also to the actions of developers and firms. In the past thirty-five years, many policies and plans have been suggested and proclaimed. However, very little has actually been realized.

The planning critics also argue that in contrast to the abundance of published plans, policies, laws and regulations, there has been a critical dearth of government investments required for the development of alternative locations where population and industries could be accommodated(Lim, 1994). Nor has the government done its best to mobilize political support to rally behind the decentralization strategy. Above all, there was no institutionalized coordination between the central and local governments in guiding private investments in the SMA. As a result, the containment policy against Seoul has been challenged and resisted, causing backfiring and controversies. This made planning efforts void and unrealistic to address the problem. The policy proclaiming the development of the SMA to be minimal has never been respected. There were endless cases of expansionist schemes. Big projects such as urban renewal schemes, high-tech plants, hospitals, residen-

tial complexes, intra-metropolitan highways, new towns, and a new international hub airport have been promoted in rapid succession. These raise doubts about the government's real intention: the formally proclaimed policy objective is nothing but lip service, and the government has disguised its real intention by focusing on the regulative measures which are not critical but visible, easily available and freely disposable to the government.

The planning critics reject the market approach to cure the problem of inequality. They argue that it has been shown theoretically and empirically that the market mechanism, without the aid of government intervention, does not work in a way to allocate resources equally among regions: the key issue is how to control it to move toward more balanced development(Lim, 1994). And they suggest policy alternatives focusing on the forced allocation of resources from the Capital Region to other depressed regions to make them grow(Kim, 1991; Hong, 1991).

Economists have quite different viewpoints. They are not interested in the effectiveness of the policy measures but in their economic validity. They try to show that any market-critical intervention would be vulnerable to failure or would be very costly(Sohn, 1993; Kim, 1996). They argue that the problem of growing inequality between the SMA and other regions and that of overgrown metropolitan area are related but different, thus different approaches are needed. According to economists, the proposition that the containment against the growth of the SMA would lead to the growth of lagging regions may be illusionary. It is a very natural process that the leading metropolitan area tends to aggregate to itself a disproportionate part of the innovative impulses, thus attracting scarce capital and skilled labor as well as entrepreneurship. Any compulsory measures to curb or reverse the tendency would lead to social costs. They claim that, when it is inevitable to do that for political reasons, it would be better to use a quasi-market system than to use direct and physical regulation incurring unnecessary transaction cost(Park, 1992; Han, 1992). They argue that the past policy measures were too obligatory and rigid, and also there were too many regulations. These have choked private initiatives in the choice of optimum location. The greenbelt, among other compulsory measures, is the best example of such effects(Ahn and Ohn, 2001).

The economist critics also argue that, although the mode of the

intervention has changed from direct and physical regulations to indirect and economic actions in the revision of the Capital Region Management Plan, this is not enough. Furthermore, they argue that the intervention of the government in the metropolitanization process can be validated only when the negative externalities of agglomeration outweigh the gains. These arguments claim that it may be a more sensible policy to let leading city-region continue to grow, but to try to guide them so as to promote economic efficiency and to reduce negative externalities. The economist critics suggest that policies should guide the deconcentration in the Capital Region, which tends to occur spontaneously, and argue that the government should give up past policies that go against the trend.

Institutional Relations of Plan-making in the SMA

1. A new Relationship between Central and Local Governments

Since 1991, with decentralization, local authorities have been led by locally elected governors and councilors. The election of local governors and councilors coming from opposition parties challenged the traditional relationships between the central and local governments, that is, the authoritarian and hierarchical patterns. In particular, in the case of conflicting matters relating to planning and the environment, local government is no longer a mere agency of the central government. As a result, new conflicts between them, which have not been experienced before, are taking place in Korea. This is a consequence of the diffusion of political power since the 1991 reforms. In this way, the diffusion of power can contribute to the opening and democratizing of local authorities in practice, creating a new arena for policy formation and implementation.

Since the local autonomy, conflicts between the central and local governments have tended to be more salient in the planning field particularly in the SMA. The key point of the conflicts between the central government and Gyeonggi Province is how the Seoul Metropolitan Area will be used. Gyeonggi Province argues that existing land-use regulations over industrial use in the SMA should be removed in

order to survive in the era of globalization, which emphasizes economic competition. The central government, by contrast, argues that current land-use regulations over industrial use in the SMA should be kept, in order to control the concentration in the region. This means that there is a tension between the hierarchically-organized planning system and the new local power in the 1990s.

Nonetheless, there are still a number of specific control mechanisms included within the various policies of the planning system by which the central government can limit the actions of local governments. For example, the decision or authorization of a planning proposal which is made by local governments is subject to the Minister of Construction and Transportation. The Minister still holds numerous reserve powers. But, recently, much of the actual implementation of planning policy for which the central government is responsible tends to be, in fact, delegated to local governments.

2. The Advent of New Governance

Together with the tendency to democratization, the environmental movements of the 1990s have also had a strong impact on planning policy and practice, with the advent of lots of civic associations. As we shall see in Table 4, the number of environmental associations by 1996 was over 200 across the nation. Of these, around two thirds were established in the 1990s.

The environmental associations contribute to the construction of new governance networks. Such social movements promoting decentralization and environmentalism are strongly supported by many civic associations. In this way, the voluntary associations have come to play a crucial role in challenging the traditional governance of the SMA. These tendencies have resulted in the building of new urban govern-

[Table 4] The Number of Environmental Associations in Korea(1996)

Before 1970	1970s	1980s	1990s	Total
16	13	49	146	224

Note: academic associations are excluded.

Source: Environmental Management Research Center, 1996; Directory of Environmental Industry, 1996

ance networks and have had a significant influence on metropolitan governance. These networks have allowed the involvement of civic associations in the decision-making process of public policy.

Finally, the advent of new governance networks has promoted changes not only in the relations between the central and local governments, but also in the relations between the public and private sectors. Such a changing governance context encourages stakeholder involvement in the governance of the SMA. This challenges the top-down hierarchical planning system, resultantly influencing planning process.

3. Changes in Key Agents

Owing to the governance changes in the city, new agents appeared in the plan-making process during the 1990s and they are increasingly playing an important role. In particular, the change of the local political system in the 1990s has led to the rapid enlargement of the spectrum of the agents taking part in the plan-making decision process.

Up to the 1980s, plan-making exercises in the SMA had been largely made by local planning authorities, with the help of specialized teams, for example, the local and central planning committees which consist of experts of various fields, such as planners and chief executive officers. During this period, the coalition of planning officers and planning experts made plan-making activity itself an exclusive possession of planners.

But, the 1990s gave more importance to other agents, such as local councils and civic associations. The involvement of these agents in the plan-making process substitutes a political approach for a technical approach to plan-making. This movement forced plan-makers, as technical staff, to rethink their relations to them. This has led to a change of the planners' role.

4. Changes in Institutional Relations

In broad terms, the nature of the institutional relations among agencies involved in plan-making exercises reflects the relationship between the state and the public. It also reflects the relationship between the central and local governments. In the Korean society,

traditionally the relationship between two levels of the government has been dominated by hierarchical(vertical) relations. The relationship between the public and private spheres has also been of an authoritarian character. The hierarchical and authoritarian style of governance at national level has been deeply embedded in the relationship between stakeholders involved in plan-making exercises.

For instance, the central government(MOCT) has controlled the form and content of plans through legislative guidelines, which include plan-making criteria in detail. The guidelines have generated standardization of the plan ignoring specific local circumstances. If local government did not comply with the guidelines in making a plan, the draft plan would not been approved. This kind of power of the central government is still dominant in spite of the expansion of the function and budget of local governments.

Decentralization tendencies and the rise of new governance networks in the 1990s have led to changes in institutional relations. Compared with the 1980s, institutional relations among agencies have become more complex. This results mainly from the involvement of the elected local councillors and civic associations. The involvement of the local council, elected by citizens, and the citizen committee, based on horizontal relations among members, is expected to change the deeply rooted hierarchical and authoritarian relations between plan-makers and other stakeholders.

The newly emerging governance networks in the city in the 1990s generated not only a tension between the hierarchically organized planning system and the new local power, but also a tension between the local city government and citizens, civic associations or local politicians. This means that planning activities in the SMA are now being caught in a double tension. This change is leading to the creation of many forums and to the renewal of the way in which norms and rules are built up in the arenas. Overall, what is happening is the creation of a different kind of planning culture in Korea.

Conclusion

In conclusion, this chapter has aimed at providing a descriptive account of the governance context and planning system in the SMA, Korea. It establishes that there are considerable pressures for changes in planning policies, instruments and practices. The policies are caught in a tension between environmental concerns and expansionist objectives. The instruments operate in a situation which aims to promote a liberalization of regulatory policy while at the same time developing a regional approach to spatial management. The practices seek less hierarchy but many more arenas for policy formation in which conflicting objectives may appear.

Taken overall, there are major changes in the governance of the SMA in the 1990s. Pressures for change are the tendency of decentralization and the plethora of voluntary civic associations in the 1990s. These pressures have contributed not only to building new governance networks, but also to changes in both central-local relations and public-private relations. These relational changes in turn lead to pressures for a change in planning culture, from traditional plan-making approaches, which are characterized by a technical approach to plan-making to approaches which promote, more or less, stakeholder involvement. In addition, recent governance changes in the city generate not only a tension between the hierarchically organized planning system and the new local power, as well as a tension between the local city government and citizens, civic associations or local politicians.

However, the existing culture of planning in the SMA will not change just because the governance context has changed. This is a necessary condition, but not a sufficient condition for a more democratic plan-making practice. If the practice of planning is to respond to these pressures for change, it needs the capacity to do so. If plan-making practices had followed the changes in the context, they would change to reflect these governance changes; i.e. it would have the following characteristics: establishing localized governance; wiping out the authoritarian-style governance of the public sector; and balancing power relations between plan-makers and other with stakes in the production of a spatial plan. However, earlier policy ideas and understandings of governance live in the minds and practices of government officials and

planners. To release a more democratic, co-operative and flexible approach to the challenge of spatial management for the SMA requires a cultural change among planners and a new attitude to the nature and practice of planning. In facing this pressure for a culture change, planners in the SMA share a challenge with many other city planners across the world.

References

Environmental Management Research Center. *1996 Directory of Environmental Industry*. 1996(in Korean).

G. C., Lim. "Theory and taxonomy of sectoral, distributional, and spatial policies." in *Cities and Nation: Planning issues and Policies of Korea*, G. Y. Lee and H. S. Kim(ed.), Seoul Korea: Korea Research Institute for Human Settlements, 1994.

J. H., Kim. "Redirection of Industrial Location Policy in the Capital Region." *Seminar Proceedings on the Globalization.* Location and the Capital Region Policy Reconsidered, Gyeonggi-do, 1996(in Korean).

J. K., Kim. "A basic direction and strategy of Seoul metropolitan policy." in *The Urban Administration Review,* vol. 3, 1991(in Korean).

J. Y., Sohn. "An appraisal on deconcentration policy and a suggestion for the Capital Region policy redirection." in *The Housing Research,* Vol. 1/2, KHRA, 1993(in Korean).

K. H., Ahn and Ohn, Y. T. "Metropolitan growth management policies in Seoul: A critical review." in *Urban Management in Seoul: Policy issues and responses*, W. Y. Kwon and K. J. Kim(ed.), Seoul Korea: Seoul Development Institute, 2001.

K. H., Hong. "The problem of concentration and deconcentration strategy of major functions." in *The Land Research*, Land Corporation, 1991(in Korean).

MOCT. The 4th National Development Plan, 2000.

MOCT. The National Plan and Use Law, 2002.

