

3. In Search of Sustainable Urban Form for Seoul

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3.1 Introduction

The global urban population is currently increasing by about 65 million a year, a number roughly equivalent to the total population of France. The growth of megacities and of megacity regions poses a great challenge to sustainable development and the environmental, economic, and social stability of nations and the world.

Although urban processes in major regions of the world are superficially similar, sustainable urban development approaches must take into account differences in the level of urbanization and in urban patterns, which are highly culture-bounded. In this regard, many theoretical and cross-cultural approaches to sustainable urban form have been suggested and debated since the 1990s (Breheny 1992; Jenks 1996, 2000, 2005; Jenks and Burgess 2000; Sorensen et al. 2004; Williams et al. 2000). Cautious conclusions have been drawn that there is no universal paradigm for sustainable urban form.

Korea's experience in shaping its capital region's metropolitan form provides some lessons, as this metropolitan area has tested three major policies germane to the discussion of sustainable urban form worldwide: a greenbelt, inner-city renewal, and planned outward development. These three policies have transformed Seoul's metropolitan form, channeling countless individual developments into the current shape, pattern, and structure of the Seoul metropolitan area (SMR) (Fig. 3-1).

This chapter reviews how these policies came about and how they have influenced the SMR's urban form. Particular attention is given to sustainability issues related to these policies, the resulting urban form, and lessons from Seoul's unique experience.

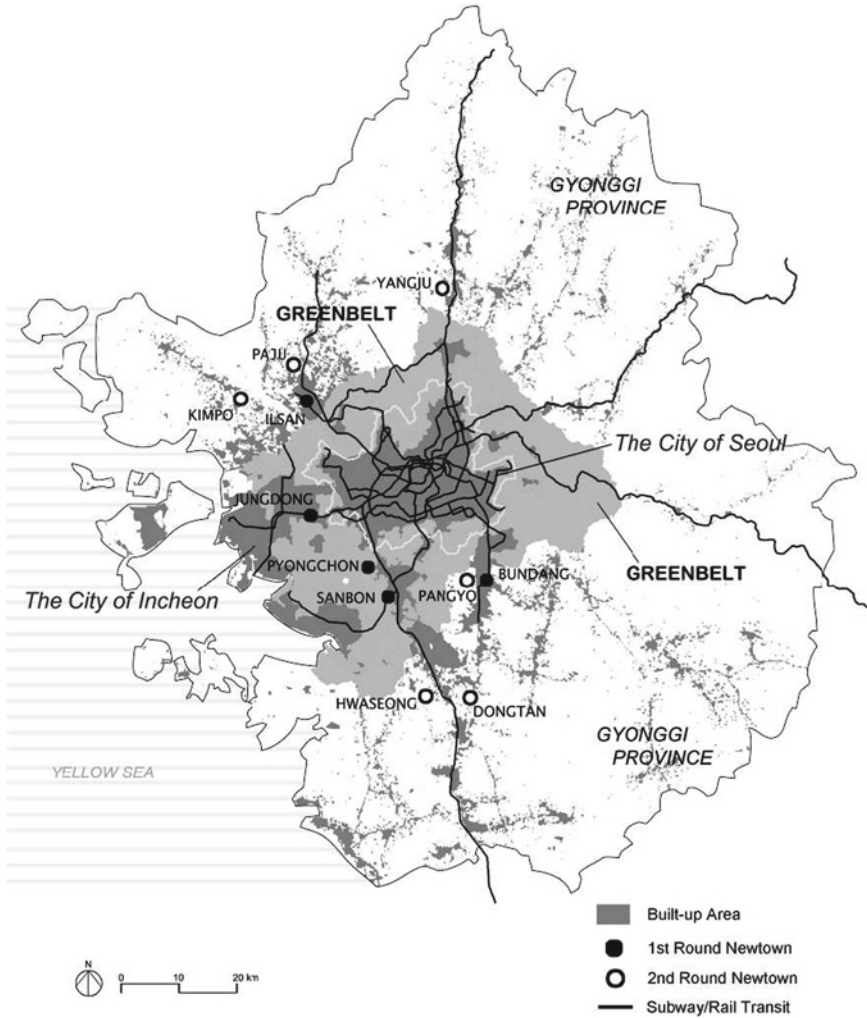


Fig. 3-1. The metropolitan form of SMR – the built-up area, greenbelt and new towns

3.2 Evolution of the Metropolitan Urban Form of Seoul

The Seoul Metropolitan Region (SMR) includes the cities of Seoul and Incheon and the province of Gyeonggi. Seoul is the capital of South Korea and the central city of SMR. Incheon is an independent city to the west of Seoul with a population of more than two million people. Gyeonggi Province surrounds Seoul and Incheon with its own cities, towns, and rural jurisdictions.

The SMR has gone through a period of rapid growth over the past 50 years, experiencing a population increase from 3.2 million in 1960 to 11.9 million in 1980 and 23.8 million in 2005, or 48.3% of the national population. The city of Seoul alone has grown from 2.4 million in 1960 to 10.3 million in 2005, and is one of the 25 world megacities of more than ten million inhabitants. The explosive growth of SMR has coincided with equally rapid economic growth and urbanization at the national level.

Seoul's suburbanization is a late twentieth-century phenomenon. In the 1960s and 1970s, the city government of Seoul laid out massive subdivisions around the traditional city center. Middle-class people left the ill-planned city center to move to this suburban area, including Gangnam south of the Han River, which offered modern houses and infrastructure and a homogeneous social milieu (Lee 2003). This grid-patterned, plot-division-led expansion took place within the city limits of 605 km². Since then, however, Seoul has undergone a unique metropolitanization process to become one of the world's largest urban agglomerations (Fig. 3-2).

