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The Morphological Consequences of Apartment Complex Building in Seoul

서울의 아파트 단지 개발에 따른 도시형태 특성 연구

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Abstract

The Morphological Consequences of Apartment Complex Building in Seoul

The residential fabric and urban landscape of South Korea's capital, Seoul, has been rapidly transforming along with the massive growth of apartment complexes. Seoul's apartment complex building is an extraordinary urban phenomenon that not only replaced the traditional housing types into new one within half-a-century, but materialized a distinctive spatial and morphological attributes over the urban terrain. Getting taller and taller over the years, now high-rise apartments are dominating the urban landscape of Seoul. The historical formation of apartment complexes differs significantly based on elements such as the development policies in each period, development mechanisms, the degree of public control, and the extent of private engagement. Apartment complex building has been regarded as the most efficient way to supply massive modern housing (Jun, 2009; Lim, 2008; Park I.S., 2013). However, these techniques focus heavily on public agendas for providing homes and housing supply, while they have not paid much attention to shaping the urban patterns that they produce.

There have been active discourses on apartment housing from historical, sociocultural, political, economic and architectural perspectives. Recently, extending from apartment as a housing type, 'apartment complex' is critically viewed in resulting

negative consequences of territorial exclusivity, social segregation and decline of non-apartment neighborhoods (Lee, K.M., 2002; Jeon, N.I, 2011; Park, I.S, 2013; Park, C.S, 2013). It is the territorial presence of a large-scale single parcel, and the aggregation effect of multiple high-rise, high-density apartment buildings with spectrum of private infrastructure that has a crucial impact on the urban fabric, form and landscape. This study aims to understand how apartment complexes have emerged through multiple development methods and how they have evolved over time and shaped Seoul's urban form by focusing on morphological aspects. This study is based upon the premise that Seoul is representing unique and indigenous morphological characteristics of apartment urbanism through the cumulative effects of different developmental period for apartment complex construction.

Urban tissue comprises the parcel, buildings, and streets that are shaped as products of a certain time (Conzen, 1960; Whitehand, 1981). As parcel is a primary spatial unit, apartment complex as a single large-scale plot that has a dual morphological nature as both parcel and tissue is critical unit in order to comprehend the urban morphology of Seoul. The concept of typomorphology that involves classifying the essential elements of urban form and identifying the typical space and structures of each type is relevant to this study, which adopts both morphological and typological approaches to generate the types of formal elements characterizing individual apartment complexes. In addition, according to Whitehand (1992) urban form is an accumulation of these morphological regions developed according to specific morphological period. This perspective enables the research to examine Seoul's apartment complexes collectively in conjunction with the urban growth of the city. This theoretical framework of "fringe belt" is relevant in investigating the role of apartment complexes as a major agent of land conversion that internalized outer undeveloped areas into the city (Whitehand, 1988; Conzen, 2009).

To investigate Seoul's apartment complex urbanism in its entirety, the study include apartment complexes constructed from 1970 to 2014, a 45-year time span that were built city-wide (complete enumeration survey of apartment complexes in Seoul). Based on two major raw data, additional information was documented regarding the complete enumeration survey data on apartment complex. This study takes the remaining 2,172 'apartment complex' with 2 and more apartment buildings to investigate four inquiries of (1) emergent process of apartment complex city, (2) morphological attribute of individual apartment complex, (3) locational and agglomeration patter of apartment complexes and (4) spatial impact within a neighborhood block by apartment complex development. By synthesizing the findings in the previous investigations, the study attempts to identify some unique and distinctive formal qualities of Seoul's apartment complex urbanism.

From 1970 to 2014, Seoul accumulated 2,172 apartment complexes containing two or more apartment buildings. Given the accumulation and renewal of apartment complexes in a short period, Seoul may be deserving of the title, "Instant Apartment Complex City." The development methods and strategy demonstrate that the morphological characteristics of apartment complexes have largely been determined by the nature of the methods. Apartment complexes are widely scattered across the urbanized area not only in general urban areas, but also along the Han River and other tributary streams, bordering mountains, and hilly areas. This ubiquity forms the unique visual pattern of the urban grain, spatial configuration, skylines, and general collective form. Through analyzing the morphological characteristics of individual apartment complexes in elements and dimensions of parcel, building, density and street, there is little to no influence of internal forces on morphological elements. This indicates that Seoul's apartment construction was influenced by external forces emanating from outside the form. Consistent is the pursuit of the maximum building height and FAR

allowed by the regulations in specific periods, regardless of the morphological frame. The morphological patterns of each development method reconfirm this evolutionary process of the development of Seoul's apartment complexes.

The locational and agglomeration patterns of apartment complexes show that over the years the apartment complexes in Seoul have been constructed at higher elevations. Among the apartment complexes located on the hillside or hilltop, a mass of tall, plank apartment buildings create Seoul's unique, multi-layered, cascading hillside apartment landscape. In total, 615 urban blocks were identified as containing the 2,172 apartment complexes investigated that show how the apartment complexes are situated within an urban block with diverse relationship with other complexes and existing urban fabric, mostly fine-grained, low-rise residential neighborhoods. The resulting urban form manifests a formal character of contrast, fragmentation, incongruence, and heterogeneity. Through investigating 'clustering index,' the degree of cohesiveness was measured among collective apartment complexes. Along with the degree of cohesiveness, regularity and development project scale, emergence process by concurrency or consecutiveness, seven types of agglomeration pattern was identified.

The fact that extremely large-scale agglomerations are evident in Seoul is a substantial morphological consequence. In addition to the large-scale, concurrent agglomerations, Seoul's unique morphological character stems from the evolutionary agglomeration of apartment complexes. Loosely clustered apartment complexes are another morphological consequence of agglomeration that exhibits distances between apartment complexes, and thus is juxtaposed with the non-apartment residential fabric. The most scattered or least clustered pattern occurs when 'not clustered' apartment complexes are individually dispersed within low-rise, fine-grained residential areas.

Cases were extracted from the seven types of agglomeration patterns in order to examine the clustering progression of apartment complexes and the relationship with

the surrounding urban fabric. As the number of apartment complexes increases, so does the private collective property area with controlled access. Accordingly, the length of the walled boundary also increases. Recently, the width of the complex border has thickened as multiple layers of elements are adopted, such as a fence, brick or concrete wall, and landscapes varying in height. On the other hand, while apartment complexes increasingly replace the existing fabric, the number of individual buildings and associated plots decreases along with public spaces such as roads, sidewalks, open spaces, and other neighborhood facilities. The impact of apartment complexes on the surrounding neighborhoods includes territorial separation between the public and private realm is remarkable, as apartment complexes take an exclusively planned development. In addition, areas where apartment complexes encroach on the existing neighborhoods, the morphological character intensifies as an uncoordinated mixture, fragmented juxtaposition, abrupt scale change, and sensual lack of order and stability.

The construction of apartment complexes over the last half a century brought up the unique morphological character of Seoul's urban form and landscape. This study intended to provide an evidence-based interpretation, using judgmental terms in a neutral sense rather than highlighting positive or negative implications. However, several social implications based on the morphological understanding of apartment complex urbanism can be initiated from this study. Increasing large unit of apartment complex is less flexible in adapting to future urban transformation than incremental change that is possible within individual parcels (Kim, et al., 2001; Park, I. S, 2013; Park, C. S., 2013), while further joint decision-making often entails social conflicts between complex members (An, 2017). When an apartment complex takes over a large territory within the existing fine-grained urban site, it inevitably causes disconnectedness and discontinuity, while the differentiation and discrepancy in infrastructural resources between internal complex environments and their vicinity,

which promotes a sense of incompatibility and disconnects the two neighboring spatial systems. As spatial and social polarization intensifies along with the continuous agglomeration of private enclaves, the issue must be approached from both perspectives. Essentially, the isolating gated exclusiveness of apartment complexes must be reconsidered and reconfigured in alternative ways to connect and maintain a degree of privacy.

This study adopted the theoretical and methodological perspectives of urban morphology, as the main concern was to know the form as a historical product and the physical consequences of the time-bounded actions of apartment complex building. By viewing apartment complex building as a generator of morphological regions representing the urban form change of over time, the study contributes to expand the perspectives on Seoul's apartment urbanism to the city scale and geographical dimensions. Future studies may extend understanding of the evolving shape of urban forms, including the inherent differences, similarities, mutual implications, and diverse strategies and applications. In the citywide plan-making, more specific site designation and design guidelines is necessary in consideration of local connectedness, site boundary served by appropriate roads, and relevant site planning and design.

Keywords: apartment complex development, morphological characteristics of apartment complex, agglomeration patterns of apartment complexes, neighborhood impacts of apartment complexes, urban form of Seoul, apartment complex urbanism

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CHAPTER I
INTRODUCTION

1.1 Research Background and Objective

Seoul has materialized a unique built form on its urban terrain by aggressively constructing apartments over the last half century. As such, a French geographer viewed the city as the "Apartment Republic," and the government, market, construction industry, and Korean people united to construct tall apartment buildings that are now pervasive across the urban territory (Gelézeau, 2007). This housing form is so pervasive it has changed the domestic lives of the Korean people and their urban landscape. Naturally, apartment urbanism has attracted numerous accounts from housing history, urban design and architecture, public policy and planning, and socio-cultural perspectives. This discourse ranges from a focus on housing type and community life to government policies, market forces, and the changing nature of Korean society. In these discussions, only partial and implicit attention has focused on the "apartment complex," a spatial unit in which apartment buildings are constructed to form a single residential territory. However, in recent years, the apartment complex has been considered key in better understanding apartment urbanism in Korea. Notably, Park I.S. (2013) and Park C.S. (2013) argued that the apartment complex, rather than apartment buildings, brought about the negative consequences of territorial exclusivity, social segregation, and the decline in non-apartment neighborhoods. While their assessment needs further debate, the apartment complex deserves extended scrutiny to

understand the apartment urbanism of Korean cities. This study aims to improve understanding of Seoul's urban form and landscape by investigating apartment complexes. By focusing on the morphological aspect, the study intends to examine the spatial manifestation of the apartment complexes that have formed and transformed Seoul over the modernization years.

1.1.1 Seoul as the "Apartment Complex City"

Seoul is perceived as comprising many high-rise, high-density apartments and is easily understood using the terminology "apartment city." In South Korea, particularly in Seoul, which experienced rapid urbanization and intense development, the supply of housing has been prioritized, resulting in the large-scale provision of apartment complexes. This multi-unit housing, which occupies a single parcel territory, is mostly bounded by roads, and possesses a self-contained infrastructure, is generally referred to as an apartment complex (*a-pa-te danji in Korean*). In fact, the apartment *complex* has been the driving force of the radically transforming urban fabric and landscape. The territorial presence of a large-scale single parcel and the accumulated effects of multiple high-rise, high-density apartment buildings greatly impact the urban fabric, form, and landscape. In addition to the apartment complexes built as new developments in the greenfield areas, public renewal policies and redevelopment projects to replace the existing spatial structure through the construction of apartment complexes are intensifying. Both foreign and domestic observers note the profound effect of apartment complexes built in the greenfield or renewal districts on the modern Korean cityscape during the period of rapid urban growth (Gelézeau, 2007; Kim and Yoon, 2003).

As such, there have been extensive discussions and controversies over endless proliferation of apartment complex alongside with the built history of apartment housing. Why and how apartment became such a popular housing type was of particular interest from socio-cultural point of view. Gelézeau (2007) brings up various facets of cultural points of view regarding living in an apartment, from interior spaces to territorial meanings for the middleclass, women, young and older generations, and the integration of traditional spatial disciplines. Issues of tradition and modernity in lifestyles of modern complexes rising through the mix of traditional notions and westernized convenience facilities, the reconstitution of interior space, and collective dwellings are analyzed. Jun (2009) details the reason why the apartment has been built in such a frenetic manner and prominently attracted to the upper-class, rendering the connotations behind apartment construction agencies and policies, the social status of apartment residents and their relations to conspicuous consumption, and the changing social norms and values in domestic life. Another reason is, he noted that the notion of a "house" possesses high value as an asset and high marketability under the government housing policy, encouraging ownership rather than renting (Jun, 2009: 56).

Regarding performance, the apartment as a housing type has been criticized based on perceived negativity towards modernist mass production and the resulting indifference to human needs and traditional Korean living culture. However, this critical view has not been influential, as apartments have continued to thrive in the housing market and public policy. However, several thinkers raised the issue of the "complex" as causing the segregation and fragmentation of the urban social and physical fabric (Lee, K. M., 2002; Park I.S., 2013; Park C.S., 2013). While "apartment" refers to an individual building type, the apartment complex constitutes a spectrum of private infrastructure such as an internal playground, community and service facilities, management offices, and parking area, all of which are included in the sales price. Park

I.S. (2013) contends that the rationale for the development of apartment complexes is driven by the government's intention to secure urban infrastructure through the private sector and minimize public investment. As the internal community infrastructure is monopolized only by residents of the complex, the phenomenon of the "collective privatization of urban space" is intensifying (Seoul Institute, 2009: 297).

The apartment complex also raises the social issues of gentrification and gated communities. The issue of gentrification emerges when apartment complexes replace lower-income neighborhoods through public residential renewal programs. Ha (2004) points out that the majority of low-income residents are forced out through market-driven public interventions, destroying the original low-income community. As apartment complexes take the form of gated communities, the phenomena of spatial inequalities and social segregation emerge. Since the 1990s, luxury high-rise apartment buildings or branded apartments represent the consequences of the "deregulation and neo-liberal logic structuring the Korean housing production system" (Gelézeau, 2008: 317). According to Jun (2009: 105), the era of "branded apartments" was successfully launched in the 2000s because of the increasing tendency to live in a homogeneous community in terms of socioeconomic characteristics, which led to the proliferation of exclusive, self-contained gated communities. Many believe that the proliferation of apartment complexes is led by government housing policies aimed at supplying mass housing through a market-driven stance centered on the middle class through private sector initiatives (Lim S.H, 2005; Gelézeau, 2007; Jun, 2009; Park I.S., 2013).

From the viewpoint of architecture and urbanism, many emphasize the physical changes shaped by high-rises and large-scale apartment complexes as an endemic problem. Reviewing the development history of Seoul, Bang (2012) contends that apartment complexes provoked a sense of alienation and visual blockage within the surrounding urban tissue and created a homogeneous and uniformly repetitive urban

landscape. Koh (2012) agrees that small-unit apartments in low-rise residential areas demonstrate the scattered proliferation of apartments that are gradually transforming the internal blocks, street networks, and sudden height changes in apartment buildings. Thus, according to Seoul Institute (2009), large-scale apartment complexes destroy existing spontaneous or grid pattern layouts and disconnect neighboring areas. Overall, they exemplify a form of urban archipelago. Park I.S. (2013: 312) uses the metaphor of disconnectedness resulting from apartment complexes as "wounding urban tissue by cutting off many capillaries within the matrix of the path." In addition, some critics maintain that Korean apartment complexes were an idea borrowed from the West; however, the original design ideals for social good were forgotten and distorted by government policies and market forces (Lee, S.H., 2012; Kim, J.W., 2017).

Given the overwhelming dominance and resulting urban implications, the apartment complex deserves further examination from spatial and morphological perspectives. Some pioneering works have focused on this formal dimension to examine the spatial reality and physical consequences of Seoul's apartment complexes (Seoul Institute, 2009; Bang, 2012; Koh, 2012; Kim, J.W., 2017). While pioneering, these works deal with the apartment complex as part of Seoul's larger physical transformation and examine issue-based exemplary cases, rather than analyzing a full spectrum of apartment complex buildings at the city level. As Bang (2012) noted, morphological study is limited to analyzing the overall formal attributes and spatial patterns of apartment complexes as a dominant urban landscape. Some researchers highlight the difficulty in examining the spatial patterns of apartment complexes at the city level over time, because of data limitations (Kang and Jang, 2011). An in-depth examination of Seoul's apartment complexes requires building a complete database and subsequent documentation, analysis, and interpretation. Based on the premise that no single endeavor can cover the whole task, this study begins with this groundwork.

1.1.2 Apartment complex city as Asian urbanism

Seoul's apartment complexes deserve further study, because they manifest a unique formal character to contemporary global urbanism. Most global observers view Seoul's urbanism as part of the larger Asian or East Asian urban phenomenon. During the past half century, Asian cities and their urban landscapes have undergone dynamic, chaotic, and contradictory evolution through the periods of colonization, modernization, urbanization, and globalization (Rowe, 2005; Lim, 2008; Watson, 2011). Asian urbanization is sometimes viewed as showing great potential with a prominent influence on global sustainability (Sorenson et al., 2004). East Asian countries and cities are now entering a new phase of urbanization, which deals not only with the globalization, modernization, and growth of an unprecedented population and urban area, but also confronts the tasks of redevelopment, conservation, social inequality, and environmental sustainability (Sorenson et al., 2004; Rowe, 2005).

According to Parent et al. (World Bank, 2016), higher-income countries in East Asia demonstrate a higher degree of urbanization in terms of land and population, exemplifying the close relationship between urbanization and urban growth. In these countries, economic prosperity enables a proactive state to promote a world-class city in terms of infrastructure and reputation, resulting in similar urban environments. This is evident in the emergence of similar business districts, cultural venues, iconic towers, consumption architecture, and gated communities alongside increasing global activities (Marshall, 2003; Buck, 2006; Chang and Kim, 2016). Rowe (2011: 6-7) considers the "tipping or turning point" to have occurred around the 1990s and during the 2000s in Asian countries such as South Korea, Hong Kong, Taiwan, and Singapore, as they transitioned from "developmental states" to "competition states." In East Asian countries, an aggressive role, direct involvement, and control operate the systems of

urban infrastructure, housing provision, and physical investment (Rowe, 2005). On the other hand, as the democratic government became more established in the 1990s upon entering the period of economic slowdown, a focus on the quality of life and transition into a post-modern city replaced production-oriented development. Under the current Communist regime, China is experiencing rapid transition through contemporary urban development under the influence of market forces. Based on these common social forces, most Western urbanists agree that East Asian cities have been creating similar urban environments (Marshall, 2003; Marcuse, 1997).

The similarity of the Asian urban form has also been ascertained in residential environments. The limited time in which to become a prosperous world city and limited territory mean that similar high-rise and high-density apartment complex buildings have emerged in East Asian cities. Rowe (2014) explains that the 'superblock configuration' which was widely adopted in the form of mega-plots implemented with multi-unit housing with community facilities that were commonly developed in East Asian countries. In Singapore and Hong Kong, most public housing is supplied in the form of blocks, or otherwise complexes comprise mid to high-rise apartment buildings. The high-quality communal domain is grouped with diverse outdoor common spaces and facilities around tall residential towers (Rowe, 2005). Both cities are considering increasing capacity through higher developments to accommodate the future population and more affluent urban residents (Rowe, 2005). In Seoul, apartment complex buildings are regarded as the most efficient way to supply large-scale modern housing (Lim, 2008; Jun, 2009; Park I.S., 2013). In addition, Japan controls large-scale apartment complexes in the city center and channels them to the outskirts of the city. Since the early 21st century, China has strived to successively construct numerous apartment complexes.

Similar apartment urbanism is evident in these cities, wherein apartment type

housing is proliferating and becoming a critical signifier, radically shaping the cityscape. Many Western viewers regard this Asian urbanism as misguided, as they appear to be pursuing prewar modernism or demonstrating indifference towards the principles advocated by Western theories and ideas such as the human scale, historical continuity, place authenticity, contextualism, and a general sense of western comfort and order. Furthermore, apartment complexes in Asian countries are negatively interpreted. This is evident in the MVRDV, which refers to a "Block Attack," meaning that problems arise when blocks of vertical apartment buildings replace existing small-scale communities, impeding and consequently dissolving an indigenous "Asian city's qualities of diversity, intimacy, and richness" (The Why Factory, 2012). Similar to Rowe's observation (2014), the proliferation of apartment complexes involves the aggregation of individual properties into large collectively owned parcels that sometimes destruct smaller blocks.

However, a different view to Asian urbanism has emerged. Regardless that Asian cities appear patch-worked and lose their traditional value, Marshall (2004: 194–211) sees them as taking their own path of civilization, manifesting "a new kind of urban form" organized in new ways that differ from those of the West. The recent flourishing discourses on global urbanism demonstrate the wider acceptance of the similarity of Asian urban form as part of a global cultural diversity to be recognized (Burdett and Sudjic, 2007). Furthermore, this widely perceived similarity in Asian urban form should be reexamined, because Asian cities materialize different formal characters governed by their unique history, culture, and social system, as well as cadastral legacy, building tradition, and public policy. There are subtle but profound differences between the urban forms of Asian cities. From an open satellite image, variety in the building grain, block pattern, and road networks among Asian cities is easily discernable. For example, compared to the coarse residential patterns of Korean cities, Japanese cities

have more fine-grained, homogeneous building patterns while Chinese cities demonstrate ubiquitous planned building blocks comprising socialist collective housing. The intention here is not to pose a contradictory dichotomy between the similarities and differences, or to state which is more relevant to understand Asian urbanism. They are different dimensions of which the relevance depends on one's viewpoint and the purpose thereof. Based on this consideration, this study observes different morphological characters that render the variety and distinction between Asian and Western cities. Observing and documenting diverse morphological phenomena according to the respective cities is necessary to understand indigenous and intrinsic spatial qualities as well as the spatial evolutionary process between cities. Furthermore, in terms of Asian apartment urbanism, close observation, documentation, examination, interpretation, and comparison of the urban form of each city is thus far insufficient.

1.1.3 Research objectives

Seoul's apartment complex development is an extraordinary urban phenomenon in which traditional housing types were replaced with new ones over a period of half a century, and distinctive spatial and morphological attributes materialized across the urban terrain. This study aims to document and analyze the morphological progression of apartment complexes over the last half century. Furthermore, it intends to extend the current body of knowledge on apartment urbanism by systematically dealing with apartment complexes within the comprehensive spatio-temporal spectrum. To investigate Seoul's apartment complex urbanism in its entirety, the study considers spatial extent and time range. As such, entire apartment complexes built on 605 km^2 of

Seoul's city area is observed. Apartment complexes began to emerge in the 1960s. However, most have been redeveloped or replaced. Thus, the study includes apartment complexes constructed from 1970 to 2014, a 45-year time span. Using the term apartment complex, the study observes sites with two and more apartment buildings that are five stories and higher, as defined in the Korean Building Law. As revealed in Chapter 2, as of December 2014, there were about 3,800 apartment sites in Seoul. Among them, over one third contained a single apartment building. These are often referred to as "stand-alone" apartments. This study focuses on the remaining 2,172 apartment complexes with two and more apartment buildings to investigate the following five inquiries.

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1) **Emergent process of apartment complex city**

   The emergent process of apartment complexes is overviewed to determine how Seoul became an apartment complex city during urbanization. In so doing, it is attempted to uncover the morphological origin and accumulated magnitude of apartment complexes. Morphological origin refers to the evolution of the formal character of apartment complexes over time. It is suggested that this formal character depends on the development methods employed during Seoul's territorial expansion. Seoul's urban growth, development planning, and apartment complex forms are reviewed according to the interrelationships between these constructs to explain the accumulation of apartment complexes.

2) **Morphological attribute of apartment complex**

   The second inquiry pertains to the morphological attributes of Seoul's apartment complexes. In this study, morphological attributes refer to the size,

shape, layout, density, and other spatial aspects of the physical elements that constitute apartment complexes. To achieve this objective, the formal characteristics of apartment complexes are analyzed in terms of morphological elements including the parcel (or plot), building, street, and density. Evidence based on the data analysis provides a grounded typological understanding of the form of apartment complexes. Furthermore, the relation of these formal characteristics with the period of development and methods is also discussed to determine their morphological origin.

3) Locational and agglomeration pattern

The next subject of inquiry in this study is geographic location and the agglomeration of apartment complexes. Here, the investigation focuses on the distribution of apartment complexes across the topographical terrain of Seoul and their situation in urban blocks. The proliferation of apartment complexes has led to diverse clustering or scattering patterns in relation to the urban context with varying degrees of cohesiveness. The emergence of these agglomeration/dispersion patterns will also be examined through typological analysis. Identifying these patterns is important, as this improves understanding of why cities look the way they do, serving as the base information for comparative studies of Asian cities.

4) Spatial and physical impact on the neighborhood

Another inquiry pertains to the impact of apartment complexes on the spatial and physical nature of the neighborhoods in which they are located. At the neighborhood level, apartment complexes are developed at different scales, sequences, and agglomerations depending on the period of development and

method. As such, changes are evident in the urban grain, structure, and landscape as well as in spatial, physical, and social elements, which transform daily life. To ensure an in-depth analysis, representative cases are examined.

5) **Manifestation on Seoul's 'Apartment Complex Urbanism'**

Finally, by synthesizing the findings of the previous investigations, the study attempts to identify the unique formal qualities of Seoul's apartment complex urbanism. It also attempts to interpret the spatial and morphological consequences of aggressive apartment complex construction over the last half century. As a result, lessons for planning and comparative implications are provided.

1.2 Research Perspective and Methodology

The discourse on apartment urbanism spans a wide spectrum of intellectual fronts ranging from architecture to urban planning to socio-cultural urban studies. The discussion can be approached according to the issues and interests under study. This study focuses on the physical and formal aspects of apartment complexes to examine the spatial and morphological consequences thereof. By spatial and morphological consequences, the study means the physical manifestation of apartment complex buildings that demonstrate a concrete form in their size, shape, layout, location, and areal organization. This study is based on the premise that Seoul demonstrates unique and indigenous morphological characteristics of apartment urbanism through the cumulative effects of different periods of development in terms of the construction of apartment complexes.

Based on this intention, the study employs, if not entirely so, research perspectives and methodologies from the school of "urban morphology." As a field that studies urban form, the school of urban morphology developed theoretical underpinnings and analytical frameworks to document and analyze the formal physicality of the city as a historical product. Next, selected theoretical and methodological aspects relevant to fulfilling the research objectives of this study are explained.

1.2.1 Form, scale, and time

Urban morphology is a loosely assembled field with European origins[1] that includes different disciplinary orientations; for example, the historico-geographical approach in the UK and Germany, and design-oriented typological approach in Italy and France (Oliveira, 2016). Although there is no single correct approach to building knowledge on urban form (Moudon, 1992), an essential common ground makes these schools a

[1] British, Italian, and French approaches to urban morphology (Oliviera, 2016)

European Schools	Orientation	Aim	Interest	Notable Researchers
British	Descriptive and explanatory purposes	Developing a theory of city building	How cities are built and why	· MRG Conzen · J.W.R. Whitehand · T.R. Slater · Peter Larkham · Karl Kropf
Italian	Prescriptive purposes	Developing a theory of city design	How cities should be built	· Muratori · Gianfranco Caniggia · Gian Luigi Maffei
French	Design criticism between theory and practice	Assessing the impact of past design theories on city building	Differences and similarities between what should be built and what has actually been built	· Phillippe Panerai · Jean Castex · Jean-Charles Depaule · Henri Lefebvre · Francoise Boudon · Andre Chastel

body of shared scholarly activities. One is understanding the urban form, and the other is a shared systematic framework to document and analyze this urban form. Moudon (1994) noted three common dimensions that unite urban morphological studies: (1) form: the physical elements of the city, (2) scale and resolution: the spatial specificity of study, and (3) time: the dynamics of urban change.

"Form" refers to the physical elements of urban form such as buildings, plots, open spaces in the plot, streets, blocks, and infrastructure. Since different patterns emerge at various scales of investigation (Scheer, 2010), form and "scale" have a binary interrelationship, as the former is determined by the latter. In other words, the physical elements constituting urban form are determined by the scale at which the researcher conducts the study. The study of urban form is multi-scaled, ranging from investigating a building to a plot, to a block to a district, or to the whole city and urban region, upon which its physical elements are identified by the research interest (Osmond, 2010). In general, urban morphologists tend to differentiate three scales, namely (1) buildings and lots; (2) neighborhoods and districts; and (3) communities, municipalities, and regions (Southworth and M. Owens, 1993; Moudon, 1997; Schirmer and Axhausen, 2016). Again, spatial elements are related to a hierarchical structure on different levels of specificity based on the distinctive properties and relations of the built form (Osmond, 2010; Kropf, 2014).

"Time" is another important dimension that distinguishes urban morphology from other urban form studies. To urban morphologists, to know urban form is to know its historical mutation from the beginning, since it is an accumulated whole of the parts produced at a particular time in the societal conditions characterizing that period. Thus, urban morphology begins with morphogenesis, i.e., its emergent original formation, and uncovers its transformation over time (Moudon 1994). Time reflects the serial

change of the corresponding period that shapes the urban form and the varying historical, socioeconomic, and developmental influences at a certain period.

The morphological perspective provides a useful intellectual foundation for studying the spatial and morphological consequences of the construction of apartment complexes in Seoul over the last half century. The dimensions of form, scale, and time were employed as a three-pillar conceptual core intertwining the subjects of this dissertation. The formal elements were selected according to research at multiple scales and through a review of the historical evolution of apartment complexes to understand their morphological origin and changes over time. In addition to the general ideas adopted from urban morphology schools, specific notions were considered to achieve the objectives of this research.

1.2.2 The apartment complex as a morphological unit

In urban morphological studies, the scale most focused on is the urban tissue level, as pioneered by MRG Conzen (Conzen, 1960; Whitehand, 1981). Urban tissue comprises the plot (parcel), buildings, and streets, and is the smallest homogeneous unit (plan unit in Conzen's terms) produced by the forces shaping a particular period (Conzen, 1960; Moudon, 1994). The plot pattern, building type, and street network as well as the organization of these elements are products of a certain time. Urban tissue is widely studied in the architecture and urban design professions for design purposes. However, urban morphologists have adopted it as an essential spatial unit to understand the origin of and changing urban form and to manage the historical landscape of the city (Whitehand, 1981). In studies on the urban tissue, a parcel (plot) is a primary spatial unit considered a cell of the city as an organic entity. This is a basic unit of

morphological changes to the city, where development decisions and actions are made. This perspective is useful to portray the landscape of Seoul, which is dominated by apartments, because it enables the researcher to view an apartment complex as a single large-scale plot from which many facets of apartment urbanism stem. As Park I. S. (2013) observed, Seoul's apartment urbanism can be better understood because it involves large plots. In other words, it is an unusually large urban cell. Thus, it can be called an "apartment complex tissue," as it is almost analogous to Scheer's classification of tissue types, namely the campus tissue equipped with internal road circulation and isolated from the surrounding tissue with limited controlled entrances (Scheer, 2010). Thus, an apartment complex has a dual morphological nature as both parcel and tissue. This perspective necessitates an investigation of the morphological characteristics of apartment complexes as parcels on the one hand, and how these large parcels are organized around other complexes on the other. These points are discussed in the three chapters focusing on morphological characteristics, agglomeration patterns, and the neighborhood impacts of apartment complexes.

According to the urban morphological view, development in a parcel is influenced by internal and external forces (Moudon, 1986). Here, internal forces refer to the constraints and opportunities stemming from the physical attributes of morphological elements including the parcel, building, and streets. With a specific size, shape, and location, they influence each other to result in specific final forms. An external force emanates from outside the parcel, such as market demands, building regulations, and other influences. This perspective is employed in the discussion on the morphological character of apartment complexes. In Chapter 3, the correlations between morphological elements such as parcel, building layout, building height, and density are analyzed to determine internal forces. The development period and methods represent the external forces and their relationships with the morphological elements.

1.2.3 Typomorphological analysis

Another perspective and methodology from the school of urban morphology is the typological approach to studying urban form. Type is a concept employed to comprehend the complex form of elements including their origin and transformation. Typological research involves classifying the essential elements of urban form and identifying the typical space and structures of each type. This enables an analytical rather than impressionistic view to describe and explain the built environment. While the typological approach was developed and used by the Italian school as an architectural design method for continuing the historicity and organicity of architecture and urban form (Moudon, 1994), this study employs this method in a more simplified way to classify the formal elements of an apartment complex and analyze the internal and external relationships between them. Typologies are applied to extract essential qualities from complex realities and provide an analytical framework for observation (Grant and Mittelsteadt, 2004). In this sense, the concept of typomorphology may be more relevant to this study, which adopts both morphological and typological approaches to generate the types of formal elements characterizing apartment complexes. Moudon (1994) contends that typomorphological studies reveal the physical and spatial structure of cities, because they describe urban form based on a detailed classification of buildings, open spaces, typical spaces, and structures by type.

1.2.4 Apartment complexes as morphological regions

Urban morphologists have developed sophisticated theoretical concepts and an analytical framework at the urban tissue level. The morphogenetic urban cell is best

understood at this level of analysis. However, the district and citywide scales remain less developed. Nonetheless, some concepts provide a useful analytical perspective from which to understand the patterns of development of Seoul's apartment complexes in conjunction with urban growth at the citywide scale. The concept "morphological region" refers to partial areas of the city that have a homogeneous formal quality different from the surrounding areas in terms of plan type (layout of parcels, buildings, and streets), building types (building size, height, architectural style), and land use (building use and land utilization). Urban morphology views the urban form as an accumulation of these morphological regions developed according to different socio-economic demand, construction technology, and development mechanisms in different periods, in this case, the "morphological period" (Whitehand, 1992). Thus, the morphological region as a product of a specific morphological period is an important concept in understanding the process of historical development of the city under study. This perspective enables the research to examine Seoul's apartment complexes in conjunction with the urban growth of the city. As discussed in Chapter 5, apartment complexes led to the urban expansion of Seoul during the period of rapid urbanization.

Similarly, "fringe belt" is another concept used to relate apartment complexes to urban growth. In urban morphology, city expansion is considered to occur by integrating outer undeveloped areas into the city. This outer area is the fringe belt, a concept originally formulated by recognizing physical limitations such as city walls on urban growth. It was further developed to establish the foundation for a morphological theory of urban growth and change (Whitehand, 1988). As the fringe belt is the outer edge immediately outside the developed area of the city, it is a transition area comprised of plots in various shapes and sizes, because it is in an unplanned and undeveloped state. Fringe belt areas can be located between built-up areas with different generative periods. As such, they constitute a mixed juxtaposition. According

to Conzen (2009), fringe belt areas are integrated into the built-up areas through a gradual process comprising the "fixation phase," "expansion phase," and "consolidation phase." In this way, undeveloped outer fringe areas become a built area, which enables an understanding of the "internal history" of a city (Whitehand, 1988). Since the city continuously expands outwards through this process, multiple fringe belts can be identified including the "inner fringe belt," "middle fringe belt," and "outer fringe belt" (Conzen, 2009). This theoretical framework is relevant in investigating the role of apartment complexes in the fringe belts that internalized outer undeveloped areas into the city.

During the urban growth stage of Seoul in the period of rapid urbanization from 1960 to 1980, apartment complexes were a major agent of land conversion from non-urban to urban built-up areas. When developed, these fringe belts become the morphological region. As such, Seoul's urban growth, fringe belt, and morphological region are associated. This perspective increases understanding of how apartment complexes influenced the evolution of Seoul's urban form at the citywide level. The locational and agglomeration patterns of apartment complexes (Chapter 4) are examined from these spatio-temporal perspectives on the citywide scale.

1.2.5 Database construction, processing and utilization

While specific analytical frameworks and methodologies are included in each chapter, a general discussion on the analytical nature of this dissertation is needed in the introduction. Discussions abound on which methods of analysis to employ in urban morphological studies, as the process is subjective and labor intensive. While studies have targeted urban forms and regions in Europe, insufficient investigations on

developing cities exist (Whitehand, 1981; Gil, Beirao, Montenegro, and Duarte, 2011). Furthermore, diverse views and methods to identify urban morphology exist, and understanding and experimenting with integrated approaches is needed, as human settlements are heterogeneous and complex (Kropf, 2009). Morphological research has acknowledged the necessity of systematic and quantitative approaches (Spatial Statistics, Space Syntax, Morphometrics, Spacemate©) to better analyze spatial properties, the mutual relation between architecture and urbanism, and the social relevance of urban form (Pont and Haupt, 2010; Venerandi et al., 2016; Panerai, Castex, Depaule, and Samuels, 2004). For example, Spacemate© is a multivariate approach to density in urbanism that employs indicators such as people's dwelling conditions, open space ratio, height, and distance between buildings to understand development patterns and the consequential environment. These studies tend to focus on the performance of urban form, not on the evolution of urban form, and often downplay the importance of mapping and visual illustration. However, as cities evolve with three-dimensional complexity in terms of height, density, and the cityscape, these aspects must be considered alongside traditional qualitative morphological studies.

To document and interpret Seoul's urban landscape as being shaped by apartment complexes, an apartment complex database was constructed for quantitative and qualitative examination. Urban morphological elements at the parcel, building, density, and street levels were statistically analyzed and interpreted based on various contextual backgrounds to comprehend the morphological characteristics of apartment complexes. The database on Seoul's apartment complexes was constructed based on two resources: 1) The Seoul Metropolitan Government's "2015 status of multi-unit housing data of Seoul," and 2) the "2015 new address base map," which is open data provided by the National Spatial Information Clearinghouse (NSIC). Where necessary, other data information was employed to supplement these main sources (Table 1). The

chronological extent of this study spans 45 years from January 1970 until December 2014, and encompasses 2,172 apartment complexes.

Table 2 provides the information elements employed to establish an Excel database for the statistical and cartographical analyses. The information for each apartment complex includes recorded data of basic morphological elements including the building, parcel, density, street, and block in addition to basic information such as the year of construction, address, number of apartment units, and type of development. Most data categories were additionally classified and coded into representative types for easier understanding. Some typological information has been recorded based on the author's subjective view.

In the data from the "2015 status of multi-unit housing data of Seoul," apartment complexes were extracted from various multi-unit housing types and stand-alone apartments. All apartment complexes were corrected, modified, and verified by comparing the data with the building ledger and Naver Real Estate service online. In each step, the data were corrected, refined, and merged to provide a final number of 2,172 complexes. The database was further compiled with additional surveyed or reconstructed materials. The addresses of the apartment complexes were geocoded to acquire the X and Y coordinates for GIS (based on the UTMK coordinate system) using the "*GeocodingTool*" provided by *biz-gis.com* as free downloadable software. The apartment data with attached location information were then merged with the apartment parcel data from the "2015 new address base map" spatially in GIS (Figure 1). This process was repeated many times whenever new morphological surveyed elements were coded in Excel and then converted into GIS. For the quantitative analysis, "SPSS Statistics version 20.0 (IBM)" software was utilized, "ArcGIS version 10.1" was employed for spatial interpretations and to produce mapping illustrations along with "AutoCad 2017" for redrawing archival map images.

In addition, examining individual apartment complexes and its agglomeration patterns required supplemental work. GIS data is available from the early 2000s, and therefore, GIS information preceded the analysis related to the 2000s and 2010s. To understand the relationship with the surrounding fabric as apartment complexes emerge and aggregate over time, periodical base maps were redrawn in CAD using image-based maps from the 1970s to the present. In addition, to analyze the bordering conditions between apartment complexes and the outer area, the height, type, thickness, and access control of the apartment boundary was documented through Naver Street View.

Since visual aspects are critical in terms of the urban form and urban landscape, a visual representation is needed to understand the spatial and morphological implications of apartment complexes at different scales. Graphical representations and several types of media are utilized including diagrams, charts, and most important, mapping illustrations. An additional in-depth methodology for different analytical content is presented in each chapter, and certain information is elaborated in the appendices.