S. C., Choe. "Urban growth management policies in Korea: Problems and agenda for reform." *International Seminar Proceedings on Urban Growth Management Policy,* Korea Research Institute for Human Settlements, 2000.

S. T., Suh. "Seoul metropolitan planning and growth management strategy," *Seminar Proceedings on Metropolitan Planning and Growth Management*, The Urban Administration Association, 2002

S. W., Park. "Direction of the Capital Region policy reconsidered." *Planning Information Bulletin 10,* No.4, Korea Research Institute for Human Settlements, 1992(in Korean).

S. W., Park. "Managing the growth of the Seoul Metropolitan Area." in *Cities and Nation: Planning issues and Policies of Korea*, G. Y. Lee and H. S. Kim(ed.), Seoul Korea: Korea Research Institute for Human Settlements, 1995.

S. W., Park. "New direction of Seoul metropolitan planning and national territorial development plan for 21st century." *Seminar Proceedings on Metropolitan Planning and Growth Management,* The Urban Administration Association,

2002(in Korean).

S. Y., Park. "Managing the growth of the Seoul Metropolitan Area." in *Cities and Nation: Planning issues and Policies of Korea*, G. Y. Lee and H. S. Kim(ed.), Seoul Korea: Korea Research Institute for Human Settlements, 1995.

W. Y., Kwon. "Seoul: Mega-city problems in Korea." in *Cities and Nation: Planning issues and Policies of Korea*, G. Y. Lee and H. S. Kim(eds.), Seoul Korea: Korea Research Institute for Human Settlements, 1995.

Y. J., Han. "Redirection of locational regulation into the Capital Region." *Seminar Proceedings on the Capital Region Policy Redirection*, Korea Research Institute for Human Settlements, 1992.

18 Application of National Geographic Information System to Urban Planning

Joong-Seok Ryu

Introduction

Geographic Information System(GIS) has been around for more than several decades since the 1970s and 1980s, but it became serious in Korea when the government announced the National GIS(NGIS) master plan in 1995. This master plan contributed to the blossom of Korean GIS industry as well as advancement of GIS technology in several ways. Firstly, it provided national digital basemap for public and private sectors to utilize. This basemap played an important role in the construction of GIS application systems by eliminating unnecessary duplication of geographic information. Secondly, it contributed to the development of human resources by training GIS specialists. These people became a core group in the private sector for the development of GIS industry. Thirdly, in a longer term, it provided a mechanism for the integration and dissemination of geographic information nation-wide.

Based on these backgrounds, a brief history of NGIS development is presented below followed by the introduction of initial attempts to utilize digital basemap provided by NGIS. However, the provision of digital basemap is not sufficient for successful utilization of GIS technology in urban planning. Although traditional methodology for GIS application such as site selection[1] and buffer analysis[2] in land use

1) Often termed as 'site suitability,' this method examines social, economic,

planning and network analysis in facility management proves to be useful, development of spatial decision support system is an emerging and promising application area with expert systems and artificial intelligence approach.

GIS in Korea: A Brief History

1. Overview of the NGIS Master Plan

Since the early 1990s, GIS has been used at several municipal governments and public organizations for managing urban infrastructure facilities including water supply and sewage treatment systems. These attempts of using GIS for facility management were made on an individual basis without a comprehensive plan even at a local government level. GIS database has been constructed from individual needs of the government departments that resulted in overlap of data construction. The GIS system introduced to each department was mainly a single purpose system. The underground gas explosion accidents, which happened in major metropolitan cities such as Seoul and Daegu, led to accelerate GIS development at the local government level. However, the need for GIS database was met by individual organizations leaving the problem of overlap of data construction unsolved. For instance, the road data of a certain district was made by several organizations in duplicate. Local governments wanted road data layer for the management of water supply pipeline while the Korea Electric Power Corporation wanted the same data layer for the management of electricity supply line. Since GIS system was developed on an individual basis, the same data layer was made by different engineering consulting companies. Although the size of GIS market has grown rapidly, there remains inefficiency from the national points of view.

It is from the concern about the inefficiency in GIS database construction that initiated the drafting of the NGIS master plan in 1995.

---

physical, biological and other criteria to locate potential site for some purpose. Several overlays of information are necessary to carry out this method.

2) The word 'buffer' is commonly used in environmental regulation and usually constructed outward to protect some elements. It is the most widely used method to identify areas of impact in sound, pollution and other aspects of the environment.

The Korea Research Institute for Human Settlements(KRIHS) provided the first draft of the master plan which was approved and adopted by the Ministry of Construction and Transportation(MOCT). Although the master plan was drafted following top-down approach, this plan became the most important national level blueprint for GIS industry. Following the seemingly successful implementation of the first NGIS master plan(1996~2000), Korean government established the second NGIS master plan to ensure continuation of support from the central government.

2. The First NGIS Master Plan(1996-2000)

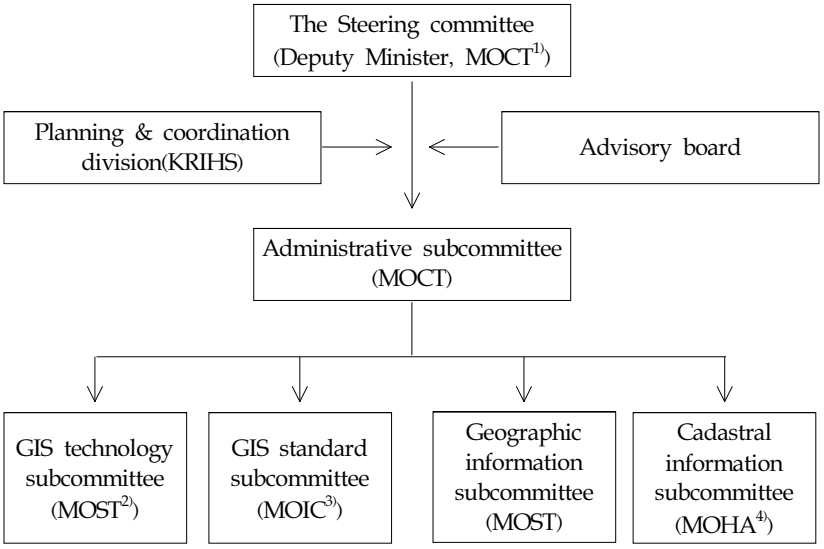
The First NGIS Master Plan was drafted in 1995 with the goal of providing information infrastructure for the country in order to promote national competitiveness and productivity. More specific goals of the first NGIS master plan are;

1) To develop national spatial database by providing digital basemap of the country.
2) To establish NGIS standards for exchange of geographic data.
3) To assist technical aspects of GIS development for both local government and private sector.
4) To encourage utilization of digital basemap for GIS application development.

To ensure successful implementation of the First NGIS Master Plan, a steering committee was organized comprising concerned departments from the central government. The organization of this committee is illustrated in Figure 1.

As outlined in Figure 1, the steering committee consists of five subcommittees. The administrative subcommittee mainly performs the overall administrative work including management and support of other subcommittees. The geographic information subcommittee mainly performs the task of digitizing topographic maps, thematic maps and underground facility maps. The National Geography Institute(NGI) under MOCT plays a major role in drafting guidelines on digital mapping procedures. This subcommittee produced 19,000 sheets of digital map of various kinds. The GIS technology subcommittee carries

[Figure 1] A Framework of NGIS Steering Committee



Notes: 1) MOCT : Ministry of Construction and Transportation
2) MOST : Ministry of Science and Technology
3) MOIC : Ministry of Information and Technology
4) MOHA : Ministry of Home Affairs(now called as Ministry of Government Administration and Home Affairs)

[Table 1] Digital Basemap Production after the First NGIS Master Plan

Digital maps	Scale	Sheets	Comments
Topographic map	1/25,000	515	Mountain areas only
	1/5,000	5,757	Covers whole country except mountain areas
	1/1,000	12,427	Covers 67 municipalities
Thematic map	1/25,000	414	Existing land use map(54% completed)
Underground facilities map	1/1,000	-	Water supply pipeline map : 32.4% Gas pipeline map : 56.5% Electricity line map : 5.8% Telephone and communication line map : 98.4% completed

out the development of GIS technique as well as training of GIS specialists. The GIS standard subcommittee provides various standards required in NGIS for the exchange of geographic information among users. Such standards include databases, system specification and mapping codes. Finally, the cadastral information subcommittee prepares a framework of cadastral information system within NGIS.

One of the major achievements of the First NGIS Master Plan was the production of digital basemaps of various scales as shown in Table 1. The year 2000 saw the completion of digital topographic map of the whole country in 1/5,000 scale with the exception of mountain areas where 1/25,000 topographic maps are available. In addition the National GIS Database Clearing House was founded to dissemminate these basemaps.

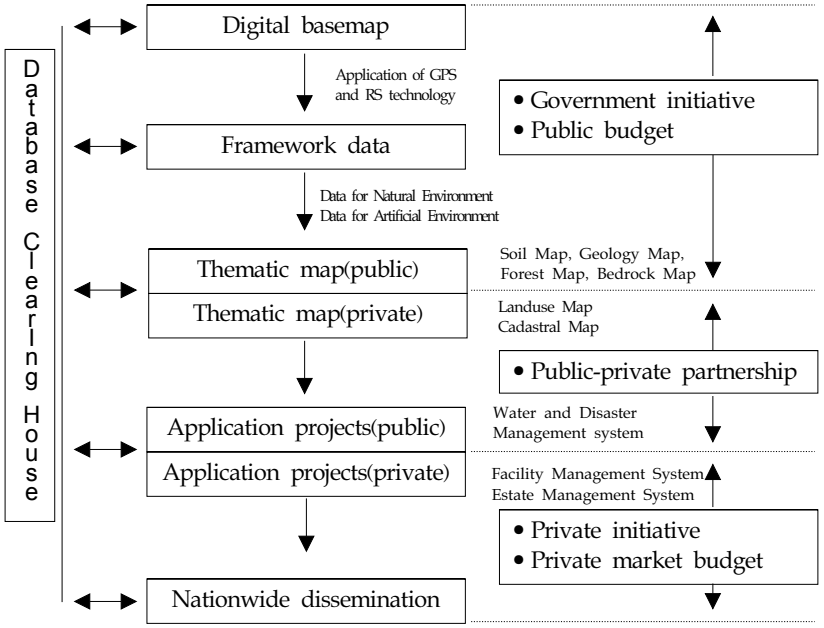
In general, the first stage of NGIS development was successful in providing information infrastructure for the country to move forward to the information society. However, several limitations were also observed due to the government-oriented strategy. For instance, GIS industry was dependent on the government projects without which medium and small companies could not survive. Investment for research and development was not sufficient for medium and small companies to achieve international competitiveness and therefore technology innovation was rarely achieved.

3. The Second NGIS Master Plan(2001~2005)

The Second NGIS Master Plan(2001~2005) has the vision of creating national digital land by expanding national spatial information infrastructure. The concept of 'national digital land' can be exemplified by the following features. Firstly, anyone who needs geographic information can get the information anytime and anywhere. This is possible by providing national spatial information infrastructure such as framework data and establishing GIS database clearing house which takes the role of distributing digital basemaps. Secondly, the country has abundant GIS application systems in both public and private sectors. Thirdly, GIS experts with creative idea are socially recognized and respected.

There are four strategies for successful implementation of the Second NGIS Master Plan. The first strategy is the maximization of customer-oriented GIS service. This strategy requires dramatic change from supply-oriented to demand-oriented service. The second is the pro-

[Figure 2] Concept of the Second NGIS Development.



vision of strong support from the government departments in policy-making, budgeting, and institutional arrangements. Pan-departmental support will provide strong driving force for implementation of the plan. The third is the finalization of NGIS dataset construction and completion of database clearing house. Service of GIS dataset through internet will allow easy access to GIS data and therefore accelerate informatization in everyday life. The fourth strategy is the reinforcement of public-private partnership. Opportunities for the cooperation between the government and private companies will be expanded through implementation of this strategy.