Along with the first suburban wave, the city adopted a greenbelt policy in 1971 based on the greenbelts in the UK. Encircling Seoul's boundary at a distance of 15 km from the city core, the greenbelt has had a profound impact on the subsequent metropolitan growth of Seoul (Choe 2004a, b). It was intended to prevent urban sprawl, to protect the agricultural land around the city, and to preserve the natural environment.

During the 1970s, much of Seoul's growth was contained inside the greenbelt, although the city's population rose from five million in 1971 to eight million in 1980. The 1980s saw a second wave of suburbanization beyond the greenbelt, which was due to the enlarged network of roadways and to increasing automobile ownership. As vacant land in Seoul was used up during the 1980s, development pressure jumped over the greenbelt and urban growth continued throughout the SMR as a whole.

Outlying areas within commuting distance from Seoul began to exhibit a high rate of growth, as population and economic activities moved out from the saturated central city (Kim and Jung 2001). This time, suburban development extended as far as 25 km from the city core. It was at this same time, however, that residential renewal began to surge inside the greenbelt.

Although the dual process of inner renewal and outer expansion was largely a market-led process, two public policies deserves much credit in shaping market forces into a particular metropolitan form. Inside the greenbelt (that is, within the inner city of Seoul), the renewal policy of the City of Seoul governed changes in density, development patterns, and the formal character of a ten-million-person megacity. Outside the

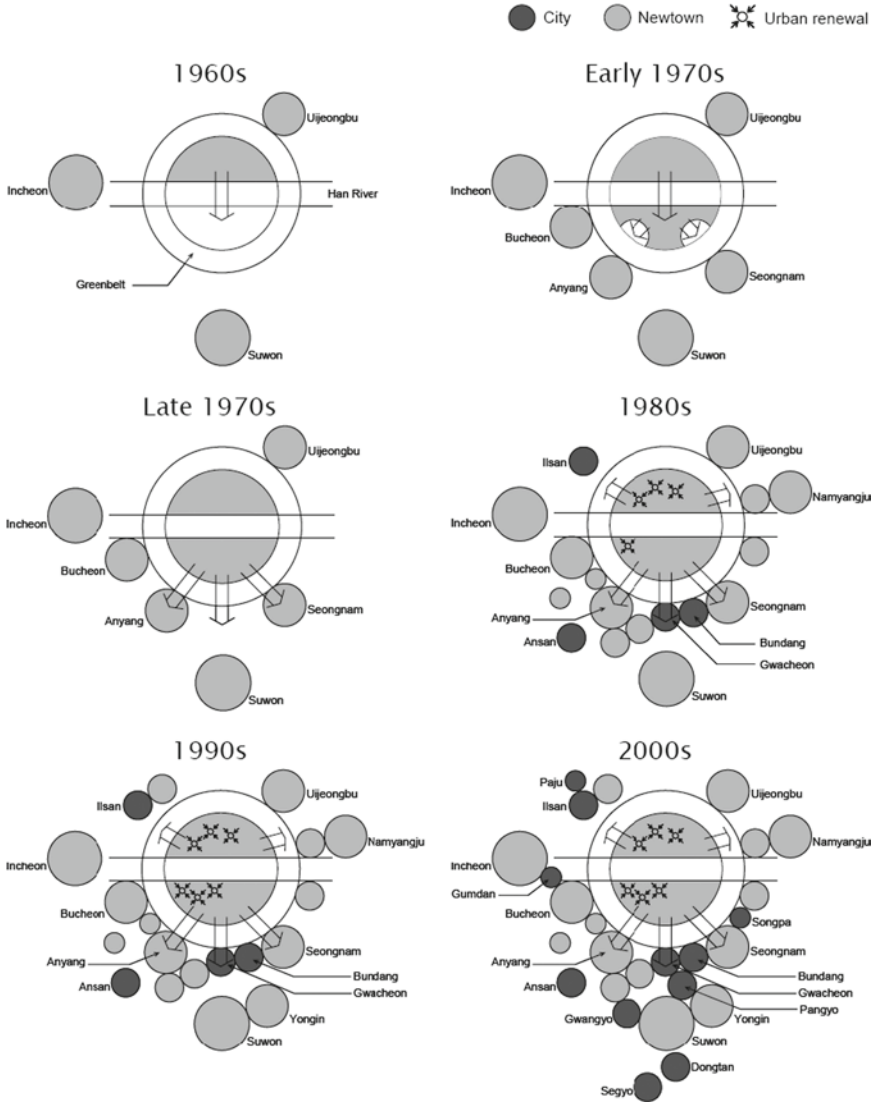


Fig. 3-2. Diagrammatic illustration of inner compaction and outer expansion of Seoul metropolitan region: 1960s–2000s

greenbelt, the new town policy of the central government accelerated new waves of the metropolitanization of Seoul.

By 2000, Seoul’s metropolitan form had been much extended, while population growth in the center city of Seoul had leveled off. The Seoul

Development Institute estimated that the built-up area of Seoul metropolitan area grew 1.5 times, from 778 km² in 1985 to 1,173 km² in 1998, consuming an equivalent amount of green and open spaces (Kim and Jung 2001). The force propelling densification of the inner city and suburbanization outside the city was housing construction. During the 20-year period of the 1980s and 1990s, a total of 2.9 million housing units were built. Of those units, 1.5 million were government projects. What follows is a detailed discussion of three major policies that created the current urban form of SMR.