Table 1 Data sources

Classification	Data	Type	Data Information	Source	Date
Urban Information of Seoul	New address base map 새주소기본도	GIS	Administrative boundary, topography, building, road, etc.	National Spatial Information Clearinghouse 국가공간정보유통시스템	2015
	Topography	GIS	Seoul's topographical contour map with 5 and 10m interval	National Spatial Information Clearinghouse	2014
	Cadastral map, land use map	GIS	Digital serial cadastral map, land use zoning data, development projects	Korea National Spatial Data Infrastructure Portal 국가공간정보포털	2015
	Archival map	Image	Seoul's base map	National Geographic Information Institute 국가지리정보원	1970s 1980s 1990s
	Housing related statistics	Excel	Seoul's housing type and proportion over time	National Statistical Office 통계청	
Urban Development Projects	Seoul Development Project	GIS	Seoul's development methods and strategies	Seoul Institute Korea National Spatial Data Infrastructure Portal	2014
			Seoul's development projects	Korea National Spatial Data Infrastructure Portal	2015
Apartment Complexes	Apartment complex status	Excel	2015 Status of multi-unit housing data of Seoul	Seoul Metropolitan Government via Open Data Portal 정보공개포털	2015
	Building ledger		Basic information of apartment complex (parcel size, built year, BCR, FAR etc.)	Building Data Open System 건축데이터개방 Naver Real Estate 네이버부동산 Daum Real Estate 다음부동산	2015
	Aerial Photography	Image		Naver Map 네이버지도 Daum Map 다음지도	2015-2016
Archival Photography	Historical photographic al images	Image		National Archives of Korea 국가기록원(행정자치부) Seoul Museum of History 서울역사박물관 Seoul Statistics 서울열린데이터광장/서울통계	2015

Table 2 General and morphological database elements and processing

Database			Source and processing
General Information	Location	Address (X, Y coordinates)	Compiled & reconstructed
	Construction	Built year	compiled & modified
		Sales type	compiled & modified
		7/14 Development methods	Compiled & reconstructed
	Apartment Complex (AC)	Name of the AC	compiled & modified
		Number by unit size types	compiled & modified
		Number of Parking lot	compiled & modified
Morphological Survey	Parcel	Area	compiled & modified
		Shape (general and specific)	Surveyed by author
	Building	Number of building	compiled & modified
		Building height	compiled & modified
		Architectural style (general and specific)	Surveyed by author
		Building arrangement	Surveyed by author
	Density	Building coverage ratio	compiled & modified
		Floor area ratio	compiled & modified
	Street	Street shape	Surveyed by author
		Bordering portion	Surveyed by author
		Bordering hierarchy	Surveyed by author
	Urban Block	AC positioning	Surveyed by author
		Occupational form of AC	Surveyed by author
		Occupational Ratio of AC area	Surveyed by author
		Urban block size and shape	Surveyed by author
	Topography	AC siting altitude	compiled & modified
		Level difference within an AC	compiled & modified
	Clustering Index	Number of adjoining ACs	Surveyed by author

Figure 1 Spatialization of geocoded data set

1.3 Organization of the Dissertation

The study is composed of six chapters and appendices (Figure 2). Chapter 1 lays out the introductory background of the research and delineates the research questions and objectives, followed by a discussion of the research perspectives and methodology. Chapter 2 reviews the history and evolution of the Apartment Complex City of Seoul over the past half century to understand the morphological origins thereof and magnitude of apartment construction. The purpose is to enhance understanding of the large volume of apartment complexes constructed during the period of rapid urbanization. In this chapter, development methods are identified in the context of housing policies and city planning. In Chapter 3, the morphological elements of apartment complexes at the parcel, building, density, and street levels are examined at the urban tissue level and classified into types to comprehend their complex formal characteristics. Typological patterns are identified according to their relationship with the period of development and development methods as well as the correlations between formal elements. This clarifies the morphogenetic characteristics of apartment

complexes. Chapter 4 examines the spatial and locational distribution and agglomeration patterns of apartment complexes. Locational patterns are examined in terms of their geographic distribution and topographical site as well as the siting within city blocks. The analysis of agglomeration patterns identifies typical patterns representing different degrees of clustering and cohesiveness as well as different coexistent relationships with non-apartment neighborhoods. These findings are linked to understanding how the development of apartment complexes created diverse morphological regions through fringe belt internalization and redeveloped transformation. The concept of formal regularity is based on a "clustering index" that measures the degree of cohesiveness. In addition, the development method and scale, formal regularity, and emergence conditions are integrated to extract seven typical agglomeration pattern types for apartment complexes. In Chapter 5, representative case areas of the agglomeration types are selected to elaborate the process of agglomeration and its relationship with the surrounding urban context. At the neighborhood level, the morphological transformation of physical qualities and current boundary conditions are observed to understand how apartment complexes bring about spatial and territorial changes in ordinary space. Finally, Chapter 6 provides a general discussion on the spatial and morphological consequences of the construction of apartment complexes over the last half century. The chapter includes an interpretive discussion on Seoul's apartment urbanism with implications for urban planning and further studies.

	Chapter 1				
	Research background, objective, structure and methodology				
	▼				
	Chapter 2				
Content	Historical evolution and formation of the 'Apartment Complex City'				
Scale	City scale				
method	Literature review, reclassification of development methods for apartment complex construction over time				
	▼				
	Chapter 3		**Chapter 4**		**Chapter 5**
Subject	Complete enumeration of Seoul's apartment complex (2,172)		Locational and agglomeration pattern of apartment complexes		Relation between apartment complex with the surrounding fabric
Content	Morphological characteristics of individual apartment complexes	+	Spatial and agglomeration pattern	+	(1) Progression of agglomeration (2) Attributes of ordinary space shaped by apartment complexes
Scale	Urban tissue scale		City and district scale		Neighborhood scale
method	Typological classification, statistical analysis, mapping, interpretation		Mapping, typological analysis and interpretation		Times serial mapping, spatial change analysis and interpretation
	▼				
	Chapter 6				
Content	Manifestation of Seoul's urban form and related urban issues				
method	Comprehensive interpretation				

Figure 2 Research structure and flow

CHAPTER II

EMERGENCE OF THE "APARTMENT COMPLEX CITY"

2.1 Introduction

Housing complex, in its simplest meaning, can be defined as a site that contains multiple houses. As such, the site may include the access road to each houses and sometimes common facilities within the complex. It is master-planned as a single site, and is developed simultaneously. By this nature, the housing complex appears in aggregated, homogeneous formal character since it is influenced by socio-economic demand, planning and design ideas, and building materials and construction methods at the time it is developed.

Housing development in the form of complexes appeared in Seoul before the emergence of apartments. During the period of Japanese colonization, the urban area inside the city wall and four main gates 사대문 of old Seoul's traditional urban houses 도시형한옥 were collectively constructed by private contractors (Kim, K.M., 2017). The colonial Joseon Housing Administration 조선주택영단 also conducted collective housing development along with land readjustment in the Sangdo-dong and Shinchon areas, which were suburbs and can be considered as collective housing developments (Park, C.S., 2017). However, collective housing developments during this time were constructed in grid-patterned re-plotted areas, in which the public owned the roads and the housing site was not formed as an exclusive territory. It was formed as a small block, connected to the intricately laid road network with no signs of private territorial demarcation. After

the Korean War, Joseon Housing Administration and the government of Seoul mobilized international aid and national bonds to construct collective housing including the Rebuild House 재건주택, Public Revival House 부흥주택, Welfare House 후생주택, National House 국민주택, and Modern House 문화주택. These types of housing can be considered as a complex design in terms of collective developments. Furthermore, they consisted of detached housing, not apartment buildings, with no specific entrance gate or enclosed boundary. In addition, most were well connected to the existing urban structure (Park, C.S., 2017).

In his account of the Korean housing history, Park C.S. (2017) notes that apartments were first built in the form of complexes after the Korean War. In 1956, the American-Korean Foundation constructed a demonstration housing site that consisted of a detached house, row house, and three-story apartment building at a single complex site in Haengchon-dong. There is little information about the spatial composition of the Haengchon-dong housing complex. According to Park C.S. (2017), in the late 1950s, the Hannam-dong foreigner housing complex, the so-called UN Village, first had exclusive territoriality. However, this housing complex is an exceptional case, since it was built primarily for UN troop families and families of staff of the US Economic Coordination Office 미국경제조정관실. Therefore, housing complexes before the 1960s were more likely developmental units than for use as exclusive territorial occupation, except for the Hannam-dong UN Village.

From the 1960s, apartment complexes as the exclusive domain of collective apartment buildings emerged in Seoul. While detached housing with a large portion of traditional houses dominated in the 1960s, high-rise apartments such as Dowha Apartments and Mapo Apartment Complex were emerging. The Mapo Apartment Complex, developed between 1962 and 1964, is considered the first complex to

include high-rise apartment buildings (Jeon, N.I. et al., 2008; Park, C.S., 2017). Under the objective of "life revolution 생활혁명" under the military regime, open space and exclusive complex facilities were arranged in the Mapo Apartment Complex. The large plot (377,325 m^2) included 642 households in 10 6-story apartment buildings based on two design types in the "Y" shape (6 buildings) and "I" shape (4 buildings) (Jeon, N.I., 2010). According to Park C.S. (2017), the boundary of the Mapo Apartment Complex was demarcated by installing walls, and it was only approachable through the single main entrance. These attributes formed a completely different complex territory compared to the surrounding residential fabric of traditional houses. Apartment development began in earnest with the Mapo Apartment Complex constructed by the Korean Housing Corporation 대한주택공사 in 1962, followed by the construction of Dongbu Ichon-dong Public Official's Apartment Complex 동부이촌동공무원아파트 (1966). However, the construction of apartment complexes remained unremarkable in the 1960s. Most apartments built in the 1960s were a public housing type called Citizen Apartments 시민아파트, which were provided for residents of the slum by then Mayor Kim Hyun Ok. These Citizen Apartments were hurriedly constructed in slum areas located on hilly topography. However, construction ceased after the collapse of the Wawoo Apartments. Already built Citizen Apartments were demolished and converted to other public usages such as parks. As a result, few apartment complexes from the 1960s remain.

Therefore, it is reasonable to examine the formative history of apartment complexes from the 1970s. This complies with the fact that the government established housing supply as an important policy target in the 2nd Economic Development Plan (1967–1970) and promoted the development of apartment complexes through the amendment and enactment of policies such as the Housing Construction Promotion Act 주택건설촉진법,

Land Compartmentalization and Rearrangement Projects Act 토지구획정리사업법, and the Housing Site Development Promotion Act 택지개발촉진법 , alongside granting the role to the Korea Housing Corporation 대한주택공사 for the mass production of inner-city high-rise apartments (Park, I.S., 2013). From the 1970s, apartment complexes have been constructed through various development methods, and in 2015, there were approximately 3,800 apartment sites among which 2,172 are apartment complexes containing more than two apartment buildings. The proliferation of apartment complexes is closely related with the expansion of the built area and transformative process of Seoul's urban area. The morphological character of apartment complexes reflects the development methods applied in this process. Accordingly, the morphological origin, i.e. morphogenesis, of Seoul's apartment complexes can be identified based on the development methods employed in each period.

2.2 Urbanization and Housing Development

Seoul has experienced rapid urbanization and intense development during the past half century, resulting in phenomenal population and economic growth as well as an extremely dense residential area. At the beginning of the 1960s, postwar chaos was overcome and the city was gradually recovering when economic development plans brought a high influx of migrants to the city. Seoul's population increased from a million in 1953 to 2.45 million in 1960, increasing by the rate of 200,000 people annually (Seoul Solution, 2016). In 1970, the population doubled to 5.5 million and exceeded 8 million by the end of the 1970s, reaching 10 million by the end of the 1980s (Table 3). National income quadrupled from $250 to $1000, resulting in the expanding middle class.

Table 3 Urbanization and demographic status in Seoul: 1960-2010

Year	Population of Seoul (1,000 people)	Population Density (Person/km^2)	Urbanization Rate	GDP/person
1960	2,450	9,113 /km^2	21%	$106 (1965)
1970	5,530	8,863km^2	38%	$608
1980	8,370	13,339km^2	63%	$2,458
1990	10,620	17,532km^2	85%	$12,340
2000	9,891	17,132km^2	94%	$18,658
2010	9,631	17,473/km^2	96%	$27,513

(Source: Seoul Statistics Chronology 서울시 서울통계연보[2], The Seoul Research Data Service 서울연구데이터서비스[3] and World Bank[4])

As such, the expansion of the built-up area and housing construction was equally phenomenal and fast. While a number of squatter areas were created around the city center, aggressive outer annexation took place in 1963. Northern and Gangnam (594 km^2) were incorporated into the city of Seoul, including residential areas such as Jamsil, Yeongdong, Gangseo, Dobong, Sanggye, and Mangwoo, expanding Seoul's administrative area to 605 km^2 as it is today (Seoul Solution, 2016; Bang, 2012). Over the last half century, Seoul's city-making has been a rapid but steady process that filled and increased the density of this urban territory. Housing construction was a major urban occupier and form-giver in this process. As such, apartment complexes played an increasingly important role.

As seen in Figure 3, until the mid-1970s, the magnitude of housing construction remained less than 50,000 units a year, partly due to the meager economic capabilities

[2] Seoul Statistics (http://stat.seoul.go.kr/jsp3/stat.book.jsp?link=7&cot=009)
[3] The Seoul Research Data Service (http://data.si.re.kr/statistics-seoul)
[4] The World Bank Group (https://data.worldbank.org/country/korea-rep?view=chart)

of people and the government. However, from the mid-1970s, annual housing construction has been more than 50,000 housing units with few exceptional years. After the mid-1980s, annual housing production reached more than 100,000 units as a rule, rather than exception. One exceptional year (1998) reflects the financial crisis in 1997. The booming years of housing construction ended around the mid-2000s, when the housing market was affected by the global credit crunch in 2007. Since then, annual housing production has remained in the range of 50,000 to 10,000 units. This annual housing supply includes new constructions on vacant plots and reconstruction after the demolition of existing houses. Since the Mapo Apartment Complex, despite poor public investment in housing construction, many apartments have been built by the private sector with accumulated technology as a result of rapid industrial growth and increasing income (Lim, S.H., 2005). As of 2015, the number of housing units in Seoul totaled 3,633,000 detached houses, row houses, and apartments, as defined by the Korean Building Law.

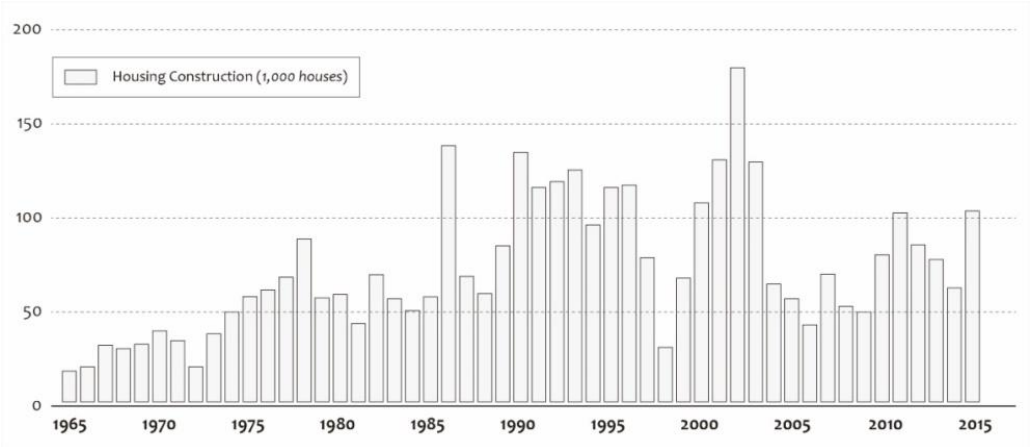

Figure 3 Annual housing constructions in Seoul: 1965–2015

(Source: Compiled by author utilizing Seoul Solution서울정책아카이브[5] and Korean Statistical Information Service국가통계포털[6])

The Korean Building Law classifies housing types as detached houses단독주택 and multi-unit dwellings공동주택. Detached housing includes independent individual houses단독주택 and semi-detached houses다가구주택 (under 3 stories with a total floor area below 660 m^2). Multi-unit dwellings include multi-family houses다세대주택 (under 4 stories with a total floor area below 660 m^2), row houses연립주택 (under 4 stories with a total floor area exceeding 660 m^2), and apartments (over 5 stories) (건축법 시행령 제3조의 4-용도별 건축물의 종류). The two graphs below show the supply quantity and changes in number of households according to the four housing types: detached housing, semi-detached housing, multi-family housing, and apartments over time.

Figure 4 shows the proliferation of apartments in Seoul's residential landscape since the 1970s. In 1975, detached houses were the dominant housing type, accounting for more than 80% of housing units. Apartments were emerging, comprising less than 10% of the total units. During the process of rapid urbanization and densification since the 1970s, the construction of apartments has intensified, positioning them as the dominant housing type in the early 1990s, exceeding the number of detached houses. As the traditional extended family shifted into the nuclear family, housing demand increased, as did the preference for apartment type housing based on the convenient living conditions provided including hot water and heating systems and the provision of community service facilities, which appealed to the growing middle class (Lim,

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[5] Seoul Solution (https://seoulsolution.kr/ko/content/서울시-주택정책).

[6] Korean Statistical Information Service (http://kosis.kr/eng/statisticsList/statisticsList_01List.jsp?vwcd=MT_ETITLE&parmTabId=M_01_01)

D.H., 1995; Kang et al., 1997; Chun, 2003; Jun, 2009).

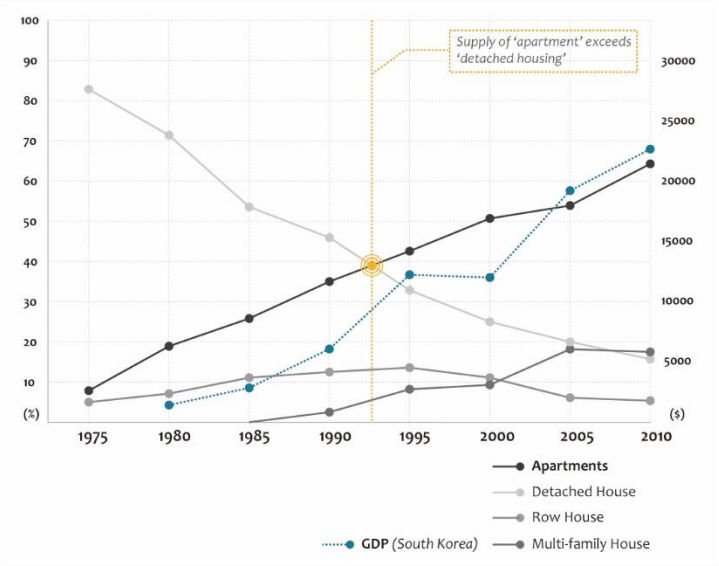

Figure 4 Supply quantity by housing types in Seoul

(Source: Illustration by author utilizing 1970-2010 Census Data and Seoul Statistics Chronology 서울시 서울통계연보)

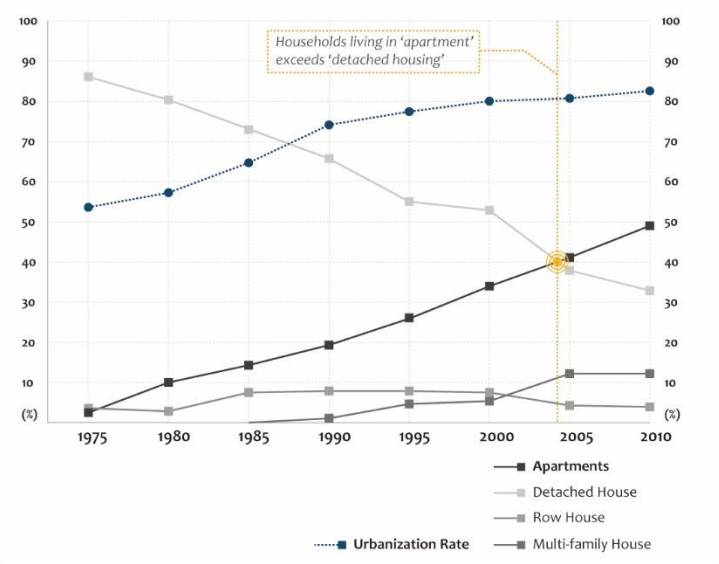

Figure 5 Proportion of number of households by housing type in Seoul

(Source: Illustration by author utilizing 1970-2010 Census Data and Seoul Statistics Chronology 서울시 서울통계연보)

In contrast to the rising portion of apartments, detached houses became less important in terms of housing supply, yielding their plots to denser multi-family apartments alongside few new constructions. In 2010, apartments accounted for more than 60% of housing units, and detached houses for less than 20%. The number of multi-family houses has increased steadily since being introduced in the mid-1980s, mostly through the reconstruction of detached houses, accounting for nearly 20% of housing stock. This compositional change in the housing mix in Seoul is strongly related to economic growth over the years. South Korea's increasing GDP and resultant personal wealth fueled the housing demand, and the burgeoning middle class favored apartments that better satisfied their needs, values, and way of life. The high growth in the national economy during which the GDP per capita reached $10,000 expanded the middle class, increasing the importance that urban public spaces meet citizens' expectations of a higher quality of life standard.

However, as seen in Figure 5, most people still lived in detached houses until the mid-2000s. This inconsistency with the portion of housing types stems from the Korean living tradition wherein multiple households share a detached house in various rental formulas. The situation is further complicated by the fact that the legal definition of a detached house included small rental multi-family apartments in the mid-1980s. As a result, more than 35% of households live in detached houses, accounting for less than 10% of the housing units referred to in the legal definition. Nonetheless, apartments house almost 50% of households, and are the most dominant housing option for Seoul's more than 3 million households since 2004. Also in this era, branded apartment complexes were launched in the market by major construction companies, providing distinctive, upgraded spatial qualities and through exclusive marketing, images of a prestige lifestyle. The provision of apartments has been constantly increasing compared to other types of housing, now constituting more than half the housing industry.

2.3 Apartment Complexes and Development Methods

Seoul became an apartment city consequent to the aggressive development of apartment complexes over the last half century. Unlike the traditional infill developments on small parcels, apartments were constructed on large parcels, resulting in numerous apartment complexes. Apartment complexes are constructed individually or in a group, spontaneously or following master plans depending on the development method applied. The historical formation of apartment complexes differs significantly based on elements such as the development policies in each period, development methods, degree of public control, and the extent of private engagement. The development methods as an implementation tool of public policy and city planning

dictated how apartment complexes were shaped and their location. This section overviews the planning policies and development methods that principally encouraged the construction of apartment complexes in the context of Seoul's urban expansion since the 1970s.

As Table 4 shows, mainly seven development methods and two development strategies were applied in the formation and transformation of apartment complexes in Seoul. Development methods are differentiated as "new development methods" and "redevelopment methods." The former applies to the construction of new apartment complexes on vacant sites, while the latter refers to renewal projects in existing built-up areas or apartment complexes. These development methods are supported by the planning laws institutionalized to respond to city planning issues pertaining to city growth, renewal, and housing supply at different times. In this study, "development strategy" refers to the city planning policy applicable to the development method to promote the development of apartment complexes. Furthermore, "Apartment District" and the "New Town Policy" were overlay zoning techniques to realize the planning goals of growth channeling, housing supply, and urban renewal.

Table 4 Development methods and strategies for the construction of apartment complexes

Development Methods	New development	**Han River Reclamation Project**한강공유수면매립사업
		Housing Site Preparation Project일단의주택지조성사업
		Land Readjustment Project토지구획정리사업
		Housing Site Development Project택지개발사업
		Urban Development Project도시개발사업
		General built up area 일반시가지조성
	Redevelopment	**Housing redevelopment Project** 주택재개발사업
		Housing reconstruction Project 주택재건축사업

Development strategies	Overlay zoning	**Apartment District** 아파트지구
	(Re)development strategy	**New Town District Policy** 뉴타운사업

2.3.1 Han River Land Reclamation Project: *The 1970s*

The emergence of apartment complexes is closely associated with the growth of Seoul city and its urban planning strategies. In the midst of the chaotic political situation after the Korean War in the 1950s, a radical influx of population migrated into the city and aggravated the ill-equipped and spontaneous urban areas formed in regions surrounding the city center. There was no appropriate planning policy for postwar reconstruction, and the urban area constantly expanded without appropriate infrastructure and housing supply. In the 1960s, Seoul's administrative boundary expanded to 605 km^2 during a period of rapid urbanization. To embrace the exploding population, the urban area expanded through the broad-scale Land Readjustment Project, through which a self-financing mechanism enabled the city to secure the necessary infrastructure without public spending. However, the construction of apartments was not generalized in the 1960s. Thus, apartment complex sites were not included in the plot division within the Land Readjustment Project.

Apartment complexes became more common from the point of planning large-scale apartment sites through the Land Reclamation of the Han River Bank 한강공유수면매립사업 and Yeouido area. After several floods in 1966, building an embankment was considered an immediate necessity to prevent overflows of the river (Jang, 2010). The then Mayor Hyun-ok Kim conceived a grand vision that resulted in today's Yeouido Island, riverside highways, and a series of riverfront apartment complexes, while taming the Han River to flood-free urban waterways (Sohn, 2003).

The upper part of the embankment was built as an expressway, and simultaneously, land reclamation of the Han River[7] was executed to form new residential land for sale as a source of revenue (Kim, K.J., 2016).

Land Reclamation of Han River Bank and Yeouido area started from the 1960s and proceeded until the 1970s generating multiple districts of large-scale apartment complex sites, ranging from some 80,000m^2 to 2,500,000m^2 (Table 5). These new large-scale sites were developed by private construction companies and some public development agencies that consequentially formed a linear strip composed on various sizes of apartment complexes along the Han River. The housing culture that was accustomed to live in detached houses started to change by the middle class's new demand for apartment. Yeouido Shibeom Apartment that was developed by the Seoul city government became a turning point (Sohn, 2003). The success of Yeouido Shibeom Apartment extended into consecutive construction of apartment complexes at the reclaimed land along the Han River. This reclaimed land was adjacent to the Land Readjustment Project for Gangnam development that allowed extremely large area of undeveloped land overall, thus the apartment complexes in this area were large-scale, consequentially building a modern residential landscape different from the traditional fabric. Some apartment complexes in Banpo, Apgujeong and Jamsil were the equivalent size of an urban block itself, and innovative community design such as Neighborhood Unit was implemented by the Korea National Housing Corporation. Partially, several apartment complexes in Jamsil were built for the low-incomer. However, most of the apartment complexes targeted the middle-class by providing modern housing structure and facilities that converted housing preference toward apartment lifestyle.

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[7] Land reclamation involved building embankments to reclaim areas extending into the public waterway and filling them to create land for development.

Figure 6 Han River Reclamation Project: Yeouido Shibeom Apartment Complex
(Source: Naver Aerial View image modified by author)

Table 5 Han River Land Reclamation Projects

Year	Project Area	Area (m^2)	Project Operator	Notes
1967.3	First section of riverside road	79,340	The Seoul government	
1967.12-1968.6	Second section of riverside road	476,000	The Seoul government	
1967.12-1968.6	Yeouido	2,876,000	The Seoul government	·Sibeom apartment complex (1,596 households)
1968.11-1969.6	Dongbu-Ichon-dong	402,730	The Korea Water Resources Development Corporation한국수자원개발공사	·Gongmuwon apartment complex (1,313 households) ·Hangang Mansion apartment complex (700 households) ·Foreigner's apartment complex (500 households)
1969.2	Dongbu-Ichon-dong	158,770	Hyundai Engineering & Construction	· Road site: 22,000 m^2 · embankment: 4,670 m^2 ·After reversion to the state, Hyundai Engineering and Construction Corporation built Hyundai apartment

				complex with 5,909 households on 13,220 m^2 of land
1970.4-1973.6	Seobingo-dong	200,000	Public management	Shindonga apartment complex (1,326 housesholds)
1970.7-1972.7	Banpo-dong	627,620	Kyungin Development Corporation (consortium of Sambu, Hyundai and Daelim Construction companies)	From 96,248 m^2 (reversion to the state), 529,722 m^2 of land was purchased by the Korea National Housing Corporation and built 99 buildings (3,650 households)
1978.5-1983.5	Gueui district	455,540	The Seoul government	About 167,000 m^2 from 500,000 m^2 was transferred to Hyundai Construction Company
1971.2-1978.6	Jamsil district	2,490,000	Jamsil Development Corporation (consortium of Hyundai, Daelim, Kukdong, Sambu and Donga Construction companies)	360,000 m^2 was nationalized for embankment and road construction. 2,131,300 m^2 went to the developer

(Source: translated and compiled from Sohn, 2005)

2.3.2 Gangnam development and Land Readjustment Project: *The 1970s and 1980s*

Legally based on the Land Compartmentalization and Rearrangement Projects Act, the Land Readjustment Project subdivided allotments of outer non-urban land into a grid pattern layout and secured lots for public usages such as roads, schools, and parks (Seoul Institute., 2009). Each landowner was obligated to cover the expenses based on reduced rates for house lots. Through a replotting method, they received land at a readjusted higher value as a result of well-equipped infrastructure and up-zoning from rural land use to urban land use (SMG, 2001). Based on the reduced rate of house lot payments from land owners and additional land secured for sale, the city was able to lighten its financial burden for infrastructure costs and accommodate the rapid population influx (Kim, K.J., 2016). The public intervened until the phase of land

compartmentalization and subsequent housing development were carried out through private interests. From the 1960s to 1980s, planar proliferation of the urban area was undertaken through the Land Readjustment Projects. From the 1960s to 1980s, 58 designated project sites were identified, covering up to 140 km^2, 39.4% of Seoul's built area (Figure 7). Eventually, the Land Readjustment Projects led Seoul's suburbanization in the 1960s to 1980s, until the City of Seoul discontinued this method in the late 1980s after a prolonged period of replotting land that complicated the mediation process and speculation in real estate (Seoul Solution, 2016).

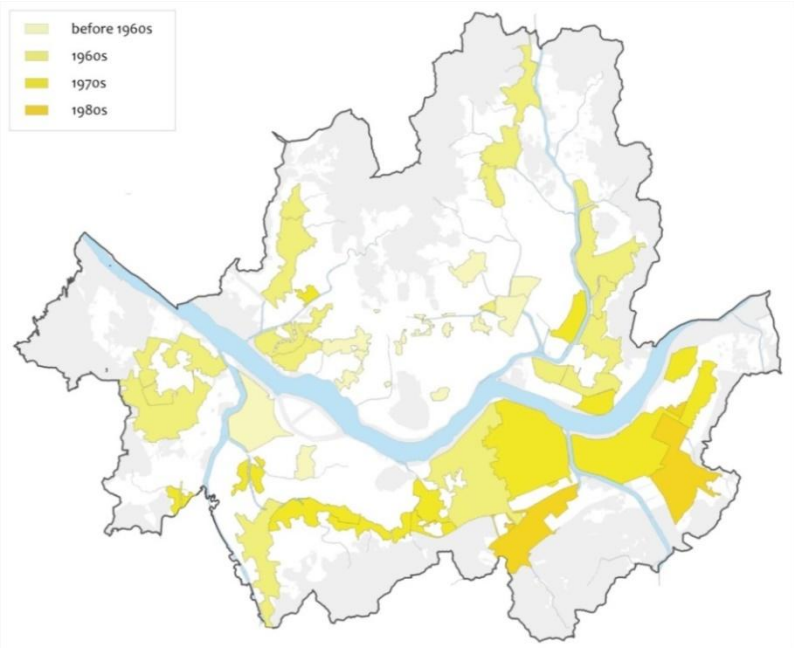


Figure 7 Land Readjustment Project areas from the 1960s to 1980s

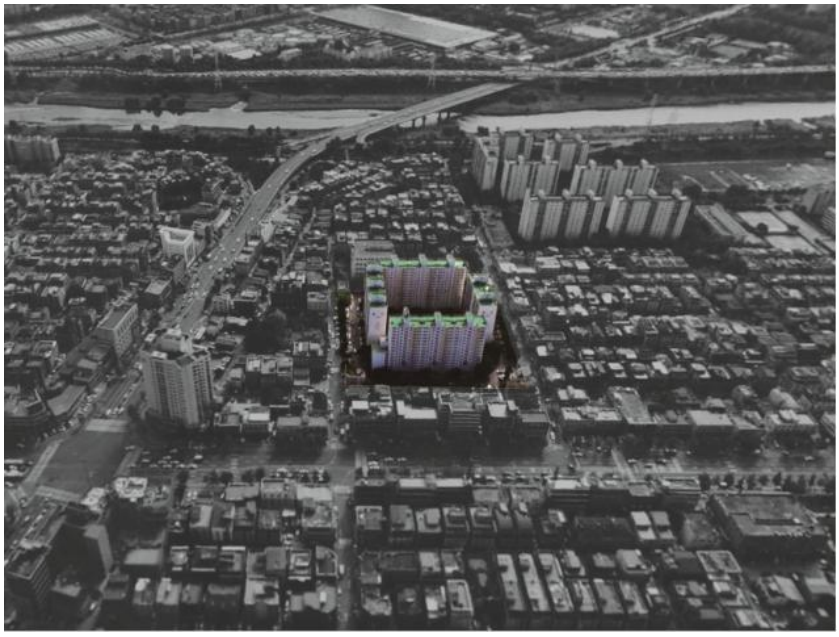


Figure 8 Land Readjustment Project area: Jamsil Hyundai Apartment Complex
(Source: Naver Aerial View image modified by author)

Nevertheless, the Land Readjustment Projects in the 1960s and 1970s involved fine-grained plotting based on the premise to provide detached houses, not apartments. These initial detached housing areas underwent densification through the reconstruction of semi-detached and multi-family houses, but maintained the low-rise residential area or so-called "traditional grid pattern residential fabric" in Seoul (Seoul Institute., 2009). Planned apartment complex sites in the Land Readjustment Projects emerged among the Land Reclamation Projects for the development of the Han River and Gangnam district in the 1970s and 1980s. According to the situation with North Korea, the development of Gangnam in the 1970s was heavily influenced by national defensive purposes to disperse Seoul's population to the South. In addition, it was expedited to secure land for the Seoul-Busan Expressway (Sohn, 2003). The Yeongdong Land Readjustment Project encompassed Seocho and Gangnam districts, which were farmlands at the time, and the reclaimed land of Banpo, Jamwon, and Apgujeong, which provided numerous apartment complex sites including Seocho,

Nonhyun, and Dogok. The areas with apartment complexes were designated as Apartment Districts 아파트지구 and were at the forefront of the development of apartment complexes for the middle class to vitalize the development of Gangnam. The first Yeongdong Land Readjustment Project 영동 1 지구토지구획정리사업 offered changes in the Land Readjustment Projects, from the provision of traditional detached residential units to apartment complex sites. This phenomenon extended to the Jamsil Land Readjustment Project. Under the vision of Mayor Taek-shik Yang to disperse the population into the Gangnam region, the Jamsil Land Readjustment Project provided apartment complex sites to ensure more planned development for the 1988 Summer Olympics in Seoul. The Garak Land Readjustment Project, which was the final one, was implemented in alignment with the 1988 Seoul Olympics in the 1980s. The government of Seoul intended to actively mix low-rise residences with multiple apartment complexes, which were becoming increasingly popular. Thus, regardless of some cases located in Gangbuk, including Dongbu Ichon-dong, Seobinggo-dong and Guui-dong, initial emergence of apartment complexes in the 1970s and 1980s stems from the Gangnam development. These apartment complexes comprised low-rise apartment buildings of 5 stories or had 12 stories, in which case they were considered high-rise buildings at the time. To attract the middle class, the latest complex design strategies were applied to provide a high-quality residential environment believed to be superior to traditional residential areas.

2.3.3 Apartment Districts as large apartment complexes: *1976 to the present*

In 1976, some of the area within the Land Readjustment Project was designated as an

Apartment District, an overlay zoning district that promoted building only apartment complexes by taking advantage of private capital (Bang, 2009; Jang, 2010). This 1976 zoning technique was introduced into the land use regulation system at the request of the Seoul Metropolitan Government to promote the development of Gangnam. However, from the central government side, the intention was to efficiently supply a large volume of housing. Superblock apartment complexes were planned along the Han River from the 1970s under the Apartment District policy. Their aggregation generated a continuous urban fabric of inclusive, self-sufficient communities. The Apartment District designation was an urban planning strategy that transformed the Han River with continuous scenery dominated by apartments. Initially, 11 districts were designated, covering 1,129 *ha* with a mix of two categories: high and low-density apartments. Currently, 18 districts including Yeouido, Ichon, Banpo, Apgujeong, Seocho, and Jamsil are spread over 11,267,000 m^2 (SMG, 2001) (Figure 9).

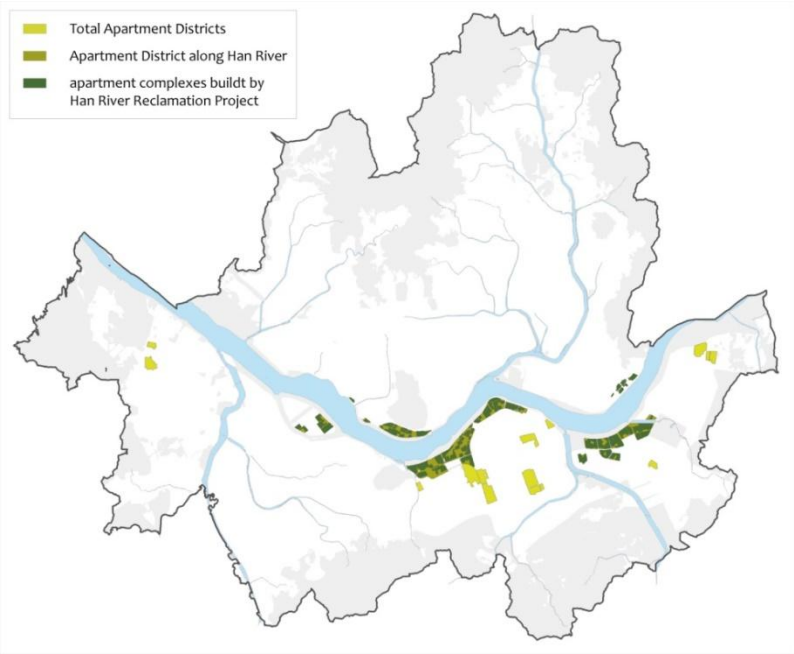


Figure 9 Apartment Districts

2.3.4 Housing Site Preparation Project: *The 1970s and 1980s*

Along with the Land Readjustment Project, the Housing Site Preparation Project was another urban planning development method for collective housing construction. The minimum size had to exceed 10,000 m^2 and was allocated in smaller residential areas where the Land Readjustment Project could not be applied (SMG, 2001). Over 50 areas designated as Housing Site Preparation Projects were built in the 1970s; however, they lost ground as the majority of small-scale housing constructions were privately developed and with the establishment of the Housing Construction Promotion Act (1977), which is a more aggressive housing supply policy. Subsequently, the Land Readjustment Project and Housing Site Preparation Project were consolidated into the Urban Development Project in the early 2000s (SMG website, 2016). In total, 21 apartment complexes were developed through the Housing Site Preparation Project, including Banpo Jugong, the Olympic Athletics and Reporter Village with heavy public involvement, and various private apartment complexes reconstructed through Housing Reconstruction Projects such as Dogok Rexel, Yeongdeungpo Purgio, and Onsu Hillstate.

2.3.5 Housing Site Development Project as a generator of apartment complexes: *The 1980s to the present*

The housing shortage problem was continuously aggravated despite efforts to increase the supply of housing through multiple approaches in the 1970s. As the Korean

economy grew under national economic development plans, the authoritative government considered meeting the housing needs of the middle class as important in maintaining its political justification and furthering the modernization agenda. To resolve problems related to the housing shortage and speculation in real estate, the Housing Site Development Promotion Act was legislated in 1980. The law paved the way for the national and local governments and their development agencies to exercise an eminent domain to purchase vacant land at the rate of the greater government (Sohn, 2003). This was followed by a national wave of large-scale housing development projects in the greenfield land that had remained undeveloped on the outskirts. This movement was led by public development agencies such as the Korea Land Development Corporation, Korea National Housing Corporation, and local development corporations that joined later. This development method laid the foundation for the large-scale, master-planned development that led to the "Newtown-in-town" in the inner city area and "Newtown" outside the central city. The development guidelines of the central government required that more than 60% of residential sites to be developed be allocated solely for the construction of apartments (Park I.S., 2013). The master plans provided a strategy for land uses, road networks, common facilities, and infrastructure, and provided numerous sites for the construction of apartments including dotted commercial plots and open spaces. In most cases, these apartment blocks were sold to private companies to construct the apartments. In some cases, the master plan included the building types and layouts, as was the case in the projects taken over by the Korea National Housing Corporation for the construction of Newtown.