4. Summary: Pros and Cons of NGIS Master Plan

Compared with the developments of GIS infrastructure in advanced countries including U.S., U.K., Canada and Australia, Korea has achieved a remarkable advances in the construction of national GIS

infrastructure in a relatively short period of time. Government-oriented, centralized and top-down approach for implementation of the master plan gave birth to the seemingly successful result. It is successful to the extent that the NGIS Master Plan provided digital basemap for the planners to utilize and standardization of data set for the industry to apply. However, this very advantage becomes disadvantages too. Strong implementation power from the government has the side effect of weakening the competitiveness of GIS industy. Most of the work for creating digital basemap is so simple that it does not require any sophisticated technology development. Nevertheless, the NGIS Master Plan gave planners a hope for rationalizing decision making process by providing results of scientific analysis based on the digital basemap.

Current Status and Trends of GIS Applications in Urban Planning

1. Current Status and Problems of GIS Industry in Korea

GIS industry in Korea enjoyed a high annual growth rate of 44% from 1995 until 1997. But as shown in Figure 3, there is a clear divide in growth rate of GIS market sales before and after 1996, the starting year of the NGIS Master Plan. This fast growth rate after 1995 was the result of nationwide digital basemap construction project under the NGIS Master Plan implementation process. However, the economic crisis caused by foreign currency instability in 1997 blunted this high growth rate and caused unbalanced growth of GIS industry.

The fast growing GIS market yielded the establishment of many medium and small GIS companies in a short period of time but the contents of their business was simple production of digital basemap. This situation discouraged research and development investment of these companies so that it was almost impossible to expect technological renovation for strengthening competitiveness. Another problem of GIS industry is its excessive reliance on the public sector. More than 80 percent of the GIS projects were ordered from the public sector leaving very little role for the private sector.

Lack of support from the government in terms of legislation is yet

[Figure 3] Growth of National GIS Market Sales, Korea.

Source: Kim. 2000: 113

another problem although the legislation of the 'National GIS Construction and Utilization Act' to support the NGIS Master Plan and promote GIS industry was made in January 2000. This act contains detailed articles for the construction, dissemination and utilization of GIS dataset, and requires the establishment of NGIS Master Plan every five years. This act provided solid legal grounds for NGIS Master Plan and other related programs but it did not contirbute to the promotion of private GIS industry.

2. Trends of GIS Applications in Urban Planning

Although attempts to apply GIS technology to the urban planning field can be dated back to the late 1980s, serious applications began to appear from the 1990s. These application systems were made from the immediate needs from the department of local governments. The needs include effective prevention of duplication in road dugging, easy calculation of road occupation tax, and effective management of infrastructure facilities. Major areas of these applications can be divided into two discrete realms; planning decision support system and infra-structure management system.

One of the most successful and widely used planning decision support system in the early 1990s is a system called 'Site Selection System

[Table 2] Cases of GIS Application to Urban Planning in Local Governments before the First NGIS Master Plan.

City	Operating system / GIS program	Application program	Purpose
Gwangju Metropolitan City	AIX / GeoGPG	Water supply management system	Water supply pipeline management
Daejeon Metropolitan City	MS-DOS / Microstation	Separate application for map management	Mapping and map management
Daegu Metropolitan City	Unix / Microstation	Dalgubeol V1.0	Management of road facilities
Incheon Metropolitan City	MS-DOS / IRMIS	Road registration management system	Management of road facilities
Seongnam City	Unix / CARIS INGRES	Water supply management system	Management of water supply facilities
Bucheon City	MS-DOS / MDL Informix	Comprehensive road facilities management system	Management of road facilities
Chungcheongbuk-do provincial government	Unix / ArcInfo	Land suitability analysis system	Site selection for agricultural item
Gumi City	VS / GDMS-M	Water supply management system	Management of water supply facilities
Korea Electric Power Corporation	Unix	Comprehensive electric facility management system	Management of electricity supply facilities
Korea Highway Corporation	Unix / ArcInfo	Comprehensive highway management system	Management of highway facilities

Source: Joong-Seok Ryu, Jung-hoon Kim and Yoon-sook Cho, 1996: 39.

for Agriculture' developed by the Chungcheongbuk-do provincial government. This system analyzes the environmental characteristics of the given site and proposes the most appropriate items of cultivation for the given site. The system utilizes topography, road, river, administrative boundary, soil, vegetation and satellite data to determine suitable land for a specific agricultural item.

A system for the management of infrastructure facilities such as sewage, water supply, and electricity was in great demand of the concerned departments of a local government from the early 1990s. The Gwangju metropolitan government, for instance, developed a comprehensive water supply management system based on the result of underground facilities survey and the digital map obtained from arial photography. Practical gains from the operation of such a system are the curtailment of expenditure by detecting leakage of water supply.

GIS applications to urban planning before the NGIS Master Plan can be characterized as a facility management system whereas those after the Master Plan are more concerned with comprehensive urban planning decision support system. The latter system comprises site selection, facility management and mapping so that supporting decision making in the planning process is possible. The provision of digital basemap from the NGIS Master Plan made this approach possible.

More recently, local government began to concentrate on the development of urban landscape analysis system using latest 3D GIS technology. Fly-through or walk-through navigation of an urban district allows detailed control over the height of a building so that it becomes possible to manage urban design regulations.

3. Summary: Where can we go from here?

GIS industry in Korea has been a major information industry which guides national economy and forms the foundation of economic development. However, GIS industry is still in its infancy and immaturity because of the short period of time since the launch of the National GIS Master Plan in 1996. Major problems of GIS industry in Korea include its high dependency on the public sector and inadequate legal and administrative system which prevents the industry from moving to a innovative and user-oriented market strategy. Considering the demands for web-based and component-based GIS, it is necessary

for the government to change its strategy of GIS industry promotion from quantity-oriented to quality-oriented.

Development of GIS application to the urban planning field tends to move from facility management to decision support system. New technology such as 3D navigation applied to the 3D GIS data and combination of several software functions such as picture mapping, rendering and animation made this trend feasible. The immediate future will see the generalization of virtual reality and intelligent systems in the urban planning field.

Cases of GIS Application in Urban Planning in Korea

1. Sustainable Land Use Planning-The Jeju Experience

As concerns for sustainable development increases, GIS proves to be a useful tool to deal with development proposal considering sustainability. A system developed for Jeju Island, Korea demonstrates such possibilities. The system determines the conservation grade of a land based on environmental impact criteria, including effects on ecology, landscape and underground water contamination. Developers can easily identify whether it is possible to develop areas in question for a certain purpose.

The criteria to determine the possibility of development came from the site characteristics of Jeju Island. This island is famous for national tourist resort and therefore the local government needs to preserve scenic beauty of the land. Most of the land consists of volcanic rocks so that the conservation of underground water is an urgent priority of Jeju Island. The Halla mountain located at the center of the island posesses endangered species which need absolute protection. Hence comes the three criteria of ecology, landscape and water contamination.

For the first time, the system utilizes digital topographic basemap made from the First NGIS Master Plan. Therefore, this project became a testbed to confirm usefulness of digital basemaps from the NGIS Master Plan. Several shortcomings of the initial version of digital basemaps were identified and feedback from this experience helped to produce better digital basemaps.

[Figure 4] Tools for Sustainable Land Use Planning as Implemented and Used in Jeju Provincial Government

Notes: 1) Top-left—The site is divided into 360 sheets of 1:5,000 scale digital map.
2) Tog-right—Soil map is an important criterion to determine vulnerability of water contamination.
3) Bottom-left—Visibility analysis determines the conservation of tourist attraction.
4) Bottom-right—The system produces a specific site for consideration grade for a site in question.

For the purpose of finding a suitable land that satisfies certain criteria, GIS offers 'overlay analysis' function. This function allows several layers of data[3] to merge so that planners can identify land parcels that meet several conditions. For Jeju Island, 43 specific layers of data were used comprising topography, water system, vegetation, wild habitat, underground water, soil, geology, land use regulations, landscape and so on.

The Jeju experience demonstrated that GIS is an indispensable tool for sustainable landuse planning. Planners can easily identify the most suitable land for a specific land use or suitability of a piece of land for

3) Data in GIS are grouped according to their characteristics and this kind of grouped data are called 'layer' in CAD and 'coverage' in GIS. For instance a GIS model for a site may have three different layers of data such as land use, ownership and soil type.

intended land use. Therefore this system has proved to be useful both for planners who is concerned with sustainable land use planning and government officials who have to determine whether the proposed planning application is appropriate or not.

2. Urban Facility Management

Management of urban infrastructure facilities is directly related to the quality of life in a city because it deals with everyday necessities including water and electricity supply, sewage treatment, road construction and so on. High-density development of a city inevitably brought a complicated configuration of underground pipelines and GIS became a natural solution to deal with such an intricate situation. Several accidents such as gas explosion accelerated the construction of urban facility management system of a local government since the early years of GIS development in Korea.

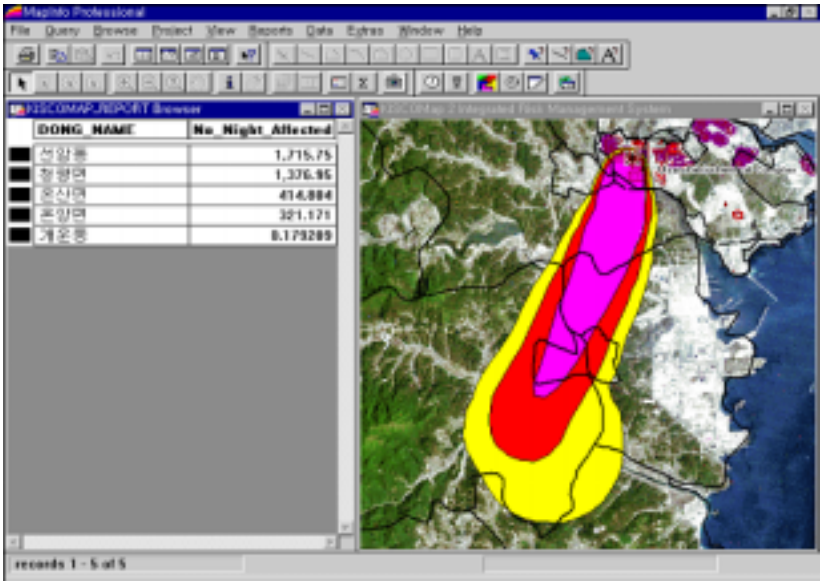
GIS offers two useful functions to manage urban infrastructure facilities; network and buffer analysis. Network is regarded as a system

[Figure 5] A Typical GIS System for the Management of Underground Urban Facilities

of interconnected linear features. Planners want to identify the most efficient route to travel or determine the closest facility in a given system of network. figure 5 demonstrates typical layout of pipeline network with different colors denoting different pipelines. By using network analysis function of a GIS system, it is possible to find the best route from a given place to a destination, the closest facility to any location on a network or the service area around any location.

Buffer analysis allows planners to identify areas of impact from a given location. Typical application of buffer analysis includes identification of impact area from a source of pollution such as sound or toxic gas. A system for emergency managment as illustrated in figure 6 shows how the result of buffer analysis can be used by planners. In this case, influence of chemical tank explosion is simulated and different levels of impact from the explosion are represented in different colors. It is possible to identify which administrative district is under the influence of the explosion and how many people needs evacuation.