3.2.1 The Greenbelt

The greenbelt was a central government policy in that it represented a national defense initiative. It was created not only to contain urban expansion but also to protect the city from North Korean artillery attack. Yet, in urban planning terms, the main objectives in introducing the greenbelt were to prevent urban sprawl, to protect agricultural land, and to preserve the natural environment. Searching for a planning tool to meet all three objectives, the Korean government examined the UK's greenbelt policy in 1971. A greenbelt policy had been tried in Japan in the late 1960s, but had failed because of strong opposition from residents and landowners. Given Korea's dictatorial regime, however, the government was able to impose this policy and a greenbelt ranging from 10 to 20 km wide was hastily designated around Seoul, known as the Seoul Metropolitan Greenbelt.

However, Korea's greenbelt policy has not very successful in containing urban sprawl around Seoul, and has resulted in distortions of urban growth patterns. As Tankel (1963) has observed, the greenbelt was about as useful in containing urban sprawl as a leather belt is useful in curbing obesity. The preservation of open space can influence urban form, but not the density of development. This is exactly what has happened in Korea.

In designating the greenbelt around Seoul, the government felt that urban sprawl would be contained as long as vacant land remained in Seoul for urban uses. However, the greenbelt resulted in the densification of the inner city and unplanned development beyond the greenbelt. Over time, the density differential inside and outside the greenbelt has equalized (Choe 2004a, b). Some areas outside the greenbelt have been developed at even higher densities than parts of the inner city. Some of the densest areas in the region are those adjacent to the greenbelt, as people take advantage of the free amenity the greenbelt offers.

In spite of the failure of the greenbelt to contain urban sprawl, Korea's greenbelt policy has had two positive outcomes. First, it has ensured the intensification of the inner city and promoted the creation of compact satellite towns within commuting distance of the city. Satellite towns tend to cluster as close as possible to the greenbelt to offer greater accessibility to the central city. The greenbelt has thus contributed to more compact development of the metropolitan area as a whole.

Second, the key goal of the greenbelt policy has changed from "belt" to "green." Along with an increasing awareness of environmental problems and the limits of conventional planning tools to bring about sustainable urban development, planners since the 1980s have worked to redefine the objectives and uses of greenbelts. During a debate at the Royal Town Planning Institute in 1993, several prominent UK planners criticized the indiscriminate use of greenbelts in containing urban sprawl. They suggested that greenbelt policies could also, by creating more contained forms of development, promote more sustained patterns of urban growth.

In 1995, the revision of Planning Policy Guidance Note 2 in the UK suggested that greenbelts had a positive role in fulfilling the following objectives (Steeley and Gibson 1998):

1. To provide opportunities for access to the open countryside for the urban population
2. To provide opportunities for outdoor sport and outdoor recreation near urban areas
3. To retain attractive landscapes, and enhance landscapes, near to where people live
4. To improve damaged and derelict land around towns
5. To secure nature conservation interests
6. To retain land in agricultural, forestry, and related uses

Given the changing objectives of the British greenbelt policies and the evolving urban growth management practices, including New Urbanism, in the US, planners are redefining the objectives and practical applications of greenbelts. After a half-century's indulgence in unbounded low-density sprawl, urban growth boundaries have been introduced in several states and local jurisdictions in the US.

The consequences of Korea's 30-year experiment with British greenbelt policy are still unclear. While Korea's metropolitan greenbelt has not curbed urban expansion, the introduction of the greenbelt was the most important determinant in shaping the current urban form of the SMR, resulting in the densification of the inner city and the concentrated nuclear development of new towns beyond the greenbelt. It has at least checked