Seoul was the central stage for this national housing supply agenda in the 1980s and for the most rapid population growth in city history. The population increased by nearly half a million every other year, totaling 8.3 million people in 1980. However,

some sizable farming areas remained in Seoul, as did undeveloped open spaces within the city boundary that had been protected by agricultural and military regulations. These undeveloped lands included the Sanggye and Junggye areas in the northeastern area, Goduck and Munjung in the southeastern area, Gaepo in the Gangnam area, Deungchon in the southwestern area, and the Mokdong area along the Anyang River. These lands were mostly the last frontiers of urban expansion within the greenbelt-encircled city boundary. Housing shortage is most palpable in Seoul, a capital city housing nearly a quarter of the national population. Thus, Seoul was at the center of large-scale housing site development projects.

These large-scale developments include Gaepo (1981–84), Godeok (1982–85), Mokdong (1983–1988), and Sanggye (1985–1989), which all exceeded 3,000,000 m^2 in size. Although social ideals may differ from its conceiver (Perloff, 1966), they comprised the Newtown-in-town in terms of their size, inner-city location, and spatial unification and self-sufficiency. As a master-planned community, they present a series of repetitive apartment complexes, forming a large chunk of the homogenous morphological region in the city. The Housing Site Development Project not only played a considerable part in ensuring that apartments dominated other housing types, but also that apartment complexes became a general urban constituent (Kim, K.J., 2016).

Housing Site Development Projects continued throughout the 1990s, 2000s, and 2010s, while the scale thereof was reduced to small or medium-sized projects (Figure 10). Since the first designation of Gaepo and Godeok in 1981, 41 housing sites were developed in Seoul until 2000. Some projects were as large as 1,000,000 m^2 as in Suseo, Sinnae, and Gayang. However, most projects in the 1990s were smaller than 300,000 m^2, and some less than 30,000 m^2. As seen in Figure 00, these Housing Site Development Projects in various sizes contributed to the formation of agglomerated

apartment complexes. Mostly away from the city center, but inside the peripheral greenbelt, these agglomerations indicate the integration of Seoul's outer fringe areas of the 1980s into the built-up urban area. Often, their site boundaries are not definable and may reflect the parcels purchased for the project. These boundaries dictate how apartment complexes meet the surrounding neighborhoods and adjoin natural features, another important morphological characteristic of Seoul.

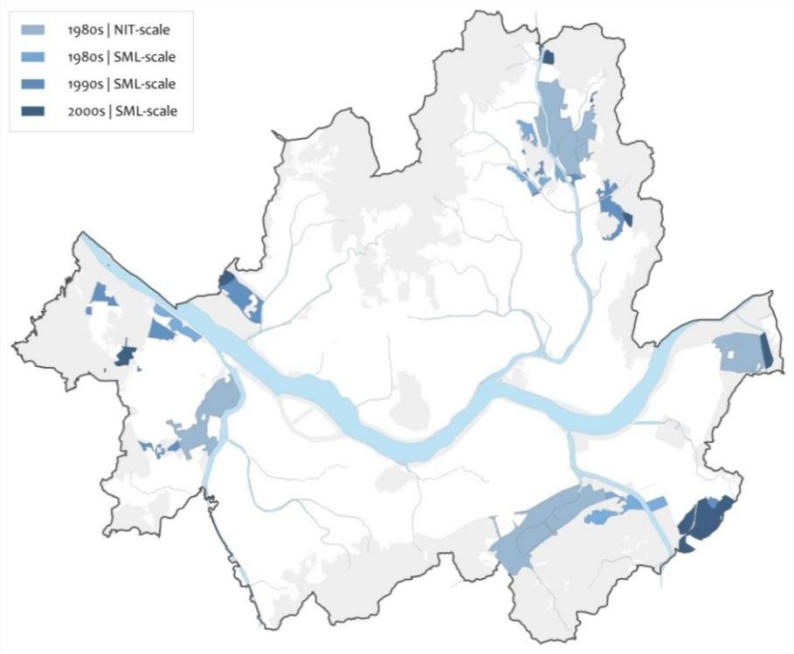


Figure 10 Housing Site Development Projects

Figure 11 Newtown-in-town scale Housing Site Development Project: Gaepo Jugong Apartment Complex in Gangnam-gu
(Source: Naver Aerial View image modified by author)

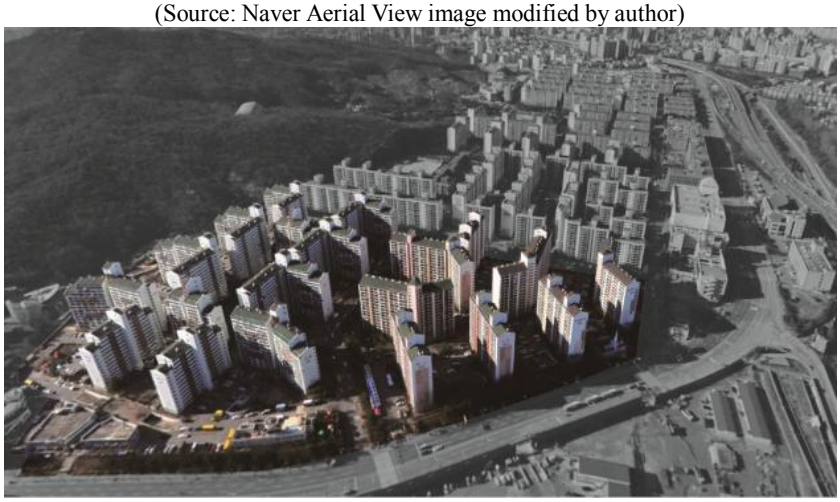


Figure 12 Large scale Housing Site Development Project: Shinnae Shiyoung Apartment Complex 9 in Jungrang-gu
(Source: Naver Aerial View image modified by author)

2.3.6 Housing Redevelopment Project as a generator of apartment complexes: *The 1980s to the present*

Housing Redevelopment Projects based on the Urban and Residential Renewal Act (formerly Urban Renewal Act) were another major development method to ensure Seoul became an apartment complex city. This clearance renewal apparatus was first initiated to demolish squatter settlements in the 1960s and 1970s, and evolved into an overall renewal of urban areas perceived as substandard (Kim, K.J., 1998). The beginning stage, which focused on squatter renewal, was as a public renewal program that involved the city government in planning, finance, and the execution of the projects. However, this method produced few apartment complexes until the mid-1980s, as the projects focused on self-help rehabilitation with a subsidy for public infrastructure. Furthermore, the projects were not implemented because of scarce public resources and weak participation from poverty-stricken residents.

The inauguration of joint renewals or partnership renewals took place in 1983, transforming this method into a privatized joint venture of land owner associations and private construction companies. As the housing demand from the burgeoning middle class strengthened from the 1980s, the squatter and substandard areas around the city center became the target of residential renewal. At this time, unplanned areas comprising small houses and narrow alleys with few public amenities were cleared to build high-rise apartment complexes. The city government devised a citywide redevelopment comprehensive plan to designate eligible renewal areas based on set criteria. This method enabled property owners to form associations to provide collective land and to hire a construction company to lead demolition to redevelop the sites while ensuring a profit from exceeding the number of original units for sale (Kim, K.J., 1998).

Housing Redevelopment Projects became the major supplier of housing in the 1990s and 2000s, as the housing demand exploded and not much sizable vacant land remained within the city boundary. By 2003, 342 sites were designated in the city's residential redevelopment comprehensive plan, covering 5% of the entire city (Figure 13). Most were either in progress or completed. In the late 1980s, less than 4% of housing was supplied through Housing Redevelopment Projects. However, in the late 1990s, 25% of housing was made available through this renewal method and the equivalent amount of substandard housing units was demolished. The population influx, economic growth, expanding middle class, and increased housing demand supported this gentrification of perceived substandard quarters.

Thus, unlike Land Readjustment Projects and Housing Site Development Projects, the location of Housing Redevelopment Projects reflects the transformation rather than urban expansion of Seoul. Representative areas include spontaneously formed residential areas around the city center, such as Jongro-gu, Jung-gu, Seongbuk-gu, Dondaemun-gu, Seongdong-gu, Yongsan-gu, Seodaemun-gu, Mapo-gu, and the later reassembled substandard squatter settlement areas such as Gwanak-gu, Dongjak-gu, and Nowon-gu. From its inception in 1973 to 2015, the Housing Redevelopment method supplied 1,281,244 housing units in the form of apartments. As such, Housing Redevelopment Projects greatly impacted Seoul's urban form and landscape in different ways to the Land Readjustment Projects and Housing Site Development Projects. The central and riverside locations on hilly topographies resulted in the free orientation layout and rugged skylines of aggregated apartment buildings. Since this method depends on the participation of land owners, the project boundaries are usually not definable, and project execution takes place in a random sequence. This affords an abrupt and fragmented formal character to the area where the projects are located. This heterogeneous urban landscape may become more homogeneous by the increasing

dominance of apartment complexes as the redevelopment projects continue.

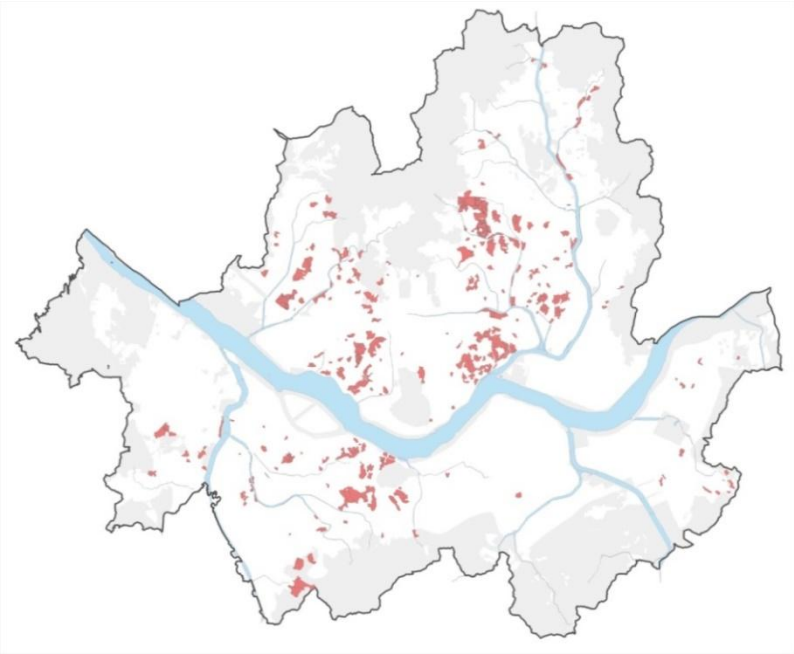


Figure 13 Housing Redevelopment Projects

Figure 14 Housing Redevelopment Project: Raemian Sangdo Apartment Complex 3 in

Gwanak-gu
(Source: Naver Aerial View image modified by author)

2.3.7 Housing Reconstruction Project and the transformation of old apartment complexes: *The 2000s to the present*

The Urban and Housing Renewal Act of 2003 introduced the concept of 'Housing Reconstruction' to control private reconstruction projects aimed at demolishing old apartment buildings for new apartment complexes. The law distinguished 'Housing Reconstruction' from the abovementioned 'Housing Redevelopment' in that the focus was on deteriorating buildings where roads and other public facilities were in fairly good condition. Although this method can be applied to the residential blocks of deteriorated non-apartment houses, it focuses on replacing low-rise with high-rise apartments.

This development method is similar to the implementation of Housing Redevelopment Projects that require a joint venture of the property owners' association and construction company. The key difference is that the land is already assembled as a single unified apartment complex. Apartment reconstruction projects began to emerge in the 1990s after four decades of apartment construction. Since then, many small and large-scale reconstruction projects have been executed in areas where numerous apartment complexes were constructed during the 1970s and 1980s. While small-scale reconstruction projects are widespread throughout the city, the large apartment blocks designated as Apartment Districts have been transformed into high-rise apartment complexes with new designs and amenities, as was the case in the Gangnam, Seocho, Songpa, and Yongsan areas.

Like Residential Redevelopment Projects, these projects have transformed the

existing urban form with considerable impact. They maintain the existing street network and site boundaries, but create a new form in the building, layout, and peripheral treatment, resulting in a more up-scale, heavily gated compound. Recent reconstruction projects, especially along the Han River, generate a monumental character with great building height, while the city of Seoul tries to curb it within the maximum 35 stories. Among Seoul's 2,172 apartment complexes comprising more than 2 apartment buildings, 509 complexes (23.4%) were transformed through Housing Reconstruction Projects (Figure 15). As the City's comprehensive residential reconstruction plan qualifies existing apartment complexes for reconstruction depending on the aging period and structural safety, the apartment reconstruction projects will continue in the coming years.

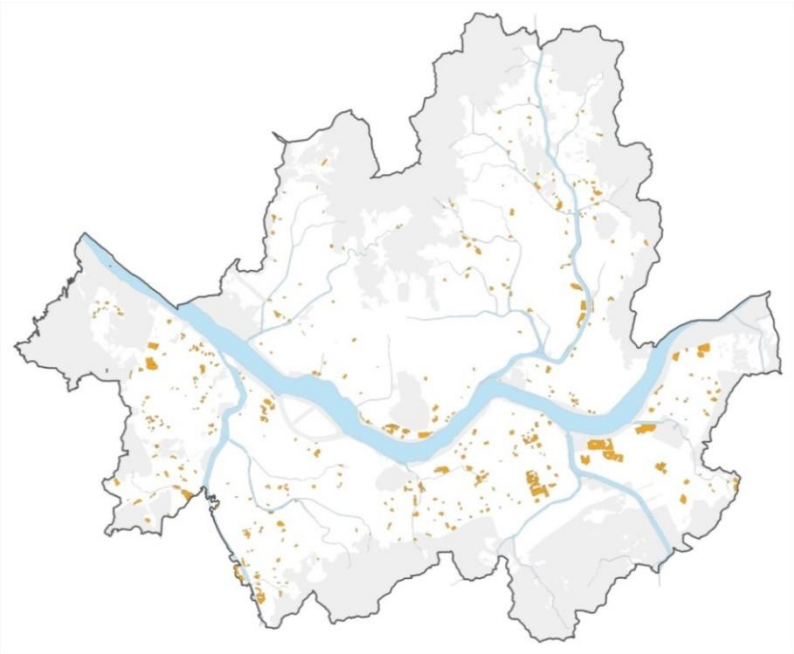


Figure 15 Housing Reconstruction Projects

Figure 16 Housing Reconstruction Project at former apartment complex site: Raemian Firstage in Seocho-gu
(Source: Naver Aerial View image modified by author)

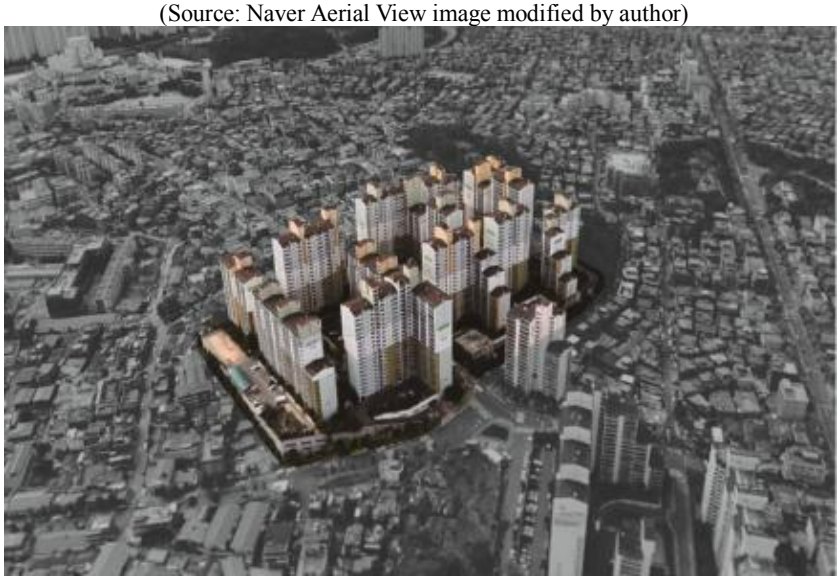


Figure 17 Housing Reconstruction Project at former General Built-up Area: Gochuck Daewoo Apartment Complex in Yeongdeungpo-gu
(Source: Naver Aerial View image modified by author)

2.3.8 The New Town Policy—Promoter of Residential Redevelopment: *The 2000s to the present*

The New Town Policy emerged in the 2000s, when the Seoul Metropolitan Government consolidated several redevelopment and reconstruction projects into uniform regional development. The New Town Policy was a collective renewal strategy to promote urban renewal in the Gangbuk area through housing redevelopment (SMG, 2016). Smaller scale or individual redevelopment and reconstruction projects were integrated through public intervention into a systematic master plan that emphasized area-wide infrastructure. The New Town Policy aimed to balance development between the Gangbuk and Gangnam regions. Soaring apartment prices in the Gangnam area deprived the residents of the Gangbuk area; thus, most of the New Town districts were designated in this region (Jang and Yang, 2008).

To support the New Town Policy, the Special Promotion Law for Urban Renewal was enacted in 2006. It facilitated urban clearance by relaxing land use regulations while providing an overall master plan of the area and financial subsidies (Kim, K.J., 2016). The population and household density before and after redevelopment through the New Town Project remain equivalent, while the floor area density substantially increased after low-rise buildings were replaced with high-rise, high-density apartments. Other attributes include deploying sustainable urban design such as mixed land use and the provision of abundant open space. However, issues pertaining to gentrification have arisen, as the project is ultimately driven by market mechanisms and thus cannot accommodate most of the existing tenants after renewal (Kim, K.J., 2016)

The New Town Policy generated a number of apartment complexes, although the global credit crunch in 2007 slowed the real estate market. In Wangshipri Newtown district, four superblocks of spontaneous residential areas transformed into multiple

apartment complexes under the master plan. This apartment complex construction to replace a traditional residential area also occurred in other Newtown Districts such as Mia, Heuksuk, Ahyun, Gyonam, and Gajewul. In 2015, there were 26 Newtown Districts occupying 23.8 km^2, housing more than 850,000 people. Although the entire area is not subject to clearance renewal, the scale of the development of apartment complexes is phenomenal (Figure 18).

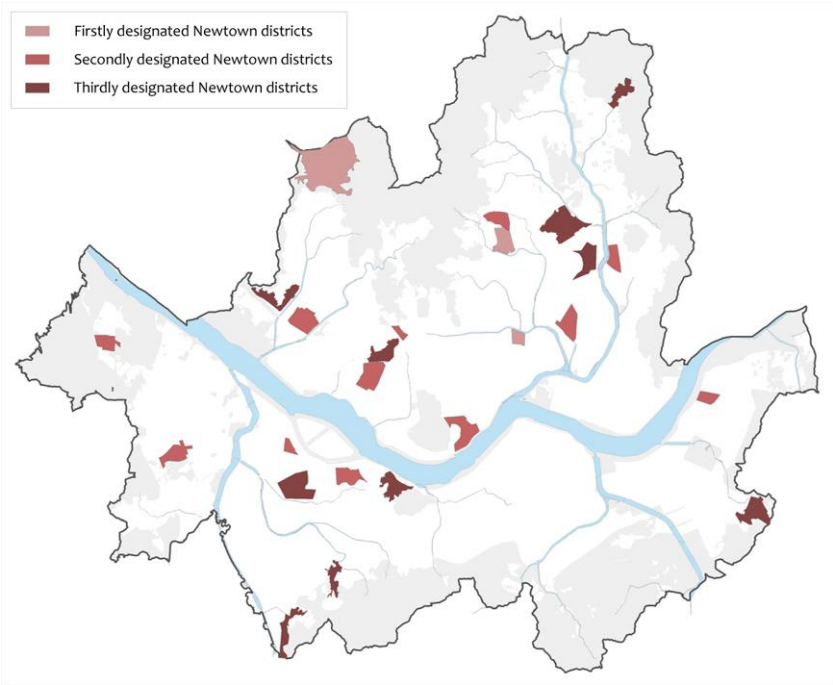


Figure 18 New Town Districts

Figure 19 Housing Redevelopment Project in Newtown District: Gileum Newtown Prugio Apartment Complex 2 in Seongbuk-gu
(Source: Naver Aerial View image modified by author)

2.3.9 Urban Development Project and recent apartment complexes on the outskirt: *The 2000s to the present*

Although not significant or applied in recent years, the Urban Development Project is another development method to create apartment complexes in Seoul. The method is based on the Urban Development Act that aimed at the planned development of vacant areas. The law lays out the legal bases for two kinds of development methods: land readjustment and public development. The former is equal to the existing land readjustment method mentioned earlier, and the latter similar to the Housing Site Development method in terms of public land purchase, but not limited to housing development. As mentioned, the City of Seoul did not employ the land readjustment method after the 1980s. However, some apartment complexes were developed through the public development aspect of the of urban development method, utilizing public land purchasing power. Figure 20 shows the sites to which this method was applied,

including Eunpyong New Town, Gangil industrial complex, and Magok district that encompassed industrial and residential uses. Currently, the Urban Development Project includes the Bogeumjari Housing Project and Public Rental Housing Project. The Bogeumjari Housing Project provides housing constructed or purchased by the public sector with the support of financing or funds to complete the house construction plan approval process as per the Bogeumjari Special Act (LH website, 2016).

Figure 20 Urban Development Projects

Figure 21 Newtown-in-town scale Urban Development Project: Eun-Pyeong Newtown Hyundai Hillstate Complex 12 in Eunpyeong-gu
(Source: Naver Aerial View image modified by author)

Figure 22 Urban Development Project: Gangil Riverpark 3 & 4 in Gangdong-gu
(Source: Naver Aerial View image modified by author)

2.3.10 General Built-up Area and individual apartment complexes: *The 1970s to the present*

Note that a significant portion of apartment complexes has been developed in General Built-up Areas without the application of the development methods discussed above. They were developed individually on a sizable parcel under the general building permission and zoning regulation. However, this does not mean that the entire general built-up area was formed in an unplanned and spontaneous way. Although some areas were formed as such, most of General Built-up Area was developed through various unspecified methods not subject to the formal development procedures of the city administration. Usually, these developments were planned on a small scale through private initiatives. Thus, spontaneously formed General Built-up Areas can be found around the city center and outer areas across the city. Apartments were developed on large plots that were either provided or assembled. As such, the apartment complexes in the General Built-up Area often seem to be of the stand-alone type surrounded by the general low-rise residential area.

2.4 Accumulation of Apartment Complexes and Development Methods

2.4.1 Accumulation of apartment complexes over time

Through these development methods and strategies, 2,172 apartment complexes have been constructed since the 1970s. As Table 6 shows, apartment complexes are mostly located in residential areas covering 60% (357.9 km^2) of Seoul's city area of 605.2 km^2 (Seoul Statistics, 2017). Based on a calculation in GIS, 2,172 apartment complexes

take up 15.7% (58.4 km^2) of the urban area. Apartment complexes are dispersed throughout the city including on hilly sites and adjacent to waterways. Exceptions are noted for the greenbelt zone, relatively steep mountainous areas, green open space, and other specifically designated zoning areas (Figure 23). There are restrictions on developing housing in the city center. However, an appeasement policy has allowed the construction of apartment complexes in certain industrial districts. Furthermore, restrictions have been lifted for several greenbelt zones for new urban and residential developments.

Table 6 Numbers for the territorial aspect of Seoul

Territorial aspect		Numerical value	Ratio (%)
Seoul	Seoul's total area	605,250,000 m^2	100%
	Greenbelt within Seoul	149,620,000 m^2	24.7% of total
	Urbanization area	370,990,000 m^2	61.3% of total
	Residential area	316,736,286 m2	52.3% of total area 69.5% of urbanized area
Apartment Complexes	Number of Apartment Complexes	2,172	·
	Total area for Apartment complex	58,401,055 m^2	15.7% of urbanized area

Table 7 Construction of apartment complexes over time

	1970s	1980s	1990s	2000s	2010s (2010 – 2014
Number of apartment complex constructed	73	340	659	890	210
Percentage (%)	3.4	15.6	30.3	41.0	9.7
Increase /decrease rate from previous period	·	465 %	194 %	135 %	n/a*

* Note that the data for 2010s is partial that only includes from the year 2010~2014, so it is difficult to conclude the tendency of increase or decrease rate.

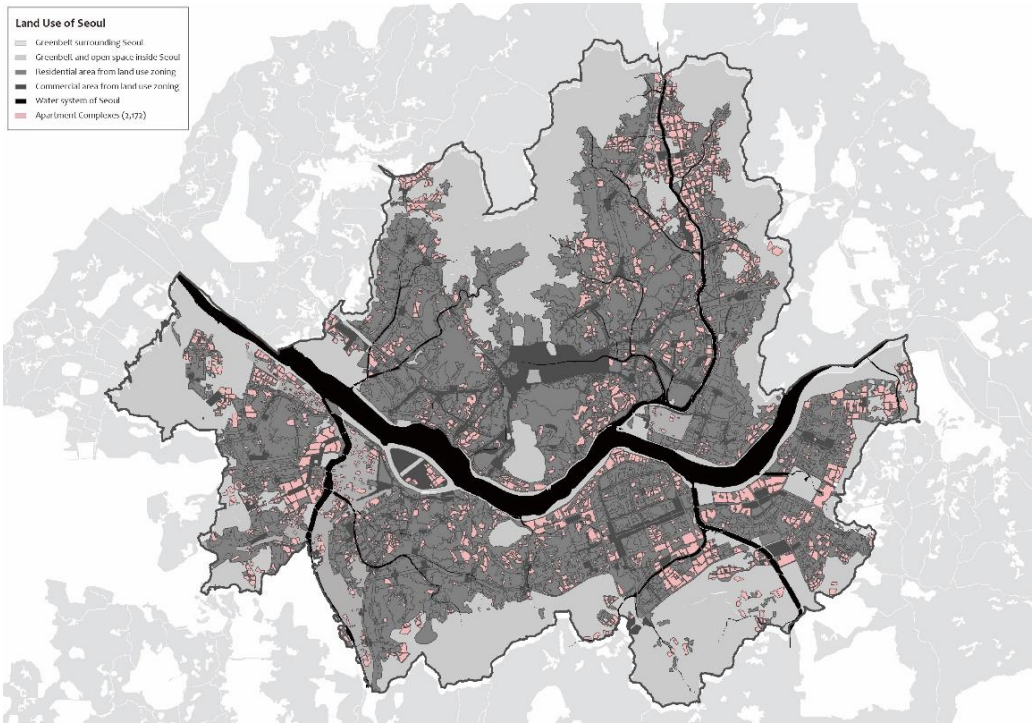


Figure 23 Apartment Complexes and residential zoning areas

As mentioned, 2,172 apartment complexes have been constructed across the capital city and some are entering the rebuilding cycle. According to the percentage of apartments constructed over time, nearly half were built in the 2000s (890 complexes, 47%) and 1990s (659 complexes, 30%). However, in terms of the rate of increase, there was an explosive supply from the 1970s to 1980s (465% increase rate), and a steady increase in terms of the provision of apartment complexes from the 1970s until the present (Table 7). Therefore, Seoul rapidly became an apartment complex city over a short period. This history of the construction of apartment complexes is closely connected to the urban morphological characteristics of the city. Figure 24 shows the rapid emergence of the apartment complex city.

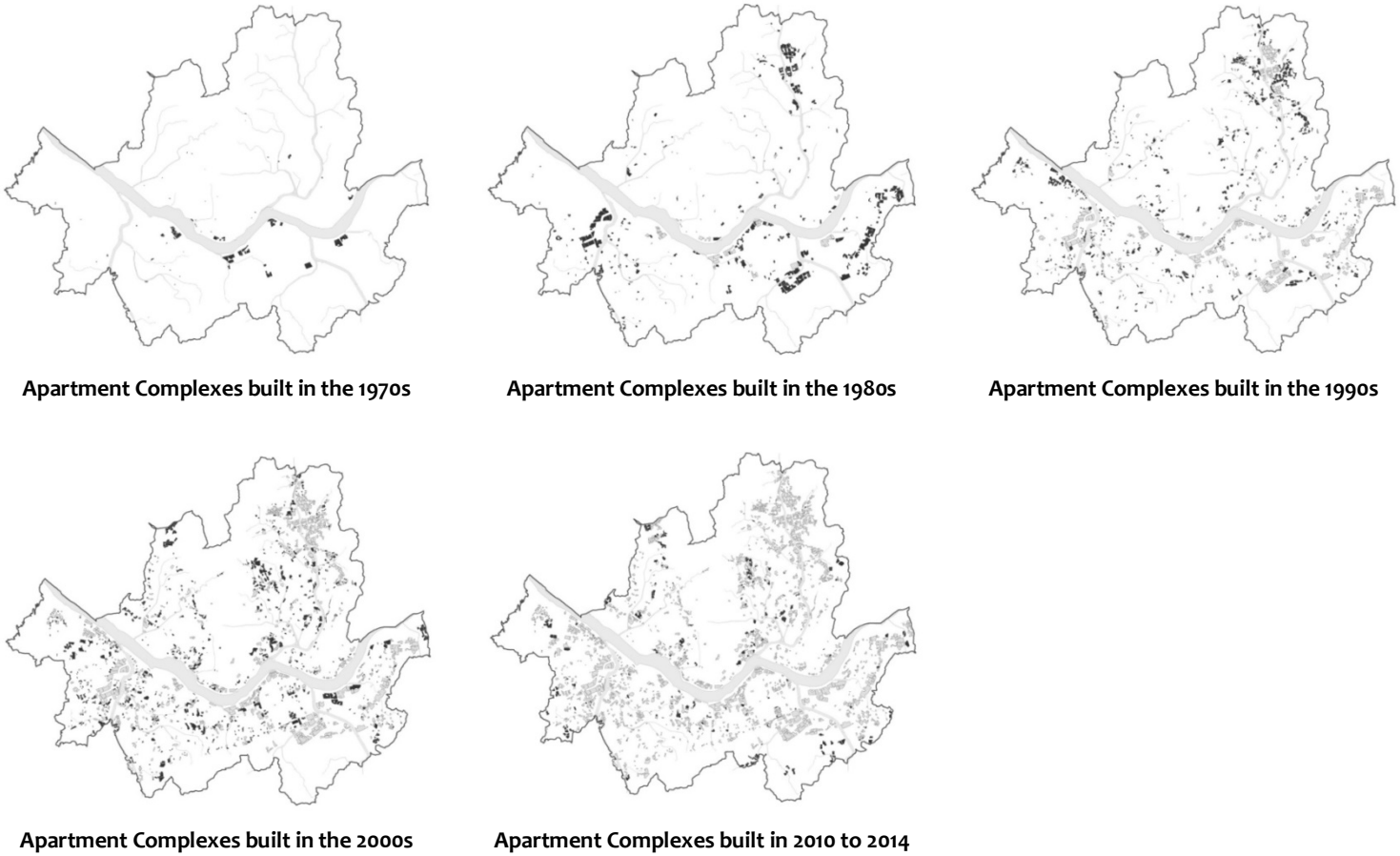


Figure 24 Rapid emergence of the apartment Complex City (1970–2014)

2.4.2. Accumulation of apartment complexes according to development method

Table 8 shows the contribution of each development method to the construction of apartment complexes during each period. In the 1970s, 73 complexes were constructed through the Han River Reclamation Project and development of the general built-up area. In the 1980s, while the Han River Reclamation Project and General Built-up Area development continued, the Land Readjustment Project, Housing Site Development Project, and Housing Redevelopment Project joined as major suppliers of apartment complexes. In the 1990s, while the Han River Reclamation Project and Land Readjustment Project slowed, general built-up area development, the Housing Site Development Project, and Housing Redevelopment Project became major generators of apartment complexes. Noteworthy is that the Housing Redevelopment Project joined these forces in the 1990s, producing more apartment complexes (123 complexes) than the Housing Redevelopment Project (95 complexes). In the 2000s, while the Housing Site Development Project reduced its supply capacity, the Urban Development Project began to emerge as a substantial supplier (39 complexes in the 2000s and 71 in the 2010s) among General Built-up Area development, the Housing Redevelopment Project, and Housing Redevelopment Project as major suppliers of apartment complexes. In the 2010s (2010–2014), the Urban Development Project developed the most apartment complexes (71 complexes) followed by the Housing Redevelopment Project (64 complexes) and Housing Reconstruction Project (34 complexes). Figure 25 shows the development methods applied and apartment complexes developed over time.

Table 8 Development methods and construction of apartment complexes over time

Development Method	1970s	1980s	1990s	2000s	2010s
Han River Reclamation Project한강공유면매립사업 (64 ACs)	28 (43.8 %)	27 (42.2 %)	9 (14.1 %)	0 (0.0 %)	0 (0.0 %)
Land Readjustment Project토지구획정리사업 (259 ACs)	9 (3.5 %)	64 (24.7 %)	74 (28.6 %)	104 (40.2 %)	8 (3.1 %)
Housing Site Development Project택지개발사업 (288)	0 (0.0 %)	72 (25.0 %)	141 (49.0 %)	61 (21.2 %)	14 (4.9 %)
Urban Development Project도시개발사업 (138 ACs)	2 (1.4 %)	23 (16.7 %)	3 (2.2 %)	39 (28.3 %)	71 (51.4 %)
General Built-up Area일반시가지조성 (534 ACs)	20 (3.7 %)	90 (16.9 %)	214 (40.1 %)	191 (35.8 %)	19 (3.6 %)
Housing Redevelopment Project주택재개발사업 (380 ACs)	2 (0.5 %)	36 (9.5 %)	95 (25.0 %)	183 (48.2 %)	64 (16.8 %)
Housing Reconstruction Project주택재건축사업 (509 ACs)	12 (2.4 %)	28 (5.5 %)	123 (24.2 %)	312 (61.3 %)	34 (6.7 %)

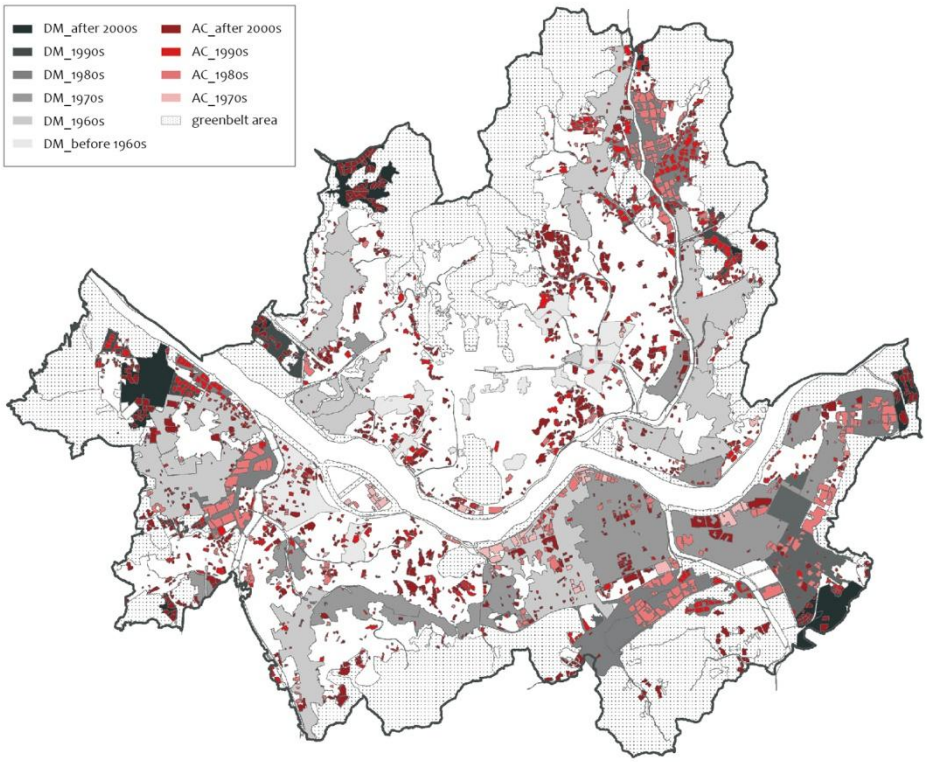


Figure 25 Applied development methods and developed apartment complexes over time

2.4.3. Specific development methods and apartment complex development

As indicated in Table 8, the development methods and strategies were applied to city expansion and the development of apartment complexes in different periods. For some apartment complexes, the development methods overlap or are replaced by reconstruction, which is one development method. Strategies to encourage the construction of apartment complexes such as the Apartment District or Newtown Project are also superimposed over the site developed through a specific development method. This combination of different methods and strategies clarifies the morphological characteristics of apartment complexes. Accordingly, considering the nature of development methods, overlapped development strategies, and development scales, 7 development methods were further classified into 14 types to investigate the relationship between development methods and the morphological characteristics of apartment complexes, as discussed in Chapter 4 and Chapter 5.

As shown in Table 8, overlapped development methods and strategies have been applied. The Han River Reclamation Project took place in conjunction with the Housing Preparation Project (HLR-HSP: 1), Land Readjustment Project (HLR-LRA: 2), and other specific development methods (HLR-GBA: 3). However, these methods produced only 64 apartment complexes (2.9%), although their scale is large enough to dominate the landscape along the Han River. More than 10% of apartment complexes were developed at sites provided by the Land Readjustment Project (LRA: 4). Furthermore, the Housing Site Development Project produced 288 apartment complexes (13.3%), which were generated by the Newtown-in-town Housing Site Development Project (HSD-NIT: 5), large-scale Housing Site Development Project (HSD-L: 6), and small/medium-scale Housing Site Development Project (HSD-SM: 7). Urban Development Projects (130 apartment complexes, 6.4%) were subdivided

according to the project scale: Newtown-in-town scale (UDP-NIT: 8) and small scale (UDP-SML: 9). About a quarter of apartment complexes (24.6%) were developed in the General Built-up Area without applying a specific development method (GBA: 10). In addition, the Housing Redevelopment Project produced 380 apartment complexes (17.5%). Among these, 70 (3.2%) were in the overlaid Newtown District (HRD-NT/O: 11) and most (310 complexes, 14.3%) were part of the Housing Redevelopment Project (HRD-N/O: 12). More than 500 apartment complexes (23.4%) resulted from the Housing Reconstruction Project, which replaced the existing apartments initially created by other development methods (HRC-DM/O: 13) or generated new apartment complexes through small-plot assembly in the general built-up area (HRC-N/O: 14). Figure 26 shows the spatial distribution of apartment complexes constructed through these 14 specified development methods.