[Figure 6] Emergency Management System against Influence of Chemical Tank Explosion



3. Urban Landscape Planning and Management

The application area of GIS is recently extended to urban landscape planning and management by using 3D simulation technique. Seoul metropolitan government developed a series of systems to manage landscape planning around major mountains and the Han River area. Traditionally 3D simulation belongs to the realm of CAD(computer-aided design) but by using 3D data model of GIS with 3D animation tools such as VRML[4], Eon studio™, Superscape™, or Cosmo player™ it is possible to simulate diverse cases of building height and FAR(floor area ratio) control as well as to manage landscape resources. Urban landscape simulation system such as shown in figure 7 and 8 allows the planner to walk-through or fly-through the site. For instance, to examine the possible effect of apartment housing site development, the system produces a static landscape image from a given point towards a landscape resource in consideration. In this case, the immediate concern of urban planners is to preserve the scenery towards the mountains. By changing the height of the apartment housing, it is possible for planners to determine appropriate level of height control for this site.

Fly-through model as shown in Figure 8 replaces the tradition paper or wood model of a development site. Recent developments in 3D simulation technology allow combination of 3D simulator with database management system. Therefore it is now possible to fly-through a model and identify attributes of a building such as height, floor area ratio, ownership and land use by just clicking on a building. If the height of a building is not satisfactory, planners can change the height and have a 3D simulation with changed height in a real time.

4. Summary: What are the benefits of using GIS in urban planning?

The three cases examined above demonstrate the usefulness of GIS in the analysis, management and simulation of an urban environment.

---

4) VRML(Virtual Reality Modelling Language) is the most basic tool for 3D simulation in a Web based environment. It allows 3D simulation on a typical web browser such as Internet Explorer by simply plugging in a software module.

[Figure 7] Application of Urban Landscape Management System for Determining Building Height to Preserve Scenery towards Mountains

[Figure 8] GIS System for Simulating Townscape

The benefits of using GIS are self-explanatory but can be summarized as follows.

As seen in the first case of the Jeju experience, a rational and scientific decision making is possible by analyzing geographical characteristics of a site and identifying suitable site satisfying given criteria. Final decision needs to be made by planners, but the results of such analysis form a ground for environmentally sound and sustainable development. The second case shows how GIS helps planners by managing urban infrastructure facilities. It is widely recognized among practitioners and scholars that the introduction of urban facility management system brings savings in budget and manpower. The third case represents the possibility of future GIS system by allowing dynamic 3D real time simulation together with management of 3D database. Tools for 3D simulation on a web browser may accelerate the general use of 3D simulation by non-professional group. Therefore it will contribute to the citizen participation in a planning process by allowing easy access to 3D model of a development site through world wide web.

Conclusion—A Step Forward

GIS has been favored by planners because of its capability of spatial analysis. Since planning process requires extensive spatial analysis, GIS has become an indispensable tool for urban planners. The NGIS Master Plan has provided a starting ground for the promotion of GIS industry and application system.

Traditionally GIS has been regarded as a computer system very complicated and difficult to use. However, such a misbelief is now changing due to the development of easy user interface and importing of a GIS system from stand alone to a web based system.

As examined above, GIS helps urban planners in several ways either by providing scientific results of an analysis or by allowing real time dynamic 3D simulation of a site. However useful such a system may be, the final decision-making has to be made by human planners. If such a system needs to work not merely as a data analysis but as a decision support system, knowledge based approaches must be introduced. A knowledge based system consists of expert knowledge and

inference engine to solve complicated real world problems. An attempt to apply such an expert system approach to GIS is already in process. The 'What-If' system(Klosterman, 1999) is a good example of this attempt. In the near future, we will see the proliferation and everyday use of an expert system in GIS. However, this does not mean that GIS overrides human planners. It should be remembered that the purpose of developing and applying expert systems in urban planning is to encourage partnership between human and machine intelligence.

References

Brail, Richard K. and Richard E. Klosterman(eds.). *Planning Support Systems*. Redlands, California: ESRI Press, 2001.

Chrisman, Nicholas. *Exploring Geographic Information Systems*. New York: John Wiley and Sons, 1997.

Eastman, J.R. et al. Gis *And Decision Making*. United Nations Institute for Training and Research, Vol. 4, 1993.

Eun-Hyung, Kim. "Methods of Promoting GIS Industry in Korea." in Proceedings of the Second GIS Promotion Seminar, organized by Korea Research Institute for Human Settlements, May 18, 2000(in Korean).

Jeju Provincial Government. *Comprehensive Survey On Mid-Mountain Area Of Jeju Island*. Project Report, Korea Research Institute for Human Settlements, 1977.

Joong-Seok, Ryu. "Strategies for Promoting GIS Industry in Korea." Paper presented at the 5th International GIS Seminar entitled "Toward a Knowledge-based Society: National GIS Policy and Technological Development." organized by Korea Research Institute for Human Settlements, held at Ritz-Carlton Hotel, Seoul on Sep. 28~29, 2000: 191~204.

Joong-Seok, Ryu,. Jung-hoon Kim and Yoon-sook Cho. *Urban Information SysTem: A Guideline For Urban Facility Management*. Research Report 94-42, Korea Research Institute for Human Settlements, 1996.

Klosterman, R. E. "The What if? Collaborative Planning Support System." *Environment and Planning B: Planning and Design* Vol. 26(1999): 393-408.

Masser, I. and F. Salge(eds.). *Spatial Analytical Perspectives On Gis*. London: Taylor & Francis Ltd., 1996.

National Geography Institute. *Digital Basemap Management And Improvement*. 1997.

NGIS Committee, Ministry of Construction and Transportation. *National Geographic Information Systems In Korea*(Phamplet). 2002.

Sang-Bum, Park. "The Past, the Present and the Future of National GIS in Korea." Paper presented at the 5th International GIS Seminar entitled "Toward a Knowledge-based Society: National GIS Policy and Technological Development," organized by Korea Research Institute for Human Settlements, held at Ritz-Carlton Hotel, Seoul on Sep. 28~29, 2000: 25~36.

Seoul Metropolitan Government. *A Feasibility Study For Urban Landscape Management System*. 2002.

19 Citizens' Role in Metropolitan Governance

Yongwoo Kwon

The Advent of a New Paradigm

1. Cities Planned by the Professionals

Modern cities are symbolized by the Industrial Revolution and the Civil Revolution. The industrialization started in England has changed the cities into the central places for production and trading of goods. The democratization ignited by the French Revolution has also played a major role in transforming the cities into gathering places for the people who want to enjoy the freedom.[1)]

However, growing population and a variety of urban activities caused new and unexpected problems shadowing the overall cities. The shortage of jobs and houses became a serious problem and the daily living environment also severely deteriorated. The need for the efficient distribution of population, jobs, and infrastructure through the proper design of living place was very high. The time for the urban planning emerged at last.

The terminology of 'urban planning' was first used in England where had suffered from urban problems accompanied with the industrialization. This planned management of living places was originated from the Garden City concept by Ebenezer Howard, an urban activist.

---

1) Taejun Kwon, "Cities in a globalizing era," *The 3rd Urban Program Lecture*, Citizens' Coalition for Economic Justice(hereafter, CCEJ, 1998), unpublished(in Korean).

He designed an ideal garden city which could provide both urban convenience and rural amenity. Urban districts, public institutions and industrial facilities were all designed as infrastructures only for the people. The garden city was spatially separated from the central city through constructing permanent greenbelts between them. Here, amenity was a key theme of the garden city.[2)]

Howard's paradigm has influenced on Raymond Unwin, Parker, and Frederic Osborn in England, Henri Sellier in France, Ernst May and Martin Wagner in Germany, Clarence Stein and Henry Wright in U. S., making all of them emphasize on the concepts of green land and open space in designing urban areas. Patrick Geddes, a professor of the University of Edinburgh, proposed a new idea of urban planning, which attached the great importance to geographic environment, natural features and climate condition, economic cycles, and historical heritage. Perry, an American planner, was very active in New York during the 1913-1937 period and developed his urban planning theory based on the neighborhood district theory. Abercrombie, a professor of the University of London, formally introduced greenbelts when presenting "Greater London Plan" in 1944.[3)]

In France, Gerge-Eugene Haussman(1809-1891), a prominent urban planner in the time of Napoleon Ⅲ, started the remodeling of Paris. He made streets wide and straight during the 1853-1869 period and completed the remodeling according to his plan which was to improve not only the supply water and sewer system, but also the streets for public transportation. Eugene Henard, an architect, also insisted on reconstructing street networks in Paris in 1910, foreseeing the emergence of automobile age. Ponval, a Portuguese, utilized the Paris model when reconstructing Lisbon which had been destroyed by the great earthquake.

In 1822, Soria Y Mata, a Spanish engineer, advanced a theory of linear city which was about developing cities along the major highways. His linear city theory was formulated based on the area which extended from Cadiz in Spain to Petersburg in Russia, 1,800 miles in total. In fact, he carried out the construction of a linear city at the

---

2) Yongwoo Kwon, *Interpreting the Seoul Metropolitan Region*(Bosunggak, 1999): 153-162(in Korean).

3) Jae-Sung Cho, *On Urban Planning*(Pakyoungryul, 1997): 129-130(in Korean).

suburban area of Madrid. Tony Garnier, a French planner, once proposed the theory on the urban industry, regarding manufacturing as a key element in the urban planning. In the 1920s, May, a German urban planner, constructed a satellite city at the suburban area in Frankfurt according to Garnier's idea. Le Corbusier(1887-1965), a Swiss architect, promoted the modern architecture movement with Frank Lloyd Wright, Walter Gropius, and Mies Van der Rohe. He attempted to reconstruct the cities through building the vertical structure, modern architecture, overpass highways, and crossways. He also built the famous 'Notre Dame de Paris' expressing his marked individuality and proposed Plan Voison Project to construct the CBD(Commercial Business District) with high-rise building and to ensure the open and wide space around the CBD.

It is with the 'City Beautiful Movement' led by Daniel Burnham in 1893 that the urban planning movement in America became active. Burnham proposed to build the city hall, parks, wide main streets and by-pass ways. The City Beautiful Movement later led to the District Freeway Plan(1896), building height control and zoning system(1899), street network mapping(1900-1906).[4] In 1958, Frederic Law Olmstead presented a model of modern city parks by constructing the Central Park in New York. In 1902, he also designed a new 'Washington D. C. Urban Plan' through revising 'Washington D. C. Plan' made by L'Enfant in 1791.

The progress of the modern urban planning in Korea can be divided into four periods : the preparation period(1876-1903), the period of road networks construction(1904-1933), the period of improving comprehensive urban planning system(1934-1961), and the period of promoting independent urban planning system(1962-current), each period ranging about 30 years.[5] The Korean cities are mainly designed and constructed by professionals in the fields of urban planning, architecture, urban and civil engineering, regional development, and geography.

As mentioned above, the professionals have played the essential role in building modern cities which emerged with the industrializa-

---

4) *Ibid*, pp. 56-57.

5) Byung-Sun Choi, "Half century of Korean urban planning," Seminar on Half Century of Korean Urban Planning, College of Environmental Studies(Seoul: National University)(in Korean).

tion. With opening of the 21st century, however, modern cities are increasingly facing a new paradigm of both citizen-centered planning and globalization, which is totally different from the former paradigm based on the industrialization. The new paradigm now demands a new and more appropriate conceptual definition for the urban planning.

2. A Citizen-centered Paradigm

The thesis that human being must play a key role in building modern cities and cities are needed to be developed with their citizens' participation was one of the main agenda effectively dealt with at the Urban Summit Conference(HABITAT Ⅱ) held in Istanbul, Turkey.