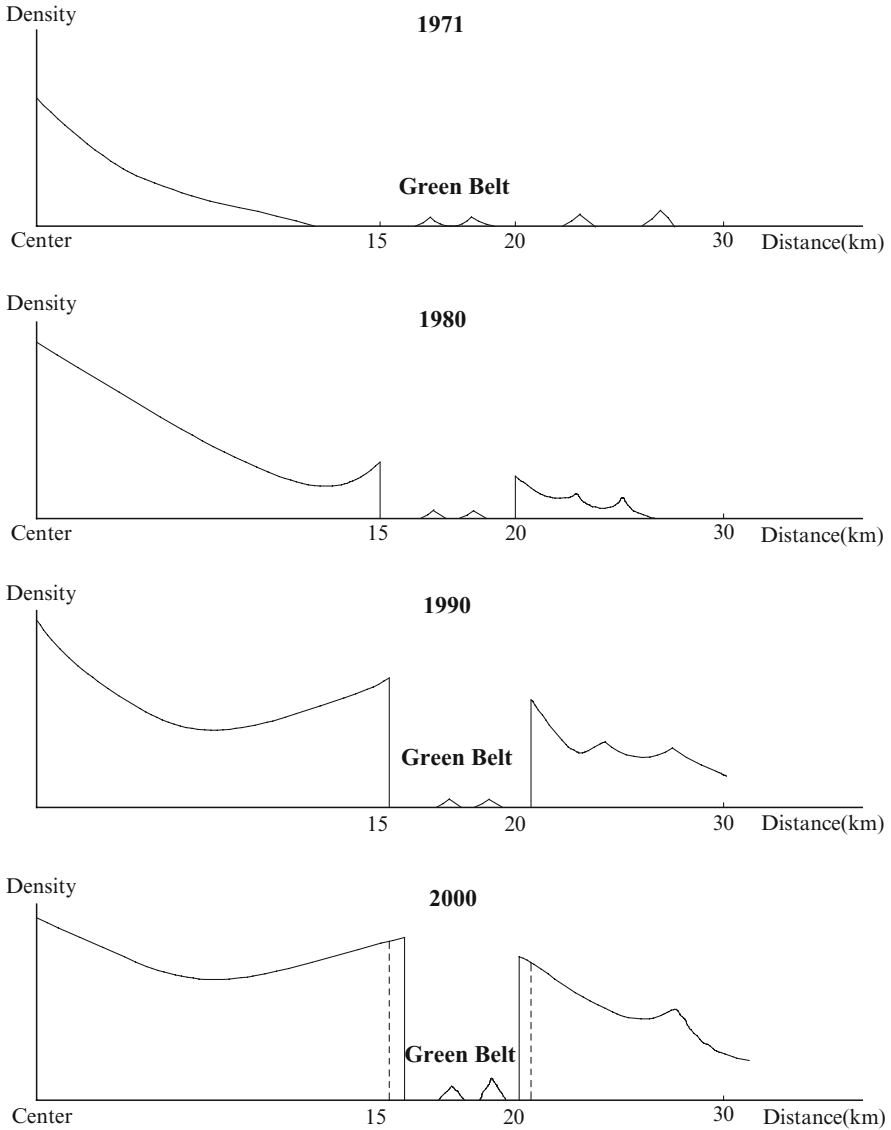


Fig. 3-3. Changing density gradients in Seoul metropolitan region (Source: Choe 2004a)

unbounded low-density urban sprawl and has secured green and open spaces accessible to the urban population, acting as an “urban lung” to mitigate air pollution and providing a reserve of land for future urban growth (Fig. 3-3).

3.2.2 Inner City Renewal

While urbanization beyond the greenbelt extended Seoul's built-up area to 30 km from the city center, extensive redevelopment took place inside the greenbelt through the late 1980s to the 1990s. Both private- and public-sector residential renewal projects raised density in the center city, making Seoul a forest of apartment buildings (Kim 2004b). The process replaced Seoul's old form, which had developed in the 1960s and 1970s, mainly through two public residential renewal policies known as Jae-Gae-Bal (JGB: replacing deteriorated houses with high-rise apartments) and Jae-Gun-Chuk (JGC: replacing low-rise apartments with high-rise apartments) (Fig. 3-4).

JGB was originally conceived as squatter clearance program in the 1960s and evolved into a general approach to renewing substandard housing. It galvanized redevelopment in the middle of the 1980s because of its profit-making development formula. The City permitted high density, landowners provided the sites, and construction companies carried out the renewal process, from demolition to apartment construction. In return, landowners were rewarded by the creation of new apartment units and construction companies profited from selling the extra units in the market. High-density development benefited both landowners and construction companies during a time of chronic housing shortages.



Fig. 3-4. Example of inner city renewal: residential redevelopment sites are shown with the existing low-rise area

JGC employed the same development method as JGB. These residential renewal programs were applied to 415 districts, where about 180,000 housing units were constructed during the 1990s. They accounted for almost half of Seoul's new housing supply in that period, absorbing enormous housing demand from the rapidly growing middle class. Seoul grew from five million people in 1970 to ten million in 1990, while Korea managed one of the fastest-growing economies.

Even more aggressive renewal policies were implemented in the late 1990s. The steep increase in housing prices in the affluent Gangnam area south of the Han River caused a sense of relative deprivation among lower-income residents, mainly in the Gangbuk area north of the Han River. While the central government relaunched its new town program to respond to this problem, the Seoul city government carried out a radical renewal of the Gangbuk area. The renewal area was very large and included multiple residential sites. In undertaking active clearance and infrastructure provision, the city hoped that the Gangbuk area would be renewed and that property values would increase.

The City of Seoul named these large-scale urban renewal schemes within the existing city the "New Town Policy." The name could be confused with the outer new town policy of the central government, so here it will be referred to as "new town in town" (NIT). Between 2002 and 2005, there were three rounds of NIT designation. In 2002, three demonstration NIT districts were designated. Even before these demonstration projects were launched, 12 NITs were designated in 2003, followed by 11 more in 2005. Policy-makers and property owners alike supported this bold move in the belief that complete renewal of their neighborhood would ensure a balance between Gangbuk and Gangnam and increase property values. In the planning community, some argued that this inner-city intensification was superior to the outer new town policy of the central government because it promoted a compact city, environmental sustainability, and smart growth.

NIT is a redevelopment scheme. Two-thirds of the designated areas was to be cleared and redeveloped. The existing JGB and JGC methods have been applied, in that individual building activities are prohibited for the sake of collective joint renewal. It is noteworthy, however, that NIT plans on average do not increase the population of an area, and therefore do not bring about an increase in population density. NIT is primarily intended to improve the physical condition of the area. Moreover, NIT areas are low-income neighborhoods in which most residents are tenants who occupy small, closely spaced rental units, yielding high population or household densities with relatively low floor-area density. Since NIT plans accommodate the equivalent number of people and households, they lead to a significant increase in floor-area density, i.e. larger housing units.