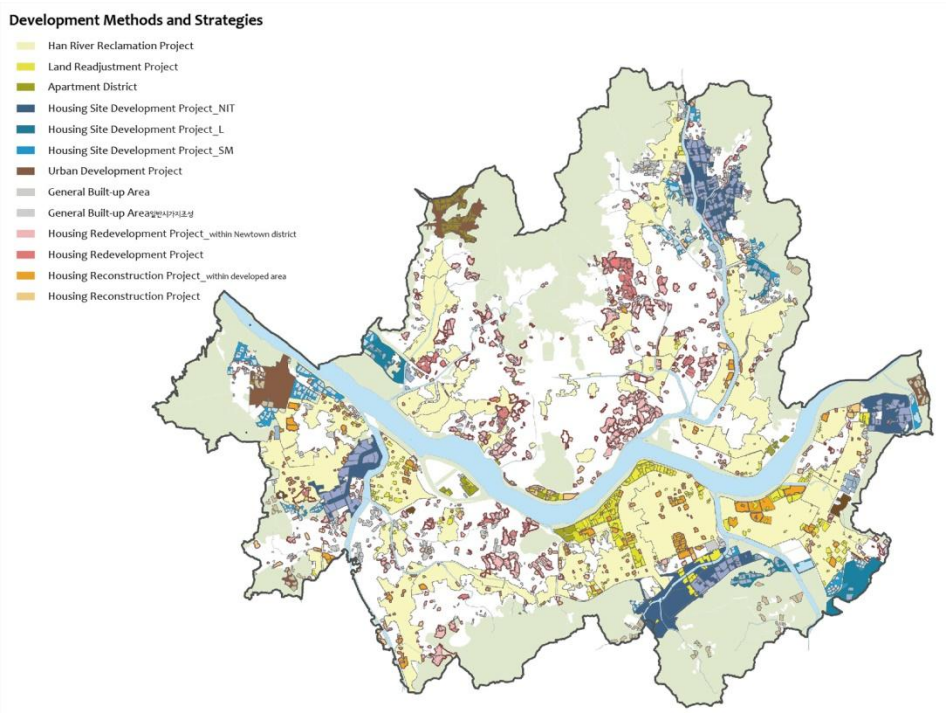


Figure 26 Specified development methods as the genesis background of the emergence of apartment complexes

Table 9 Main (7) and Specific Categories (14) of reclassified development methods

Main Category			Specific Category of 14 Development Methods (DM)			DM project scale
1	HLR	Reclamation Project한강공유수면매립사업	1	HLR_HSP	Housing Site Preparation Project	Individual
			2	HLR_LRA	Land Readjustment Project	Individual
			3	HLR_GBA	General Built-up Area	Individual
2	LRA	Land Readjustment Project토지구획정리사업	4	LRA	Land Readjustment Project	Individual
3	HSD	Housing Site Development Project택지개발사업	5	HSD_NIT	NIT-scale Housing Site Development Project	NIT
			6	HSD_L	Large-scale Housing Site Development Project	L
			7	HSD_SM	Small and medium-scale Housing Site Development Project	S / M
4	UDP	Urban Development Project도시개발사업	8	UDP_NIT	NIT scale Urban Development Project & Newtown over-layered	NIT
			9	UDP_SML	Other Urban Development Projects	S / M / L
5	GBA	General Built-up Area일반시가지조성	10	GBA	Without layering of development method(s)	Individual
6	HRD	Housing Redevelopment Project주택재개발사업	11	HRD_NT/O (Newtown Overlay)	Newtown strategy overlaid	S / M / L
			12	HRD_N/O (No Overlay)	Only Housing Redevelopment Project	Individual
7	HRC	Housing Reconstruction Project주택재건축사업	13	HRC_DM/O (DM Overlay)	Reconstruction within development project sites	Individual
			14	HRC_N/O (No Overlay)	Reconstruction within general built up area	Individual

2.5. Interpretive Conclusion

The active construction of apartment complexes in Seoul has been promoted by various development methods and strategies supporting the urban and housing policies of the central government and City of Seoul. During the 1960s and 1970s, Land Readjustment Projects were widely applied to urban expansion in all directions from the city center, providing small-plot residential subdivisions, while apartment complexes began to emerge at large sites as a result of the Han River Reclamation Project and Yeoeuido Development. The development of Gangnam joined to support the development of apartment complexes by providing large parcels in Yeongdong and the Jamsil Land Readjustment Project in the 1970s and 1980s. In addition to providing large parcels for the construction of apartments, the central government and City of Seoul further promoted this construction through the Apartment District zoning technique to achieve the aim of building a modern nation. Through these apartment complex developments, traditional detached houses began to lose their dominance as those in the middle class increasingly preferred apartment living. The involvement of the central government in the supply of housing in the 1980s further laid the ground for large-scale Newtown-in-town developments through the Housing Site Development Project. The outlying farmlands and forests were transformed into master-planned apartment communities as well as small and medium-scale apartment complexes. During the same period from the late 1980s, the Housing Redevelopment and Housing Reconstruction Projects gained momentum, becoming the major supplier of apartment complexes on numerous hillsides and in general neighborhoods in Seoul. In the 2000s, housing reconstruction began to emerge as a transformer of old apartment complexes built in the 1970s, as the demand for quality housing remained strong consequent to sustained economic growth. Since the 2000s to date, the last vacant lands on the city

periphery such as in the Eunpyeong, Magok, and Gangil districts were developed through the Urban Development Project under heavy public involvement, providing a new style of apartment complexes.

From 1970 to 2014, Seoul accumulated 2,172 apartment complexes consisting of two or more apartment buildings. Only 73 apartment complexes exist at present that were built from the 1970s, although the production rate accelerated to 2,172 complexes within 45 years. The Han River Reclamation Project initiated this movement in the 1970s, and once ignited, the land readjustment, housing site development, housing redevelopment, housing reconstruction, and urban development methods followed to create the large volume of apartment complexes over time. Besides these institutionalized development methods, apartment complexes were built in the general built-up area through private initiatives. In fact, among Seoul's 2,172 apartment complexes, 534 were developed in the General Built-up Area, the most among the 7 development methods discussed. It is also notable that the housing reconstruction method generated the second most apartment complexes (509 complexes), meaning that the transformation of apartment complexes occurred in a short cycle of time. Apartment complexes built in the 1970s and 1980s are under heavy pressure from market demand to demolish and rebuild these complexes in the new style. Given the accumulation and renewal of apartment complexes in a short period, Seoul may be deserving of the title, "Instant Apartment Complex City."

The development methods examined in this chapter demonstrate that the morphological characteristics of apartment complexes have largely been determined by the nature of the methods. Each development method has its own policy goals and subsequent land provisions that require different planning approaches and development processes. Furthermore, each method reflects the period in which it was introduced under the current socio-economic situation. As such, development methods are the

window through which to understand the morphological origin of apartment complexes. Here, 7 general development methods and 14 specific methods were identified to examine their relationships with the formal characteristics of apartment complexes in the following chapters.

CHAPTER III

MORPHOLOGICAL CHARACTERISTICS OF INDIVIDUAL APARTMENT COMPLEXES

A city is often compared to a living organism based on dynamics in the genesis, evolution, and transformation of architecture and the urban fabric as cells and tissues. In urban morphological studies, a parcel is the base unit of urban form, while containments within a parcel such as buildings, building use, or open space around the building are considered as urban cells (Moudon, 1994). These homogeneous cells come together to form urban tissue (Whitehand, 1981). An apartment complex is a development unit viewed as an urban cell, and simultaneously embeds the quality of the urban tissue based on a large parcel that comprises multiple buildings. The urban tissue is an assembly of homogeneous cells, in other words, it is the "plan unit" composed of a parcel, building, and street (Conzen, 1960). Apartment complexes differ from traditional small-scale parcels that accommodate detached houses 단독주택, row houses 연립주택 , and multi-unit housing 다세대주택 (Seoul Institute, 2009). This chapter identifies the morphological characteristics of apartment complexes in terms of the parcel, building, street, and density of apartment complexes. As discussed in the previous chapter, morphogenesis was produced by the development methods applied in a particular period. Furthermore, the influence of the development method and development period on morphological characteristics is examined. Finally, the interrelationship between selected morphological elements is ascertained to understand their mutual influences.

3.1 Morphological Analysis of Apartment Complexes

3.1.1 Morphological elements and dimensions

In this section, an analytical framework is proposed to extract the morphological characteristics of an apartment complex as a cell unit and urban tissue composing the urban form. In urban morphology, a plot, building, and street are considered the three elements comprising the urban tissue (Moudon, 1994). An apartment complex is a relatively large plot containing more than two high-rise buildings as well as an internal road system, broad open space for parking, and greenery. In this context, the element of density is added to the traditional methodology of analyzing the dimensions of parcel, building, and street (Table 10).

(1) Parcel: Size and shape of the apartment complex site is recorded, taking it as a single plot.
(2) Building: Apartment building is documented according to architectural style, height range, and arrangement type.
(3) Density: Density is measured using three elements: the building coverage ratio (BCR), which demonstrates the relationship between built and non-built space, and floor area ratio (FAR) to examine the building intensity independently of the programmatic composition. The open space ratio (OSR) shows the proportional amount of open space within a complex.
(4) Street: Shape of the street, proportion that borders the apartment complex, and character of the street classified according to types of hierarchy are examined. Based on limited site information, internal streets are not examined.

Table 10 Morphological elements and dimensions of apartment complexes

Morphological Elements	Dimensions
Parcel	· Parcel Size · Parcel Shape
Building	· Number of Buildings · Building Height · Architectural Style · Building Arrangement
Density	· Building Coverage Ratio (BCR) · Floor Area Ratio (FAR)
Street	· Street Shape · Bordering Street Proportion · Bordering Street Hierarchy

The morphological dimensions of the four elements were observed, classified according to type, and recorded individually for all apartment complexes by the author. All recorded data was coded by type, compiled in the apartment complex Excel database, and then converted using the GIS program. The database and GIS information enhance understanding of the typological characteristics of formal attributes of apartment complexes and their spatial patterns over the built-up areas of Seoul.

3.1.2 Internal and external forces

The database, which was coded by formal type for each apartment complex, enables an examination of the internal and external forces influencing the morphological characteristics. As discussed in Chapter 1, the term internal force refers to the limitations and opportunities of morphological elements. Urban morphological studies

have demonstrated that the form itself strongly influences the shaping of urban form. For example, the size and shape of the parcel influence the building size and layout, while building size and shape affect building use and density. Here, external force means the influences from outside the physical form, such as market demand, planning regulations, and other socio-cultural factors. This dissertation does not examine these external forces. Instead, each dimension of the morphological elements is investigated in terms of (1) development period and (2) development methods, as they reflect the specific external forces shaping the urban form.

Thus, the analysis reviews aspects of the current condition of accumulated apartment complexes, while changing attributes are discussed in relation to the periods of development at 10-year intervals. Viewing the morphological characteristics in relation to the development method provides insights into the genesis of apartment complexes. The morphological elements were statistically analyzed through a descriptive analysis and chi-squared test to determine the current condition according to development period and method.

3.2 Parcel

At the parcel level, which is a single apartment complex, the size and shape is investigated as a principal morphological characteristic. Parcel shapes vary; however, they were first categorized into types based on regularity and then subdivided into detailed shapes with some degree of simplification. The size and shape of a parcel were examined in terms of their relationship with the development method and period of development as external forces.

3.2.1 Parcel size

Compared to an individual plot size within a grid pattern residential area, an apartment complex, which is a single plot, occupies a fairly large area. Regarding the 2,172 apartment complexes under study, the parcel size varies, ranging from 1,105 m^2 (the smallest) to 560,766 m^2 (the largest), with an overall mean value of 26,863 m^2. Figure 27 shows the distribution pattern of parcel size during the study period of 1970 to 2014. A heavy concentration is evident below the 50,000 m^2 line, and some cases are scattered above the 200,000 m^2 line. Considering this pattern, this study classifies parcel size into seven types (Table 11).

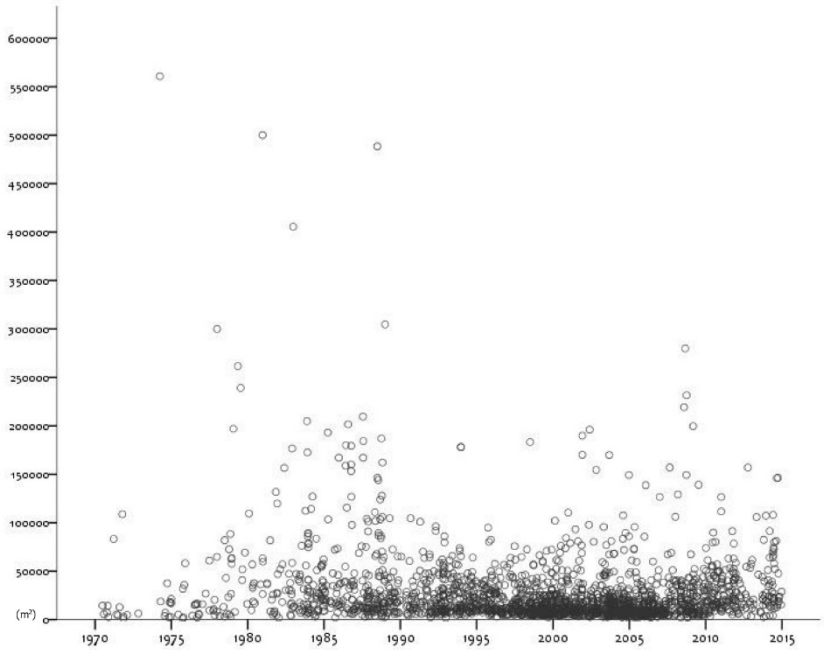


Figure 27 Parcel size distributions over time (2,172 apartment complexes)

Table 11 Parcel size values and type classification

Overall value	Mean	Median	Minimum	Maximum
	26,888 m^2	15,665 m^2	1,105 m^2	**560,766 m^2**
Types	**Parcel Size**		**No. of ACs**	**Percentage (%)**
PS-1	under 2,500m^2		17	0.8
PS-2	over 2,500 – under 5,000 m^2		151	7.0
PS-3	over 5,000 – under 10,000 m^2		560	25.8
PS-4	over 10,000 – under 50,000 m^2		1183	54.5
PS-5	over 50,000 – under 100,000 m^2		181	8.3
PS-6	over 100,000 – under 200,000 m^2		66	3.0
PS-7	over 200,000 m^2		14	0.6
Total			2,172	100.0

The majority of apartment complexes are smaller than 10,000 m^2 to 50,000 m^2 (PS-4: 54.5%), followed by the 5,000 to 10,000 m^2 type (PS-3: 25.8%). The area size of these two types is substantially large compared to a soccer field measuring 8,000 m^2. A small percentage of apartment complexes (PS-1 and PS-2: 168 complexes, 7.8%) have a parcel size of less than 5,000 m^2, 151 sites (PS-2) measure 2,500–5,000 m^2, while only 17 apartment complexes (PS-1) are smaller than 2,500m^2. However, even the smallest types are significantly larger than the traditional grid subdivision plot, which normally measures between 90 and 200 m^2 (Seoul Institute, 2009: 254). This attribute of apartment complex sites presents a radically different urban cell that incubates a physical tissue different to the fine-grained grid residential fabrics occupying 37.2% of Seoul's residential area (Seoul Institute, 2009: 234).

Furthermore, 11.9% of apartment complexes (PS-5, PS-6, PS-7: 261 complexes) are larger than 50,000 m^2. Among these, 181 are in the area range of 50,000–100,000 m^2 (PS-5: 8.3%), and 66 in the area range 100,000–200,000 m^2 (PS-6: 3.0%).

Throughout Seoul, 14 complexes occupy more than 200,000 m^2 of land as a single parcel (PS-7, 0.6%). The largest apartment complex is Banpo Jugong Apartment Complex, built in 1973 and measuring 560,766 m^2. The second largest is Dunchon Jugong Apartment Complex, built in 1980 and measuring 469,880 m^2. While both are composed of smaller sectors, Jamsil Parkrio, which was built after demolishing a 5-story apartment complex in 2008, is the largest single parcel complex (279,928 m^2) with no subdivided sectors. This is similar to the superblock-based housing reconstruction of the Jamsil area, originally developed as low-rise apartment complexes through the Han River reclamation projects. These large parcels may not be equivalent to notable planned residential communities such as in Radburn, New Jersey, the US, which measures around 600,000 m^2 or a similar size of the 800 x 800m superblock in Gangnam, Seoul. However, this size range of 50,000 m^2 to more than 250,000 m^2 is large enough to produce a residential community within the city, forming a distinctive morphological region in the particular period in which they were built.

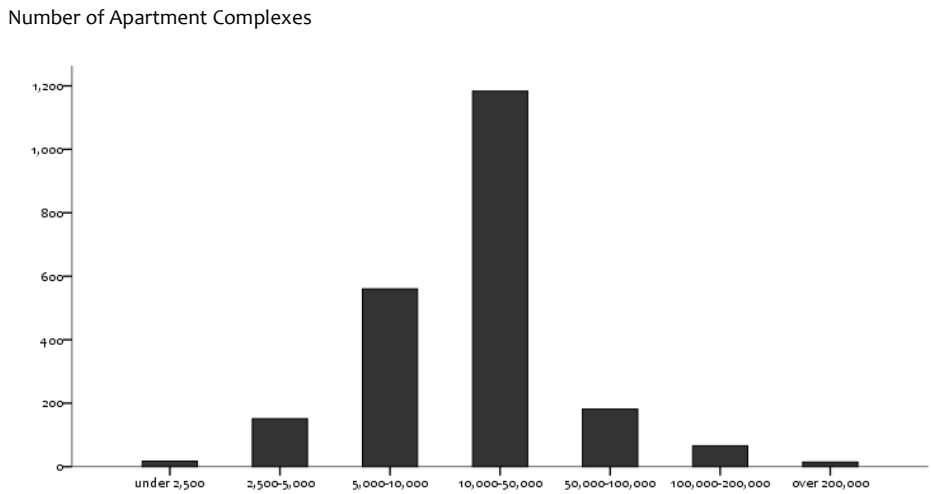


Figure 28 Number of apartment complexes according to parcel size types

Table 12 indicates the changing pattern of parcel size depending on the period of development and development methods applied. The average parcel size was more than 40,000 m^2 in the 1970s and 1980s, and less than half this in the 1990s and 2000s. This has recently increased to the original size of more than 30,000 m^2. As mentioned earlier, large-scale complexes were developed under the Housing Site Development Project. The 1990s and 2000s demonstrate the decreased sizes of development units when individual complexes were constructed under the Housing Redevelopment and Land Readjustment Projects. Large apartment complexes were actively built through the Housing Reconstruction Project in the 2010s.

The smallest complex size ranges from 1,105 m^2 in the 1970s to 2,628 m^2 in the 2010s, the sizes not differing much during these periods. Presumably, extremely small complexes were built in the General Built-up Area and grid-patterned Land Readjustment Project area. On the other hand, the largest complexes differ considerably in size during each period. In the 1970s, the largest complex, Banpo Jugong Apartment Complex, was constructed in Seoul, measuring 560,766 m^2, while Dunchon Jugong Apartment Complex (469,880 m^2) was the largest in the 1980s. Haeoreum Hanshin Hanjin Apartment Complex measuring 183,281 m^2 in the 1990s, Jamsil Parkio Apartment Complex at 279,928 m^2 in the 2000s, and DMC Ramien e-Pyeonhan Saesang Apartment Complex in the 2010s are the largest complexes constructed in each period. Compared to earlier periods, from the 1990s, the maximum complex size has been decreasing consistently. However, it is anticipated that numerous Housing Reconstruction Projects are likely to produce larger-scale complexes and increase the average parcel size.

Table 12 Parcel area values over time according to development method

		Mean (m^2)	Median (m^2)	Minimum (m^2)	Maximum (m^2)	Total (m^2)
Development Period	**1970s**	43,377	15,205	1,105	**560,766**	3,166,527
	1980s	**45,174**	25,823	1,889	469,880	15,359,265
	1990s	21,796	14,420	1,843	183,281	14,364,055
	2000s	20,581	11,508	1,984	279,928	**18,318,829**
	2010s	34,256	24,664	2,628	157,001	7,193,967
Development Method	**Han River Land Reclamation Project**한강공유매립사업	55,475	32,295	4,444	560,766	64 ACs
	Land Readjustment Project토지구획정리사업	16,388	9,895	2,269	144,011	259 ACs
	Housing Site Development Project택지개발사업	46,120	29,962	5,792	469,880	288 ACs
	Urban Development Project도시개발사업	47,094	33,870	5,283	488,408	138 ACs
	General Built-up Area일반시가지조성	16,647	10,750	1,105	239,200	534 ACs
	Housing Redevelopment Project주택재개발사업	32,190	21,263	2,360	196,006	380 ACs
	Housing Reconstruction Project주택재건축사업	19,061	10,047	1,843	279,928	509 ACs
Total						2,172 ACs

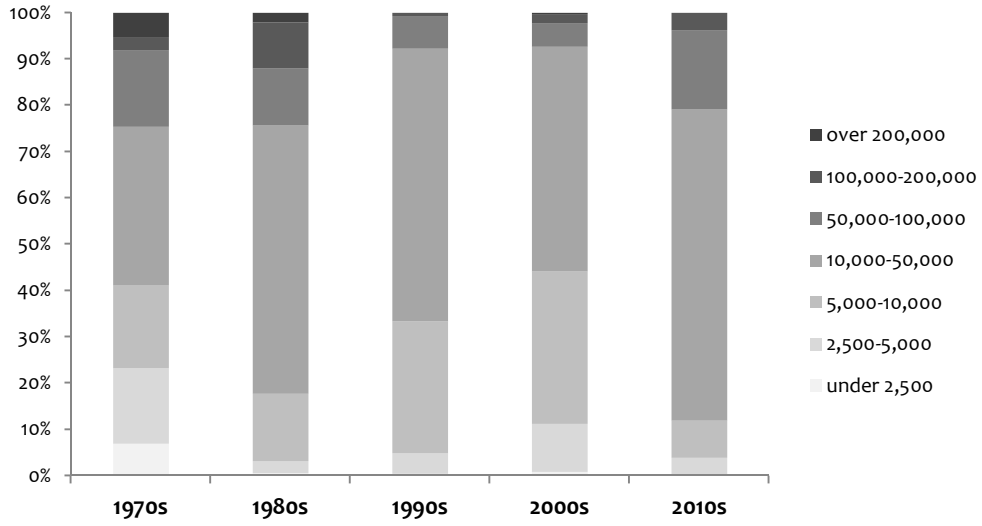


Figure 29 Composition of 7 parcel size types according to development period

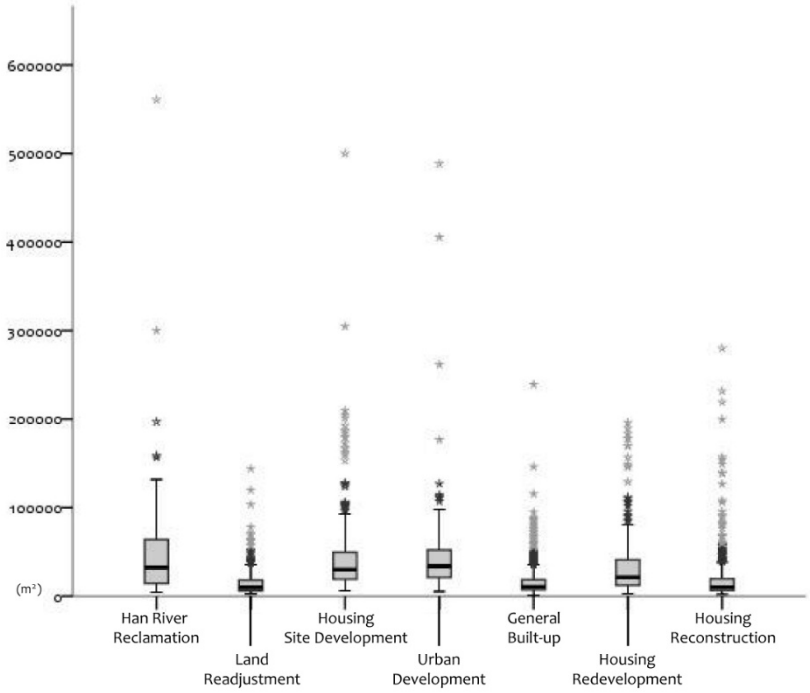


Figure 30 Parcel size range according to development methods

Figure 29 delineates the composition of the parcel size types in each development period. In the 1970s and 1980s, approximately 75% of apartment complexes were smaller than 50,000 m^2 (PS-1, PS-2, PS-3 and PS-4), while complexes larger than 50,000 m^2 (PS-5, PS-6 and PS-7) were also promoted for construction. Specifically, a relatively high proportion for the largest type measuring more than 100,000 m^2 (PS-6 and PS-7) is evident compared to other periods. This can be attributed to the population influx, which exceeded 10,000,000 people in 1988, and the government's active role in promoting the provision of large-scale complexes in policies such as the Housing Site Development Promotion Act택지개발촉진법, Housing Construction Promotion Act주택건설촉진법, and projects like the Han River Reclamation and Housing Site Development.

In the 1990s and 2000s, over 90% of apartment complexes were smaller than 50,000 m^2 (PS-1, PS-2, PS-3 and PS-4), and fewer larger complexes were constructed than in earlier periods. Housing Site Development continued, but provided smaller complexes with a reduced project area. Furthermore, Housing Redevelopment Projects were implemented on a smaller scale according to the Housing Redevelopment Master Plan주택재개발기본계획. In addition, smaller apartment sites of less than 50,000 m^2 were under the developing Land Readjustment Projects and Housing Reconstruction Projects executed for smaller complexes. This was reflected in the overall decrease in parcel size in the 1990s and 2000s.

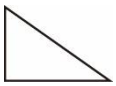
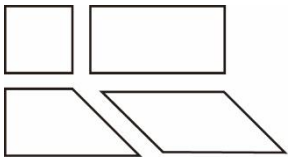
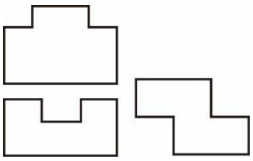
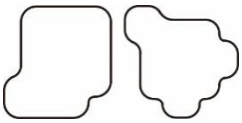
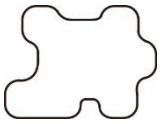
However, in the 2010s, the portion of complex types smaller than 50,000 m^2 (PS-1, PS-2, PS-3 and PS-4) decreased to less than 80%, while parcel types larger than 100,000 m^2 (PS-6 and PS-7) increased. This can be attributed to large development projects such as the Eunpyeong Newtown Sang-am Housing Site Developments executed under the Housing Reconstruction Projects of large apartment complexes along the Han River. These reconstructions of existing apartment complexes increased the portion of parcel sizes ranging from 10,000 m^2 to 50,000 m^2.

3.2.2 Parcel shape

Parcel shapes vary; however, these were categorized based on regularity and then subdivided into detailed shapes with some degree of simplification. In general, apartment complexes have a regular or irregular shape. As such, two tiers exist for parcel shapes. First, the shapes include a trilateral, tetragon, deformed polygon, or partially planned curved shape, which are categories of the regular shape classification. The irregular shape is roughly sorted according to the degree of the irregular formal aspect. Second, among the first category, the tetragon and deformed polygon can be sorted into more precise figural shapes. The parcel shape of each complex was viewed and classified based on the author's judgment (Table 13).

Regarding the general types, as shown in Table 14, the regular type includes more definable parcel shapes than the irregular type, the boundaries of which curve irregularly to varying degrees. In Seoul, the number of apartment complexes with a regular or irregular shape is similar: 1,089 complexes (50.1%) for the former and 1,083 (49.9%) for the latter. Figure 31 shows that in the 1970s and 1980s, more apartment complexes had a regular parcel shape. However, from the 1990s, more apartment complexes were irregular in terms of parcel shape. Although the gap between the two general parcel shapes is not significant, this trend reflects the changing development methods over time. In the 1970s and 1980s, large-scale master-planned developments were implemented on the relatively flat land of the Han River reclamation sites and outer agricultural land such as Ichon, Banpo, Jamsil, Sanggye, and Mokdong.

Table 13 Types of parcel shapes

General Shape	Specific shape				
	Primary Classification	Secondary Classification		No. of ACs	(%)
Regular	Trilateral		Triangle (right, acute, obtuse triangle)	13	0.6 %
	Tetragon		Square	37	1.7 %
			Rectangle	181	8.3 %
			Trapezoid	159	7.3 %
			Parallelogram	19	0.9 %
	Deformed polygon		Protruded	388	17.9 %
			Recessed	65	3.0 %
			Deflected (bent)	113	5.2 %
	Partially curved		Partially planned curve	114	5.2 %
Regular Shape Subtotal				1089	50.1 %
Irregular	Partially irregular		Partially irregular	127	5.8 %
	Completely irregular		Completely irregular (overall shape 'or' crooked boundary)	331	15.2 %
	Extremely irregular		Overall warping shape 'and' zigzagging boundary	625	28.8 %
Irregular Shape Subtotal				1083	49.9 %
Total				2,172	100 %

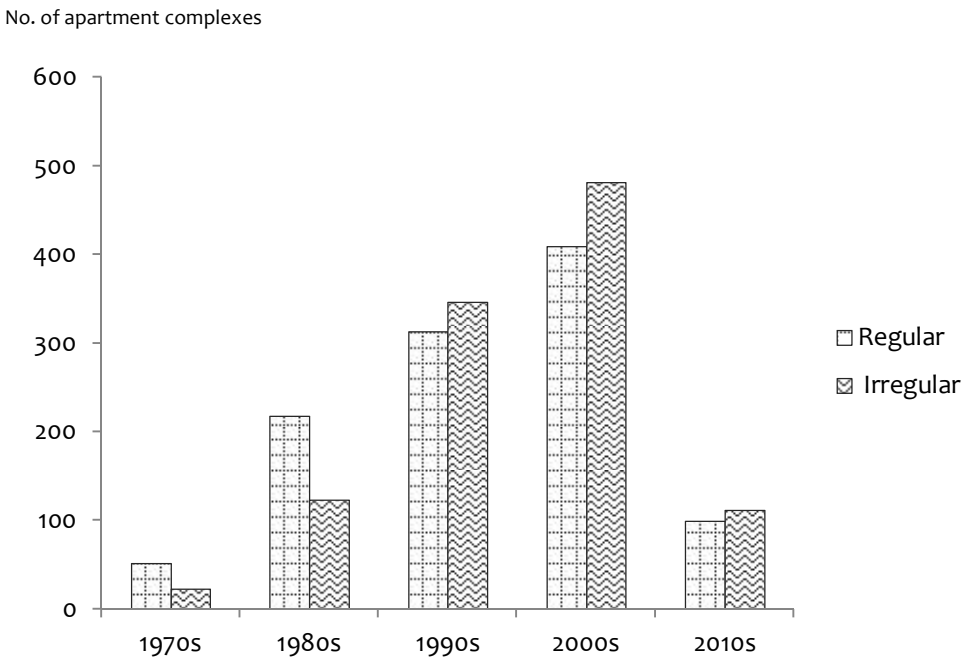


Figure 31 Changes in parcel shapes (general)

From the 1990s, more apartment complexes were built on irregularly shaped parcels. This reflects urbanization in Seoul during that period. In the further outlying areas along the inner edge of the greenbelt area, Housing Site Development Projects produced numerous medium and small-scale apartment complexes. For example, at the foot of Suri Mountain and to the eastern side of Acha Mountain, apartment complexes took the irregular parcel shape, because their boundaries were delineated along the hilly mountain side. This was also true for master-planned apartment complexes such as Dunchon Jugong, the boundary of which faced the curving greenbelt lines. On the other hand, Housing Redevelopment Projects transformed Seoul's inner city area from the 1990s. Since these development methods targeted unplanned substandard areas mostly on hilly topography and their site boundaries were determined by numerous narrow, winding roads and irregularly assembled small parcels, the parcel shape of

apartment complexes demonstrated strong irregularity. Table 14 shows the overall relationship between parcel shape and development methods. A regular parcel shape is prevalent in the Land Readjustment Project, Housing Site Development Project, and Urban Development Project, while more parcels have an irregular shape in the General Built-up Area and Housing Redevelopment Project. In the Housing Reconstruction Project, a similar number of regular and irregular parcel shapes are evident.

Table 14 General parcel shape according to development period and methods

		Regular Shape	Irregular Shape	Total
Development Period	1970s	51 (69.9 %)	22 (30.1 %)	73
	1980s	217 (63.8 %)	123 (36.2 %)	340
	1990s	313 (47.5 %)	346 (52.5 %)	659
	2000s	409 (46.0 %)	481 (54.0 %)	890
	2010s	99 (47.1 %)	111 (52.9 %)	210
Development Method	Han River Land Reclamation Project한강공유수면매립사업	53 (82.8 %)	11 (17.2 %)	64
	Land Readjustment Project토지구획정리사업	231 (89.2 %)	28 (10.8 %)	259
	Housing Site Development Project택지개발사업	245 (85.1 %)	43 (14.9 %)	288
	Urban Development Project도시개발사업	111 (80.4 %)	27 (19.6 %)	138
	General Built-up Area일반시가지조성	132 (24.7 %)	402 (75.3 %)	534
	Housing Redevelopment Project주택재개발사업	37 (9.7 %)	343 (90.3 %)	380
	Housing Reconstruction Project주택재건축사업	280 (55.0 %)	229 (45.0 %)	509
Total		1089	1083	2172

Parcel type (regular and irregular) can be further classified in terms of specific form. Table 15 shows that within the primary classification of regular-shaped complexes, the tetragonal shape (18.2%) and deformed polygon (26.1%) are prominent. The tetragonal-shaped parcel seems to be related to the surrounding road structure, whereas the deformed polygon shape mostly results from combining several individual lots into a single parcel. Partially planned curved parcels also come from the bordering road, which is curved, or are intentionally planned in the respective development method. Also evident is a large portion of extremely irregularly shaped parcels (28.8%) with zigzagged boundaries. There are also irregularly shaped parcels, which partially border a straight road structure.

In terms of the detailed shapes in the secondary classification, the majority of parcels have a rectangular or trapezoidal shape (rectangle: 44.9% and trapezoid: 40.9% within tetragonal shape). Besides the rectangular shape, a significant proportion of trapezoid and triangular or parallelogram shapes derive from the existing road structure. Furthermore, a significant portion of a protruded shape (68.2% within the tetragonal shape and 17.9% of the total) is evident between the deformed polygon shapes. In many cases, apartment complexes are generated through collectively joining small individual parcels, and in this process, the overall shape may not be a clean-cut polygon. Certain buildings such as public facilities may not be integrated into the joint parcel process, which could also leave an uneven boundary, leading to a protruded, intruded, or deflected complex shape. As mentioned, more than half the complexes have an irregular shape with an irregular boundary (58.1% among those with an irregular shape), followed by complexes with an irregular boundary (26.5% among those with an irregular shape) and partially irregular shape (12% among those with an irregular shape).

Table 15 Specific parcel shape according to development period and methods

	Regular				Irregular		
	Trilateral	Tetragon	Deformed polygon	Partially curved	Partially irregular	Completely irregular	Extremely irregular
1970s	0 (0.0 %)	21 (28.8 %)	28 (38.4 %)	2 (2.7 %)	3 (4.1 %)	8 (11.0 %)	11 (15.1 %)
1980s	1 (0.3 %)	64 (18.8 %)	133 (39.1 %)	19 (5.6 %)	19 (5.6 %)	42 (12.4 %)	62 (18.2 %)
1990s	4 (0.6 %)	114 (17.3 %)	168 (25.5 %)	27 (4.1 %)	51 (7.7 %)	114 (17.3 %)	181 (27.5 %)
2000s	5 (0.6 %)	171 (19.2 %)	200 (22.5 %)	35 (3.9 %)	41 (4.6 %)	141 (15.8 %)	297 (33.4 %)
2010s	3 (1.4 %)	30 (14.3 %)	33 (15.7 %)	33 (15.7 %)	13 (6.2 %)	25 (11.9 %)	73 (34.8 %)
Han River Land Reclamation Project한강공유수면매립사업	0 (0.0 %)	21 (32.8 %)	29 (45.3 %)	3 (4.7 %)	4 (6.3 %)	3 (4.7 %)	4 (6.3 %)
Land Readjustment Project토지구획정리사업	3 (1.2 %)	102 (39.4 %)	120 (46.3 %)	6 (2.3 %)	4 (1.5 %)	20 (7.7 %)	4 (1.5 %)
Housing Site Development Project택지개발사업	2 (0.7 %)	74 (25.7 %)	130 (45.1 %)	39 (13.5 %)	16 (5.6 %)	11 (3.8 %)	16 (5.6 %)
Urban Development Project도시개발사업	1 (0.7 %)	28 (20.3 %)	35 (25.4 %)	47 (34.1 %)	5 (3.6 %)	6 (4.3 %)	16 (11.6 %)
General Built-up Area일반시가지조성	2 (0.4 %)	50 (9.4 %)	77 (14.4 %)	3 (0.6 %)	40 (7.5 %)	139 (26.0 %)	223 (41.8 %)
Housing Redevelopment Project주택재개발사업	1 (0.3 %)	14 (3.7 %)	18 (4.7 %)	5 (1.3 %)	27 (7.1 %)	74 (19.5 %)	241 (63.4 %)
Housing Reconstruction Project주택재건축사업	4 (0.8 %)	111 (21.8 %)	153 (30.1 %)	13 (2.6 %)	31 (6.1 %)	77 (15.1 %)	120 (23.6 %)

Relational patterns emerge from the specific parcel shapes and development methods. Regarding the form of the parcel, those in the Land Readjustment and Housing Site Development Project are mostly of a square, rectangle, or protruded rectangle shape. However, in the Urban Development Project, most parcels are partially curved, which is also evident in Housing Site Development. This is related to the locational siting of the two development methods, which were planned for the hilly

or mountainous outskirt areas of Seoul. There is slight difference between the General Built-up Area and Housing Redevelopment Project in terms of shape, although the extremely irregular shape dominates, as the General Built-up Area includes parcels in the polygonal and completely or partially irregular shape. Most of the Housing Redevelopment Project is composed of extremely irregularly shaped parcels. This may be the result of topographical siting differences, as the former type is likely to be located among flatlands and the latter on hilly or mountainous areas. The Housing Reconstruction Project includes parcels shaped like a square, rectangle, or deformed polygon, and a high portion of parcels is extremely irregularly shaped, as reconstruction occurs in both planned and spontaneous areas (Figure 32).

In summary, Seoul's apartment complexes have various parcel shapes. Noteworthy is that the parcel shape of more than half the complexes is irregular, even though most complexes were planned and developed through the development methods for which the government provided legal foundations. Even if they are of a regular shape, many have deflecting or zigzagging forms. This irregular characteristic is also affiliated with the building layout, which is examined later. Based on the nature of the parcel shape, Seoul's apartment urbanism could be perceived as indefinable, because of the complex orientations of apartment buildings. Thus, even though apartment complexes are the product of planned actions, the resultant urban landscape demonstrates weak stability and cohesiveness.

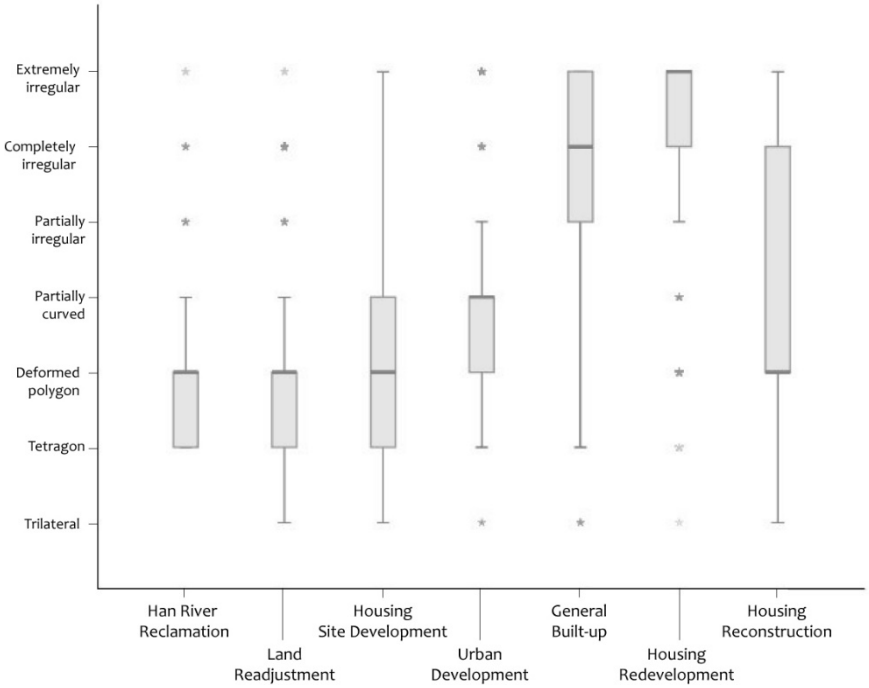


Figure 32 Specific parcel shape distribution by development method

3.3 Building

In this section, building refers to apartment buildings. Along with the parcel, building is another essential morphological element comprising urban tissue. Building is the most visible element of urban form, while the parcel is not easily noticeable and functions as the morphological frame upon which a building is laid out, realizing its height and density. In this section, the number of buildings, building height, architectural style, and building arrangement on an apartment complex parcel are examined. Also reviewed are the relations of these building dimensions to the period of development and development methods.