The Urban Summit Conference was held in June of 1996, and some 20,000 urban professionals from more than 180 countries around the world attended the meeting. This conference, sponsored by UN, was the last global-scale international meeting of the 20th century following such meetings as UNCED in Rio de Janeiro(1992), the World Summit for Social Development in Copenhagen(1995), and the World Conference on Women in Beijing(1995).

The Urban Summit Conference was held as a part of international efforts for improving the societal, economic, and environmental qualities of human habitats. It started to aim at the drawing of a global consensus and the action of the plan for both 'stabilized habitat supply for all' and 'sustainable development in the urbanizing world.' It is twenty years after the first Habitat Conference in Vancouver in 1976 that the second Habitat Conference was held in Istanbul, Turkey, on June 3rd-14th of 1996.

Barbara Ward first employed the term of 'sustainable development' at the UN Conference on the Human Environment, Stockholm(1972) and it was officially mentioned at Cocoyoc Declaration which was adopted at the UN Conference in Mexico. Sustainable development became one of the important objectives of the UN World Environment Protection Strategies announced in 1980. This idea was spread out to the world through the report released by the UN Environment and Development Commission in 1987. Especially, the main agenda of UNCED in Rio de Janeiro was to promote 'sustainable development' and the term finally became familiar with all. In the forum held in England in 1994, 'A City and Sustainable Development' was adopted

and it means that the concept of 'sustainability' became a major topic in both environment and development not only at the global level, but also at the local level. A number of municipal governments worldwide are now making feasible action plans at their level.

The sustainable development plays a role as a supportive paradigm to protect deteriorating the human settlement resulted from the rapid urbanization. In other words, promoting the sustainable development refers to the protection of human rights for the decent residential environment and the quality of life for urban residents.[6)]

The Urban Summit Conference in Istanbul has three significant implications on human settlements worldwide. First, it provided the favorable grounds on the urban reform movement. The Habitat Ⅱ began with the critical review on the urbanization process over the past 50 years and it made clear that for sustainable human settlement, we should transform our cities and towns into the livable and inclusive human settlement worldwide. The Istanbul Declaration clarified the goals and principles of global action plans for implementing nine Habitat agenda such as equality, poverty eradication, sustainable development, adequate shelter for all, family, empowerment and participation, partnership of all institutions including governments and non-governments, global solidarity, and international cooperation. This means that the principal urban paradigms such as 'sustainable development', 'enhancement of civil rights', and 'sound and healthy progress of society' should be achieved in this century. Many people in Korea agree on that if we are satisfied with the current urban living environment, Korean cities will be strayed and stumbled in the midst of reckless development. In this regard, current cities must be transformed into environment-friendly ones, that is, healthy, citizencentered, and humancentered ones. Related with this, it is very desirable and timely that non-governmental organizations(hereafter, NGOs) in Korea have led the civil movement for urban reform which was initiated after the Habitat Ⅱ.[7)]

---

6) Yongwoo Kwon, "A declaration on the sustainable urban development and housing rights," *Professor Newspaper*(July 15, 1996).

7) It is the Urban Reform Center, CCEJ that took urban problems as the civil movement agenda and initiated urban reform movement. The CCEJ prepared to set up the Urban Reform Center announcing 'Urban Reform Civil Declaration' on June 28th of 1996, the first anniversary of the Sampoong Department

Second, a distinguished feature of the Istanbul Declaration is the recognition that it is not only national governments, but also community organizations, voluntary sector organizations(including NGOs) that are essential to achieve the goals. That is, global issues, only discussed by the governments before the Habitat Ⅱ, became concerns of non-governmental institutions and the representatives from NGOs and community-based organizations(hereafter, CBOs), which participated in the conference with national governments and devoted their energies to improve the quality of urban life. UN organizers fully supported NGOs' involvement and allowed NGOs with any substantive claims to be formally involved in committee activities dealing with the conference declaration and agenda. This new trend can be considered same as an international declaration that urban living problems in detail must be solved by citizens' representatives to participate. It also refers to the new recognition that governmental bodies alone cannot solve the problems of deteriorating living environments resulted from the rapid urbanization.[8)]

Third, it declared the right to an adequate standard of living. The declaration of 'supporting and confirming the health and quality of human settlements for all' was unanimously adopted. The principle of the right to adequate housing is based on the international humanitarian law such as the 'Universal Declaration of Human Rights' and it states explicitly that the efforts by all the levels of governments to provide the adequate shelters for their residents are obligatory. The hou-

---

Store disaster. It held the proposing meeting of the center on October 21st of 1996, the second anniversary of the Seongsu Bridge disaster and opened the center on June 28th of 1997. Afterwards the center held the urban program lecture eight times to train urban professionals and researchers with a great success. In addition, the center brought up many important issues including greenbelts, relaxation of land use control, quality of urban life, SOC, housing policy, homeless, huge flood damage, transportation policy, the Capital Region problems, the Sustainable Urban Prize, restructuring of the Seoul government, etc. and has played a role of the meaningful leader of public opinion.

8) The Korean government dispatched some 150 delegates from the central and local governments, NGOs and CBOs. In terms of size, it is second to U.S. Relatively active involvement of NGOs in Korea can be contributed by the fact that many people, especially Prof. Seong-Kyu Ha, Dr. Jae-Hyun Yu, Hye Kyung Kim, an Assemblywoman, Rev. Jong Ryeol Park, and Prof. Moon Soo Park, organized 'Non-governmental Committee for UN HABITAT II.' The author attended the Istanbul conference as a vice-chair of the CCEJ Policy Planning Committee and a chair of the Territorial Development Division.

sing right declaration stating that 'everyone has the right to an adequate standard of living for themselves and their families regardless of race, political ideology, religion, culture, and economic status,' was officially recognized worldwide.[9] There were, however, different voices in terms of endorsing the housing right as a human right and regretfully it failed to agree on the status of the housing right as one of human basic rights.[10]

3. Modern Cities in the Globalization Era

Nowadays the world increasingly becomes one living space without borders. When Wall Street in New York downgrades the Korea's financial standing, the Korean economy goes under direct impacts and greatly suffers. The latest mode in fashion from Paris can be reached to young ladies in Seoul walking down the street to show off. High-quality leather goods produced at small towns in Italy are sold not only in major world cities including London, Frankfurt, Tokyo, but also even in small cities in Korea. Then, where does this take place? It is in the city, not to mention. Cities are just like active volcanoes or a blast furnace smelting heterogeneous lifestyles and creating various cultures.

Current cities, however, are different from the cities in the past. Modern cities can be characterized by the revolutionary information and economic changes, namely by internationalization, informatization, localization, and pluralism. In particular, the information revolution has impacted on the modern cities deeper than the Industrial Revolution. Communication network through personal computers and high-speed

---

9) Seong-Kyu Ha, "Housing rights and improving quality of life," a paper presented at the Symposium by People's Welfare Improvement Coalition(1996. 6. 22)(in Korean).

10) Korean delegates were sincere and active for the issue of the housing right. During the 15-day long conference, urban professionals presented and argued that the housing rights were essential for the human settlement. Enforcing coalition with urban activists and civil activists from all over the world, they held 'World Forum on Housing Right' at the downtown plaza and Galata Bridge in Istanbul. They also presented Korean cultural events including traditional hanging pictures and performing arts and promoted the housing right movement to a higher cultural movement. They also carried out a fieldwork around Istanbul and its vicinity and had active discussions on the housing condition. Their activities were broadcasted by major news carriers including CNN, but few major news companies in Korea broadcasted them.

optical networks have changed the way of life as well as expanded the productivity. Web-like networks have made it possible to effectively trade the information and services worldwide without traveling around the world. This trend goes well beyond just the dimension of technological advancement, but further fundamentally changed relationships among the cities, enterprises, and people.

Globalization strategy in an internationalized society is an essential factor in economic changes centered on both production and finance. Based on informational technologies, multinational corporations take a step forward to the enterprises which can mobilize the capital, management, technology, manpower, and culture worldwide. International finance that is willing to invest wherever it can produce profits, accounts well for the facts mentioned above. At a humble office, for instance, in the financial business district in London, a worker can transfer billions of money from A city in B country to C city in D country and then transfer again to E city in F country. All it takes is just one click on the computer. The national borders are getting meaningless. The world is now in the middle of the information and the economic revolutions driven by the gigantic power of the global finance through the informational infrastructure.

This is not only the case to the metropolitan cities such as New York and London. Through e-commerce on the Internet, internationally popular goods made even in small town in Japan, can be delivered worldwide through global delivery companies. As a result, the location of current enterprises is free from the traditional location theory.

The world became much closer than ever well before we noticed it. Glocalization, a compound word of both globalization and localization, is getting familiar and used ubiquitously in a daily life.

Globalization which symbolizes a new epoch in the history of civilization entails the advent of 'urban era' worldwide. In fact, the city becomes an actual unit for economic competition and a central place for production and consumption. The city, therefore, becomes a self-autonomous economic unit to maintain the proper level of the capital and enterprise concentration. The city also plays a role of the regional and cultural living space and, therefore, it is time to pursue promoting both quantity-oriented growth and quality-oriented value at the same time.

'Interaction' and 'competitiveness' are core powers in the globalization era. The cities that have different resources and indigenous

backgrounds are likely to maintain complementary relationships each other through the strategic alliance. In this case, each city carries out either competitive cooperation or cooperative competition without hesitation.[11)]

Each city, therefore, is devoting all its energy in order to become a 'world city' through the expansion of high-speed transmission networks connecting cities across countries, the opening of direct lines connecting major cities worldwide, the expansion of harbor and loading facilities for the freights, and the establishment of key highways. Each city is giving efforts to intensify competitiveness, not only through urban infrastructure, but also through cultivation of professionals leading an open society in the future, development of new soft programs, enhancement of the cultural level, and protection of the environment for sustainable development.

Cities need to be equipped with both efficiency and equity in order to cope effectively with the globalization. In advance, however, 'comfortable and sustainable development' needs to be set forth as a premise. First, the amenity of city provides high-quality of life to the members of the civil society. Human beings are carrying out all kinds of civil activities. As a place for their activities, urban environment needs to be attractive to the people as a living place. Along with the progress of the society and the growth of civil consciousness, amenity in the urban environment becomes an important background for more desirable urban development. The city's competitiveness depends on the level of the amenity in terms of both natural environment and cultural environment. Second, 'sustainability' is also essential. Environmental crisis is impending due to the rapid industrial growth which has been accompanied by the excessive consumption of resources and

11) Every country is desperate to survive in the rapidly changing world. Japan attempts to transform the territorial development pole including the nexus of Tokyo, Osaka and Nagoya into an internationalized zone for business and also focuses on the expansion of various infrastructures. China tries to push opening up their economy by carrying out the Tumen River Project. Russia of Japanese investment to develop the Far East. In Europe, every country tries to invest on constructing infrastructures, and cross-border highway networks and also agrees upon the introduction of the Euro. Especially, France considers the territorial development policy as an essential state policy in order to make every corner of the country open to the globalizing process. Germany is investing a huge amount of capital on the transportation networks to the former East Germany to prepare the new millennium.

reckless development. In connection with this, the world begins to consider 'the environmentally sound and sustainable development' as one of the significant urban development agenda and puts it at the center of essential urban policy. To this end, each city has accelerated its efforts for the sustainable development by way of the energy- and resource-efficient land use, the establishment of environment-friendly transportation system, the ensuring of the space for parks and green spaces, and the civil participation in administrative decision-making.[12)]

Civil Participation in Urban Reform

As mentioned above, urban life in these days is changing toward a totally different direction compared to the past urban life. In addition to the efforts of the urban professionals, the full and equal participation of city's residents who should take a leading role in an urbanizing world, is required. Now, it is time for citizens to develop livable cities with urban professionals. In this context, this part of the paper will discuss the need of urban reform and its principles as well as its directions in the next part.