Table 3-1. Aggregated changes in ten selected NIT (new town in town) projects in Seoul

	Existing	Planned	Change
Area (ha) – A	646	646	No change
Population – B	273,070	271,850	-1,220
Household	109,630	106,950	-2,680
Population density (B/A)	422	420	-2
Residential land (ha)	414	371	-43
Commercial land (ha)	44	63	19
Business land (ha)	139	167	28
Ratio of road (%)	15.7	13.9	-1.8
Ratio of park (%)	2.0	6.6	4.4
Ratio of school site (%)	0.9	7.3	6.4

Source: Assembled from Seoul Metropolitan Government website information

As seen in Table 3-1, NITs accommodate approximately the same number of people and households while providing more open space, public facilities, and commercial uses by reducing the footprint of residential land uses and reducing the space used for roads. Without exception, two-to-five-story buildings are replaced by apartment buildings of 20 or more stories with outdoor open spaces. The existing fine street networks are replaced by wider superblock roads. The significant increase of commercial and business land use implies that NITs seek a mixed land use, although the existing residential land uses are already highly mixed. The plans for each NIT employs such sustainable elements as pedestrian amenities, bikeways, green corridors, and eco-friendly materials, among others. Although the total population remains virtually the same, the population density in some areas is as high as 400 persons per hectare.

Features such as high population densities, inner-city revitalization, mixed land uses, walkable communities, and environment-friendly design align with current theories of the compact city and sustainable planning and design. At the same time, however, NITs represent a form of gentrification. Among the existing households, more than 60% are tenants. After renewal is complete, public rental housing units will be available to only 35% of them, as the current law requires. Further, the realization of these projects relies on market mechanisms.

NIT policy depended on a national law that promoted urban clearance through the relaxation of development controls and the provision of financial subsidies. In the Special Promotion Law for Urban Renewal, the national law enacted in 2005 to support NIT policy, deregulation was more highlighted than public resource commitment.

3.2.3 Suburban New Town Development

Government-initiated new towns are not new in the history of Seoul. Seoul itself was a new town built in the fourteenth century, and in the 1980s the inner area of Seoul grew through the development of further new towns. Gaepo (936 ha), Goduck (335 ha), Mokdong (430 ha), and Sanggye (330 ha) were planned new towns inside the greenbelt, each accommodating 80,000–170,000 people. These huge apartment towns were previously outlying agricultural fields or forests between 10 and 16 km from the city center. Housing supply was the main impetus behind this planned urban expansion within the city boundary. They were called “new city areas,” meaning newly built-up areas, rather than “new towns.”

The *bona fide* new towns, in name as well as suburban location, came in the late 1980s. In 1987, the housing supply ratio (the ratio of housing units to households) in Seoul was 50.6–100 and the number of households was growing faster than the population, causing severe housing shortages. At the same time, private money accumulated by a growing economy generated uncontrollable speculative home buying. In a hurried response, the central government, while encouraging aggressive inner-city renewal in central Seoul, also constructed the first five new towns, intending to boost the housing supply quickly and reinvigorate the slumping domestic economy (Ahn and Ohn 2001). Thus the impetus of the new town policy was both economic and political.

These new towns were master-planned. Each one ranged from 160,000 to almost 400,000 inhabitants. Most housing was in the form of high-rise apartments. As Table 3-2 shows, the gross population density of new towns ranged from 19,700 to 39,600 persons per square kilometer, higher than the density of the City of Seoul (16,364 person per square kilometers). New town building in Seoul’s outlying area occurred at a distance of 20–25 km from the city core of Seoul. New towns are either beyond or inside the greenbelt (Fig. 3-1). Often linked by transit lines to the center of Seoul, car dependency is lower than 40%, although the commuting time is about 1 h.

These five new towns provided 293,000 new housing units for 1.2 million residents in less than 7 years, or as much as 20% of Seoul’s total housing stock. This massive housing supply stabilized housing prices: the 32% annual increase in 1990 fell to 0.7% in 1995. Despite this dramatic effect, the new towns faced heavy criticism soon after their construction. The most common complaint was the lack of self-sufficiency. As most people commuted to central Seoul, traffic congestion became a serious problem. Furthermore, new town brought haphazard developments caused by land speculation around them.

Table 3-2. Selected suburban new towns in the Seoul metropolitan region

	Distance from centre (km)	Area (ha)	Pop. (000s)	Density (pop/ha)	Residential FAR (%)	Rail transit	Work in Seoul (%)	Car use (%)
<i>First round new towns</i>								
Bundang	20	1,964	390	197	184	Linked	53.1	36.3
Ilisan	20	1,574	276	174	169	Linked	41.2	38.6
Pyongchon	20	511	168	327	204	Linked	46.6	NA
Sanbon	25	420	168	396	205	Linked	52.2	NA
Jungdong	25	545	166	301	225	Linked	23.9	NA
<i>Second round new towns (under construction or planned)</i>								
Pangyo	20	931	80	86	161	Linked	NA	NA
Hwaseong	35	904	121	134	173	No	NA	NA
Kimpo	30	1,185	154	130	170	No	NA	NA
Paju	25	941	125	133	174	No	NA	NA
Yangju	30	611	79	130	165	No	NA	NA
Dongtan	40	904	121	134	80-220	No	NA	NA

Source: Adapted from Kim (2007)



Fig. 3-5. Example of suburban sprawl in Yongin area: individual apartment construction encroaching green spaces

Given these problems in the early stage of new town development, the government suspended its new town policy and allowed small-scale housing estate development and individual development (Fig. 3-5). However, the problems of new towns have only been aggravated, as new development has proliferated without adequate infrastructure. In 1997, the government turned to a “mini-new-town” policy whereby smaller new towns were developed in outlying areas beyond the greenbelt. In the Seoul metropolitan area, 2,580 a were devoted to mini-new-town development after 1998. The chief purpose of this policy was to supply housing sites. However, the mini-new-town policy was not considered a viable alternative to larger new towns: the towns were too small to support transit lines or to be economically self-sufficient.