3.3.1 Number of buildings

The 2,172 apartment complexes in Seoul comprise 16,469 apartment buildings. Figure 33 shows the distribution pattern of the number of buildings in a single apartment complex. Many have fewer than 10 buildings, followed by the same portion within the range of 10 to 20 and 20 to 30 buildings in a complex. Considering this pattern, the number of buildings was classified into five types as follows: "Few (2 to 4 buildings)," "average (5 to 9 buildings)," "somewhat large (10 to 20 buildings)," "significantly large (20 to 39 buildings)," and "exceptionally large (more than 40 buildings)." Table 16 indicates that nearly half (46.7%) of Seoul's 2,017 apartment complexes have 2 to 4 apartment buildings. Furthermore, 30% are categorized as average, with 5 to 9 apartment buildings. Less than a quarter (some 23%) of apartment complexes has more than 10 apartment buildings, while around 6% (134 complexes) have more than 20 apartment buildings. Exceptional cases are the 24 apartment complexes (1.1%) with more than 40 apartment buildings.

Table 16 Types of number of buildings within apartment complex

Types	No. of buildings	No. of ACs	%
Few	2-4	1011	46.5 %
Average	5-9	659	30.3 %
Somewhat Large	10-19	368	16.9 %
Significantly Large	20-39	110	5.1 %
Exceptionally Large	40 and more	24	1.1 %

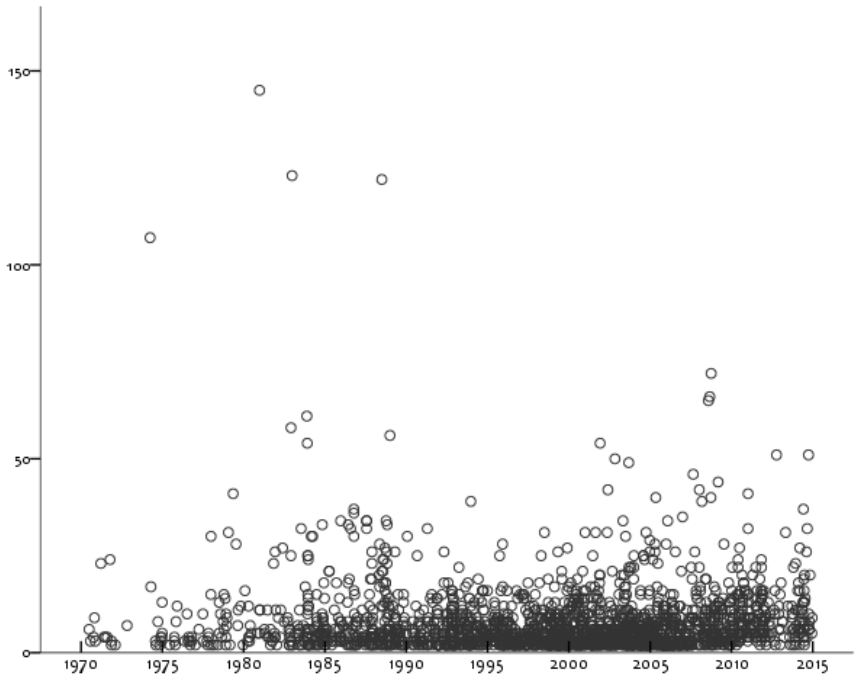


Figure 33 Number of buildings within apartment complexes by time period

On average, a single apartment complex contains 7.58 apartment buildings. As this study targets apartment complexes with two and more apartment buildings, the least number of buildings is two. The highest number of buildings within a single complex is as many as 145 (Dunchon Jugong Apartment Complex built in 1980). This range in terms of the number of apartment buildings reflects the various parcel sizes discussed earlier. In addition, the overall chronological trend is similar to the previously mentioned parcel size, as the two are closely related. The largest number of buildings in a single complex emerged in the 1970s and 1980s, with fewer buildings in the 1990s and 2000s and a slight increase in the 2010s. Similar to parcel size, this pattern is related to Seoul's urban expansion and the development methods applied. As such, large-scale apartment complexes with many buildings were developed through

the Han River Reclamation Project or extremely large-scale Housing Site Development Projects in the 1970s to 1980s, followed by medium and small-sized developments through the Housing Site Development Project, Land Readjustment Project, and Housing Redevelopment Project in the 1990s to 2000s. Recently, the Residential Reconstruction Project has been implemented for the previously large block apartment complexes (Table 17).

Table 17 Number of buildings according to development period and method

	Overall (n= 2,172)	**1970s** (n= 73)	**1980s** (n= 340)	**1990s** (n= 659)	**2000s** (n= 890)	**2010s** (n= 210)
mean	7.58	8.99	**10.08**	5.97	7.02	**10.5**
Minimum	2	2	2	2	2	2
maximum	145	107	145	39	72	51
Total	16,469	656	3,428	3,931	**6,248**	2,206
Han River Land Reclamation Project한강공유면매립사업		13.3 (28)	8.3 (27)	6.7 (9)	-	-
Land Readjustment Project토지구획정리사업		6.0 (9)	5.8 (64)	3.9 (74)	3.7 (104)	3.0 (8)
Housing Site Development Project택지개발사업		-	20.4 (72)	8.7 (141)	7.6 (61)	13.6 (14)
Urban Development Project도시개발사업		22.5 (2)	24.3 (23)	2.7 (3)	9.5 (39)	11.4 (71)
General Built-up Area일반시가지조성		5.3 (20)	5.5 (90)	4.9 (214)	4.9 (191)	6.5 (19)
Housing Redevelopment Project주택재개발사업		7.5 (2)	5.1 (36)	8.2 (95)	10.5 (183)	12.2 (64)
Housing Reconstruction Project주택재건축사업		5.3 (12)	4.6 (28)	4.4 (123)	7.0 (312)	8 (34)

*Mean value presented with number of according apartment complexes in ( ).

3.3.2 Building height

In this study, building height is represented by the number of stories. Information on the number of building stories was retrieved from the "2015 status of multi-unit housing data of Seoul" issued by the government of Seoul. Here, the number of building stories is classified into five categories as follows: (1) 5 stories, (2) 6 to 10 stories, (3) 11 to 15 stories, (4) 16 to 20 stories, and (5) more than 21 stories. Therefore, there is some limitation regarding apartment complexes comprising different numbers of building stories, which is recorded according to the highest number of stories. However, the height difference is mostly not significant, and since there are not many of these cases, it is still relevant to use the building story data to understand the level of verticality of apartment buildings in Seoul. Considering the overall building height distribution pattern and following the pre-organized classification, the building height type is indicated as "low (5 stories)," "medium (6–10 stories)," "medium-high (11–15 stories)," "high (16–20 stories)," and "very high (21 stories and higher)."

Currently in Seoul, nearly half the apartment buildings (46.4%) range from 11 to 15 stories. Notably, 83% (15,217 buildings) of the apartments are higher than 11 stories, meaning these buildings are almost 30 m high[8]. The percentage of buildings that are high (more than 11 stories and more than 33 m high) to very high (higher than 21 floors and 50 m in height) is considerable, indicating that a large portion of high-rise and super-high-rise buildings comprises the urban landscape.

[8] The height of a single floor may differ between apartment complexes, ranging from between 2.5 to 3.3 m. In this research, to approximately calculate the height of an apartment building, a height of 3 m per story was applied for convenience.

Table 18 Building height according to development period and method

		Low	Medium-high	Medium-high	High	Very high	Total
Development Period	1970s	24 (32.9 %)	13 (17.8 %)	36 (49.3 %)	0 (0.0 %)	0 (0.0 %)	73
	1980s	59 (17.4 %)	33 (9.7 %)	237 (69.7 %)	8 (2.4 %)	3 (0.3 %)	340
	1990s	13 (2.0 %)	18 (2.7 %)	303 (46.0 %)	171 (25.9 %)	154 (23.4 %)	659
	2000s	11 (1.2 %)	36 (4.0 %)	346 (38.9 %)	248 (27.9 %)	249 (28.0 %)	890
	2010s	1 (0.5 %)	16 (7.6 %)	86 (41.0 %)	54 (25.7 %)	53 (25.2 %)	210
Development Method	Han River Land Reclamation Project한강공유지매립사업	4 (6.2 %)	8 (12.5 %)	42 (65.6 %)	5 (7.8 %)	5 (7.8 %)	64
	Land Readjustment Project토지구획정리사업	9 (3.5 %)	17 (6.6 %)	135 (52.1 %)	51 (19.7 %)	47 (18.1 %)	259
	Housing Site Development Project택지개발사업	22 (7.6 %)	14 (4.9 %)	210 (72.9 %)	32 (11.1 %)	10 (3.5 %)	288
	Urban Development Project도시개발사업	6 (4.3 %)	20 (14.5 %)	79 (57.2 %)	22 (15.9 %)	11 (8.0 %)	138
	General Built-up Area일반시가지조성	37 (6.9 %)	22 (4.1 %)	246 (46.1 %)	111 (20.8 %)	118 (22.1 %)	534
	Housing Redevelopment Project주택재개발사업	10 (2.6 %)	16 (4.2 %)	144 (37.9 %)	118 (31.1 %)	92 (24.2 %)	380
	Housing Reconstruction Project주택재건축사업	20 (3.9 %)	19 (3.7 %)	152 (29.9 %)	142 (27.9 %)	176 (34.6 %)	509
Total		108 (5.0 %)	116 (5.3 %)	1008 (46.4 %)	481 (22.1 %)	459 (21.1 %)	2172

Table 18 shows the increasing heights of apartment buildings over the years. In the 1970s, more than 30% of apartment buildings were five-story walk-up buildings. Around 50% of apartment buildings were no higher than 10 stories, while the other half were 11 to 15 stories high, which was within the then building height limit

regulation of 12 stories (Bang, 2012). In the 1980s, more than 70% of buildings were higher than 10 stories. Since the 1990s, approximately 50% of buildings were higher than 16 stories, and around 25% higher than 21 stories. At the same time, less than 10% of buildings were low rise (less than 10 stories), and almost none were 5-story walk-ups in the 2010s. This trend was also observed by Park I.S. (2013: 83–84), who noted the prevalence of 5-story apartments in the 1980s and that apartment buildings became higher in the 1990s, with most having more than 15 stories, increasing their FAR to 180–220%. According to Park, the first high-rise apartment building was Yeouido Shibeom Apartment Complex, which boasted 12 stories in 1970. The first 15-story apartment was built in Jamsil Jugong 5-danji Complex in 1976. From the mid-1980s, apartment buildings higher than 20 stories began to appear in Seoul, soon becoming fixtures in the government Newtowns around Seoul. In the 2000s, Housing Reconstruction Projects produced apartment buildings 30 to 40 stories high. To control the ever-increasing height of apartment buildings, the Seoul Metropolitan Government's Comprehensive Plan set a 35-story height limit for these constructions. The changing patterns in building height over time are related to the development methods. Medium height apartment buildings (11 to 15 stories) were the norm in the Land Readjustment Project and Land Development Project in the 1970s and 1980s. After the 2000s, buildings constructed through the Development Project were also mostly of medium height. Park I.S. (2013) mentioned that the Housing Redevelopment and Reconstruction Projects elevated the average building height through the construction of extremely high buildings (Figure 34).

Figure 34 Jamsil apartment complexes with super high-rise buildings: Northeastern view (above) and Southeastern view (below)
(Source: Naver Aerial View image compiled by author)

3.3.3 Architectural style

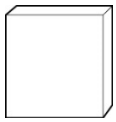
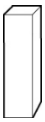
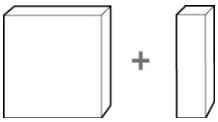
The architectural style of apartment buildings is also a prominent element of urban form, as it directly influences the appearance of cities. This study identified the architectural style of Seoul's apartment buildings at the general and specific levels. The general architectural style conveys an instantly perceptional type of apartment building, such as a flat type, tower type, or mixed type (flat and tower type mixed). Flat type buildings are shaped in linear rectangular forms, preferably with a Southern orientation.

There usually have more than two entrances connected to the vertical core that distributes circulation to each unit. The units are arranged side by side, and accessed through a communal corridor. In other cases, two units share a stair or elevator hall. Tower type apartments usually have a main vertical core surrounded by the units. The footprint of the tower type is relatively compact, making available more open space to the community. Furthermore, the density is fairly high in higher buildings. Table 19 indicates the status (as of 2014) of the architectural styles of apartment buildings. Nearly 70% of apartment buildings are a flat type form, and around 30% either tower type (12.7%) or mixed type (18.9%).

The architectural styles of apartment buildings have changed over time (Figure 35). Flat type apartments are dominant, as these were constructed in the early stages in the 1970s (80.2%). Based on the traditional Feng-Shui culture, flat type apartments are aligned facing south for exposure to the sun and cross ventilation. These types of buildings were popular until the 2000s. However, multiple flat type apartment buildings oriented towards the south obstructs views and generates a monotonous design. Until the 1990s, the flat type was the dominant style, and more than 90% of apartment complexes were constructed in this way. Recently, the tower type building style is becoming more popular, as it allows a slimmer building footprint while providing larger open green spaces. The advantage of this type is that the buildings can be higher, increasing density. The tower type building was often constructed in the 1970s and 1980s, usually in a mixed type complex. The tower type itself emerged in the 1990s, and more than 10% of these buildings were constructed in the 2000s. This architectural style was the most popular in the 2010s, with more than 50% of apartment complexes constructed in this form. Alongside this trend, complexes with mixed type buildings were constructed in the 2000s (30%) and 2010s (40%), while only flat type constructions accounted for only around 10% of buildings in the 2010s. The mixed

type of buildings, in which flat and tower type buildings are located together, became more popular because of the disadvantages associated with tower type buildings including ventilation problems and orienting the building in all four directions. Despite that most apartment complexes are generally similar, there are differences in the specific shape, material, proportion of length, and aperture treatment.

Table 19 Types of general architectural style

	Flat-type	Tower-type	Flat and Tower mixed type
General Style	  *Yeoeuido Shibeom*	  *Banpo Raemian*	  *Jangan Raemian*
No. of ACs	1486	276	410
%	**68.4 %**	**12.7 %**	**18.9 %**

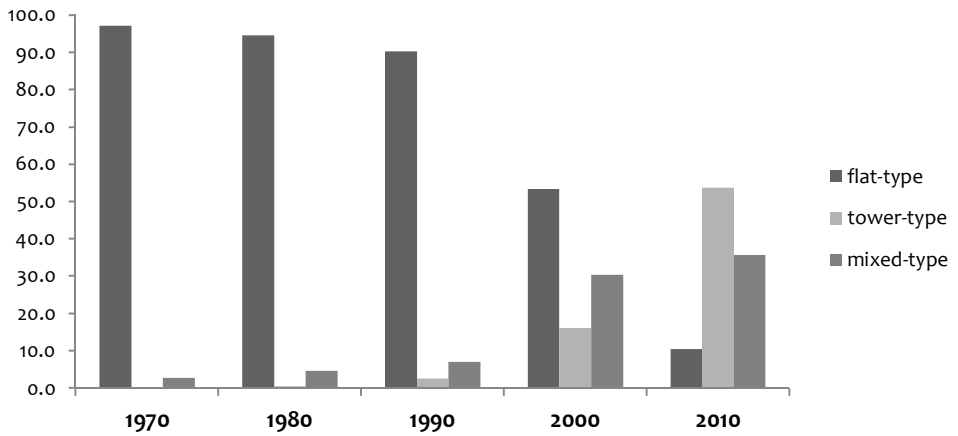
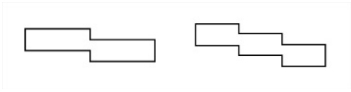
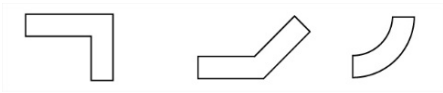
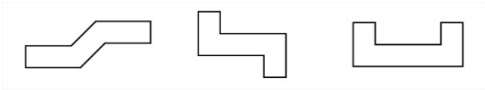
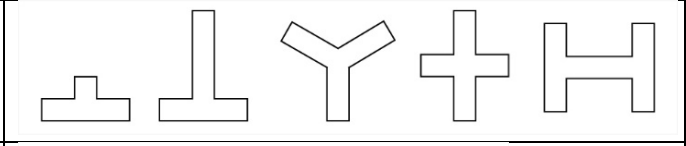
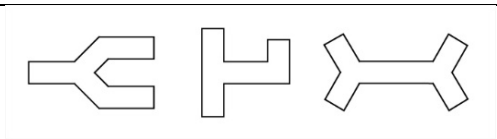
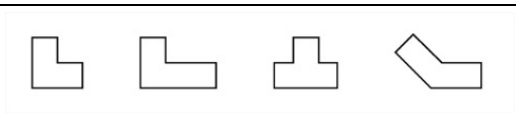
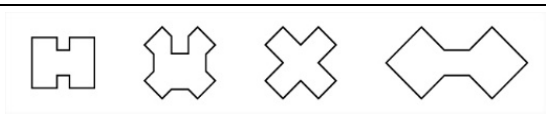
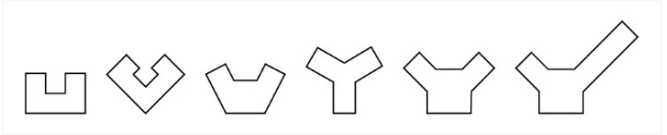


Figure 35 Changes in the architectural style (general) of apartment building

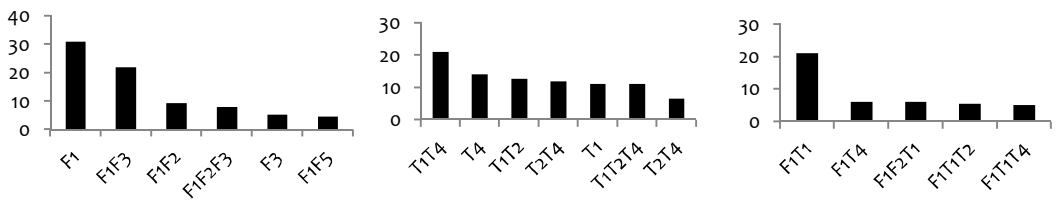
Table 20 Specific architectural style of apartment buildings

General Shape	Specific shape		
	Classification		code
Flat-type	Row		F1
	Stepped Row		F2
	Bent (0-1point)		F3
	Bent (2points)		F4
	Intersect		F5
	Combined		F6
Tower-type	Compact		T1
	L/T Shape		T2
	H/X Shape		T3
	V/Y Shape		T4

Based on the general classification of flat type and tower type buildings discussed above, more detailed architectural styles were identified to examine changing building forms over time (Table 20). The primary observations of detailed architectural styles were based on two-dimensional building footprint shapes in GIS. To acquire a three-dimensional understanding and accurate information, Naver Street View was referred to. Despite the dominance of conventional flat type buildings, which are shaped as a linear rectangle, modified, deformed, or transformed versions of the flat type are evident. In addition, tower type complexes were constructed by integrating diverse designs, including in flat and tower type mixed complexes. The flat type is further classified into six types (F1–F6) according to whether the form is a simple row, stepped, bent, intersected, or combined. The tower type is further delineated into four types including a compact shape, L/T shape, H/X shape, and V/Y shape. In general, the norm is a combined version of multiple styles in an individual complex, rather than the use of only one building style (Figure 36).

Among the dominant flat type style, most are the F1 (simple row) type (30.9%), followed by F1F3 (row+bent1: 22%), F1F2 (row+stepped row: 9.4%), F1F2F3 (row+stepped row+bent1: 8%), F3 (bent1: 5.3%), and F1F5 (row+intersect: 4.7%). Apartment complexes that comprise tower type buildings (12.6 %) include a distributed composition of diverse styles including T1T4 (compact+VY: 21%), T4 (VY:14.1%), T1T2 (compact+LT:12.7%), T2T4 (LT+VY: 12%), T1 and T1T2T4 (compact and compact+LT+VY: 11.2%), and T2 (LT: 6.5%). A simple row construction combined with compact tower (F1T1: 21%) is most evident among the mixed flat and tower type apartment complexes constructed more often (18.8%) than only tower type complexes. The combination of other specific types is evenly distributed (less than 3%), except F1T4 (row+VY: 6.1%), F1F2T1 (row+stepped row+compact: 6.1%), F1T1T2 (row+compact+LT: 5.6%), and F1T1T4 (row+compact+VY: 5.1%). Although some

apartment complexes are designed in a single style, others incorporate a combination of six building forms. For example, the architectural styles used in one flat-type apartment complex in Guro-gu includes the row (F1), stepped row (F2), and bent with one point (F3) structures, while in terms of tower type buildings, the compact (T1), L shape (T2), and V shape (T4) forms are included.



Flat-type apartment complex	Tower-type apartment complex	Mixed-type apartment complex

Figure 36 Combinations of specific architectural styles within the general classification

The architectural style of apartment building has been changed over time. As Figure 35 shows, the flat type was dominant in the 1970s, 1980s, and 1990s as it was adopted by more than 80 percent of apartment complexes. Tower-type and mixed-type emerged in a significant portion in the 2000s and tower-type became a majority of architectural style in the 2010s. This changing profile of building type is related to development methods responding to development period. During the 1970s-1980s, Han River Reclamation Project, Land Readjustment Project, Housing Site Development Project, and general built-up area project were majorly built with flat-type buildings. Specific architectural style includes significant proportion of row (F1) and row and bent together (F1F3). In the 1980s and 1990s, Housing Redevelopment projects also

showed flat-type as the main building style, but more recently tower-type or mixed type relatively took high portion. In the 2000s and 2010s, Urban Development Project employed mixed-type the most while flat-type building scored low. Specifically, compact and 'V-shape' tower building mixed turns out to be the most dominant style along with various tower and flat-type combinations of F1T4, T1T2T4, F1T1 and so on. Similarly, in general built-up area project and Housing Reconstruction Projects in recent years, there are more variation of different flat-type buildings mixed, such as F1F3, F1F2, F1F5 and F1F2F3.

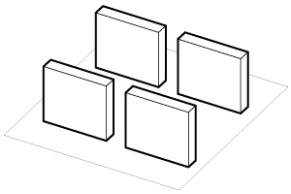
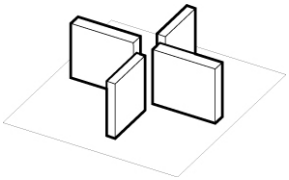
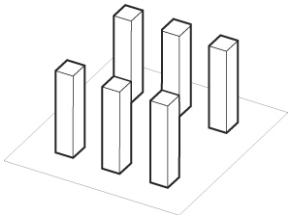
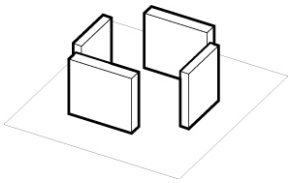
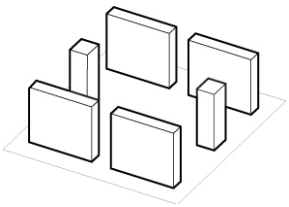
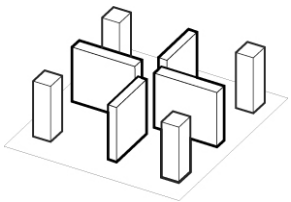
This is also similarly apparent in Housing Redevelopment Projects where mixed type of F1T1 and F1F2T1 is dominant followed by combinations of tower-type, such as T1T4 and T1T2T4. All these patterns show that Seoul's apartment buildings are getting higher, slimmer and more free-shaped in architectural style, leaving the traditional south-faced, regularly-shaped forms. This change gives Seoul a character of its own urban form.

3.3.4 Arrangement of buildings

Since apartment complexes have multiple buildings, the arrangement of these buildings is an important aspect in understanding Seoul's unique apartment urbanism. The primary observations of building arrangements were based on two-dimensional building footprint shapes in GIS. Building arrangement can be classified into three types: the "parallel row," "cross," and "dot" configuration. Furthermore, three compounded versions are identified, namely the "parallel row+cross," "parallel row+dot," and "cross+dot" (Table 21). The most typical apartment building arrangement combines the parallel row and perpendicular arrangements (parallel

row+cross: 35.8%), referred to as a courtyard composition, followed by the cross type or grid type (25.3%) and parallel row configurations (20.3%).

Table 21 Six types of apartment building arrangements

Parallel Row	Cross	Dot
		
442 (20.3 %)	549 (25.3 %)	120 (5.5 %)
Parallel Row + Cross	**Parallel Row + Dot**	**Cross + Dot**
		
778 (35.8 %)	136 (6.3 %)	147 (6.8 %)

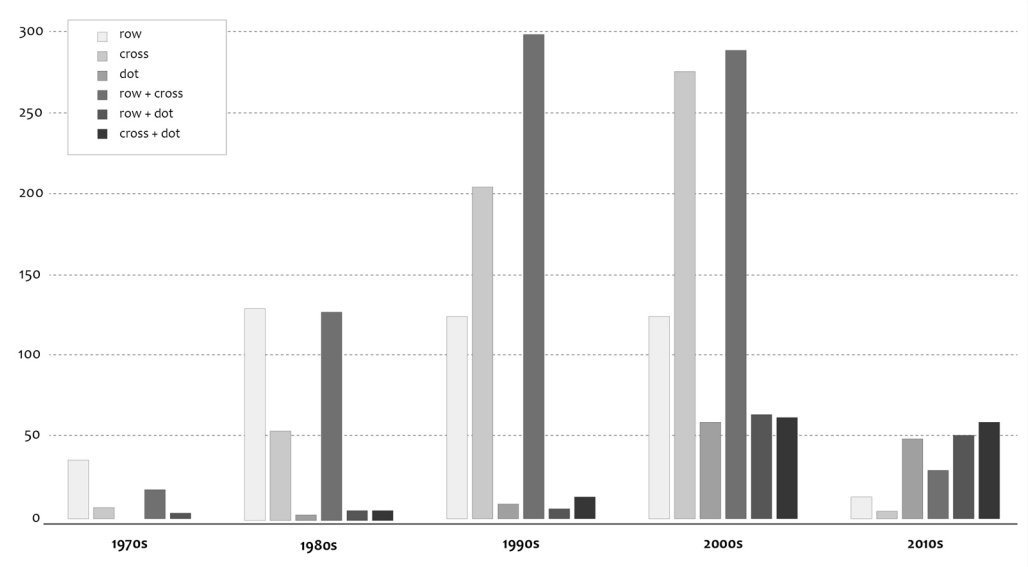


Figure 37 Types of building arrangements according to Period

In the 1970s, the dominant arrangement was the "parallel row," in which multiple rows were lined up to face the south, as seen in the Han River Reclamation Project and Land Readjustment Project in Yeouido, Ichon, Banpo, and Apgujung, among others. This type produced the uniformly repetitive, monolithic horizontal landscape. In the 1980s, along with parallel row, the courtyard style (parallel row + cross) emerged as the most dominant arrangement, as seen in the Housing Site Development Project. During this period, the cross arrangement became popular, involving simple variations by rotating the building's orientation. From the 1990s, the parallel row arrangement lost steam, making way for the parallel row + cross (courtyard style) and cross arrangements. This changing pattern is related to the decreasing parcel size of apartment complexes alongside higher density development pressure in development methods including the Housing Redevelopment Project and a number of small and medium-scale Housing Site Development Projects. In the 2000s, when the tower type apartment buildings were introduced through the Housing Redevelopment Project,

Housing Reconstruction Project, and Urban Development Project, the arrangement shifted towards the dot arrangement, as the linear footprint was no longer necessary Thus, the cross arrangement became as popular as the parallel + cross type, while the dot arrangement also increased in popularity, either in the dot form or mixed with the parallel row and cross arrangements. However, the preference for row type apartments persisted, resulting in mixed arrangements of tower and row or cross type apartments (Figure 37)..

3.4 Density

This section examines the density of apartment complexes in terms of BCR and FAR. Figure 38 shows the distribution pattern of BCR and FAR over the period 1970–2015. Considering this pattern, five ranges of BCR and FAR are delineated as types of density (Table 22).

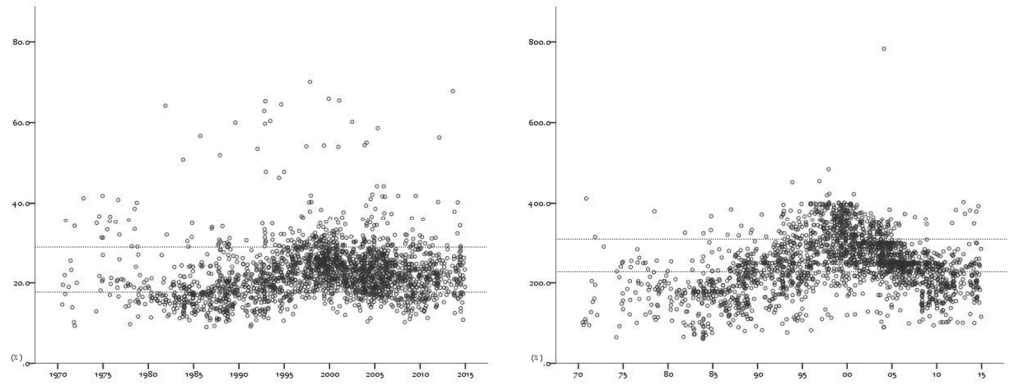


Figure 38 Distribution pattern of BCR and FAR of apartment complexes

Table 22 Types of density of apartment complexes

Types of BCR and FAR		No. of ACs	Percentage (%)
BCR (Building Coverage Ratio)	under 10%	6	0.3 %
	over 10 – under 20%	801	36.9%
	over 20 – under 30%	1171	53.9%
	over 30 – under 40%	151	7.0%
	40% and higher	43	2.0%
FAR (Floor Area Ratio)	Under 100%	38	1.7%
	over 100 – under 200%	510	23.5%
	over 200 – under 300%	1183	54.5%
	over 300 – under 400%	428	19.7%
	400% and higher	13	0.6%

3.4.1 Building Coverage Ratio (BCR)

More than half the apartment complexes (53.9%) have a BCR of 20–30% followed by those with a BCR of 10–20% (36.9%). Thus, more than 90% of apartment complexes account for less than 30% of the BCR. Only 194 complexes (9%) occupy more than 30% of their parcel in terms of building placement. Some cases demonstrate exceptionally low or high BCR. For example, less than 6 apartment complexes (0.3%) have a BCR of less than 10%, such as Asia Athletics Reporter Village Apartments in Jamsil, Jamsil Jugong 5-Danji, Yeuodo Shibum, Snaggye Jugong 15-Danji, and Mokdong 4-Danji. These are mostly government-sponsored demonstration projects constructed for a specific purpose. Furthermore, 43 apartment complexes (2.0%) have a BCR of more

than 40%. Of these, 12 complexes have BCRs ranging between 60 and 70%. These were mostly developed in the late 1990s and 2000s, for example, Daejo Samsung in Eumpyeong-gu (1997, 70.1%), Walker Hill Prugio (2013, 67.8%), Samsung Gwannaru (2001, 65.5%), and Cheongdam Gyeonyeong (1992, 64.5%).

The average BCR of the 2,172 apartment complexes in this study is 22.4%. During the period 1970–2015, the average BCR remained at around 20%, more or less similar despite a slight decrease to 18.6% in the 1980s (Table 23). However, an examination of the BCR pattern over the 10-year period indicates a slight decrease in BCR. As seen in Figure 00, the portion of complexes with a BCR higher than 30% is decreasing, while that of complexes with a BCR less than 20% is increasing, although this is not significant. In the 1980s, the BCR pattern deviates, likely because of the Housing Site Development Projects implemented as master-planned promotion projects at the time.

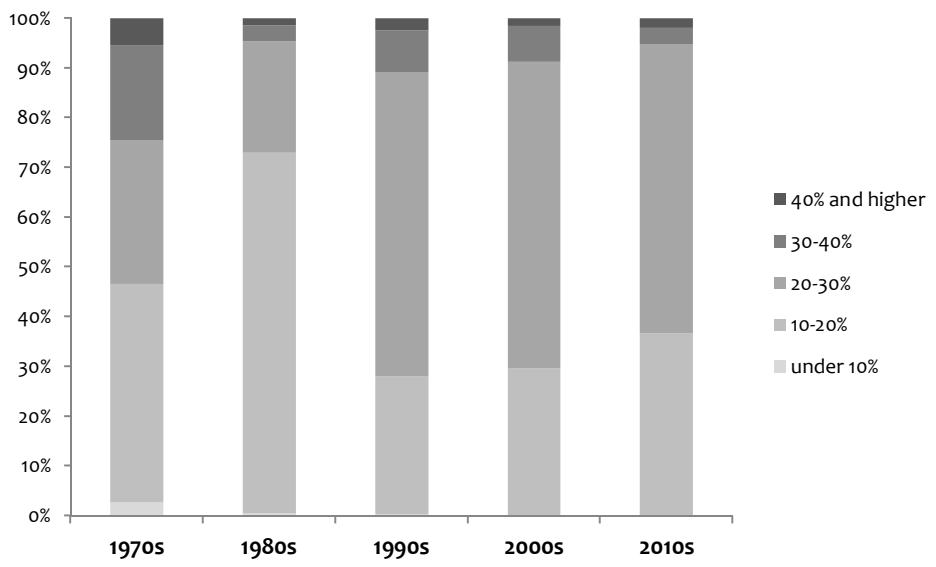


Figure 39 Proportion of BCR types over time

Table 23 Density values over time

Density		Overall (n= 2,172)	1970s (n= 73)	1980s (n= 340)	1990s (n= 659)	2000s (n= 890)	2010s (n= 210)
BCR	mean	**22.4**	**23.0**	**18.6**	**23.6**	**23.1**	**22.1**
	median	21.7	20.4	17.3	23.1	22.5	21.5
	Minimum	9.0	9.3	9.0	9.2	10.2	10.8
	maximum	70.1	41.8	64.2	70.1	65.5	67.8
FAR	mean	**246.8**	**187.7**	**185.6**	**278.2**	**260.6**	**210.1**
	median	247.4	186.5	181.3	276.4	253.4	203.8
	Minimum	60.7	64.6	60.7	76.8	89.5	100.0
	maximum	783.0	411.7	384.5	484.48	783	402.6

3.4.2 Floor Area Ratio (FAR)

Building density is higher when the FAR is greater, indicating an increased gross floor area in relation to the plot area. As seen in Table 00, more than half the apartment complexes (1,183 complexes, 54.5%) have a FAR of 200–300%, followed by those with a FAR of 100–200% (510 complexes, 23.5%). Thus, nearly 80% of apartment complexes have a FAR within the 100–300% range. Furthermore, 20% (428 complexes) have a FAR of 300–400%. As such, some cases have exceptionally low or high FAR. For example, the FAR of 38 apartment complexes (1.7%) is less than 100%. These were mostly five-story walk-up apartment complexes constructed in the 1970s. In addition, 13 apartment complexes (0.6%) have a FAR of higher than 400%, which were developed either at the time when zoning regulations were relaxed or in non-residential zoning districts.

The average FAR of the 2,172 apartment complexes in this study is approximately

250% (Table 23). The average FAR fluctuated between 186 and 278% during the period 1970–2015. In the 1970s, only 5-story walk-up apartments were constructed with FAR values of less than 100%, for example Banpo Jugong, Hangang Mansion, and Ichon Shibum. However, the average FAR in the 1970s was 188%, because higher density developments were constructed with a FAR ranging between 150 and 300%. These were typically 12-story buildings such as Banpo Gyeongnam (1971) with a FAR of 183%, Banpo Woosung (191) with a FAR of 183%, and Eunma (1979) in Gangnam-gu with a FAR of 204%. An extreme example is Yeonnam Apartment Complex in Mapo-gu, which was developed in the late 1970s with a FAR of 411%. The average FAR during the 1980s was similar (186%), although from the 1990s, it increased significantly to more than 250%. The average FAR was 276% in the 1990s and 261% in the 2000s. This trend in terms of density can be attributed to the housing demand and market-driven housing policy that relaxed height and FAR regulations and promoted privately initiated residential renewal. At this time, in Seoul's housing industry, most apartment constructions were based on the self-financing formula, especially in the Housing Redevelopment Projects and Housing Reconstruction Projects that supplied housing in the 1990s to 2000s. The average FAR decreased to 210% in the first half of the 2010s, likely because of stricter regulations[9] and stabilized housing demand. Trends in terms of FAR are illustrated in Figure 40.

[9] The change of BCR and FAR regulation over time

	1973	1977.71	1979.3.20	1985.10.1	1990.4.10	1990.11.14	1998.4.30
BCR	-	25%	18%	25%	30%	60%	60%
FAR		200%	180%	250%	300%	**400%**	300%
Distance between buildings		1.25H	1.25H	**1H**	**1H** (0.8H for over 16-story bldg.)	**1H**	**1H**
Distance to adjacent property	0.625H	0.625H	0.625H	0.5H	0.5H	0.5H	0.5H
Applicable Act	Building act enforcement (article 167)	AC Building code (Seoul)	Mayor's approval to build multi-unit housing	Mayor's solution for promoting construction	Building code (Seoul)	Building code (Seoul)	Building code (Seoul)

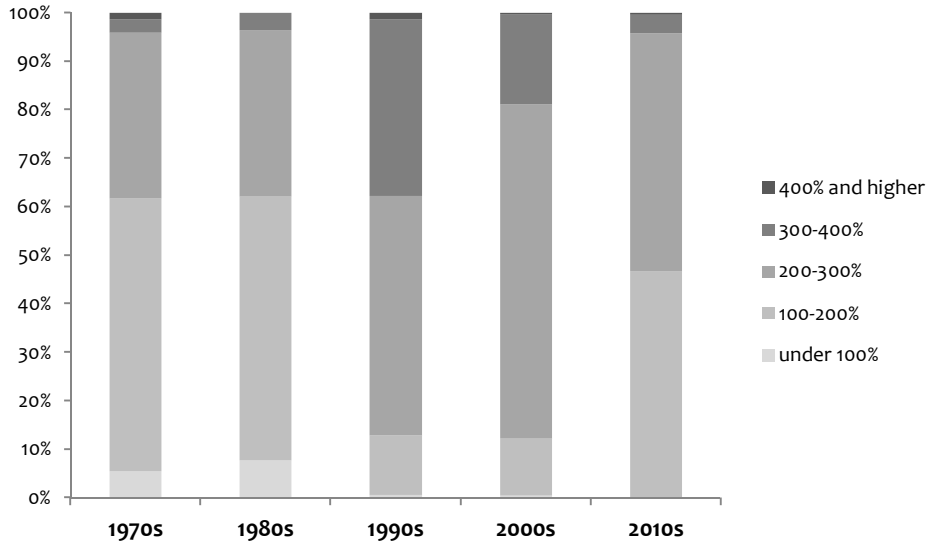


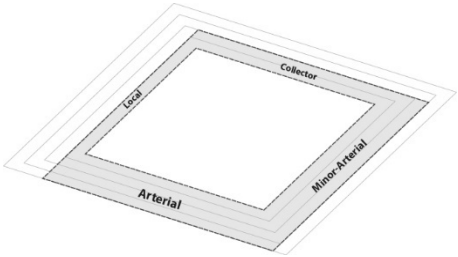
Figure 40 Proportion of FAR types over time

3.5 Street

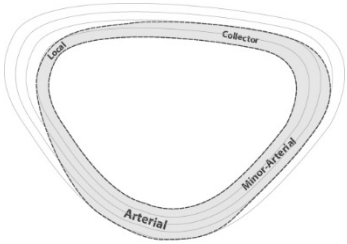
In the study of urban morphology, the street is a vital urban form element because it frames and organizes the urban tissue, weaving parcels containing buildings. This section examines how apartment complexes are defined and linked by street. Street shape and parcel shape show the high degree of accordance in numerous instances as apartment complex tends to be built with relevant access from the road. As conceptually illustrated in Table 24, three aspects of street form are recorded and analyzed: 1) Shape of the bordering street (whether the bordering street shape is regular or irregular), 2) Bordering street proportion (how much apartment complex are bordered by the street), and 3) Bordering street hierarchy (how wide the bordering streets are). GIS data on street layer was referenced which were classified in the four main category of arterial, minor –arterial, collector, and local road. However, since the GIS data was not fully recorded and had limitations, the road is classified by road

width, and for further clarification, every apartment complexes were compared and checked with the approximate measurement of road width in Naver aerial view via online.