1. Needs of Urban Reform Movement

During the past 40 years, Korea has achieved per capita GNP of up to $ 9,000 as a result of the growth-driven policy. Even though Korea has experienced the financial crisis,[13)] it still remains one of the powers in global trade. Because about 90 percents of its population are living in cities and towns, Korea becomes one of the highly urbanized countries in the world.

The arbitrary growth-oriented development, however, resulted in the serious destruction of the national land. Anti-environmental and growth-oriented policy has deteriorated the urban environment. Due to

---

12) Yongwoo Kwon, "Internationalization strategy centered on the city," *International Exchange*(Local Autonomy Internationalization Foundation, 1998): 21-25(in Korean).

13) Hee-Yun Hwang, "Is it reasonable to relax the land control under current financial crisis?" a paper presented at the Land Control Relaxation Committee(CCEJ Urban Reform Center, unpublished, 1998)(in Korean).

the rapid and reckless development, citizens' daily life is increasingly confronting greater danger.

Sihwa District in the west coast has been severely mismanaged and becomes almost useless in any ways. It is the same case as Yeocheon Industrial District. There are even houses between industrial plants. Therefore, people are directly exposed to environmental hazards everyday. The streams, which are covered to deal with the rapid population growth and land shortage, have already changed into poisoned ones like sewers. There is no more green space left for parks due to the reckless development and destruction. And even low mountains in large cities are almost destroyed. Apartment complexes have been built there only to ruin the natural skyline of the cities.

As the destruction of environment gets accelerated, cities and their sky are getting hazy and dark. Exhausted gas from smoke of automobiles and plants has caused photochemical smog-laden cities. Citizens in Seoul are often annoyed with ozone warnings. Water is contaminated seriously and cannot be used without some purification. People cannot open windows even during the sultry summer because of annoying ceaseless noise. People's dream of the quality of life in a comfortable environment is crumbled into dust.

The break-down of Seongsu Bridge in 1994 and the collapse of Sampoong Department Store in 1995 drove the whole country into shock and grief. It was such an unprecedented calamity. How on earth did such weak buildings get a final approval? There is no wealth more important than a life. The hasty construction, without considering safety and harmony with environment, has eradicated the base for safe living conditions.

Not to mention city's hardware, its software, being shadowed by the growth- and development-oriented policy, does not play the role in the right place for a desirable city. Especially, the poor, the handicapped, the old and the weak have suffered more than anyone else. Rent costs and housing price soared and sometimes resulted in driving the people out to streets. The compulsory demolition and redevelopment with forced evacuation without considering residents become daily events. Only the strong, like a Hercules, can survive in this city, alienating the weak thoroughly. There are also few facilities for the handicapped in our cities.

In the meantime, government has maintained the growth-pole

policy which brings benefits to a few at the expense of many. To make matters worse, they adhere to the market rule of competition and concentration which makes rich areas richer. In addition, under the good name of the relaxation of government regulations, reckless developments are further encouraged. The balanced territorial development becomes more difficult to achieve. Small and medium-sized cities in the rural area are getting deteriorated.

Since 1995, the introduction of local autonomy has certainly played an important role in democratization process of Korea. In many cases, however, most of local governments are only interested in securing the local budget condition and short-sighted development benefits. The extreme regionalism and economic concentration on specific areas are obviously against the long-time governmental efforts for equal development. NIMBY(Not In My Backyard) and PIMFY(Please In My Front Yard) syndromes as well as the concentration-oriented approach to support the developed region more than any other regions, should be reconsidered. Furthermore, it is anti-environmental that reckless development of greenbelt areas without principles is being attempted in the name of improving the local budget system and the relaxation policy of government regulations.

Above all, the most serious problem of the growth-oriented development policy is the insecurity and inconvenience to people's life. Development-oriented government policies for its land in the past caused a number of anti-human and anti-civil problems. The majority of citizens who do not have their own houses are sometimes driven out and move around due to skyrocketing rent costs. Subway accidents and the collapse of bridges as well as the shortage of the green space and water contamination increasingly put citizens' life in great danger. However, there is one thing that we should make sure. We, ordinary citizens, who abide by the law and pay taxes, are entitled to enjoy a certain quality of life. We are not the kind of strangers to this world who only suffer and tolerate our destroyed land. Both urbanization and industrialization are no longer an engine for our city's growth and management. By now, harmful side effects of urban growth turn out to be a threat to the soundness of everyday life.

We should accept the reality that the city as a true living space of citizens has instead distorted ordinary people's life. Without beginning the urban reform movement at this moment, the benefits of the

development achieved by hard-working efforts would not lead to improve the quality of citizens' life. What we need is a new development strategy that is both sustainable and environment-friendly and gives the highest priority to the quality of citizens' life. So should the urban reform start at this moment that aims to change the city into the livable and healthy place of our citizens.[14]

2. Principles of Urban Reform Movement

In order to make a sustainable, citizen-centered, and livable city, we have to promote the urban reform movement in accordance with several principles as follows.[15]

First, it is a sound and livable city. The urban environment truly for the people has nothing to do with excessive high-density development. Greenbelts and green space within the city are essential for a green city. It is a basic need to provide clean air and fresh water to the residents. A national territory is not a simple place to work and sleep, but the ecological environment to provide a richer and better quality living place.

Second, it is a sustainable and environment-friendly city. In the past, development efforts directly caused the environmental degradation. It was generally accepted that the development was most important to make a living and resultantly environmental disruption was inevitable. However, it is not appropriate that the economic development with great priority has already begun to threaten the quality of people's life. Natural resources will be exhausted in the near future due to excessive use. In order to achieve better and sustainable citizen's life, development-oriented approach must be changed to conservation-oriented one. The protection of environment and ecology should have top priority in terms of any development projects. The sustainable and environment-friendly territorial policy must be regarded as an essential principle in all kinds of development planning including the urban planning.

---

14) The necessity and propriety of urban reform was clearly announced on the prospectus of the Urban Reform Center, CCEJ on June 28th of 1997.

15) Yongwoo Kwon, "Urban reform movement to improve the quality of citizen's life," *Economic Justice* 31(CCEJ, 1996): 72-79(in Korean).

Third, it is a self-governing city to promote civil participation. Civil participation in decision-making process and urban governance is of great importance. Broad civil participation in decision-making process, together with accountability, simplicity of procedures and transparency, is imperative to prevent corruption as well as to promote public interests. In this regard, we must redouble our efforts to make a legal framework for ensuring the responsible urban governance and the citizen monitoring system. It is necessary to enact the administrative procedure law and public information acts so that all citizens can have access to the information that they want. It is reasonable for local authorities, civil organizations and community organizations to participate in all processes of designing, executing and evaluating local development policies. Civil participation is essential for this kind of urban reform to be realized. We can no longer entrust local governments that only promote growth-oriented approach regardless of citizen's needs and are interested in local budget conditions and development gains. We can only expect the change of government's behavior when our demands for urban reform get strong enough.

Fourth, it is a equally developed city. Growth-pole policy which sacrifices many only for a few, is no longer appropriate for the current society moving toward the localization and self-governance. A new paradigm for balanced development is needed not only to intensify competitiveness, but also to remove its obstacles including extreme regionalism and economic concentration in specific cities. How on earth do people want to promote their own regional interests at the expense of others? Regional specialization does not always mean the enhancement of whole nation's competitiveness. It is time both to consider the balanced approach at the whole national level and to overcome the extreme regionalism. Nowadays the trend of globalization demands every corner of our land to become the flexible open space with its own special function. We need a new balanced development strategy to be able to consider the balanced development between urban and rural areas, between and within cities, and between cities and their vicinities.

Fifth, it is a safe city with appropriate urban infrastructure and services. Now, it is necessary to control the speed of urban growth and to fix ugly-grown areas. We need a new paradigm to put the distorted territory back to the desirable path. Habitual practices of poor manage-

ment need to be stopped. Urban environment and facilities should be managed in order to provide safe and accountable living spaces for all. It is time to pursue the human-oriented territorial development rather than the quantity- and material-oriented approach in the past. We continue to make efforts to create the living space which can give the true rest and relaxation to citizens. To accomplish these purposes, well-managed territorial policies are to be promoted in all public services such as housing, construction, transportation, environment, etc.

Sixth, it is a city with the adequate urban environment. More than 20,000 urban specialists and representatives of NGOs from 180 nations participated in UN Conference on Human Settlements in Istanbul, Turkey in June of 1996. They determined to give full efforts to develop adequate shelters for all and sustainable human settlements in an urbanizing world. It is time to create the urban environment for the human being arduously overcoming all harmful consequences of the rapid urbanization. The conference finally produced the Istanbul Declaration "supporting principles of adequate shelters for all and the development of sustainable human settlements." The declaration also emphasized adequate housing as a component of people's rights for standard living. In particular, it clearly stated government's role and responsibility to ensure adequate urban settlements for its citizens.

Seventh, it is a humane city for its citizen. A citizen is an essential part of the city. Urban environment must give satisfaction to the citizen who has been neglected in the process of growth-oriented policy. When community protects the weak, the city becomes a true one. To achieve this, it is necessary to improve supporting facilities and welfare levels for the handicapped as well as the old and the weak. Furthermore, there should be a human-oriented management system for all aspects of human settlement including transportation and environment.

Finally, it is a city for the poor. Under the centralized and top-down system, loyalty to higher appointive powers is more important to government officials than the responsibility for their citizens. Therefore, ostentatious urban policies to focus on the count of the policy results became dominant rather than the policy to respond to its citizens' needs in the past. This goes against the times toward more democratic and self-governing society. Every policy decision making needs to be changed to the humane urban policy to respond to citizens' needs and take responsibility for them.

The Direction of Urban Reform Movement

In order to promote the efficient and effective urban reform movement, systematic reform efforts by citizens are a crucial factor. Here are realistic action plans for the reform to promote the full and equal participation of citizens as well as to make cities better, more livable and inclusive human settlements.

1. Clean and Pleasant City

- Give the highest priority of urban reform to creating a clean and green city
- Preserve greenbelts which must be kept without exception
- Preserve well urban parks and green spaces within cities
- Be prudent in terms of covering urban streams and try to daylight as many streams as possible
- Manage thoroughly sewage and waste disposal facilities
- Enforce environment-friendly management for all urban policies

2. Safe and Crime-free City

- Establish an urban security system by legislative and administrative efforts
- Prepare installation guidelines for safety facilities in order to improve the safety of urban infrastructures
- Create safe urban environment through comprehensive evaluation system of the functioning of urban infrastructures
- Establish information networks of urban facilities and prepare guidelines to manage underground space
- Establish a monitoring and indictment system for weak facilities with safety monitoring groups
- Enact both the prior consultation and the post evaluation system and to promote citizens' participation
- Promote more determined actions against urban crime and violence for children, elderly and women
- Intensify night-time security and establish the legal framework to secure minors from red-light districts

- Keep the young from amusement places by intensifying guidelines

3. Pedestrian-oriented City

- Create the transportation-minimizing city to give priority to pedestrians and transportation safety
- Expand the auto-free zone
- Enhance the quality of transportation through the improvement of public transportation services and system
- Promote the use of environment-friendly transportation modes such as bicycle paths
- Promote advanced transportation culture and control well automobile exhaust gas
- Reduce speed limit or ban the vehicle in residential areas
- Make more parking spaces for the handicapped and manage well transportation facilities in crossways
- Remove obstacles against the handicapped and the elderly and provide convenient facilities.