These problems led to the introduction of a new urban-rural unitary planning system through the enactment of the National Land Use and Planning Law, which involves a new land use control system based on the catchphrase of “no plan, no development” (Choe 2004a, b).

On the other hand, over time, the five new towns have shown an increasing degree of self-sufficiency as their commercial, business, and educational facilities are developed (Fig. 3-6). The general consensus is that self-sufficiency does not come overnight and the new towns were far better



Fig. 3-6. Planned new town Bundang: neighborhood commercial establishments in front of a subway station

than unplanned or sporadic development. Their contribution to the stabilization of housing price was also acknowledged. As housing prices skyrocketed again in the late 1990s, the central government turned again to a large-scale new town policy, while the city of Seoul adopted its NIT policy.

In 2001, the second round of new town construction was announced: six more large-scale new towns were to be built within 5 or 6 years (Table 3-2). These new towns are farther outside the greenbelt, between 30 and 40 km from Seoul city center. These extended locations have benefited from the newly built Capital Region Second Ring Highway. Reflecting an increased personal income level of over \$10,000 and increased homeownership (82% in the SMR), these new towns offer lower densities and more open spaces than the first round of new towns.

The second round of new towns was subject to Planning and Design Standards for New Towns, drafted by the central government. This new town development standard was devised in 2004 in an effort to improve the proposed new towns compared to those in the first round. Interestingly, the standard calls for the environmental, social, and economic sustainability of the new towns. It applies to sites of larger than 330 ha and its criteria includes social mix, self-sufficiency, optimal density, transit use, energy

saving, ecological awareness, traffic calming, urban forestry, barrier-free environments, and compact development, among others. Using these guidelines and requirements, the second-round new towns employed various sustainable concepts such as extensive bikeways, public transit, storm water reuse, eco-friendly sewage treatment, minimum 20% green space, and commercial and business centers for self-sufficiency. While supporting the compact city model, however, the guidelines state that the site should not exceed medium density, that is, no more than 150 people per hectare. The second-round new towns fit these criteria with an average of 130 people per hectare, while first-round new towns have 175–400 people per hectare.

Despite the inclusion of elements of sustainability in their plans, the assessment has yet to come, as these new towns are still under construction. Their location, 40 km away from the Seoul's city center, was based on the research finding that commuting to Seoul sharply decreased at this distance, and thus, if the new towns offered sufficient business opportunities, they would be self-sufficient. However, since these new towns rely on the outer ring highway of the SMR, their commuting and traffic patterns remain to be seen.

Some of the new towns are already visible. Closely clustered 30-to-40-story apartment buildings rise in the middle of rice fields with a backdrop of distant mountain ranges. The interim assessment of the Korean Planners Association is that they represent a high-quality living environment and sustainable design (Kim 2007). Yet these new towns are deemed unduly concentrated along the corridor of the Kyungbu Express Highway, which is likely to cause traffic congestion. Also, the landowners received high levels of compensation from the government for land for these massive new towns. Unbridled, small-scale individual developments proliferating around new towns may be a further unintended negative effect (Fig. 3-5). Finally, many people believe that the development of outlying new towns causes the decline of the inner city. Considerable debate still swirls around the new towns.

These three policies – the greenbelt, inner-city renewal, and outer new town development – explain to some extent how and why Seoul's metropolitan region has taken the form it has and provide grounds for debate on sustainable metropolitan areas. Seoul's urban form, of course, is not shaped by these three policies alone. Other land use controls, topographical constraints, land availability, and the government system have also played roles in the evolution of the SMR. The outcome of these forces is a metropolitan region that is dense, discontinuous, heterogeneous, and amorphous, and presents some issues of sustainable urban form.

3.3 Seoul's Metropolitan Form and Sustainability Issues

From a satellite image, the impact of the greenbelt and topography is evident in Seoul's overall metropolitan form. The encircling greenbelt separates the dense center city of Seoul from outer new towns and other urbanized areas. Urban expansion follows a linear pattern along the topographically constrained corridors to the north, east, and south. To the west, the region is open to the Yellow Sea and allows a coalescence of the cities of Incheon and Seoul along the Kyung-In corridor.

To the naked eye, the SMR defies the classic notion of a density gradient, which assumes declining density with distance from the city center. Dense developments and tall buildings are found throughout the entire metropolitan region, both inside and outside the greenbelt.

The greenbelt, inner-city renewal, and outer new town development have been the main public policies that have shaped the SMR. Whether the resulting form is sustainable is hard to say, either because there is little consensus on how to gauge the sustainability of a particular urban form or because no comprehensive and reliable data is available for the assessment. Some exploratory and comparative discussion may serve as a useful examination for the time being.

3.3.1 Compactness: Population Density Vs. Building Density

Compactness has multiple dimensions. It relates to the degree of population density, morphological agglomeration, and building accumulation. It can be examined at the scale of the metropolitan region, the city, the district, or the block.

In terms of population density, Seoul is one of the most compact center cities as well as most compact metropolitan areas in the world. Based on available 1999 and 2000 data, Kim et al. (2002) compare the population density of selected world megacities: Seoul at 16,364 persons per square kilometers is more dense than Tokyo's 23 urban districts (13,092 persons per kilometer), New York's five boroughs (9,721), or London's 32 boroughs (4,671). When it comes to built-up area density (or net density), Seoul is distinct from other cities, because 40% of the land within the city boundary is not built up, therefore the net density is approximately 27,000 person per square kilometers.