Table 24 Street conditions adjacent to apartment complex



Regular shaped street and hierarchy



Irregular shaped street and hierarchy

Shape, proportion and hierarchy of bordering street			frequency	percentage
Street	Shape of the Bordering Street	Regular	1402	64.5 %
		Irregular	770	35.5 %
	Bordering Street Proportion	Completely bordering	389	17.9 %
		Partially bordering over 50%	970	44.7 %
		Partially bordering under 50%	475	21.9 %
		Single Point Access	336	15.5 %
	Bordering Street Hierarchy	Arterial (over 40 m)	46	2.1 %
		Minor Arterial (25-40m)	111	5.1 %
		Collector (10-25m)	355	16.3 %
		Local (under 10m)	411	18.9 %
		Arterial + Minor Arterial	89	4.1 %
		Arterial + Collector	178	8.2 %
		Arterial + Local	100	4.6 %
		Minor Arterial + Collector	378	17.4 %
		Minor Arterial + Local	148	6.8 %
		Collector + Local	356	16.4 %

3.5.1 Street shape

Table 24 summarizes the condition of bordering streets in 2014. Approximately 65% of apartment complexes are bordered by straight regular streets and the remaining 35% by curved irregular streets. From the 1980s throughout the 2000s, regular-shaped streets dominated, since most apartment complexes were developed on relatively flat land in a planned manner through the Housing Site Development, Land Readjustment, and Urban Development methods. The Housing Redevelopment Projects were implemented throughout the 1990s and 2000s, and numerous individual parcels were joined for redevelopment. This resulted in an irregular parcel shape and irregular bordering street shape. Figure 41 illustrates the increasing number of irregularly shaped bordering streets.

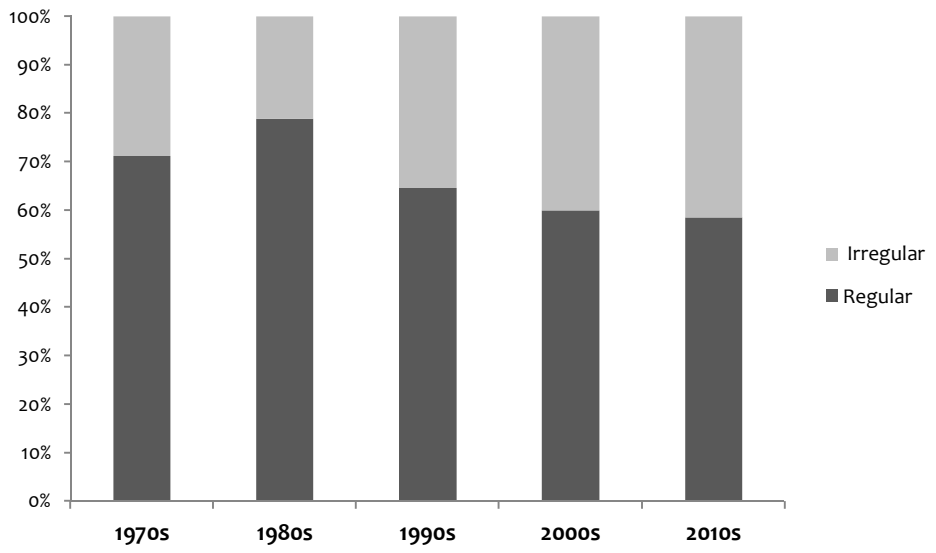


Figure 41 Proportional change of bordering street shape over time

3.5.2 Bordering street proportion

An examination of the proportion of streets bordering apartment complexes reveals that the most general condition is having more than 50% of the apartment complex surrounded by streets (44.7%). This is evident in the apartment complexes built during the 1980s to 2000s, of which 22% are located next to adjacent plots with buildings or other lands, thus bordering the street on less than two sides or less than 50% of the complex perimeter. Around one fifth (17.9%) of apartment complexes are completely enclosed by streets, while fewer (15.4%) have only an access point, in other words, a single street leading to the apartment complex. Figure 42 demonstrates that this pattern has been maintained from 1970 without significant changes over time, although developments with less borders increased in the 2010s.

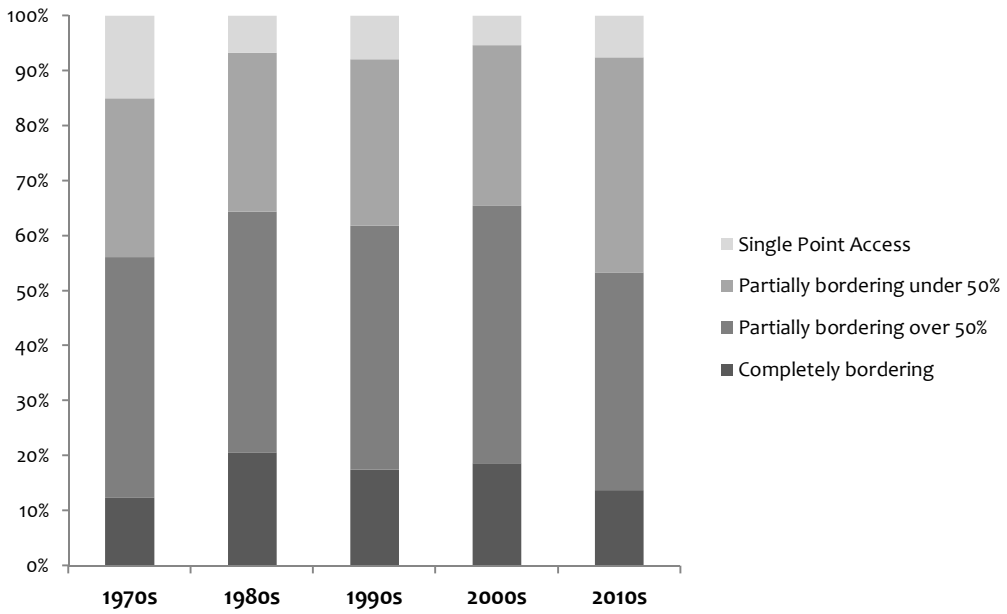


Figure 42 Proportional change of bordering street proportion over time

3.5.3 Bordering street hierarchy

Regarding the hierarchy of bordering streets, 22% of complexes are surrounded by arterial roads (40 m and over), completely (2.1%) or partially (along with minor arterial, collector, and local: 16.9%). The majority of apartment complexes (78%) is defined or accessed by a minor arterial, collector, and local road. Minor arterial roads (25–40 m wide) define 5.1% of apartment complexes, and collector and local roads 24.2%. More than half (51.6%) of apartment complexes are served only by collector and local roads, while 411 (18.9%) are served only by narrow local roads of less than 10 m. In summary, around half the apartment complexes face arterial and minor arterial roads, while the other half are served by narrower collector and local roads.

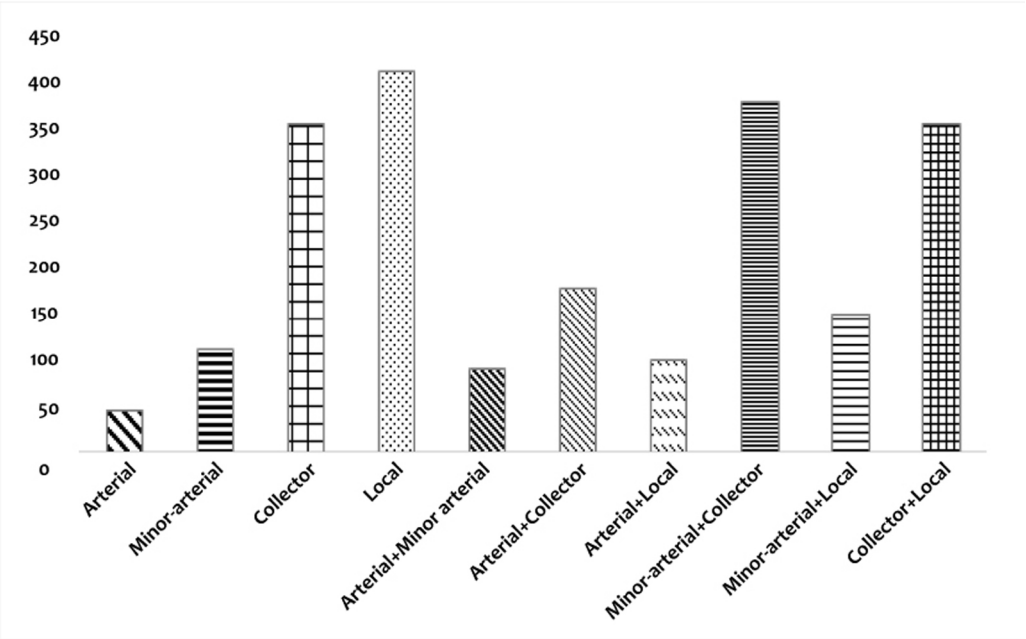


Figure 43 Hierarchy of Bordering Street

3.6. Morphological Influence of Internal and External Forces

Urban morphology as a field of studying urban form has both descriptive and explanatory dimensions in its inquiries. The descriptive study documents the urban form in its formal characteristics mainly through typological analysis and mapping. The explanatory dimension addresses why those forms came to be the way they did. For this explanatory understanding, urban morphology distinguishes the internal force and external force that influence the formation and transformation of urban form. The internal force comes from the form itself. Morphological characteristics of urban form elements perform as constraints or opportunities to each other. Thus, the correlations between the selected morphological elements are examined. Especially, parcel and street perform as 'morphological frame' within which the subsequent building and land use are determined. According to this perspective of morphological frame, this section takes parcel and street as morphological frame and examines the internal force by ascertaining their influence to building and density. On the other hand, the external force comes from outside the morphological realm. It is the diverse socioeconomic determinants of urban form such as market demand, planning regulations, architectural custom and construction technique of certain time. The in-depth study of the specific external forces is beyond the scope of this study, and thus 'development period' and 'development methods' are taken as representing the external forces on the assumption that they might reflect the complex external forces in a comprehensive manner. Their correlations to morphological characteristics of parcel, building, density and street are examined to provide an explanatory discussion.

3.6.1 Influence of internal forces

Table 25 provides the results of the statistical correlations between the morphological elements discussed above. Some relationships are not statistically significant, while others demonstrate statistical significance with varying degrees of correlations. In this study, 0.4 to 0.7 is regarded as a “moderate correlation” and 0.7 to 1.0 as a “strong correlation.” Less than 0.4 is considered a “mild correlation.” Although correlations emerge between these elements, the focus of this study is on how the elements of the morphological frame—parcel and street—influence the building and density.

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Table 25 Correlations between morphological elements

	Parcel size	Parcel shape	Specific shape	No. of buildings	Building height	Building style	Building arrangement	BCR	FAR	Street shape	Street portion	Street hierarchy
Parcel size		-.041 (.057)	.026 (.229)	.747** (0.000)	.034** (.117)	.209** (.000)	.185** (.000)	-.451** (.000)	-.237** (.000)	-.044* (.039)	-.082** (.000)	.034 (.117)
Parcel shape			**	-.057** (.008)	-.086** (.000)	.040 (.062)	.014 (.505)	.060** (.005)	.122** (.000)	.654** (.000)	.301** (.000)	-.086** (.000)
Specific shape				.027 (.202)	-.077** (.000)	.087** (.000)	.056** (.008)	.019 (.387	.086** (.000)	.675** (.000)	.318** (.000)	-.077** (.000)
No. of buildings					.032** (.141)	.352** (.000)	.180** (.000)	-.303** (.000)	-.224** (.000)	-.033 (.122)	-.071** (.001)	.032 (.141)
Building height						-.012** (.572)	.066** (.002)	.009** (.689)	.082** (.000)	.093** (.000)	-.094** (.000)	.068** (.002)
Building style							.294** (.000)	-.102** (.000)	-.035 (.104)	.076** (.000)	-.047* (.030)	-.012 (.572)
Building arrangement								-.040 (.061)	-.043* (.044)	.085** (.000)	-.092** (.000)	.082** (.000)
BCR									.328** (.000)	.038 (.075)	.015 (.476)	.009 (.689)
FAR										.085** (.000)	-.092** (.000)	.082** (.000)
Street shape											.226** (.000)	-.050* (.021)
Street portion												-.312** (.000)
Street hierarchy												

* The number above each cell is Pearson R value which is the correlation coefficient value and below number in the parenthesis ( ) is the p-value where $p<0.05$ is considered as statistically significant

**'Specific shape' is derived from more general 'Parcel shape', thus its correlation value is meaningless.

Strong correlation (R: 07-1.0) Moderate correlation (R: 0.4-0.7) Mild correlation (R <0.4) Insignificant correlation (R<0.1)

Parcel size

The morphological dimensions of parcel are its size, shape, and collective pattern. These constitute a morphological frame that influences the formal character of subsequent building and land use. As expected, parcel size demonstrates a strong positive correlation (more than 0.7 coefficient value) with the number of apartment buildings in the apartment complex. This correlation provides a significant implication in terms of understanding Seoul's apartment-driven urban form. The large parcel size of apartment complexes in Seoul explains why the apartment buildings in the city appear in groups with individualistic homogeneity.

A strong correlation between parcel size and building form is expected, because the larger parcel may provide an opportunity for more freedom in terms of site planning and architectural design. However, no statistical significance was found between parcel size and building height. Parcel size is only mildly correlated with building layout (0.185), indicating a non-significant influence. Furthermore, the row, cross, and mixed arrangement types are employed regardless of parcel size. This is similar for the relationship between parcel size and architectural style, which are mildly correlated (0.209). In general, parcel size does not determine whether apartment buildings were constructed as flat, tower, or mixed types. This independence of building height, building layout, and architectural style from parcel size can be attributed to the fact that the construction of apartment complexes in Seoul is more a market venture to achieve the maximum profit, not a design project seeking parcel-based environmental value.

The relationship between parcel size and building density demonstrated weak, negative correlations: The larger the parcel size, the lower the BCR and FAR. Although BCR demonstrated a moderate correlation (-0.451), FAR demonstrated only a mild

correlation (-.0.237). This indicates a weak tendency evident in the decrease in density according to the increase in parcel size, although the influence of parcel size was not significant. This pattern is understandable, as government regulations require more common facilities and open spaces depending on the number of households, which is dependent on parcel size. This pattern also indicates that the density of apartment complexes is not determined by morphological frame, i.e. parcel size, but by market mechanisms seeking the maximum density allowed.

A number of architectural and urban thinkers argue Seoul's apartment buildings as a FAR game governed by market mechanisms and supply-minded government policies (Multi-unit Housing Research Association, 1999). The data-based correlation analysis shows that parcel size is simply a container of apartment buildings, not an internal force framing subsequent building actions. Thus, the role of parcel size as a morphological frame was not found.

Parcel shape

Table 25 shows that from a statistical viewpoint, parcel shape had little influence on subsequent building actions, including building regular or irregular or the specific seven types of complexes. In contrast to expectations, the relationship between parcel shape (regular or irregular) and building layout (row, cross, or dot) is not statistically significant. Regarding the specific seven types of building arrangements, only a very weak relation (0.056) is confirmed. No or weak correlations were also determined for the number of buildings, building height, and architectural style (flat, tower, mixed). Similar results were found for BCR and FAR, as parcel shape demonstrated only a very weak correlation. As for parcel size, the results indicate that the construction of

apartment buildings is not influenced by parcel shape, but is more susceptible to other forces in determining the building height, layout, and style. As mentioned, achieving the maximum FAR through an efficient building layout and maximum building height might be a direct determinant in the market-driven, privately initiated housing construction industry in Seoul (Multi-unit Housing Research Association, 1999).

Street and parcel

Street plays a significant role in framing urban blocks and integrating the partial urban fabric into a whole. However, in this study, only bordering streets were investigated according to their shape, bordering portion, and hierarchy at the individual complex level. Neither internal streets nor wider outside street networks were included in the database. Because of this limited information, the role of a street as morphological frame is not fully examined and limited to ascertaining the correlations to other morphological elements. Table 25 shows few correlations between parcel size and street form. Street shape (regular or irregular), the bordering portion of a street, and the hierarchy of bordering streets were not meaningfully correlated with parcel size, despite expectations that wider streets serve sites with a larger parcel size. This pattern can be interpreted as resulting from the general practice of apartment complex development in Seoul. In large-scale apartment development such as the Housing Site Development Project, arterial roads were provided, although only some apartment complexes are served by them. The same is true for apartment complexes in the Land Readjustment Project, where only some apartment complexes face arterial roads. Furthermore, in the Housing Redevelopment Project area, where roads and other infrastructure are usually in poor condition, the norm is that only limited access is

provided to each apartment complex. Clearly, Seoul's apartment complex development is not linked to the provision of public infrastructure such as roads.

Parcel shape is strongly correlated with the bordering street shape. Here, parcel shape (regular or irregular/specific seven types) and street shape (regular or irregular) demonstrate a strong correlation (0.654, 0.675 respectively), since the street shape follows the parcel boundary. However, the portion of bordering streets and street hierarchy demonstrate little correlation with parcel shape, likely because of the weak provision of public infrastructure characterizing the development of apartment complexes in Seoul.

Other relationships between morphological elements

Internal forces as explanatory factors of urban form require careful analysis to determine the influences of morphological elements. The results of the statistical correlational analysis (Table 25) do not provide internal causal explanations of these elements. However, some, even if weak, interrelationships with notable implications emerged. The number of buildings demonstrates a mild correlation with architectural style (+0.352) and density (BCR -0.303, FAR -0.224). Architectural style demonstrates weak correlations with building layout (+0.294) and BCR (-0.102), but no statistically significant correlation with FAR. These patterns imply the internal influence of architectural style based on whether it is a flat, tower, or mixed type; the number of buildings; building layout; and BCR; which are all partially impacted. Interestingly, building layout (row, cross, dot, mixed) has nothing to do with BCR (no statistical significance) and little with FAR (-0.043). The same pattern emerged for the correlation between building height and density, indicating that a higher building does not necessarily yield higher density. These results contribute towards explaining the

formal character of Seoul's apartment urbanism. The little or no influence of internal forces on morphological elements indicates that the construction of apartments in Seoul was largely influenced by external forces emanating from outside the form. As such, many urban thinkers highlight market forces as the key determinant shaping the form of apartment complexes in Seoul. Consistent is the pursuit of the maximum building height and FAR allowed in specific periods, regardless of their morphological frames. It is also likely that architectural styles and building layout were subordinate to this goal, only reflecting the changing housing market situation and planning regulations.

3.6.2 Influence of external forces

What external forces exist and their influence on the formal character of morphological elements are important inquiries in explaining why Seoul's apartment complexes are shaped the way they are. As mentioned, the external forces are various socio-economic and politico-cultural forces shaping urban form. These forces interplay in a complex manner, requiring in-depth study to unveil their influence on the morphological characteristics of apartment complexes. Also as mentioned, as a simplified investigation, this study examines the correlation of the morphological characteristics of apartment complexes with the period of development and development method as reflecting complex external forces. Since the correlation with development period is discussed in previous sections, this section reviews the relation of development method and the morphological characteristics of apartment complexes. As an external force, the development method is assumed to reflect public policy, residential planning, and the housing market at the time it was employed.

Table 26 Correlations between morphological elements and 14 development methods

Morphological elements	Pearson R value*	Chi-square (p-value)**
Parcel size	14%	0.000
Parcel shape	36-41.5%	0.000
Specific shape	33-40%	0.000
No. of buildings	7%	0.001
Building height	24-27%	0.000
Building style	7-10%	0.000
Building arrangement	4%	0.039
BCR	14-15.5%	0.000
FAR	24-26%	0.000
Bordering street shape	32.4-36.7%	0.000
Bordering street portion	11-14%	0.000
Bordering street hierarchy	1-3%	0.124

*Converted into percentage (Pearson R value * 100)
** Statistically significant when $p<0.05$

As described in Chapter 2, the development methods applied to the construction of apartment complexes in Seoul can be classified into 14 types contained in 6 general categories. The statistical correlation analysis shows if these 14 development methods demonstrate correlations with the formal character of morphological elements. Table 26 shows that except for building layout and hierarchy of the bordering road, all other formal aspects are meaningfully related with the development methods (Chi-square value <0.005). Specifically, parcel shape and street shape demonstrate a relatively strong correlation (R>33%), followed by building height and FAR. This indicates that

in general, the morphological characteristics of apartment complexes are influenced by the development methods applied, although this correlation is not strong enough to have explanatory power. Yet, the relationship is strong enough to explain that parcel shape and road shape were influenced by what development methods were applied.

In general, the Land Readjustment Project produced a regularly shaped parcel and road, because of the planned nature of land subdivision. Parcel size varies. When land readjustment projects were employed under the Han River Reclamation Project, the parcel size was extra-large. In general, in the land readjustment projects, most complexes were small. Most apartment complexes constructed using this development method in the 1970s and 1980s comprised buildings that were of the flat type, had 11 to 15 stories, an average BCR of 15–25%, and average FAR of 150–250%.

The Housing Site Development projects also produced regularly shaped parcels and roads, as these were included in the master plan and constructed on flat topography. Most parcels were small or medium sized, although the projects were large in scale. In the Newtown scale projects such as Sanggye and Mokdong, apartment complex parcels were small and medium sized. Furthermore, plank type apartments with buildings 10 to 15 stories high were typical in the 1980s and 1990s. The density pattern differs slightly depending on the project scale. The Newtown-in-town project demonstrated a lower density form, an average BCR of 10–20%, and average FAR of 100–200%. This is in comparison to the small and medium-sized Housing Site Development projects, which had an average BCR of 15–25% and average FAR of 200–250%. As a public planned development, roads were better provided and had a regular road shape and higher bordering proportion.

The Urban Development Project, a newer version of public planned development, demonstrated a pattern similar to that of Housing Site Development: a regular parcel and road shapes and small and medium parcel size. This reflects the more recent period

in which these methods were applied, evident in the dominant flat and tower architectural style with a taller height. In Newtown Urban Development projects including Eunpyeong New Town, the average BCR is 20–25% and average FAR is 100–150%. This higher BCR with lower FAR likely resulted from an intentional design aiming to create an ideal residential environment. In other Urban Development Projects, the density pattern follows the typical development of apartment complexes with an average BCR of 15–20% and average FAR of 150–200%.

In the General Built-up Area projects, a less planned nature is evident. Irregularly shaped parcels and bordering roads abound, and parcel size is relatively smaller. The bordering portion of the street is low, and a local road of less than 10 m provides access to the sites. Most are also flat type buildings of 10–19-stories. The dominant density pattern is an average BCR of 20–25% and average FAR of 200–300%, which is typical of apartment complexes constructed in the 1990s and 2000s.

Housing Redevelopment Projects as a clearance renewal of spontaneous deteriorated areas mostly on hillsides are distinguished into two types. The first is the general type, and the other is in the Newtown district, which promotes renewal projects through incentives including the relaxing of regulations. Since both types target substandard areas on hilly locations, an irregular parcel shape and irregular and narrow bordering roads are common. The density pattern is an average BCR of 15–25% and average FAR of 200–250%. Regarding architectural style and building height, along with the typical flat type, the tower style is more common in the Newtown district, and buildings tend to have more than 20 stories, as is more common in recent developments.

The Housing Reconstruction Projects showcase visually outstanding aspects in terms of super-high-rise buildings, high density, and relatively low BCR. Mostly, these have replaced former apartment complexes with newer versions. When existing

apartment complexes were constructed through planned methods such as land readjustment, housing site development, or urban development, these are of a regular parcel and street shape. The irregular shape was more common in the housing reconstruction implemented in the general built-up area. Although irregular in terms of morphological frame, the Housing Reconstruction Projects in the general built-up area developed higher apartment buildings, although the density pattern remained similar (average BCR: 20–25%; average FAR: 250–300%).

In summary, the morphological patterns of each development method confirm the results of the statistical correlation analysis. The shape of the parcel and bordering street is related to the development methods, which employ different public intervention and planning approaches as well as different topographical and local situations. The patterns for BCR, building style, and height indicate some relationships, although these are more related to the development period and changes in the market situation. Interestingly, the FAR pattern did not change much, indicating that this was key in ensuring the project's financial feasibility in the market-driven, privately initiated apartment complex construction industry in Seoul.

3.7 Interpretive Conclusion

While only providing a simplified understanding, typological documentation and analysis clarifies the morphological patterns of the 2,172 apartment complexes in Seoul, enabling the understanding of complex variances. First, the most direct consequence of the construction of apartments in Seoul for the last 45 years is the size of the parcel (complex site), the average of which is 26,888 m^2. Furthermore, the average apartment complex contains eight apartment buildings. While half the complexes accommodate 2 to 4 buildings, more than 100 sites house more than 20 buildings. In extreme cases, more than 100 buildings were constructed in a single apartment complex. This suggests that a substantial grouping of apartment buildings marks the morphological character of Seoul.

The formal character of apartment building grouping is reinforced by the architectural building style. Although Seoul's apartment buildings are becoming higher, slimmer, and freer in shape in terms of architectural style, the traditional south-facing, regularly shaped, flat building form is still pervasive. The mixed building style springing up in groups provides Seoul with its own urban form, which may not be as stable or homogenous as that in Western or other East Asian cities. This character is more evident when considering the various parcel shapes of the city's apartment complexes. The parcel shape of more than half the complexes is irregular, even though most were planned and developed by the government or through local public intervention. Even when regularly shaped, many adopted deflecting or zigzagging forms. This irregular characteristic is further associated with the arrangement of buildings, resulting in an urban form that is difficult to define based on the confusing orientations of apartment buildings.

The morphological patterns of each development method reconfirm the evolutionary process of the development of Seoul's apartment complexes. Only the shapes of the parcel and bordering street are related to the development methods, which differ in terms of public intervention and planning approaches as well as in the topographical and local situations in which they are applied. Other elements demonstrated only a weak relationship with development methods, reflecting that they are determined by the financial feasibility of the project in the market-driven, privately initiated apartment complex construction industry in Seoul. This private sector nature of Seoul's apartment construction industry is accompanied by the weak provision of roads and other community infrastructure. In many cases, apartment complexes were poorly serviced in terms of the hierarchy and bordering portion of the roads, even though most were planned and developed through development methods for which the government provided legal foundations.

CHAPTER IV

LOCATIONAL AND AGGLOMERATION PATTERNS OF APARTMENT COMPLEXES

As reviewed in the previous chapter, it is crucial to analyze the morphology of apartment complexes at the site level to comprehend the urban form of Seoul. Moreover, to understand the morphological characteristics of Seoul shaped by apartment complexes, it is also critical to grasp the wider patterns of apartment complexes dispersed spatially throughout the city. The urban form and landscape differ between Asian cities depending on the siting conditions of apartment complexes, where the apartment is the main morphological factor. In this chapter, the spatial dispersion of apartment complexes is analyzed according to three aspects, namely 1) the locational pattern that looks into spatial distribution, 2) topographical siting and urban block configuration of apartment complexes, and 3) the agglomeration pattern in terms of the attributes of morphological patterns and agglomerative formation process.

The locational pattern of apartment complexes is determined by analyzing horizontal and vertical distribution characteristics. Horizontal distribution indicates the two-dimensional spatial dispersion of apartment complexes across Seoul's urban terrain. Time series documentation of dispersion attributes allows verifying the close linkage between apartment complexes and Seoul's urban growth and renewal process. Vertical distribution shows how apartment complexes are settled within the topography of Seoul. The topographical siting condition of an apartment complex is examined by considering that complexes built on hilly areas constitute a strong morphological

element that characterizes the urban landscape of mountainous Seoul. Diverse patterns of the formation or siting of apartment complexes within the urban block are evident. At times, an apartment complex becomes an urban block or single or multiple complexes are contained within the urban block. Accordingly, various spatial conditions of apartment complexes in relation to the urban block elucidate the urban fabric and form of Seoul. The agglomeration pattern is investigated in terms of the spatial pattern of an apartment complex, namely whether it is clustered or scattered, and its relationship with the existing urban fabric, which is also connected to the urban morphology of Seoul.

The planar and vertical locational distribution, configuration within an urban block, and agglomeration and dispersion pattern per se of an apartment complex manifest the urban form of Seoul. By documenting these patterns over time, the evolutionary process of urban morphology can be clarified. When viewed in terms of the urban expansion of Seoul, these patterns confirm that the urban form of Seoul is a compound of various morphological regions. For this purpose, the city-wide dispersion pattern and formation process of 2,172 apartment complexes were examined. Spatial mapping through GIS was executed based on the database that includes locational information, period of construction, and the development method of individual apartment complexes. The locational process of apartment complexes built through sequential periods is compared with the phases of urban area expansion and development methods to understand how and in what spatial pattern Seoul became an apartment complex city over time.

4.1 Locational Pattern of Apartment Complexes

4.1.1 Spatial distributional pattern

Generality in apartment complex dispersion

Of Seoul's 605 km^2 territory, 40% is designated as a Development Restriction Zone known as the greenbelt or other open spaces, and the remaining 60% is the built-up area (Table 27). The residential zoning area accounts for 88% of the built-up area, which covers more than half (52.3%) the total area of Seoul. Most apartment complexes were located in the residential zoning area as per the land use zoning regulation, and some minor apartment complexes were developed in semi-industrial zones such as Yeongdeungpo. In terms of area, the 2,172 apartment complexes in this study occupy almost one fifth (18.4%) of the residential area.

Table 27 Statistics for the territorial aspects of Seoul

Territorial aspect		Numerical value (m^2)	Ratio (%)
Seoul	Total area	605,244,224	100%·
	Non-built-up area	249,187,735	41.2%
	Built-up area	360,332,756	59.5%
	Residential area	316,736,286	52.3%
Apartment Complexes (with 2 or more apartment buildings)	Number	2,172	·
	Total area	58,401,055	18.4% (within residential area)

Furthermore, this rate of occupation does not include about 1,400 apartment sites with single buildings (stand-alone apartments), although apartment complexes are widespread across Seoul. In certain areas, planning regulations prohibit the construction of apartment complexes or these are not developed because the area is part of the historic city center, commercial and business district, low-rise residential zoning district, or greenbelt area. Except for these, all other areas house apartment complexes in different concentrations and distributions (Figure 44). Extensive grid-structured low-rise regions[10] developed under the Land Readjustment Project in the 1960s and 1970s and spontaneously formed urban areas on hilly areas remain without major apartment complexes. However, these areas have been transforming through the redevelopment projects replacing old apartment complexes.

Thus, as seen in the map below (Figure 44), apartment complexes are dispersed throughout the city, not only in general urban areas, but also along the Han River and other tributary streams, bordering mountains, and hilly areas. This should be considered as characteristic of the urban form and landscape of Seoul, as it entails the unique visual pattern of urban grain, spatial configuration, skylines, and general collective form. The widespread dispersion of apartment complexes fuels the perception of Seoul as an apartment city, as clustered high-rise apartment buildings hide the more widespread low-rise areas and dominate the city's visual appearance.

[10] Seongdong-gu, Mapo-gu (Hapjung-dong, Seogyo-dong, Donggyo-dong, etc.), Gangnam-gu, Songpa-gu, Eunpyung-gu (Bulgwang-dong, and Gangseo-gu (Hwagok-dong)

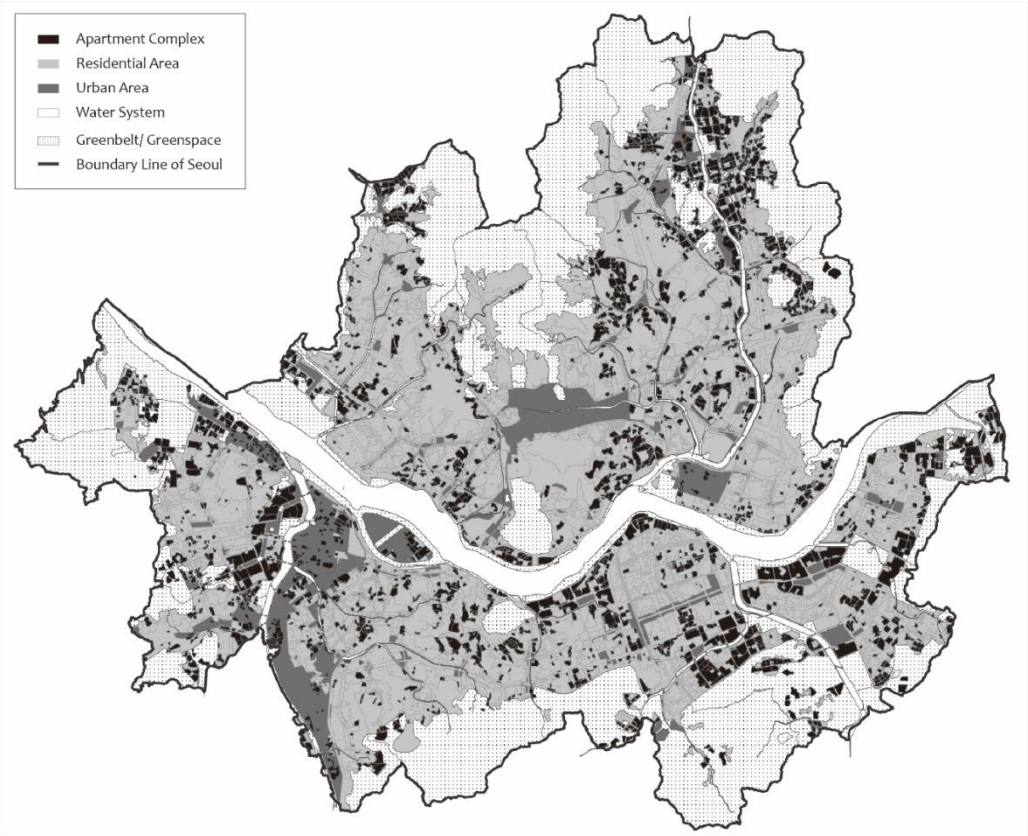


Figure 44 Dispersion of apartment complexes across Seoul

Urban area expansion and apartment complex proliferation over time

The present pervasiveness of apartment complexes is the result of continuous, piecemeal development at various scales over the last half century. In fact, the locational progress of apartment complexes accompanied the urbanization process of Seoul in which built-up areas expanded in all directions since the current area of 605 km^2 was aggressively annexed in 1963. In many cases, apartment complexes were at

the forefront of this territorial growth; thus, they constitute a morphological region, a homogeneous urban form developed in a particular period—the morphological period—in urban morphology (Whitehand, 1982).

In the earlier period (before the 1960s), the territory of Seoul was centered on the inner-city center (currently Jongro-gu, Jung-gu, Seongdong-gu, Seongbuk-gu, Seodaemun-gu, and Mapo-gu) and the Yongsan-Noryangjin-Yeongdeongpo corridor to the southwest. These areas were laid out through historic evolution, spontaneously, or through colonial land readjustment. As Seoul's city boundary expanded to its current area in 1963 and underwent rapid urbanization after that, the built-up area expanded equally rapidly, filling the outer vacant lands. In the 1970s, Seoul expanded outwards in all directions from the city center through the Land Readjustment Projects. These created fine-grained, grid-patterned residential areas for the then popular one to two-story detached houses, for example in the Hwagok, Bulkwang, Janganpyeong, Guui, Shilim, and Yeongdong areas.

Figure 24 shows how the development of apartment complexes is related to Seoul's urban growth within the city boundary. In the 1970s, amid widespread urban expansion through land readjustment activities, apartment complexes began to emerge along the Han River and in the Gangnam area. The sites were provided through the Yeouido Development, Han River Reclamation Project, and Gangnam Area Land Readjustment Project (Yeongdong and Jamsil Districts). These projects represent urban expansion in the city center and outer areas in the 1970s. As such, the Yeouido Development and Han River Land Reclamation Project brought about inner expansion to create new land around the city center, while the Land Readjustment Project led outward expansion.

In the 1980s, the development of apartment complexes intensified in the Han River Reclamation areas and in large-scale Housing Site Development Project areas such as Goduck, Geopo, Mokdong, Sanggye, and Dunchon. Figure 45 shows the development

of apartment complexes in the 1980s, indicating their intense, agglomerated form, which is in contrast to the individualistic scattering form in other periods. However, individualistic apartment complexes were also constructed in the 1980s in the eastern, southwestern, Gangnam, and Songpa areas.

In the 1990s, intensive Housing Site Development Projects were implemented around the Sanggye area and Gangseo area. At the same time, individualistic scattered developments emerged through the Housing Redevelopment Project, which aimed to transform unplanned, spontaneous residential areas. Until this time, Seoul's urban expansion had ended, as vacant land was no longer available within the city boundary. While Seoul's growth continued at the metropolitan level, in the 2000s, individualistic developments were implemented across the city through the Housing Redevelopment Project, Urban Development Project, and Housing Reconstruction Project. Many of these projects were promoted through city policies such as the Newtown Policy, intensifying the development of apartment complexes. For half the 2010s, individualistic Housing Redevelopment and Housing Reconstruction Projects were at the forefront of the construction of apartment complexes, while the government initiated urban development projects at some locations in the greenbelt area to implement public subsidy housing projects in the form of apartment complexes.

Geographically, the increase is similar both in Gangnam and Gangbuk. In the 1970s, apartment complexes were constructed in only nine boroughs, mostly along the Han River. By early 2014, Yangcheongu housed the most apartment complexes (206, 9.5%), followed by Nowon-gu (182, 8.4%), Gangseo-gu (159, 7.3%), and Gangnam-gu (158, 7.3%). In these boroughs, apartment complexes were mostly constructed in the 1980s to 2000s, influenced by the Newtown-in-town developments through the Housing Site Development Project initiated from the 1980s. Yeongdeongpo-gu and Guro-gu rank high, despite that land use here is mostly designated as industrial sites. Many

reallocated areas previously occupied by factories have been converted into apartment complexes. Boroughs with a low ratio of apartment complexes are located in the traditional downtown area, including Jongno-gu, Jung-gu, Gangbuk-gu, and Seodaemun-gu, based on inner-city restrictions on residential development, as mentioned. From the 1990s, apartment complexes became more dispersed. These were either new land developments, adjacent to existing apartment complex clusters, or individually scattered. Restricted urban areas also gradually become partially deregulated followed by the construction of apartments aligned to apartment housing replacement in existing obsolete residential areas.