4. Open City with Well-equipped Information System

- Establish efficient urban information infrastructure to dominate in the globalization era
- Make open city by connecting it with places all around the world through the information infrastructure
- Make use of urban geographical information system for efficient city management
- Improve the guiding system including road signs, guide maps, guide signs, etc.
- Develop a new address system for the convenience of citizens

5. City as Appropriate Human Settlements

- Establish the urban settlement standards for the minimum livable urban environment

- Expand public housing for citizens without home ownership
- Establish a protection system against extraordinary rent increase and improper evacuation
- Introduce the housing quality guarantee system to officially secure housing conditions
- Introduce the circular demolition system when carrying out urban redevelopment and renewal
- Restrain excessive expenditure for housing and impose progressive heavy tax to palatial mansions

6. Equally-developed City

- Reorient the process of the National Land Development Planning based on an equal development strategy
- Promote the development of small and medium-size cities and rural areas whereas slow down the metropolitan growth
- Prevent reckless development around metropolitan areas and establish a reasonable development strategy
- Set up an institutional mechanism to promote balanced development within urban areas
- Regulate high-rising development of local towns, especially on agricultural and mountainous land through downsizing policies
- Reorient current expansion-oriented policies for the ever-growing Capital Region
- Promote the mixed-use land development in order to prevent hollowing-out of downtowns

7. City with a Rich Historical Legacy

- Enrich the city's tradition and historical legacy and promote its cultural characteristics
- Preserve historically and culturally rich areas and create cultural and historical roads
- Try to reform legal and institutional system in order to preserve historical and cultural legacy
- Compensate devaluation of private properties within historical and cultural legacy preservation districts
- Set up civil educational programs in order to promote historical

and cultural awareness

8. Cities with Rich Cultural Character[16)]

- Develop the city's history and tradition and promote cultural characters
- Expand cultural activities for citizens
- Promote cultural activities for ordinary citizens and provide opportunities for the activities
- Transform existing urban space into cultural space
- Open up public facilities as a space for cultural events
- Establish a supporting system for citizens' participation in exhibition and performing arts
- Expand cultural space for youth and promote youth festivals
- Regularize cultural events by cultural and arts groups for the whole citizens
- Expand cultural activities and opportunities for ordinary citizens and low-income people
- Establish theme-oriented cultural facilities such as the art museum, historical museum, natural historical museum, etc.
- Set up a cultural activity service center for each city
- Promote international cultural events by establishing an international cultural exchange center
- Promote and develop culturally-rich streets and various cultural theme parks
- Systemize urban culture administration by linking with such activities as sports and tourism
- Strengthen the financing capacity for local cultural activities
- Improve the planning capacity for urban culture and art events and set up the responsibility management system
- Create inter-city cultural networks and a system to share administrative responsibilities between local governments
- Help internationally-recognized cultural events take roots in each city

16) Moon-Hwan Kim, *Cultural Economics*(Seoul National University Press, 1997)(in Korean).

Civil Participation in Urban Reform

Civil participation is a keyword as well as a must for the current urban reform movement. There should be an institutional system for citizens to participate in the process of designing, decision-making and practicing of urban planning. In order to do so, it is necessary to set up the public hearing and citizen monitoring system for related urban policies and to create a system to accommodate citizens' opinions in law-making processes. It can be also considered to establish a local social development committee in which both civil organizations and local governments participate as well as to introduce civil ombudsman system for taking care of citizens' needs. Only after civil opinions are accommodated in making administrative procedure laws and city codes, the civil participation can be realized.

Here we examine principles and concrete strategies for civil participation to urban policies. First, it is an institutionalization of administrative procedures. It is essential to enact administrative procedure codes to formally allow civil participation in planning and practicing urban policies. Therefore, we need to transform the current policy determination process, namely the 'decide-announce-defend' process into a new 'participate-negotiate-compensate' process. In addition, it is necessary enact the 'administrative procedure law' to guarantee the civil participation in administrative activities.[17)]

Second, it is an institutionalization of information disclosure. Each city needs to set up an information center to allow relevant information open to the public. It is also necessary to develop and provide an electronic data interchanging system.

Third, it is an introduction of civil ombudsman system. It was initially introduced in Sweden in 1809. It is essential to adopt this system in order to effectively carry out civil monitoring function for administrative activities, to strengthen the mediation role for conflicts and to improve the effectiveness of administrative processes.

Fourth, it is an introduction of the various ways of civil participation. It is necessary to introduce auditing and investigation claims program as well as civil proposing system. It is also necessary to make it

17) Byung-Joon Kim et. al., *Let's Change Our Seoul This Way*(Bibong Publisher, 1995)(in Korean).

a requirement to disclose any activities of government committees as well as to promote civil participation to public hearings on urban policies.

Fifth, it is necessary to support civil organizations serving public interests. Financial supports for current government-sponsored organizations need to be curtailed to make urban administration more transparent. Swedish-style citizen voluntary organizations as well as NGOs and CBOs need to be promoted. Overall urban policy should be balanced out with feedbacks of NGOs' and CBOs' monitoring activities.

Concluding Remarks

New urban era was begun with the introduction of the Industrial and Civil Revolution. There was a huge inflow of population and a variety of urban activities sprung up in cities. Many remarkable urban professionals created the ever-lasting urban culture with their wisdom. Their efforts brought the relevant living space to ordinary people.

However, many changes have taken place nowadays. It becomes an era when most of population lives in urban areas so that urban problems increasingly become the problems which national government needs to deal with. Urban problems become serious ones beyond the capability of urban professionals.

Then what can be done for these problems? The answer is, in fact, not far away. It is to encourage citizens to take charge of their life in cities and deal with problems with urban professionals. Any urban issues such as housing, transportation, environment, safety, quality of life, and culture can be effectively dealt with through the active civil participation.

This proposition that both citizens and urban professionals collaborate to create humane urban environment turns out to be quite reasonable to us in a globalizing world. Increasing competition in this world, therefore, pays the special attention to the urban level rather than the national level. As a result, each city tries to carry out spatial restructuring and the hierarchical structure of cities becomes rapidly restructured. Globalization has brought about severe competition between cities. Only competent cities will survive and become affluent whereas weak ones perish.

Competitiveness can be maximized through slimming down and right-sizing of administrative organizations. Each individual of organization should maximize its capability while organization itself needs to be flexible. This requires a lot of hardworking and efforts. And this should be done because every inter-relationship is built on the competitiveness in the period of globalization and internationalization.

Global mobility by way of computers, satellites and networks has scaled down the spatial division of labor from the national level to the city level and then redefined the national position within the world system based on the inter-relationship between cities. The nexus of spatial units leads to severe process of competition, but also forms strategic and collaborative relations. Therefore, maintaining competitive collaboration system, it is necessary to strengthen city's competitiveness. Now it is time that both citizens and urban professionals collaborate to promote the general competitiveness in metropolitan regions whereas the specialized competitiveness in small and medium local cities.

References

Byung-Joon, Kim. et. al. *Let's Change Our Seoul This Way*. Bibong Publisher, 1995(in Korean).

Byung-Sun, Choi. "Half century of Korean urban planning." Seminar on Half Century of Korean Urban Planning, College of Environmental Studies, Seoul National University, 1986(in Korean).

CCEJ Urban Reform Center. *A City of Citizens*. Hanul, 1997(in Korean).

Chang-Soo, Lee. "Changes and tasks of our Capital Region policy." A paper presented at the Workshop on the Capital Region Policy, May 3, 1997, CCEJ(in Korean).

Elkin, T and Hillman, M. *Reviving the City*. Friends of the Earth, 1991.

Hee-Yun, Hwang. "Is it reasonable to relax land control under current financial crisis?" A paper presented at the Land Control Relaxation Committee, CCEJ Urban Reform Center, 1998(in Korean).

Inn, Kim. *Globalization and World City*. Center for Korean Regional Studies, Seoul National University, 1993(in Korean).

Jae-Sung, Cho. *On Urban Planning*. Pakyoungryul Publishing Inc., 1997(in Korean).

Jung-Jeon, Lee et al. *Fundamental Approach to Greenbelts Policy in Korea*. Civil Coalition for Greenbelts, 1998(in Korean).

Le Gates, R. T. and Stout, F. *The City Reader*. Routledge, 2000.

Moon-Hwan, Kim. *Cultural Economics*. Seoul National University Press, 1997(in Korean).

Myungrae, Cho. "Roles and tasks of civil movement in the period of local autonomy." *Urban Studies,* 3, Korean Center for Urban Studies, 1997(in Korean).

Sassen, S. *The Global City*. Princeton Univ. Press, 1991.
Seong-Kyu, Ha. "Housing rights and improving quality of life." A paper presented at the Symposium by People's Welfare Improvement Coalition, June 22, 1996(in Korean).
Soosam, Kim. "Improving urban safety for citizen." A paper presented at the CCEJ Founding Ceremony, June 28, 1998(in Korean).
Taejun, Kwon. "Cities in a globalizing era." The 3rd Urban Program Lecture, CCEJ, unpublished, 1998(in Korean).
Walter, B. and Arkin, L. *Sustainable Cities*. Eco-Home Media, 1992.
Yongwoo, Kwon and Lee, Jawon. "Residential mobility in the Seoul metropolitan region, Korea." *Geojournal,* 43(4), 1997: 389-395.
Yongwoo, Kwon. "Urban reform movement to improve the quality of citizen's life." *Economic Justice,* 31, CCEJ, 1996(in Korean).
Yongwoo, Kwon. "A declaration on the sustainable urban development and housing rights." *Professor Newspaper*, July 15, 1996(in Korean).
Yongwoo, Kwon. "Internationalization strategy centered on the city." *International Exchange*, Local Autonomy Internationalization Foundation, 1998: 21-25(in Korean).
Yongwoo, Kwon. *Interpreting the Seoul Metropolitan Region*. Bosunggak, 1999(in Korean).
Yongwoo, Kwon. et. al. *Understanding Cities*. 2nd Ed., Pakyoungsa. 2002(in Korean).

474쪽 백면

Contributors

Jeong-Sik Lee

Professor, Department of Urban Engineering, Anyang University.
Ph. D in Geography, University of Hawaii.
He served as President of the Korea Research Institute for Human Settlements (KRIHS) and Korea Section of Regional Science Association. He was a visiting scholar at McGill University, Montreal, Canada. Recent research works include 『Real Estate Reform Process in Post-Communist Countries』, 『New Directives for Land Policy of Korea』 and 『Urban and Regional System in Canada: The Case of Greater Montreal』.

Yang-Ho Park

Senior Research Fellow, KRIHS.
Ph.D. in City and Regional Planning, University of California - Berkeley.
He is currently Director of the National Territorial Planning & Environmental Research Division at KRIHS, and served as a senior advisor to the Minister of Construction and Transportation. Recent research works include 『The Fourth National Comprehensive Territorial Plan 2000～2020』, 『The Long-Term National Territorial Strategy for the 21st Century』 and 『Forecasting Territorial Evolution toward 2020』.

Won-Bae Kim

Senior Research Fellow, KRIHS.
Ph. D. in City and Regional Planning, University of Wisconsin - Madison.
He is currently Head of the Northeast Asian Research Team at KRIHS. Recent research works include 『Territorial Policies in Korea and Japan in an Era of International Cooperation』, 『Management Strategies for the Korean Peninsula in the 21st Country: A Geo-economic Perspective』, 『Restructuring Design for the Korean Peninsula in New Regional Economies of Northeast Asia』. He also edited two books; Culture and City in East Asia (1997, Oxford Univ. Press) and Asian NIEs and the Global Economy (1995, Johns Hopkins Univ. Press).