At the metropolitan level, the gross density (metropolitan population relative to metropolitan area) requires careful interpretation, as each urban region has unique boundaries. Hence the population density of the built-up area (net population density) provides useful information on the compactness

of the metropolitan area. An estimate based on satellite images of the built-up area shows Seoul's net metropolitan population density is 21,500 persons per square kilometer (Kim et al. 2002). Using the same approach, Tokyo's net metropolitan density yields 31,152 persons per square kilometers, Beijing 16,345, and Paris 5,925. At the metropolitan level, Tokyo seems to offer the densest form of metropolitan living. Nonetheless, it is clear that Seoul is one of the densest megacities of the world.

Seoul provides a unique example of a compact city. While the Western notion of compact city largely means an increase in population density, Seoul has followed policies that increase physical compactness, as evidenced in inner-city renewal projects. Indeed, at the block level, Seoul's building density in the central business district is no higher than that of many Western megacities. For example, downtown Seoul averages about 3.0 FAR, while New York's Manhattan exceeds 10.0 FAR and Paris has 5.0 FAR (Kim 2004a). Seoul's recent downtown renewal projects are intended to achieve 10.0 FAR. At the same time, Seoul has residential densities of 1.5 FAR on average and allows new apartment development as high as 2.5 FAR – a much higher level of residential density than that found in Western cities.

These different density dimensions have complicated compact city discussions in Korea's planning community, since neither advocates nor opponents have made this crucial distinction. Given the initial low-density development of the inner-city area, Seoul needed to develop a more compact physical form. However, it is debatable whether Seoul should be more compact in terms of population density.

While dense living provides a number of benefits associated with theories of sustainable development, negative impacts are also in evidence, such as overcrowding, traffic congestion, bad air quality, noise, and soaring housing prices. As Richardson et al. (2000) point out, these problems might not be entirely a direct consequences of high density. It is undeniable, however, that density makes a difference to the quality of space. Indeed, some economists have argued that the greenbelt contributed to oversaturation of the inner city, causing unduly high land prices and housing costs (Kim 1998). And as in Hong Kong, excessive high-rise and high-density development is viewed as a cause of environmental degradation (Zhang 2000).

3.3.2 Morphological Dimensions

Another dimension of sustainable urban form is the shape of the city. The same population or building floor space can be accommodated in many different shapes. All kinds of city shapes have appeared in urban history

such as rectangular, circular, linear, or star (Duany et al. 2003). Each shape is associated with different performance dimensions in energy consumption, social interaction, and land use efficiency. Morphological dimensions can thus be crucial in achieving sustainable form.

As seen in Fig. 3-1, Seoul's metropolitan form takes the shape of a jellyfish: the densely patterned and agglomerated inner city is attached to several linear corridors along narrow valleys radiating out from the city, linked by either radial or circular highways. Seoul's mountainous topography presents constraints on urban expansion. Indeed, most of greenbelt area comprises mountain slopes not suitable for urban expansion.

Size and connection are also important aspects of sustainable urban form. With a relative short history of urban growth and suburbanization, Seoul's metropolitan built form is smaller than that of, for example, Tokyo or Paris. One estimate (Kim et al. 2002) shows that the built-up area of Seoul metropolitan area is 990 km², smaller than Tokyo's 1,076 and Paris's 1,848. In addition, the SMR's 990-km² built-up area is less contiguous than that of other world megacities with a longer metropolitan history such as Tokyo, New York, London, or Paris.

As Fig. 3-1 shows, Seoul's metropolitan form is agglomerated within 10-km-radius where the center cities of Seoul, Incheon, Bucheon, Seongnam, and Anyang are concentrated. Outside the center, built-up areas are scattered along transportation corridors. The greenbelt leaves room for additional conglomeration. In fact, parts of the greenbelt have been used for public interests such as affordable housing. The issue is politically sensitive, however, as the greenbelt is linked to the issues of environmental conservation and over-concentration of the SMR.

The sustainability issue, then, is how to link the region in a sustainable manner. Seoul's bus lines are extensive, but it has a limited network of rail lines that could carry larger numbers of people with lower levels of pollution. Nine subway lines serve the center of Seoul: only four lines connect with outer areas. Only the first-round new towns have direct linkage to Seoul by subway. Of the six second-round new towns that are under construction, only one will be served by rail transit: the remaining five, located 30–40 km from the center of Seoul, will have to rely on automobiles and buses. Unlike megacities in Western countries or Japan, the SMR lacks regional commuter rail lines and light rail transit.

3.3.3 Concentration Vs. Decentralized Concentration

The City of Seoul's NIT policy and the central government's new town policy represent the concurrent processes of concentration and decentralized

concentration. These local and central government policies have often come into conflict over jurisdictional interests. Originally, both policies were devised to address specific problems such as the physical improvement of the inner city or housing shortages. Yet as the two levels of government insist on the superiority of one policy over the other, the debate entails issues of sustainability.

Seoul's NIT policy matches Western theories on inner-city regeneration, the reuse of existing infrastructure, transit-oriented development, and mixed-use development, among others. Indeed, NIT documents are filled with these ideas and promise to provide healthy, sustainable communities. Though smaller in extent, the areas redeveloped under the NIT policy have denser populations (more than 300 persons per hectare) than the new towns. Energy conservation and the preservation of rural open space are also benefits of the NIT policy compared with new towns. Yet this property-led renewal involves a massive displacement of low-income tenants and small shopkeepers (Hong 2003). It also often involves a thoughtless clearance of usable buildings, and causes a further deterioration of the area by renewal designation that prohibits individual reconstruction for the sake of later collective redevelopment (Kim and Yoon 2003).