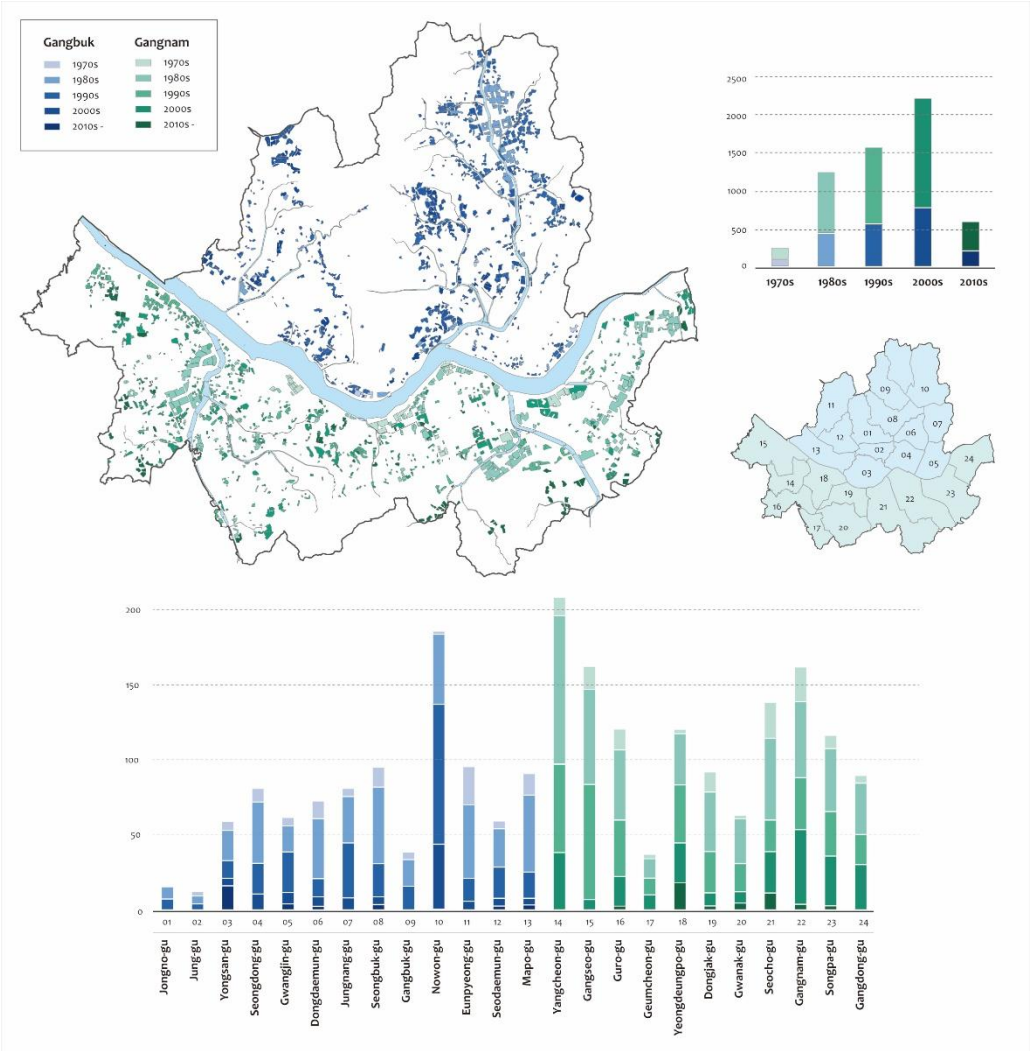


Figure 45 Construction of apartment complexes in Gangbuk/Gangnam and 25 boroughs

Thus, the spatial distribution of apartment complexes has proliferated in close conjunction with the expansion of the urban area, especially through residential developments. The Land Readjustment Project initially formulated a grid pattern area for small plots, later allocating the sites for apartment complexes, while the Housing Site Development Project developed large-scale apartment districts. While these

methods were converting non built-up areas (mostly agricultural land) into urban use, a number of redeveloped complexes emerged from the existing spontaneous urban areas near the city center. Through these processes, apartment complexes became dispersed across Seoul, forming various morphological regions that represent the distinguishable morphological character of the period in which they were developed. The discussion on morphological region and morphological period continues in conjunction with the agglomeration/dispersion patterns described later in this chapter.

4.1.2 Topographical siting

Siting topography

Seoul's extensive proliferation of apartment complexes and their siting on topography represents an urbanism that differs from that of other Asian megacities. Seoul is encircled by mountains that form basin topography (Seoul Institute, 2013). Mountains in the inner city include Naksan낙산 (111 m), Inwangsan인왕산 (338 m), Namsan남산 (262 m), and Bukaksan북악산 (342 m), which create an undulating topography mixed with flat land. The city border is surrounded by Bukhansan북한산 (837 m), Dobongsan도봉산 (740 m), Sooraksan수락산(638 m), Bulamsan불암산 (508 m), and Gwanaksan관악산 (629 m). Between this mountainous topography run several streamlets including the Cheonggyecheon청계천, Bulgwangcehon불광천, Anyangcheon안양천, Tancheon,탄천 and Yangjaecheon양재천. These tributary streams join the Han River, which traverses from East to West and generates low flatlands along the riverside (Fiure 46). Seoul City Hall is located at an altitude of around 20 to 30 m, and the Gangnam subway station at 15 m. Most low-lying flatlands at 0 to 15 m are located along the Han River and tributary

streams.

Regarding analysis, the topography of Seoul totals 84 sections in 5 m intervals. Of these, apartment complexes occupy 43 sections[11]. Thus, the lowest and highest altitudes and topographical difference within an apartment complex should be understood as an approximation between each level. Considering the lowest point as the siting altitude of each apartment complex, the lowest land level is 5 m and the highest altitude 130 m.

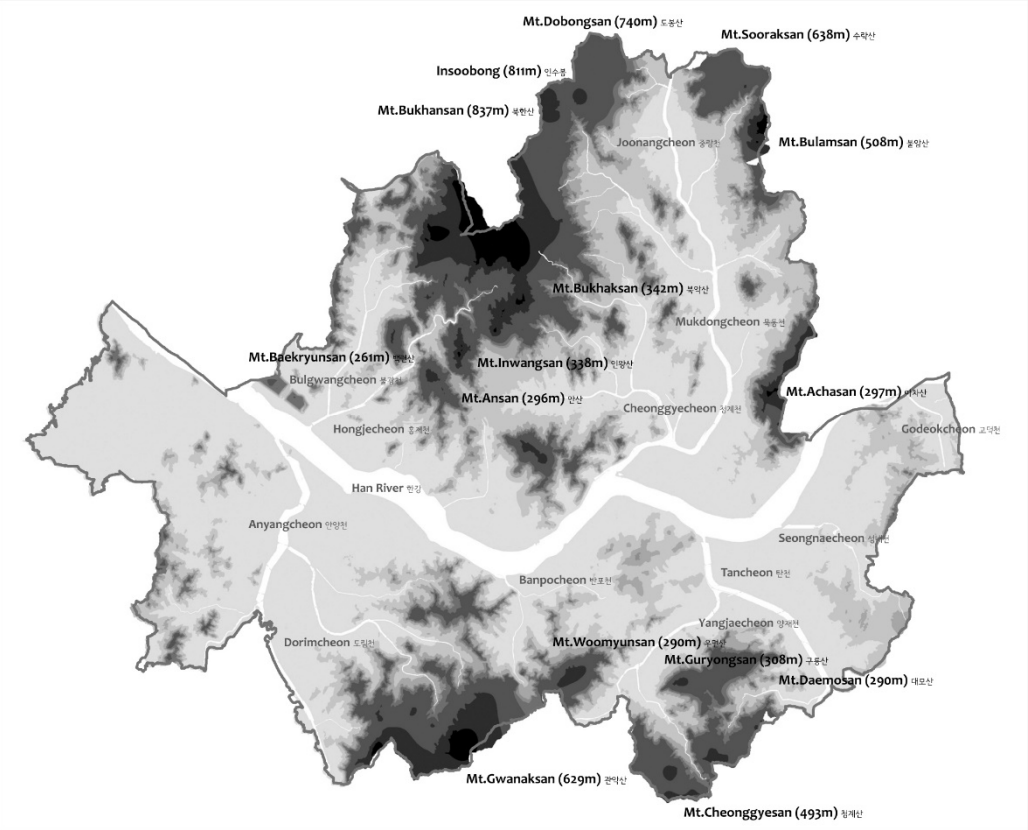


Figure 46 Topographic map of Seoul
(Source: Redrawn from the "Geographical Atlas of Seoul 2013," using 2015 GIS data)

[11] In GIS, a contour map including 5 m intervals was utilized. (data from NSCI)

Table 28 Apartment complex siting altitude over time

	1970s	1980s	1990s	2000s	2010s	Total_01*
0-25m	58 (5.0%)	203 (17.5%)	348 (29.9%)	451 (38.8%)	103 (8.9%)	1163 (53.5%)
25-50m	9 (1.1%)	126 (15.3%)	259 (31.4%)	339 (41.1%)	91 (11.0%)	824 (37.9%)
50-75m	5 (3.4%)	9 (6.2%)	41 (28.3%)	77 (53.1%)	13 (9.0%)	145 (6.7%)
75-100m	1 (3.1%)	2 (6.2%)	8 (25.0%)	18 (56.2%)	3 (9.4%)	32 (1.5%)
Over 100m	.	.	3 (37.5%)	5 (62.5%)	.	8 (0.4%)
Total_02**	73 (3.4%)	340 (15.7%)	659 (30.3%)	890 (41%)	210 (9.7%)	2172 (100%)

* Total_01: Values in the total_01 row show the overall portion of each altitude column.
** Total_02: Values in the total_02 column show the overall portion of each date period row.

Table 28 and Figure 47 present the topographical siting patterns of apartment complexes. Among the 2,172 apartment complexes, more than half (56.3%) are located at between 0 to 25 m. Most of the low lands within the 0 to 25 m level are located along the Han River and its tributary streams, meaning these areas are mostly the river basin flatlands. These include apartment complexes built in the 1970s as part of the Apartment District on the reclaimed land along the Han River and large-scale Newtown-in-town development of agricultural land in the 1980s. However, nearly 70% of the apartment complexes at the 0 to 25 m level were developed in the 1990s and 2000s through small-scale Housing Site Development Projects in areas such as Deungchon and Gayang, Housing Reconstruction Projects in Jamsil, and Urban Development Projects in Gangil in southeastern Seoul.

The second most common topographical siting is between 25 and 50 m, at which

824 complexes (37.9%) are located. Most of these (more than 70%) were developed in the 1990s and 2000s through the Housing Redevelopment Project on the tip of Bukhan Mountain and Surak in Nowon-gu and Gangbuk-gu and in the Geumho and Gwanak areas. Apartment complexes located at this level were also developed through the Munjeong Land Readjustment Project and Housing Reconstruction Project in the Gangnam-gu area, where apartment sites were originally development under the Land Readjustment Project in the 1970s.

Furthermore, less than 10% of topographical sites are located at an altitude higher than 50 m. In total, 6.7% of apartment complexes (145 complexes) are located in the range of 50 to 75 m. Most were developed in the 1990s and 2000s through the Housing Redevelopment Project on the eastern tip of Bukhan Mountain (Gileum and Mia area) and on the western tip in Eunpyeong-gu. In addition, Housing Redevelopment Projects in the Geumho, Oksu, Gwanak, and Dongjak areas were located at this level and promoted by the City's Newtown Policy, as is the case in Mia Newtown area. Although exceptional, 32 complexes (1.5%) are situated at an altitude higher than 75 m, including Heukseok New Town District south of the Han River and Nangok Housing Redevelopment Project area on the tip of Gwanak Mountain, which were constructed in the 2000s.

In general, most planned apartment complexes are located at a low altitude in terms of topography. In addition, most low-level flatlands are distributed along the lower area of the Han River, namely in the Gangnam region including Jamsil, Apgujeong, Banpo, Gaepo (in the Southeast area along Tan stream탄천) and towards the Southwest area, Yeondeongpo and Mokdong areas (along the Anyang stream안양천), and from Gayang to Banghwa in Gangseo-gu, which has a broad flatland area lower than 5 m. In the upper area of the Han River, Mapo, Yongsan, Seongdong, and Joonrang-gu have continuous areas of flatland. Hilly areas are located partially along the Han River,

including the Geumho and Dongjak areas. Towards the southern region, Gwanak and Woomyun Mountain gradually generates a hilly topography. In the northern Gangbuk region, most apartment complexes are located at a high altitude of more than 50 m amidst the mountains including Inwang, Bookhan, Bulam, Soorak, and Dobong.

Over the years, Seoul apartment complexes have become located at a higher elevation. Among those situated at an altitude higher than 50 m, more than 50% were developed in the 2000s and after, mostly through the Housing Redevelopment Project. This trend already emerged in the 1990s, instilling tall, hillside apartment buildings as a common urban landscape of Seoul. Since these are apartment complexes with multiple buildings, a series of grouped masses replacing the natural topography with a manmade skyline emerges, blocking the mountain views. This siting pattern sometimes exaggerates the natural topography, creating a massive enclosure of ordinary residential neighborhoods in the lower part of the city. Thus, in Seoul's apartment urbanism, the textbook land use principle that suggests intensive use of lower flatland while preserving the environmentally sensitive higher topography is mostly ignored.

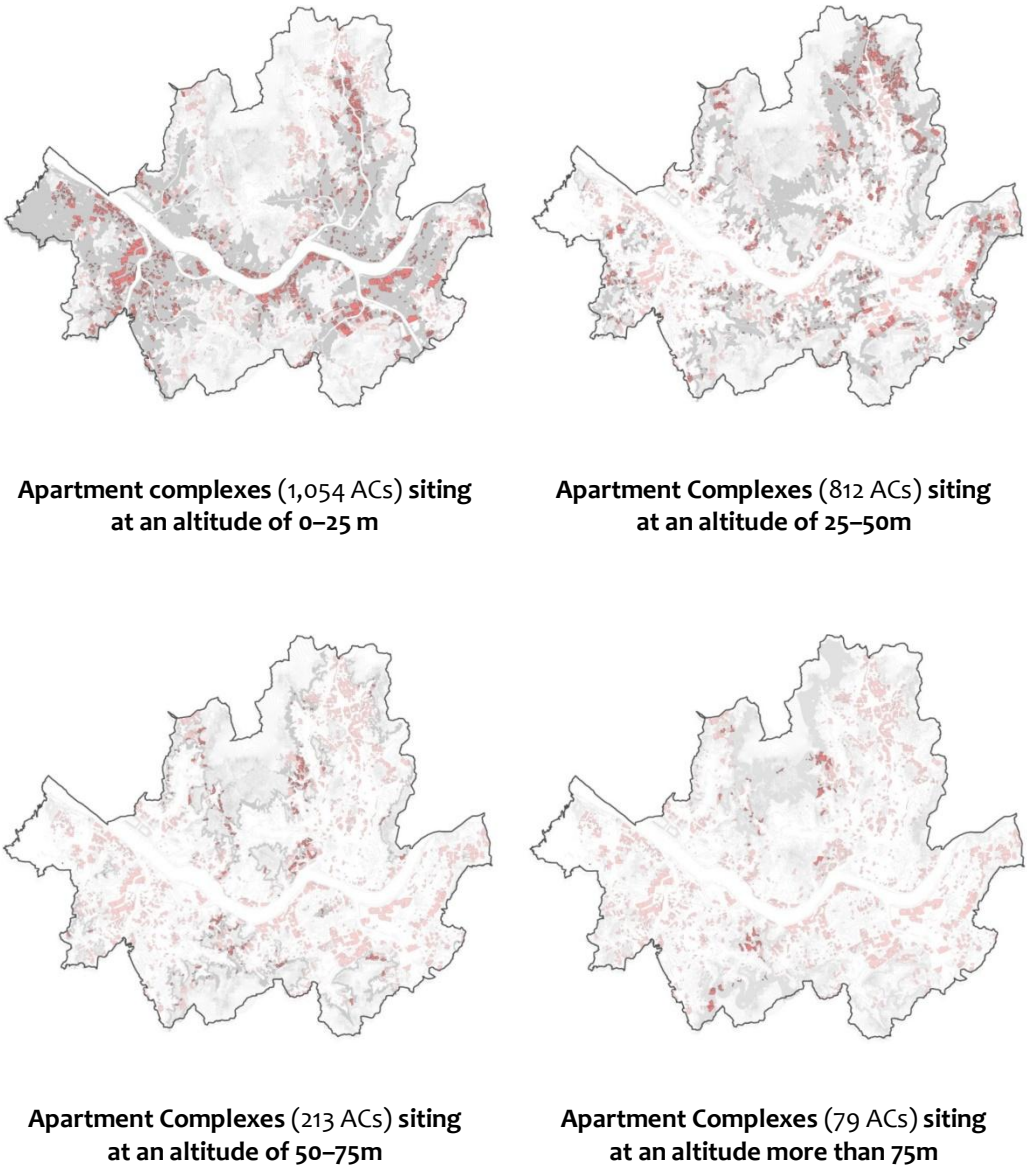


Figure 47 Topographical siting of apartment complexes

Topographical differences within a single apartment complex

Corresponding to the topographical siting discussed above, a large portion of apartment complexes are located on inclined land or have topographical differences in a single complex. There are few cases of altitude differences in an apartment complex built on flatland, but complexes sited on hilly areas could differ substantially in terms of incline (Table 29). Approximately 53% of the 2,172 apartment complexes in this study were constructed on flatlands that do not differ topographically. Most were developed through the Land Readjustment Project, Han River Reclamation Project, and Housing Site Development Project on the flatlands. Approximately 20% of apartment complexes have topographical differences of less than 5 m, which is considered as slightly inclined. The remaining 27% are located on inclined sites with differences of more than 5 m between the highest and lowest points. Around 21.1% of the complexes (459 complexes) are relatively inclined with a topographical difference of 5 to 25 m between the highest and lowest points. A single complex differing by more than 25 m is considered a highly inclined apartment complex (5.6%, 121 complexes in this study). In particular, 27 apartment complexes (1.2%) have a topographical difference of more than 45 m in an individual complex.

Most apartment complexes were developed on the flatlands or slightly inclined sites during the 1970s. From the 1980s, complexes began being constructed in higher areas, mostly at altitudes lower than 40 to 50 m. Overall, apartment complexes tend to be level, or retain marginal topographical differences. During the 1980s to 2000s, apartment complexes with a steep slope emerged, increasing in number from the 1990s. Complexes with considerable topographical differences located on hilly areas emerged after spontaneous residential areas including squatter settlements were redeveloped in the 1950s and 1960s. Thus, on many Housing Redevelopment Project sites, multi-

terraced grading is common with zigzagging internal roads and stepped building placement. Since these were constructed on a hillside, sometimes on the hilltop, a mass of tall, plank apartment buildings create Seoul's unique multi-layered, cascading hillside urban landscape (Figure 48).

Table 29 Topographical siting of apartment complexes

Classification	Topographical difference	Number of ACs	Percentage
Flat land	0 m	1149	52.9 %
Slightly inclined	0 – 5 m	443	20.4 %
Relatively inclined	5 – 15 m	319	14.7 %
	15 – 25 m	140	6.4 %
Highly inclined	25 – 35 m	62	2.9 %
	35 – 45 m	32	1.5 %
	Over 45 m	27	1.2 %
Total		2,172	100 %

Figure 48 Apartment complexes on hilly topography developed by Housing Redevelopment Project

(Source: Naver Aerial View image modified by author)

4.2 Urban Block Configuration of Apartment Complexes

Another dimension of the locational pattern is the relationship between apartment complexes and urban blocks. The issues in this section pertain to how apartment complexes are located within urban blocks and how they have formed urban blocks in Seoul. An urban or city block is defined at different scales, from small blocks composed of a number of plots and surrounded by alleys or local roads to a combination of small urban blocks including open spaces bordered by a higher hierarchical road system. In this research, an urban block is considered a collective territory of plots, internal roads, open spaces, and buildings surrounded by a hierarchy of arterial or minor-arterial roads

In certain areas, an urban block is difficult to recognize based on geographical features, as they are not fully enclosed by arterial or minor-arterial roads or are a spontaneous fabric with irregular boundaries. An urban block was investigated to understand the nature of the location of an apartment complex based on its shape and size as well as how the apartment complex is positioned in terms of other complexes. Five attributes were analyzed in terms of the urban block. The 2,172 apartment complexes in this study were classified according to the typological classification of the attributes below (Table 30).

(1) Positioning of an apartment complex within an urban block
(2) Relationship to other coexisting apartment complexes within an urban block and number of apartment complexes
(3) Occupational ratio of apartment complex area within the block
(4) Shape of the urban block
(5) Classification of the block size

Table 30 Analysis framework for configuration of apartment complex within an urban block

AC positioning	Completely embedded
	Partially bordering street by one side
	Bordering street by two sides
	Bordering street by three sides
	Whole block
	Block undefined
	Undefined boundary still conceived as block (mountainous borders etc.)
Occupational form of AC(s)	single
	Multiple, disjoined
	Multiple, adjoined
	Multiple, mixture of disjoined and adjoined
	Number of ACs within a block
Occupational ratio of AC area	Under 25%
	25%-50%
	50%-75%
	75%-100%
Urban block shape	quadrate
	rectangular
	partially curvilinear
	polygonal
	Irregular
Urban block size	Extraordinary size (exceeding Gangnam block size)
	Superblock size (Gangnam block size approximately 5~600m* 7~800m)
	Common size 4~500 *4~500
	Compact size 2~300* 2~300

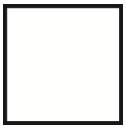
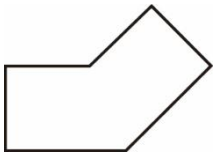
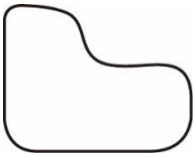
4.2.1 Shape and size of an urban block

The shape of an urban block is usually defined by the surrounding street structure. Mostly, planned area takes straight roads with clear hierarchy in a grid structure, while spontaneously formed urban areas are equipped with winding roads. In certain cases there are some unusually shaped urban blocks, due to its existing urbanized area or topographical reasons. In most cases, the shape of the urban block and road exert its influence to the apartment complex's characteristic that is situated within the block, notably in cases located at the periphery of an urban block. Additionally, the size of the urban block is a determinant that allows either certain size of individual apartment complex or multiple complexes to aggregate.

Based on the GIS map, urban blocks containing apartment complex(es) were identified as types according to the author's judgment (Table 31). In total, 615 urban blocks were identified, containing 2,172 apartment complexes in Seoul. Of these, 217 urban blocks (35.3%) could not be defined as an urban block, and the other 398 (64.7%) were delineated according to the five shape types. One fifth are square or rectangular, and about 45% have curvilinear, polygonal, or extremely irregular features. Furthermore, relationships were identified between the shape of the block and development methods. Apartment complexes included in the Land Reclamation and Land Readjustment Projects tend to be located on rectangular-shaped blocks. Housing Site Development and Housing Reconstruction Projects constructed apartment complexes on regular and irregularly shaped blocks, while those produced through Urban Development, development of the General Built-up Area, and Housing Redevelopment Projects tend to be located on irregularly shaped urban blocks. In terms of block size, complexes supplied through the Land Reclamation, Land Readjustment, and Housing Reconstruction Project, and in the General Built-up Area tend to be

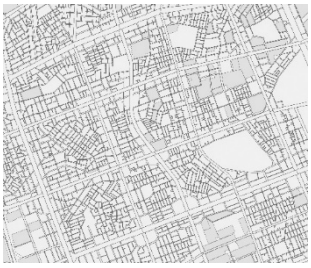
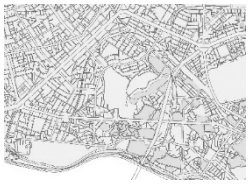
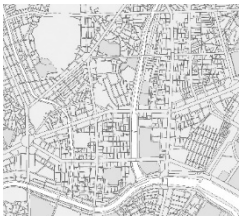
located on larger planned urban blocks, while those in the Housing Site and Urban Development Projects become their own urban block; thus, the size is smaller.

Table 31 Types of urban block shapes

Urban Block Shape		Number of Blocks	percentage
Quadrate		26	4.2 %
Rectangular		88	14.3 %
Partially curvilinear		100	16.3 %
Polygonal		53	8.6 %
Irregular		131	21.3 %
undefinable block shape		217	35.3 %
Total		615	100 %

In terms of size of the urban block, four types are identifiable (Table 32) in which undefinable block was measured in approximation. Among the urban blocks that contain one or more of apartment complexes, there are 11% of extraordinary large scale blocks. In most case of this condition includes low lines of hills or extremely irregular or undefinable block shape. Gangnam grid structure is a representative area composed of superblock size urban blocks that takes up more than one fourth of the overall portion. These superblocks measures up around 600~800m in length and width. Urban blocks of 400m in width and height length is the most common size (35.8%) throughout, while smaller size block (200 to 300m in length and width) also comprises of one fourth (25.8%) portion.

Table 32 Types of urban block size

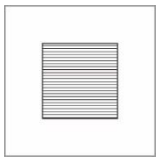
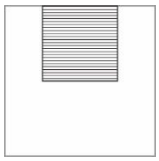
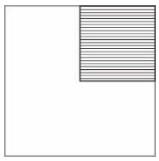
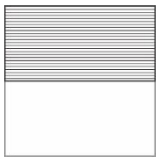
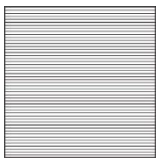
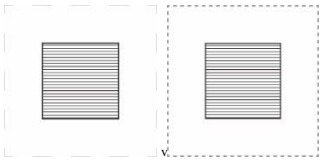
Urban Block Size		Number of Blocks	Percentage
Extraordinary size Approximately 1000m * 1000m (exceeding Gangnam block size)	 Hwagok-dong	68	11.1 %
Superblock size approximately 5~600m * 7~800m (similar to Gangnam block size)	 Nonhyun-dong	168	27.3 %
Common size approximately 4~500m * 4~500m	 Shinsoo-dong	220	35.8 %
Compact size approximately 2~300m * 2~300m	 Yongshin-dong	159	25.8 %
	Total	615	100 %

4.2.2 Positioning within an urban block

Various conditions pertain to the positioning of an apartment complex in an urban block, generating morphological impacts. By scanning all the apartment complexes, six conditions were observed in general (Table 33). First, apartment complexes completely embedded within an urban block are difficult to recognize at the urban block periphery, although feasible to residents or daily passengers of the urban block. This generates internal differences between the embedded apartment complex and surrounding urban block context. The second, third, and fourth types depend on the number of bordering streets. An apartment complex bordering two streets is located at the corner of a road intersection, while those bordering three streets have two intersections. Complexes bordering a street on only one side display their presence less than the former types. The most influential type is when an apartment complex occupies a full urban block. Not all apartment complexes are clearly defined with a road structure, which can be perceivable as an urban block surrounded partially by streets and natural topography or completely located within an urbanized area without any indication of the urban block boundary.

By recording the positioning of all apartment complexes in Seoul, 615 urban blocks containing more than one apartment complex were identified. In the case of 2.5% of the complexes, the complex constitutes an entire block, such as Jamsil 1-4 Apartment Complex. The remaining apartment complexes are embedded in urban blocks in some way. About half (47.3%) border a street on more than one side. Of these, most border one street (30.9%), followed by bordering streets on two sides (12.9%). Considering the size of an urban block, it is possible to border streets on three sides (3.5%) when the apartment complex is somewhat large. Finally, 11% of the apartment complexes are situated within an urban fabric that cannot be defined as a block.

Table 33 Positioning of apartment complex(es) within an urban block

Apartment Complex Positioning within an Urban Block		Number of ACs	percentage
Completely embedded		614	28.3 %
Bordering street by one side		671	30.9 %
Bordering street by two sides		280	12.9 %
Bordering street by three sides		77	3.5 %
Whole block		55	2.5 %
Block undefined Undefined boundary/ conceived as block		392	11.0 %
	Total	2,172	100 %

*In the diagram the solid line indicates the urban block boundary, dashed line representing undefined block boundary and the hatched pattern refers to an apartment complex.

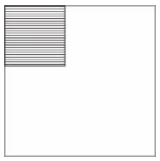
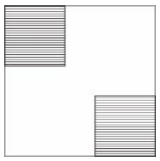
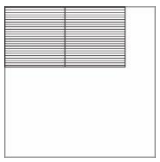
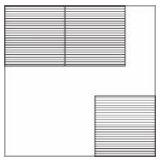
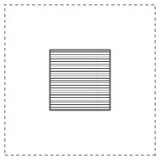
Three types of positioning patterns can be identified in terms of development methods. Apartment complexes developed under the Land Reclamation, Land Readjustment, and Reconstruction Projects are usually completely embedded within a block or border an external road (that surrounds a block) on one side, as the urban blocks are based on a planned grid structure that is larger than the individual complexes. On the other hand, complexes constructed through the Housing Site Development and Urban Development Projects border an external road on two sides. Here, multiple medium to large complexes are adjoined in a linear form. The general built-up area and Redevelopment Projects were generally more spontaneous, and complexes supplied through these projects are positioned in various ways, some partially bordering an external street and others completely embedded or located within blocks that cannot be defined.

4.2.3 Occupational form and ratio within an urban block

Some urban blocks house a single apartment complex, but multiple apartment complexes can also coexist within a single urban block. A single complex or complexes that are dispersed may have a less influential presence than clustered multiple complexes. Several apartment complexes can be adjoined on a bordering line, on a point, or can be detached. In cases where more than two apartment complexes are located within a block, these sport a mixture of adjoining and separate conditions.

In total, 9% of apartment complexes stand alone on an urban block alongside other residential or building types. Furthermore, 8% of apartment complexes coexist with other complexes within a block: 10.1% are detached and 23.8% contiguous. The highest portion (45.9%) is mixed adjoining and detached complexes located within a

Table 34 Occupational form of apartment complex(es) within an urban block

Occupational relationship with other AC(s)		Number of ACs	percentage
single		195	9.0 %
Multiple, disjoined		220	10.1 %
Multiple, adjoined		516	23.8 %
Multiple, mixture of disjoined and adjoined		1002	46.1 %
undefinable block		239	11.0%
	Total	2,172	100 %

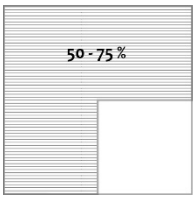
block. As such, nearly 80% of apartment complexes are positioned with other complexes, fragmenting the composition by being detached or creating an abrupt profile through the grouping of multiple apartment complexes. In terms of occupational relationship with other apartment complexes, other than complexes

produced through the housing site development and urban development methods, a mixture of detached and adjoined complexes is evident.

In total, 615 urban blocks are occupied by apartment complex(es) to varying degrees (Table 35). Of these, 217 blocks (35.3%) have a definable shape. Thus, the remaining 398 urban blocks can be classified into 4 types based on the occupation ratio. For about a quarter of the urban blocks (160 blocks, 26.0%), apartment complex(es) occupy less than 25% of the block area. Furthermore, 25 to 50% of 76 urban blocks (12.4%) are occupied, while in 71 urban blocks, 50 to 75% of the area is occupied by apartment complex(es). Finally, 75 to 100% of 91 urban blocks (14.8%) are occupied by apartment complex(es).

This means that regardless of the size of the block, most apartment complexes are embedded alone or with other complexes in large urban blocks adjoining the non-apartment urban fabric, mostly fine-grained, low-rise residential neighborhoods. This provides a mixed texture to residential areas in terms of housing type such as detached houses, small multi-unit flats, and apartments of various heights. The diversity of housing types in residential neighborhoods may be advocated by design theories as desirable. However, in reality, in Seoul, this mixed texture is dominated by apartment complexes in terms of building mass, height, and territoriality within the urban blocks in which they are embedded. The resulting urban form has a formal character that manifests as contrast, fragmentation, incongruence, and heterogeneity. Furthermore, this morphological character spans the city, as diverse urban blocks with apartment complexes are pervasive at the citywide level.

Table 35 Occupational ratio of apartment complex(es) within an urban block

Occupational relationship with other AC(s)		Number of ACs	percentage
AC occupancy below 25 % of an urban block		160	26.0 %
AC occupancy between 25 - 50 % of an urban block		76	12.4 %
AC occupancy between 50 - 75 % of an urban block		71	11.5 %
AC occupancy over 75 % of an urban block		91	14.8 %
undefinable block shape		217	35.3%
	Total	615	100 %

4.3 Agglomeration Patterns of Apartment Complexes

As examined in the previous section, apartment complexes are distributed over the terrain of the built-up area in Seoul. The ubiquitous and pervasive nature of apartment complexes comprises the unique, formal character of Seoul, which is known as an apartment city (Gelézeau, 2007). However, how apartment complexes are aggregated or scattered is another important dimension in terms of the morphological consequences of constructing apartments over the last half century. The patterns of agglomeration of apartment complexes are investigated by analyzing their reciprocal locational relationship in the urban setting. As world cities demonstrate their own patterns of agglomeration for apartment and high-rise buildings, the aggregation patterns of apartment complexes and their occurrence reveal the unique character of Seoul's urban form and landscape. In Seoul, multiple apartment complexes are settled in the city, grouped as a single entity, and are relatively cohesive or individually scattered. This section identifies the patterns of agglomeration of apartment complexes in terms of two aspects: 1) to what degree and in what form are they grouped or scattered, and 2) the occurrence of these patterns over time.

4.3.1 Clustering types of apartment complexes

The 2,172 apartment complexes in Seoul in this study (as of 2015) demonstrate various reciprocal relationships with each other in terms of location. There are differences regarding the degree of concentration of multiple apartment complexes. To analyze the degree to which they are aggregated or scattered, this study employed the "clustering index[밀집도]" to measure the intensity of aggregation. To measure the 'clustering index,'

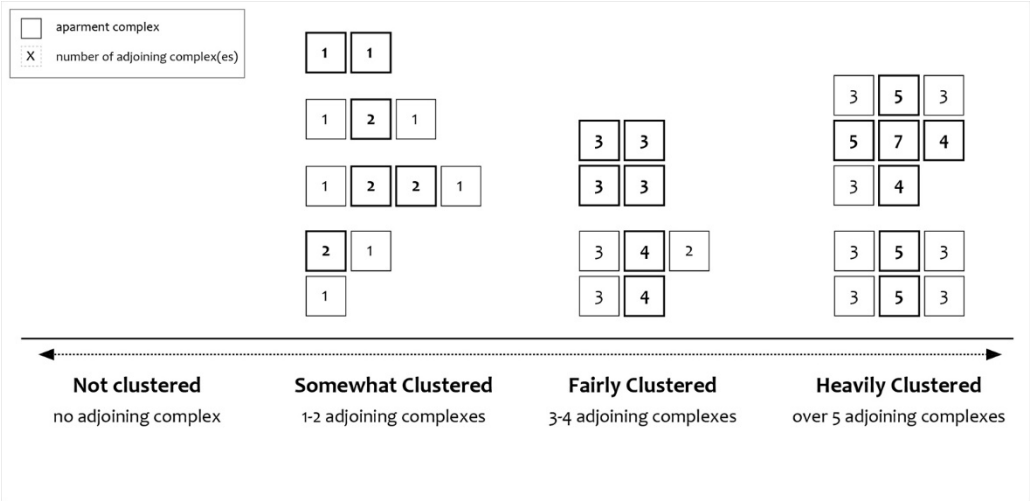


Figure 49 Clustering index: Conceptual types of apartment complex clustering

each apartment complex was examined based on its adjoining condition with other complexes through a line or point. Conceptually, the adjoining condition of apartment complexes is illustrated in Figure 49. Each apartment complex is coded with a number that represents how many lines and points adjoin each complex to another. When an apartment complex adjoins another along the boundary line, the number of adjoining lines is coded. When apartment complexes are diagonally adjoined, only meeting at one point at the corner of the site, they are coded according to the number of adjoining points. Figure 49 shows that the degree of cohesiveness can be derived from the number of adjoining value.

Based on the index number, this study identified four types of clustering patterns: 1) not clustered, 2) somewhat clustered, 3) fairly clustered and 4) heavily clustered. In the clustering index, “0” means that an apartment complex is not adjoined to another, which means it falls into a type of ‘not clustered’. Furthermore, “1” or “2” indicates that apartment complexes adjoin another on one or two lines or one or two points. This

clustering is evident when apartment complexes are arranged linearly or positioned beside each other or perpendicularly. The degree of concentration is not that strong; thus, it is referred to as "somewhat clustered." When the clustering index is indicated as "3" to "4," apartment complexes form groups on two rows connected through lines and points. This is considered as "fairly clustered." When the index exceeds "5," apartment complexes tend to border others on more than two sides and one point, demonstrating a "heavily clustered" condition.

Table 36 Classification of adjoining conditions to measure the degree of cohesiveness

Clustering Types	Number of adjoining AC(s)	frequency	percent
Not clustered	**0** (no adjoining complexes)	526	24.2%
Somewhat Clustered	**1 - 2**	1100	50.6%
Fairly clustered	**3 – 4**	457	21.0%
Heavily clustered	**Over 5** (more than 5 to less than maximum of 9)	89	4.1%
Total		2,172	100 %

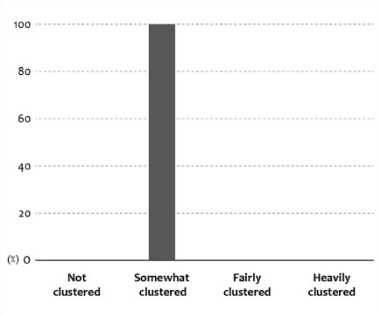
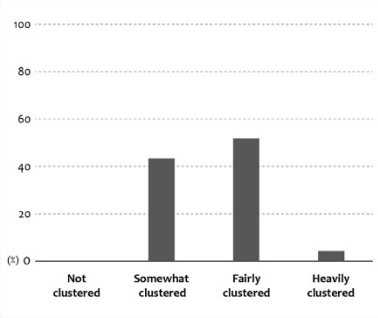
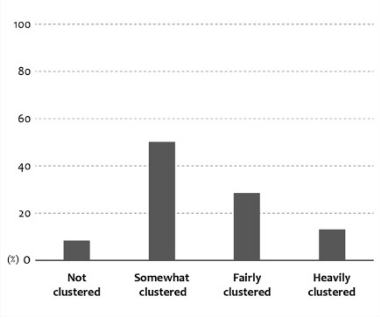
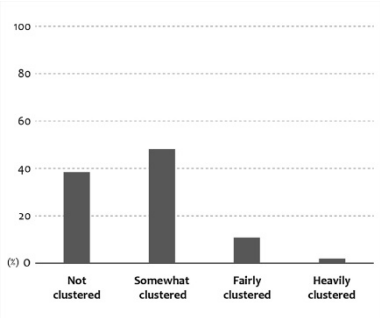
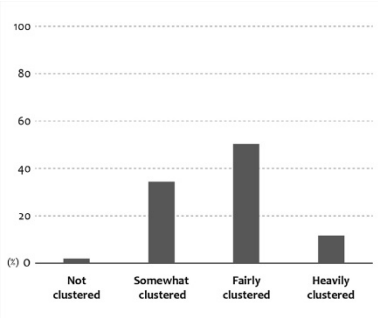
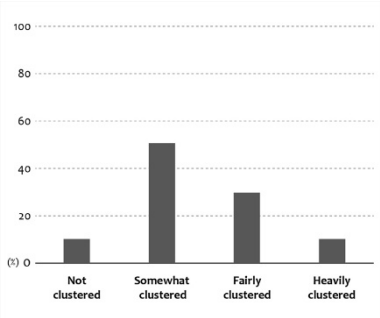
Table 36 shows the different degrees of cohesive aggregation classified according to the clustering index (Figure 49) Almost a quarter (24.2%, 526 complexes) of apartment complexes exist independently without adjacently located complexes. This means that most apartment complexes (76.8%) exist together, adjoining other complexes on at least one line or point. Nearly half the apartment complexes (1,100 complexes) are adjoined on one or two lines or points, and about one fifth (21%, 457 complexes) are fairly clustered. Furthermore, 89 complexes (4.1%) are strongly

clustered, bordering more than 5 complexes. Given that a single apartment complex comprises 7.6 apartment buildings on average, this clustering pattern indicates that Seoul's apartment complexes are a substantial group of apartment buildings.