Jeong-Ho Kim

Visiting Professor, KDI School of Public Policy and Management.
Ph. D. in Urban Planning & Policy Analysis, University of Michigan - Ann Arbor.

He served as a director of various research divisions, including Land Policy, Transportation/Infrastructure and Construction Economics, and Housing. Before joining KRIHS, he worked for the city governments of San Francisco and Oakland. Some of his major research works recently completed include 『A Comprehensive Overview of Housing Policies』 and 『Changes in Construction Business Environment with OECD Membership』.

Kyu-Bang Lee

President, KRIHS.
Ph. D. in Economics, Ohio State University.
He served as Director of the Private Infrastructure Investment Center of Korea (PICKO) and Secretary to the President for Economic Affairs. His major research works include 『Mid-to-Long Term Plan for Private Participation in Infrastructure (PPI)』, 『International Joint Research Project: Model Transaction Development』, 『Strategic Issues on the Regional Development』, 『Improvement of Housing Policy in Korea』, 『A Study on the Mid-to-Long Term Infrastructure Investment Priority』, 『Long Term Development Direction of Construction Economics』, 『A Study on Efficient Distribution of Housing Financial Benefits』 and 『The Inducement and Enhancement of Private Investment』.

Sam Ock Park

Professor, Department of Geography, Seoul National University.
Ph. D. in Economic Geography, University of Georgia, USA.
He is currently serving as Chairperson of International Geographical Union Commission on the Dynamics of Economic Spaces, President of Korean Geographical Society, and Past President of Pacific Regional Science Conference Organization. Professor Park's recent research interests focus on industrial restructuring, regional innovation systems, E-commerce, and knowledge based economy in the Pacific Rim. His major publications include 『Modern Economic Geography』 and 『Asia Pacific Rim and Globalization』.

Sung-Woong Hong

President of Korea Remodeling Association.
Ph. D in Regional Science, Pennsylvania.
He served as Head Researcher of Regional Plan and Development Committee, lecturer in the Department of Regional Science, University of Pennsylvania, researcher of Argonne National Research Institute in USA, President of Construction & Economy Research Institute of Korea, and Professor of Hanyang University. His major research works include 『Global City in a Nation of Growth : A Case of Seoul』, 『Building a Power House』 and 『Problems of Infrastructure Development in Newly-developed Industrial Country』.

Dong-Ju Kim

Research Fellow, KRIHS.
Ph. D. in Regional Economics, University of Pennsylvania.

He is currently Head of the International Research Cooperation Committee at KRIHS. His recently published papers include 『Evaluation of the Socio-Economic Effects on the Concentration of Capital Region in Korea』, 『Development of Investment Promotion Areas for the Inducement of Foreign Direct Investment in Korea』 and 『Master Plan and Feasibility Study on the Incheon International Airport Region』.

Young-Sub Kwon

Research Fellow, KRIHS.
Ph. D. in Urban Administration, The University of Seoul.
Recent research works include 『Strategies for Enhancing Regional Innovation Capabilities in the Knowledge-Based Industry』, 『Model Technopark Project and Building the Regional Innovation System in Korea』, 『Industrial Agglomerations and Regional Clusters in Korea』 and 『Locational Characteristics of Knowledge-Based Industry and Policies for the Local Economic Development』.

Euijune Kim

Associate Professor, Department of Urban Engineering, Yonsei University.
Ph.D. in Regional Science, Cornell University, USA.
He served as an assistant at the Socio-Economic Research Institute, Cornell University and research fellow at KRIHS. He also serves as an evaluator of the Review and Evaluation Committee, MOCT, and guest research fellow of Construction & Economy Research Institute of Korea. Recently research works include 『Proper Scale Estimation of Construction Investment in Korea』 and 『Study on Economical Effect of Harbor Investments』.

Youn Hee Jeong

Researcher, KRIHS.
M. S. in Urban planning & Engineering, Yonsei University.
Major research projects and studies concerning urban planning and regional economics include 『Locational Characteristics and Local Industrial Linkage of Foreign Direct Investment Companies in Korea』 and 『Analysis of Source of Regional Income Inequality』.

Gyeong-Seok Kim

Senior Research Fellow, KRIHS.
Ph. D. in Engineering, Karlsruhe University, Germany.
He is currently serving as a professor at North Korea Graduate School in Kyungnam University, UN ESCAP Consultant, and advisory commissioner of National Policy Project in the Board of Audit and Inspection of Korea. Recent research works include 『Analysis on the Effects of Driver's Eye Movement to Driver's Driving Behavior』 and 『Analysis of Competitiveness for the Logistics of Port Cities in Northeast Asia』.

Won Kim

Honorary Professor, Department of Urban Engineering, The University of Seoul, Korea.
Ph. D. in Urban Planning, Columbia University, USA.
He is currently serving as Chairperson of Central Urban Planning Committee, Ministry of Construction and Transportation, and past president of Korea Planners Association. He recently published papers include 『Urban Administration Theory』, 『Urban Management Theory』, 『Direct ion for Techno-urban Construction』, 『Techno-science Park』, 『Study on National Territorial Development of North Korea』, and 『Socialism Urban Planning』.

Seungil Lee

Assistant Professor, Department of Urban Engineering, Seoul National University.
Ph. D. in urban and regional planning, University of Dortmund, Germany.
His Major research works include 『Umweltvertr?agliche Stadtentwicklung fur Gwangju. Dortmunder Beitr?age zur Raumplanung 94. IRPUD Dortmund 2001』, 『A Study on Sustainable Urban Forms for Enhancing Traffic Avoidance. Journal of the Korea Planners Association. Vol. 35 2000』, 『A Study on Methodology for Environmentally Sustainable Development at Urban-Fringe Area, The Korea Spatial Planning Review Vol. 35 2002』, and 『A Study on Forecast of Road Traffic Noise Impacts in Central City Area. Journal of the Korea Planners Association. Vol. 38 No. 3 2003』.

Seong-Kyu Ha

Professor, Urban Planning and Housing Policy in the Department of Urban and Regional Planning, Chung-Ang University.
Ph. D. in Urban and Regional Planning, University of London.
He is currently serving as Dean of the Graduate School of Social Development associated with Chung-Ang University and President of the Korea Regional Development Association. Recent Research works include 『Housing Policy』, 『Urban Management』, 『Housing Policy and Practice in Asia』, and 『Housing and Urban Development Problems in Korea and Elsewhere in Asia』.

Woo Jong Lee

Professor, Department of Urban Planning, Kyungwon University.
Ph. D. in Urban Planning, Seoul National University.
He is currently serving as Dean of College of Engineering, Kyungwon University, member of Board of Senior Directors of the Korea Planners Association and chief editor of its Journal. He also served as a post-doctoral fellow at the Center for Urban Studies, Portland State University and visiting scholar at the Graduate School of Design, Harvard University. He served as a member of the Central Urban Planning Committee of the Ministry of Construction and Transportation. Recent research works include 『Introduction to Urban Planning History』, 『Theory of Urban Planning』, 『Planning and Management of Cities』 and 『Urban Land Use Planning』.

Hyun-Sik Kim

Senior Research Fellow, KRIHS.

Ph. D. in Urban Planning, Princeton University.

He is currently Director of the Urban & Regional Planning Research Division at KRIHS and member of the Central Urban Planning Commission of the Ministry of Construction and Transportation. He was an assistant professor of Urban Studies at the University of Maryland, College Park from 1981 to 1985. Recent research works include 『Metropolitan Planning and Management: With Special Emphasis on Area-Wide Urban Services in the Seoul Metropolitan Area』and 『Regulatory Reform in the Administration of Construction and Transportation』.

Hyun-Soo Kang

Assistant Professor, Department of Urban Engineering, Joongbu University.

Ph. D. in Environment, Seoul National University. Completion of Oxford University Post-Doctoral Program.

He was a visiting professor in Oxford University. His recent research focus on Urban Planning, Regional Development and Economic Geography. Recent research works include 『Impacts of Cyberspace on Social Transformation: Focus on the Possibility of Virtual Urban Communities』, 『Urban Region and Society』, and 『Spatial Policy Economics-research for Modern City and Region』.

Myeong-Soo Kim

Research Fellow, KRIHS

Ph. D. in Economics, Pennsylvania State University

He is currently serving as a member of Regulation Judgment Committee in the Ministry of Construction and Transportation. He participated in 『Task Force for Deregulation』 and 『Task Force for Efficient Execution of Public Projects』 in the Ministry of Construction and Transportation. He is currently serving as a member of Regulation Judgment Committee in the Ministry of Construction and Transportation.

Jae-Gil Park

Research Fellow, KRIHS.

Ph. D. in Urban Planning, Tokyo University

He served as a committee member of the Gwacheon Urban Planning Commission.

Major research projects and studies concerning urban planning and development include 『Restructuring of Zoning System for Urban Land Use Control』, 『Dongbaek (Yongin-si) New Town Development Plan』, 『Improvement of the Statutory Urban Planning and Development System』 and 『Cheonan New Town Development Plan』.

Hee-Yun Hwang

Professor, Urban Planning in the Department of Urban Engineering, Chungbuk National University.
Ph. D. in Urban Planning, Seoul National University.
He is currently serving as Chairperson of the Strategy Planning Board at Chungbuk National University. His recently published books include 『New Paradigm for Urban Planning』 and 『Urban Ecology and Urban Spatial Structure』.

Byungseol Byun

Professor, Department of Urban Engineering, Chung-Ang University.
Ph. D. in USA City and Regional Planning, University of Pennsylvania.
He is currently serving as a research fellow of the Korea Environment Institute and member of Editorial Committee of Korea Planners Association and served as a lecturer of University of Pennsylvania. Recently research works include 『Understanding Environment Planning』 and 『Urban Ecology and Spatial Structure』.

Soon-Tak Suh

Assistance Professor, Department of Urban Administration, The University of Seoul.
Ph. D. in Urban Planning and Policy, Newcastle University.
He served as a research fellow at KRIHS and Advisory Commissioner at the Board Audit and Inspection of Korea. His recent research interests focus on the regional development and land policies. Recent Research works include 『Comprehension of New Territorial and Urban Planning System』, 『Collaborative Urban Planning』, and 『Institutional Development Plan for Balanced Regional Development』.

Patsy Healey

Professor, Newcastle University and Chief Editor of Planning Theory and Practice.
Ph. D. in London School of Economics.
He served as Professor of Newcastle University, Director of Centre for Research in European Urban Environments, and President of Association of European Schools of Planning. His recently published papers include 『Collaborative Planning, 1997, Macmillan』, 『Communicative Turn in Planning Theory and its Implication for Spatial Strategy-making』, and 『Environment and Planning B, Vol 23』.

Joong-Seok Ryu

Professor, Department of City Engineering, Chung-Ang University.
Ph. D. in Architecture, Sheffield University, United Kingdom.
He served as a research fellow at KRIHS. His recent research focuses on Computer Application for the part of Urban Planning and Urban Designing. Recent research works include 『The Overall Research on Middle Remote Mountain Region in Jeju-do』 and 『A Study on the Possibility and Limitation of Urban Design by New Urbanism』.

Yongwoo Kwon

Professor, Department of Geography, Sungshin Women's University.
Ph. D. in Geography, Seoul National University.
He is currently serving as Chairperson of Korean Association of Geographic Education, member of Committee of Central Urban Planning in the Ministry of Construction and Transportation, and President of Urban Reform Center in Citizens' Coalition for Economic Justice. He also served as a visiting professor in the Department of Geography in University of Minnesota. Recently research works include 『Interpreting the Seoul Metropolitan Area』, 『Suburbs in the Seoul Metropolitan Area』, and 『Spatial Structure of the Seoul Metropolitan Area』.