The central government's new towns have been much criticized as bedroom communities lacking the workplaces that would make them self-sustaining. The government's instant city-making has been also under attack for not offering a sense of place. Nonetheless, the new towns have been well accepted by middle-class people who moved there in search of good housing, a good environment, and investment value (Kwon and Lee 1995; Lim et al. 2002; Cheon 2004). Given the size of the new towns and the consumer base of middle-class households, the new town business centers have now filled up with offices, institutions, and a wide range of commercial uses, providing goods and services to the residents. The governmental development guidelines also ensured adequate provision of schools, parks, and other public facilities and infrastructure. The new towns are also dense enough to support transit service: new towns are often well linked by mass transportation networks. New town plans normally adopt the concept of transit-oriented development. Thus, this planned mode of decentralized concentration has some similarities to western suburban development models of New Urbanism.

Indeed, although they are still not entirely self-sufficient (Jung 2006), the first-round new towns show increasing degrees of self-sufficiency and transit use. As Table 3-2 shows, in four of the first-round new towns, about 40% of the residents travel to work in Seoul. In Jungdong, a new town close to the city of Incheon and the Kyung-in industrial corridor, only 23.9% of commuters work in Seoul. The auto dependency of commuters is less than

40% in the two largest new towns of Bundang and Ilsan, thanks to a network of transit and bus lines (Table 3-1).

In the SMR as a whole, the number of commuters has increased substantially. From 1990 to 2000, about 250,000 commuters lived within 20-km radius of the center and about 130,000 within 20–40 km. Thus outer expansion has increased commuting distances. By one estimate, SMR consumes about 172 million Bbl a year, of which 60% is consumed by the transportation sector (Hwang 2001). Since a significant portion of total transportation energy consumption is accounted for by private automobiles, more housing is needed in inner-city job centers and more jobs are needed in outer areas (Lee 2007).

3.4 Conclusion

As a capital region in a rapidly growing economy, Seoul Metropolitan Area has absorbed a population increase of 20 million since 1960. Under this enormous development pressure, it has experimented with a greenbelt, inner city densification, and decentralized concentration. These policies were devised to meet specific and limited goals, not as part of a comprehensive view of sustainable urban form. Nonetheless, Seoul offers some lessons to other megacities, as these concepts has been widely discussed as viable options for sustainable planning and design worldwide.

Seoul's greenbelt experience shows that this means of growth management should be carefully scrutinized as to its possible impact on metropolitan form. As intended, this containment policy indeed contributed to the intensification of inner area. However, despite its substantial width (10–20 km), the greenbelt could neither curb nor contain urban growth, because of the rapid pace of growth in the region. Rather, it changed the growth pattern: the intensification of the inner city has coincided with dense developments in suburban areas outside the greenbelt. The result is that the greenbelt now serves as a vital green open space in the middle of a dense metropolitan area. With extensive hiking trails, it is a popular leisure destination for millions of residents. The excessive densification and the restricted land supply might be shortcomings, but these outcomes fit with the principles of sustainable urban form.

Inside the greenbelt, urban renewal has led to the further intensification of the inner city of Seoul, where land prices have increased steeply. Seoul is now one of the densest cities in the world. As Western sustainability theories advocate, Seoul's dense living provides social benefits such as heavy transit

use, reduced energy use, a balance of housing and jobs, the conservation of rural land, and urban vitality. However, as Zhang (2000) notes about the Hong Kong case, excessive intensification can cause environmental degradation. It is necessary to monitor the impact of high-rise and high-density development on urban sustainability, as many Asian cities exhibit this form of urban change. Seoul's experience also shows that market-driven inner-city intensification involves widespread gentrification, loss of usable buildings, and the excessive use of building materials.

The outer new town development also has pros and cons. The new towns were created to provide large amounts of housing quickly and thus lacked the sophistication of good city making. Yet, master-planned under the government development standards, outer new towns have physical amenities and good infrastructure. The initial lack of self-sufficiency has been much eased as new towns have matured. Like Western suburbanization processes, commercial activity and jobs have followed residential development. The size and density of the new towns support elements of sustainable planning and design such as mass transit, town centers, business facilities, and public parks that would otherwise not be possible. Not all new towns were originally supported by mass transit, but later transit provision is likely as transportation corridors develop over the coming years. All these features have contributed to limiting the new town residents' auto-dependency for commuting to 40%. Further efforts should be devoted to improve outer new towns with more social mix, increased self-sufficiency and better transit linkages, while making them more walkable, diverse, and affordable. Finally, given the development pressure within the SMR, it is undeniable that planned new towns have prevented or limited much worse sprawl.

The urban form of the SMR as a whole presents a number of positive elements arising from dense agglomeration. High levels of mass transit use, extensive mixed-used development, and intensive use of brownfields are all positive signs of a sustainable future. However, Seoul poses the issue of long-term sustainability. Development has taken place within a short period of time in both the inner city and the outer suburbs. And most new developments have entailed joint landownership of apartment complexes. The aging of buildings occurs simultaneously and the unit of change is getting increasingly large due to joint ownership. This will lead simultaneous blight of buildings and, to renew them, will require a responsive agreement from the multiple landowners. While Seoul has seen some concerted collective decision-making, it has never been easy. Little attention has been paid to how to ensure continued population turnover and renewal. Seoul's metropolitan form will test its flexibility and adaptability to urban change in the future.

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