As seen in Figure 50, the 14 development methods identified in Chapter 2 produced different types of clustering patterns. Table 37shows the development methods that produced each of the four clustering types. Most of 'not clustered' apartment complexes were developed in the General Built-up Area (28.1%), Housing Reconstruction Projects (29.9%) and Land Readjustment Projects (19%), through which more individual than collective apartment complexes were developed. 'Somewhat clustered' of complexes were mainly produced in the General Built-up Area, Housing Redevelopment and Reconstruction Projects (respectively 17.1% and 24.2%), and Land Readjustment Project (11.6%), with a minor contribution from the Housing Site Development Project (7.6%). Because of the relatively large number of apartment complexes in the General Built-up Area, many are 'fairly clustered' and 'heavily clustered.' The Housing Site Development and Housing Redevelopment Projects supplied many high-level clusters of complexes. The Housing Reconstruction Project also produced some fairly clustered complexes. Many heavily clustered complexes were supplied during the Newtown-in-town and small to medium-scale Housing Site Development Projects (15.7% and 12.4%), and Redevelopment and Urban Development Projects (11.2% and 7.2%), which represent the nature of these planned, large-scale developments.

Table 37 Clustering index value according to development methods

Clustering Index ▶ / Development Method ▼		Not clustered 0 adjoining ACs	Somewhat clustered 1 – 2 adjoining ACs	Fairly clustered 3 – 4 adjoining ACs	Heavily clustered Over 5 adjoining ACs	Total
Reclamation Project 한강공유수면매립사업	**HLR_HSP**	0 (0 %)	2 (100 %)	0 (0 %)	0 (0 %)	2 (100 %)
	HLR_LRA	0 (0 %)	15 (42.9 %)	18 (51.4 %)	2 (5.7 %)	35 (100 %)
	HLR_GBA	2 (7.1 %)	14 (50.0 %)	8 (28.6 %)	4 (14.3 %)	28 (100 %)
Land Readjustment Project 토지고획정리사업	**LRA**	100 (38.6 %)	128 (49.4 %)	27 (10.4 %)	4 (1.5%)	259 (100 %)
Housing Site Development Project 택지개발사업	**HSD_NIT**	3 (2.6 %)	40 (34.8 %)	58 (50.4 %)	14 (12.2 %)	115 (100 %)
	HSD_L	5 (10.2 %)	25 (51.0 %)	14 (28.6 %)	5 (10.2 %)	49 (100 %)
	HSD_SM	9 (6.2 %)	84 (57.5 %)	42 (28.8 %)	11 (7.5 %)	146 (100 %)
Urban Development Project 도시개발사업	**UDP_NIT**	0 (0 %)	7 (18.9 %)	23 (62.2 %)	7 (18.9 %)	37 (100 %)
	UDP_SML	12 (15.4 %)	52 (66.7 %)	13 (16.7 %)	1 (1.3 %)	78 (100 %)
General Built-up Area 일반시가지조성	**GBA**	148 (27.7 %)	279 (52.2 %)	89 (16.7 %)	18 (3.4 %)	534 (100 %)
Residential Redevelopment Project 주택재개발사업	**RRD_NT/O**	19 (27.1 %)	22 (31.4 %)	24 (34.3 %)	5 (7.1 %)	70 (100 %)
	RRD_N/O	71 (22.9 %)	166 (53.5 %)	63 (20.3 %)	10 (3.2 %)	310 (100 %)
Residential Reconstruction Project 주택재건축사업	**RRC_DM/O**	83 (30.7 %)	136 (50.4 %)	46 (17.0 %)	5 (1.9 %)	270 (100 %)
	RRC_N/O	74 (31.0 %)	130 (54.4 %)	32 v13.4 %)	3 (1.3 %)	239 (100 %)
Total		526	1100	457	89	2,172

1. HLR_HSP	2. HLR_LRA	3. HLR_GBA
		
4. LRA	**5. HSD_NIT**	**6. HSD_L**
		

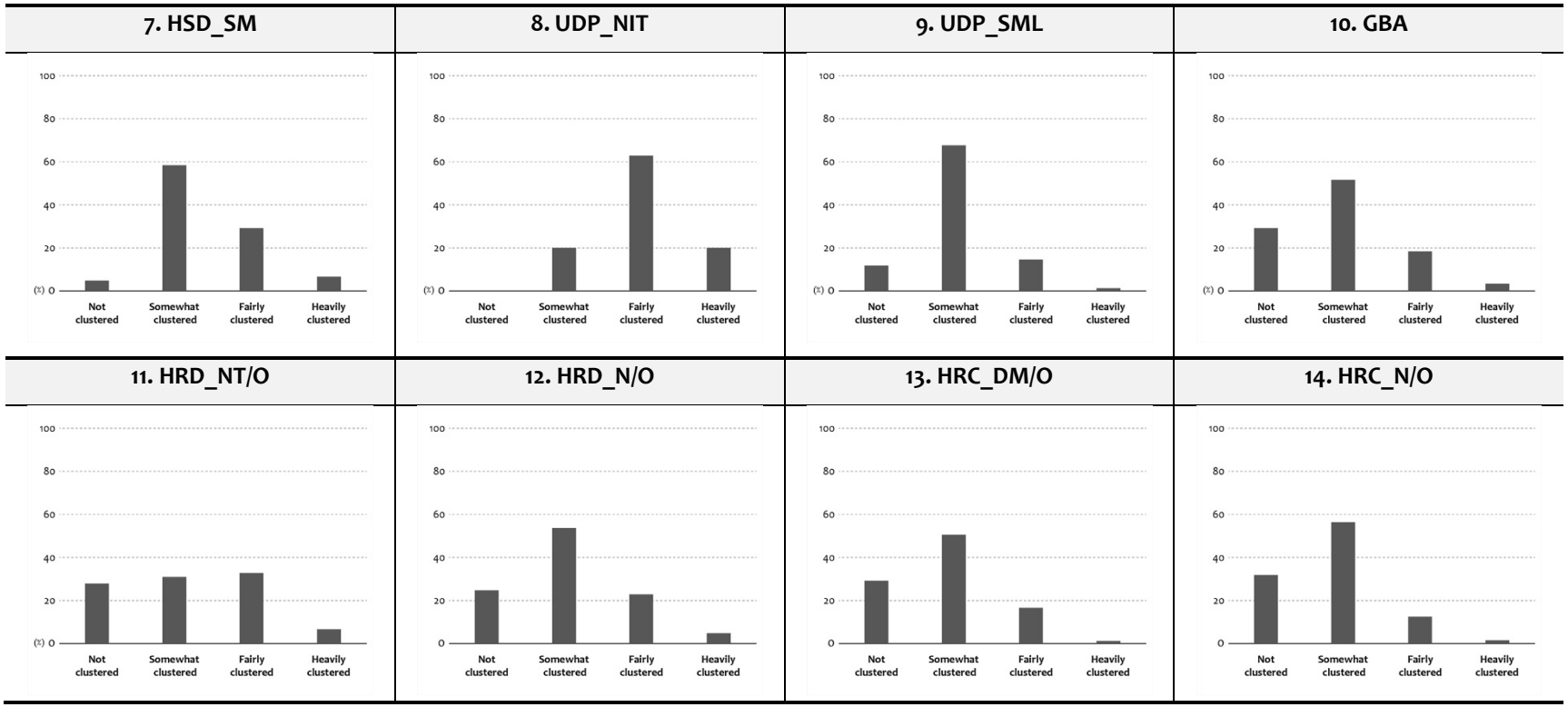


Figure 50 Clustering index according to the 14 development methods

4.3.2 Distribution of clustering types and agglomeration patterns

To spatially identify the pattern of agglomeration and degree of cohesiveness, different grey-scale saturations were applied to the apartment complexes according to the clustering index. Figure 51 demonstrates the overall pattern of agglomeration of apartment complexes. A darker color indicates a stronger degree of cohesiveness. The map represents the three aspects regarding the pattern of agglomeration of apartment complexes: 1) spatial distribution of apartment complex according to clustering index, 2) territorial scale of the agglomeration of the apartment complex, and 3) shape of the clustering mass as a morphological character of agglomeration.

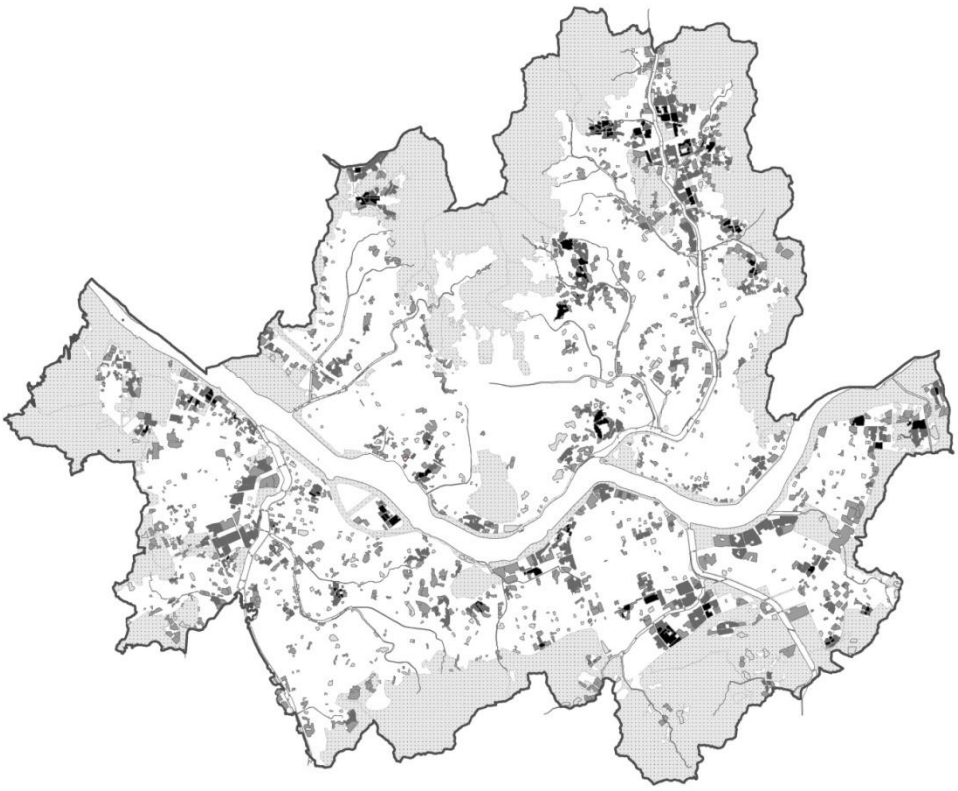


Figure 51 Mapping apartment complexes according to 'clustering index'

Heavily Clustered Agglomeration

The darkest areas are those most concentrated with apartment complexes developed through large-scale greenfield developments such as the Housing Site Development Project and Newtown Project, which are distributed in an omnidirectional fashion in most regions in Seoul. In the northeastern area, particularly Nowon and Gangbuk-gu, apartment complexes cluster with a strong concentration. These were developed through the Sanggye, Joonggye, and Wolgye·Gonreng·Shinae Housing Site Development Projects. Heavily clustered apartment complexes are also evident in Gilum·Mia, where multiple Housing Redevelopment Project sites were designated as part of the Newtown Project. These areas display generally irregular attributes because of the mountainous topography and road structure. The Gileum·Mia district in Seongbuk-gu and Geumho·Oksu district in Seongdong-gu underwent intensive housing redevelopment, as indicated by the darkest color, which shows clustering of more than five complexes. In the southeastern region, a strong degree of clustering is evident in the areas developed by the Housing Site Development Project or in the Apartment District area on the reclaimed land along the Han River. These areas include Godeok district in Gangdong-gu, Gaepo district in Gangnam-gu, and Jamwon-dong in Seocho-gu. In the northwestern region, apartment complexes are strongly aggregated in the Eunpyeong district, which developed as part of the Newtown Project, and in Dohwa and Ahyeon-dong in Mapo-gu. In the southwestern region, highly concentrated apartment complexes are located in Yeouido in Yeondeungpo-gu and the Deungchon Housing Site Development Project area in Gangseo-gu.

There are about 89 apartment complexes (4.1% of the total 2,172 in this study) of ‘heavily clustered’ type. Therefore, for a more realistic understanding of the patterns

of agglomeration, fairly clustered apartment complexes (457 complexes, 21% of 2,172) were also considered, because 'heavily clustered' complexes are likely surrounded by these, as they adjoin 3 to 4 others. Consequently, 546 apartment complexes (25.1% of 2,172) produce intensive apartment complex agglomerations of various sizes and shapes in Seoul.

Agglomerations are characterized by various sizes and forms. First, an agglomerated area exceeding 3,000,000 m^2 (approximately 1 million pyeong) is emphasized as a highly concentrated apartment complex area occupying a large territory. These areas were developed and planned under strong public interventions to implement the construction of apartment complexes of various scales as part of the Housing Site Development Project, Newtown-in-Town Urban Development Project, designated Apartment Districts on the reclaimed land along the Han River, and the Housing Redevelopment districts overlaid by the Newtown District. Representative areas include Sanggye·Joonggye, Gileum·Mia, and Geumho·Oksu (in the northeastern region); Godeok, Jamsil, Gaepo, Dogok·Yeoksam·Daechi, and Banpo·Jamwon·Seocho (in the southeastern region); Mokdong and Deungchon·Gayang (in the southwestern region); and Dohwa·Ahyeong, Sangam, and the Eunpyeong area (in the northwestern region).

Morphological distinctions are evident between these large-scale agglomeration areas in terms of the boundary and shape of the collective mass. Some boundaries of the aggregated area are clearly defined in terms of territory, and were developed through the Housing Site Development Project or are apartment complexes clustered within a grid-base of the Land Readjustment Project area (Mokong, Gaepo, Jamsil, and so on). However, not all housing site development complies. For example, Godeok is integrated with the natural environment and the uneven project border line of Sanggye generates an ambiguous boundary condition. Moreover, apartment complexes that

consecutively agglomerate such as in Mia or the Geumho Housing Redevelopment areas have an indefinable boundary despite a strong, broad area of concentrated apartment complexes.

The shape of agglomerations also differs, providing implications in terms of understanding the characteristics of Seoul's urban form. In Figure 04-00, conspicuous shape attributes can be recognized based on their areal면적 and linear선적 aspects. An areal shape refers to apartment complexes aligned in multiple tiers that constitute a continuous mass, such as Sanggye, Godeok, or Gileum·Mia in the Geumho·Oksu area. In contrast, a linear shape is evident along the Han River or at medium-scale Housing Site Development Project sites including Banpo, Jamwon, Seocho, Apgujeong, and Jamsil (Apartment Districts on the reclaimed land along the Han River) and Doonchon, Deungchon, and Gayang (medium-scale Housing Site Development Project), which are aligned in a row or T shape. These shapes stem from limitations of the land to be developed, which is sometimes narrow and long. Based on these morphological characteristics, Seoul's apartment complexes give rise to an urban landscape with large-scale agglomeration, allowing for considerable seriality.

Some areas demonstrate a similar highly clustered agglomeration pattern, but on a smaller and more compact scale, such as Yeoeuido in Yeondeungpo, Dongbu Ichon-dong in Yongsan-gu, Gueui-dong in Gwangjin-gu, Banghak-dong in Gangbuk-gu, and Shinae-dong in Joongnang-gu. Although the territorial area is medium-scale compared to the large-scale agglomerations discussed earlier, many smaller individual apartment complex clusters exist. These cases also show an agglomerate territorial area with definable and indefinable boundaries.

Loosely Clustered Agglomeration

In total, 50% of apartment complexes adjoin one or two other complex(es). These somewhat clustered and 'fairly clustered complexes display a looser agglomeration than those with a more intensive concentration. Planned areas such as Munjeong·Garak and Dangsan·Yangpyeong exhibit a mosaic or patchwork pattern, while spontaneous areas redeveloped as apartment complexes such as in Gwanak and Dongjak-gu, Shinsoo·Hapjeong-dong in Mapo-gu, Banghwa-dong in Gangseo-gu, and the industrial zoning areas in Yeondeungpo-gu demonstrate a loose agglomeration with overall irregularity. There are also differences between the sizes of apartment complexes constructed through a similar development method. For instance, medium to large apartment complexes occupy the Munjeong·Garak area, while mostly smaller complexes are found in Yangpyeong·Dangsan. Both areas were developed through the Land Readjustment Project. This is also evident in the case of large apartment complexes in the Dongjak and Gwanak areas, compared to the small to medium-sized complexes in the Shinsoo and Hapjeong-dong areas. In addition to differences in size, the former areas have a denser concentration of complexes.

A loose agglomeration implies a low-rise, fine-grained urban fabric between apartment complexes. In the Land Readjustment Project, most apartment complex sites were allocated in conjunction with a small plot fabric, whereas in the Housing Redevelopment Project areas, apartment complexes resulted from the partial conversion of deteriorated low-rise residential areas. Specifically, individual apartment complexes were developed incrementally by replacing relocated factory sites in the industrial zones of Yangpyeong and Dangsan. These areas are in the process of transformation, and over time, more apartment complexes will emerge, creating highly concentrated apartment agglomeration areas. This mixture of high-rise apartments and

low-rise housing is an unplanned collective outcome depending on the feasibility of developing individual apartment complexes. As such, they manifest a random character to Seoul's apartment urbanism. While diverse and free in morphological character, randomness, abruptness, and opportunistic fragmentation are also evident, which is in contrast to other East Asian Cities.

Individually Scattered Pattern

With reference to the map (Figure 51), another agglomeration pattern is characterized by numerous individual apartments spontaneously dispersed throughout the city of Seoul. Independently existing stand-alone apartment complexes account for 24.2%, and are scattered so randomly that it is difficult to find the logic behind the dispersed locations or distribution pattern. This scattered pattern is classified into two types depending on the size of the apartment complex. First, relatively large-scale complexes independently exist within a fine-grained fabric, such as in Jeonnon·Dapsimri in Dondaemun-gu, Nonhyun-dong in Gangnam-gu, Shinjeong-dong in Gangseo-gu, and Shingil-dong in Yeondeungpo-gu. However, many of these areas are in a transitional stage, as they are at the initial phase of the Newtown and Urban Development Projects, which aim to transform the area into larger apartment towns. As these projects proceed, a concentration of multiple apartment complexes will emerge as replacements of the fine-grained areas, which is likely to reinforce large-scale agglomeration. The latter is found in Eungam-dong in Eunpyeong-gu, Bangbae area in Seocho-gu, and the Cheonho area in Gangdong-gu. Smaller-scale apartments are steadily proliferating by assembling several individual plots into an apartment complex. This implies that loosely agglomerated areas are gradually being converted into more

densely aggregated areas. However, how this will progress remains unknown, since the morphological transformation of Seoul will be determined by demographic factors, the real estate market, planning policy, and general socio-economic change in the future.

4.3.3 Seven types of comprehensive agglomeration patterns

From a morphological perspective, deeper understanding of the patterns of agglomeration of apartment complexes is possible by considering additional aspects such as scale, shape, and the formative process of agglomeration. Here, it was attempted to derive comprehensive typologies of agglomeration patterns based on 1) cohesiveness of the agglomeration measured through the clustering index, 2) size of the agglomeration represented by the project scale of development methods, 3) shape of the agglomeration represented by regularity or irregularity, and 4) emerging types of agglomerations representing the formative process thereof.

The cohesiveness of agglomeration is based on the measurements of the clustering index. Heavily and fairly clustered apartment complexes imply strong cohesiveness, while stand-alone apartment complexes are less cohesive and exhibit a scattered dispersion. Size of the agglomeration is determined by the project scale of the applied development method. Five project scales were identified ranging from the Newtown to individual apartment complex scales: Newtown-in-town (NIT), large (L), medium (M), small (S), and individual apartment complexes (IND). The shape of the agglomeration examines whether the form of the agglomeration is regular or irregular. A regular form refers to an orthogonal, grid-based road structure and conforming urban blocks with subdivisions of parcels. These regular forms of agglomeration are found in

the existing grid pattern of the urban fabric or planned greenfield developments. An irregular form is evident in spontaneous town formations or among hilly and mountainous topographical siting conditions, which include winding roads and naturally formed parcels. Emerging types of agglomeration refer to whether the agglomeration has resulted through concurrency or consecutiveness. Concurrency refers to a development method based on the master plan and constructed en-bloc, such as complexes supplied through the Housing Site Development Project or Urban Development Project. Concurrently developed apartment complexes demonstrate higher cohesiveness, as multiple complexes were built collectively at the same time. Consecutiveness refers to the gradual formation of the agglomeration. Consecutively built complexes tend to cluster one or two complexes, three to four complexes, and a higher percentage of stand-alone complexes.

Considering the four aspects of agglomeration, the types were identified in two steps. In the first step, five types were identified based on how the complexes were adjoined and the resultant degree of cohesiveness (Table 38). Following this, the five types were further refined into seven types by considering the scale, form, and process of emergence of the agglomeration of apartment complexes (Table 39).

Table 39 shows the seven types of agglomeration based on the scale, regularity, and consecutiveness of the agglomeration and the development methods applied. Type 1 demonstrates strong cohesiveness with a regular shape. These apartment complexes were developed concurrently in a planned way as part of the Housing Site Development or Urban Development Projects at the Newtown-in-town scale. Type 2 exhibits cohesive agglomeration at the large scale, but in irregular forms. These are found in the areas of the Newtown Development Promotion Districts where Housing Redevelopment Projects are concentrated. Because of the promotion incentives and public involvement, despite an individualistic site-based development mechanism, this

Table 38 Types of agglomeration according to adjoining conditions and degree of cohesiveness

Development Method		Adjoining condition of apartment complex(es)	Degree of cohesiveness
01	HSD_NIT UDP_NIT	'fairly clustered' > somewhat clustered' > 'heavily clustered'	Strongly cohesive
02	HRD_NT/O	'fairly clustered' = 'somewhat clustered' = 'not clustered'	Relatively cohesive
03	HLR_HSD HLR_GBA HSD_L HSD_SM	'somewhat clustered' >> 'fairly clustered' > 'heavily clustered'	Relatively cohesive
04	UDP_SML HRD_N/O	'Somewhat clustered' >> 'not clustered' = 'fairly clustered'	Relatively cohesive or scattered
05	HLR_LRA LRA GBA HRC_DM/O HRC_N/O	'somewhat clustered' > 'not clustered' >> 'fairly clustered'	Relatively cohesive or scattered

*the sign '>' refers to an inequation that indicates the left is stronger in numbers than the right. '>>' has stronger dominancy in connotative meaning as '>.' '=' show approximately equal value.

area demonstrates a concurrent emergence pattern of apartment complexes, as seen in the Wangshipri and Mia/Gileum Newtown Districts. Type 3 is a cohesive agglomeration with a regular shape, which resulted from planned development methods such as the Han River Land Reclamation and Housing Site Development projects, which were implemented at the small, medium, and large scales. The planned nature of the development methods means these complexes were developed concurrently in a short period. Type 4 represents a loosely cohesive agglomeration with an irregular form. This type was developed through small-scale Urban Development Projects and mostly as part of the general Housing Redevelopment Project, General

Built-up Area, and Housing Reconstruction Project. The complexes were consecutively agglomerated through the development of individual sites. Type 5 exhibits a scattered pattern of agglomeration with an irregular form, which is seen in the Housing Redevelopment Area or General Built-up Area. Here, individual apartment complexes were initially scattered, becoming increasingly clustered over time. In the type 6 pattern, apartment complexes are clustered in a regular form, but the clustering is not strong and loosely cohesive. This type emerged as a result of a number of individual projects consecutively developed in the Han River Reclamation, Land Readjustment, and Housing Reconstruction Projects. In the type 7 pattern, not clustered apartment complexes are scattered in regular forms and were developed consecutively through the Han River Reclamation, Land Readjustment, and individual Housing Reconstruction Projects.

Table 39 Seven types of agglomeration patterns based in scale, regularity, cohesiveness and concurrency

#		Project scale		Regularity/ Irregularity		Reclassified by regularity	Concurrency/ consecutive-ness	Consecutive-ness Subdivision		Reclassified by emergence pattern	#	Types of Agglomeration pattern
1	HSD_NIT UDP_NIT	NIT	▶	Regular	▶	HSD_NIT UDP_NIT	Concurrent	·	▶	HSD_NIT UDP_NIT	1	NIT multi-tier block
2	RRD_NT/O	L	▶	Irregular	▶	RRD_NT/O	Concurrent	·	▶	RRD_NT/O	5	Irregular cohesive
3	HLR_HSP HLR_GBA HSD_L HSD_SM	S / M/ L	▶	Regular	▶	HLR_HSP HLR_GBA HSD_L HSD_SM	Concurrent	·	▶	HLR_HSP HLR_GBA HSD_L HSD_SM	2	Regular cohesive
4	UDP_SML RRD_N/O	S / M/ L	▶	Irregular	▶	DP_SML RRD_N/O	Consecutive	clustered	▶	DP_SML RRD_N/O *Cluster*	6	Irregular loosely cohesive
								Stand-alone	▶	DP_SML RRD_N/O *Individual*	7	Irregular scattered
5	HLR_LRA LRA GBA RRC_DM/O RRC_N/O	IND.	▶	Regular	▶	HLR_LRA LRA RRC_DM/O	Consecutive	clustered	▶	HLR_LRA LRA RRC_DM/O *Cluster*	3	Regular loosely cohesive
								Stand-alone	▶	HLR_LRA LRA RRC_DM/O *Individual*	4	Regular scattered
				Irregular	▶	GBA RRC_N/O	Consecutive	clustered	▶	GBA RRC_N/O *Cluster*	6	Irregular loosely cohesive
								Stand-alone	▶	GBA RRC_N/O *Individual*	7	Irregular scattered

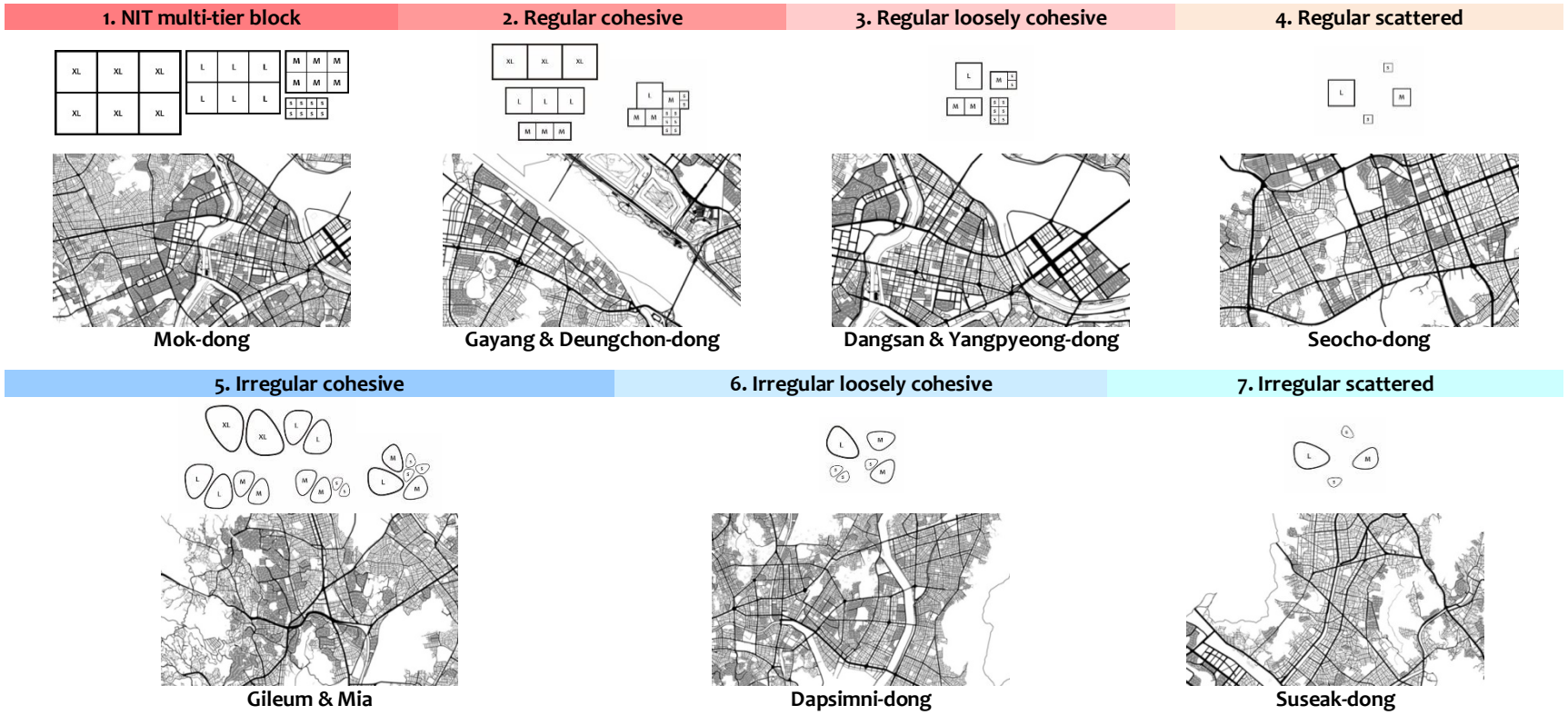


Figure 52 Seven types of agglomerations and representative areas in Seoul

4.4. Interpretative Conclusion

This chapter analyzed the spatial dispersion of apartment complexes according to 1) locational pattern to determine spatial distribution, 2) topographical siting and urban block configuration of apartment complexes, and 3) agglomeration pattern in terms of the attributes of morphological patterns and the formative process of the agglomeration. The process of locating apartment complexes built sequentially was compared with the phases of urban area expansion and development methods to understand how and through which spatial patterns Seoul became an apartment complex city. The results imply that Seoul is morphologically distinct from other Asian cities, as apartments comprise most of the city's urban form.

Although the 2,172 apartment complexes in this study occupy less than one fifth (18.4%) of Seoul's residential area, the complexes are dispersed across urbanized areas because of the dominant portion of the residential area (88% of the built-up area) in which most are located. Their pervasiveness is evident in their spatial dispersion over Seoul's 605 km^2 terrain, not only in general urban areas, but also along the Han River and other tributary streams, bordering mountains, and hilly areas. This characterizes the urban form and landscape of Seoul, constituting a unique visual pattern of urban grain, spatial configuration, skylines, and general collective form. It provides Seoul with the image of an apartment city, because clustered tall apartment buildings hide the more widespread low-rise areas, dominating the city's visual exposure.

Given Seoul's mountainous geography, the topographical siting of apartment complexes is an important morphological element characterizing the urban landscape. Among the 2,172 apartment complexes in this study, more than half (53.5%) are located at an altitude between 0 to 25 m, 824 (37.9%) at an altitude between 25 to 50 m, and 195 (8.6%) at an altitude of more than 50 m. Although exceptional, 40 complexes

are located at an altitude higher than 75 m. Over time, the apartment complexes in Seoul have become located at increasingly high elevations. Of those located higher than an altitude of 50 m, more than 50% were developed in the 2000s and after as part of the Housing Redevelopment Project. This trend coincides with the increasing topographical gap between the highest and lowest points of apartment complexes. Approximately 53% of the 2,172 apartment complexes in this study were developed on flatlands without topographical differences. However, 27% are constructed on inclined sites with a difference of more than 5 m, while approximately 20% are slightly inclined with a difference of less than 5 m between levels. Furthermore, 121 complexes (5.6%) have a difference of more than 25 m, and 27 (1.2%) have a topographical difference of 45 m between the highest and lowest points of an individual complex. Thus, at many Housing Redevelopment Project sites, multi-terraced grading is common, including zigzagging internal roads and a stepped building placement. Since they are located on the hillside and sometimes on the hilltop, a mass of tall, flat-type apartment buildings characterize Seoul's unique multi-layered, cascading hillside urban landscape. This pattern has become the common urban landscape of Seoul. As many apartment complexes have multiple buildings, a series of grouped masses replaced the natural topography with a manmade skyline, obstructing the mountain views. This siting pattern sometimes exaggerates the natural topography, enclosing general residential neighborhoods in the lower part of the city.

Another dimension of the locational pattern of apartment complexes is the relationship between apartment complexes and urban blocks. In total, 615 urban blocks were identified as containing the 2,172 apartment complexes in Seoul. Of these, 217 urban blocks (35.3%) could not be defined as urban blocks, and the remaining 398 (64.7%) were of various sizes and shapes, as per the development methods applied. Among the 615 urban blocks, 2.5% of complexes comprise the whole block, such as

the Jamsil 1-4 Apartment Complex. The rest are embedded in urban blocks in some way. Nearly 80% of apartment complexes are positioned alongside other complexes, bringing about a fragmented composition through their detached locations or abruptness through the grouping of multiple apartment complexes. Regarding the occupational relationship with other apartment complexes, other than those developed as part of the master plans in the Housing Site Development and Urban Development methods, a mixture of detached and adjoined complexes is common. This means that regardless of the size of the block, most apartment complexes are embedded alone or with other complexes in large urban blocks adjoining the non-apartment urban fabric, mostly fine-grained low-rise residential neighborhoods. This characterizes the mixed nature of the residential area in terms of housing types such as detached houses, small multi-unit flats, and apartments of varying heights. The diversity of housing types in residential neighborhoods is advocated by design theories as desirable. However, in reality, in Seoul, this mixed nature highlights the dominance of apartment complexes in terms of building mass, height, and territoriality within the urban blocks in which they are embedded. The resulting urban form has a formal character in terms of contrast, fragmentation, incongruence, and heterogeneity. Furthermore, this morphological character spans the city, as diverse types of urban blocks comprising apartment complexes are pervasive at the citywide level.

The present pervasiveness of apartment complexes is the result of continuous, piecemeal development at various scales over the last half century. In fact, the locational progress of apartment complexes accompanied urbanization in Seoul, during which the built-up area expanded in all directions to the current area of 605 km^2 since the aggressive annexation in 1963. In many cases, apartment complexes were at the forefront of this territorial growth, forming various morphological regions, a homogeneous urban form developed in a particular period, namely the morphological

period. The agglomerations of apartment complexes represent diverse morphological regions produced in a specific morphological period. Given that the city is a spatial combination of various morphological regions, these agglomerations characterize the unique morphological quality of Seoul's urban landscape.

The fact that extremely large-scale agglomerations are evident in Seoul is a substantial morphological consequence. A planned development at the newtown scale such as in Mokdong, Sanggye, Gaepo, Goduck, and large apartment complexes along the Han River create a unique morphological region produced by the government urban and housing policy in the 1970s to the 1990s. Developed en-bloc, these morphological regions showcase the mass production of a strongly homogeneous form and lifestyle. These homogeneous apartment complexes should be regarded as Seoul's unique formative process of urban form, which can be compared to the 19th century modernist urban expansion in European cities, 20th-century Levittown suburban development, and master-planned communities in American metropolises or more recent explosive urbanization developments in Asian urban centers. Equally significant and unique is that these large-scale agglomerations are dispersed in all directions from the city from the inner riverside to outer fringe. These are the morphological regions that accommodated the rapid urbanization of undeveloped areas on the fringe of the built-up area. On the Han River reclamation sites and outer greenfield area, Land Readjustment and Housing Site Development Projects created a new city area. Expanding the built-up area through land conversion is typical of how a city grows and the internalization of undeveloped fringe areas. The dispersed large-scale apartment complex agglomeration areas demonstrate the internal history of Seoul's built form.

In addition to the large-scale, concurrent agglomerations, Seoul's unique morphological character stems from the evolutionary agglomeration of apartment complexes. Although developments were implemented individually, the resultant

aggregation is substantial in scale. The Housing Redevelopment Project, originally conceived as a method to renew squatter settlements, led this large-scale agglomeration process, resulting in the irregular, indefinable forms arising from their locations at spontaneously formed hilly areas. Incrementally grown, there are some differences between the sizes of agglomerations based on the progression of redevelopment projects in the area. Large-scale agglomerations were achieved in areas such as Geumho, Oksu, and the Mia Housing Redevelopment areas. Less agglomeration is evident in the Gwanak, Hapjeong, and Banghwa areas, although these will become more agglomerated as they progress. Since most Housing Redevelopment projects were concentrated on hilly locations, the agglomeration of apartment complexes here strongly influences the morphological character of Seoul's urban form. Clustered tall apartment buildings are grouped in various orientations, architectural styles, and topographical levels, often without a clear logic of coexistence. Topographical variations and mountain ridgelines are tamed by apartment buildings located at higher altitudes, which dominate Seoul's skyline.

Loosely clustered apartment complexes are another morphological consequence of agglomeration. Neither heavily agglomerated nor completely scattered, this pattern exhibits distances between apartment complexes, and thus is juxtaposed with the non-apartment residential fabric. This pattern materialized mainly in Land Adjustment Project areas such as Munjeong and Garak in the 1980s and the Yeongdeungpo Semi-industrial district, where vacant factory sites were converted into apartment complexes in a piecemeal manner. This formative process provides Seoul with its unique morphological character, where apartment complexes are intertwined with the low-rise, fine-grained residential fabric in a fragmented way. Owing to this character, Seoul seems more heterogeneous and abrupt in form compared to Tokyo's relatively more homogeneous, fine-grained urban pattern. Similar to Seoul, Chinese cities responded to

rapid urbanization with large-scale housing developments; however, Seoul exhibits a more mixed and less planned formal character.

The most scattered or least clustered pattern occurs when 'not clustered' apartment complexes are individually dispersed within low-rise, fine-grained residential areas. This pattern results from the development of individual apartments by integrating small plots or through the land conversion of sizable plots in residential areas plotted before complexes became widely accepted as a housing type. These areas were plotted through Land Readjustment Projects or spontaneously formed until the 1970s. Later, Housing Reconstruction Projects in the former and Housing Redevelopment Projects in the latter produced individual not clustered apartment complexes in low-rise residential areas. This scattered pattern is evident in residential areas in Seodaemun-gu, Eunpyeong-gu, Mapo-gu, Gangseo-gu, Guro-gu, Seocho-gu, Gangdong-gu, Seongdong-gu, Gwangjin-gu, and Seongbuk-gu. In these areas, individual apartment complexes were developed in an opportunistic way, creating abrupt changes in scale and distinctions in the territory. Here, perhaps the unplanned mixture and juxtaposition with the low-rise, fine-grained residential fabric is determined more by individualistic values than community vision.

CHAPTER V

MORPHOLOGICAL FORMATION OF APARTMENT COMPLEXES IN NEIGHBORHOODS: CASE STUDIES

As examined in the previous chapter, apartment complexes exist in various types of agglomerations in the residential neighborhoods in which they are located. In some cases, the neighborhoods are comprised of only apartment complexes, as is the case in large-scale developments. In most cases, apartment complexes are part of the neighborhoods alongside other housing types and urban fabrics. This chapter employs a case study at the district and neighborhood scales to investigate the formative process of apartment complexes and relationship with the surrounding urban fabric of the neighborhood.

Cases were extracted from the seven types of patterns of agglomeration of apartment complexes identified in the previous chapter (Table 40, Figure 53). As discussed, these types represent different sizes, shapes, and cohesiveness of agglomerations, and thus different relationships with other residential fabrics in the neighborhood. Corresponding to these seven types, case study areas were selected throughout the city of Seoul considering morphological and geographical balance.

Table 40 Seven case study areas

Case Area		Agglomeration Pattern	Development Method	Urban Context
1	**Sanggye & Joonggye**	NIT multi-tier block	• NIT and large scale Housing Site Development Project	Only consisted with large-scale apartment complexes
2	**Jamsil**	Regular cohesive	• Han River Reclamation Project overlapping with Land Readjustment Project • Housing Reconstruction Project within development project sites	Large-scale apartment complexes with neighboring fine-grain fabric
3	**Munjeong & Garak**	Regular loosely cohesive	• Land Readjustment Project • Housing Reconstruction Project within development project sites	Apartment complexes mixed with fine-grain fabric
4	**Hwagok**	Regular scattered	• Land Readjustment Project • Housing Reconstruction Project within development project sites	Apartment complexes mixed with fine-grain fabric
5	**Geumho**	Irregular cohesive	• Housing Redevelopment Project	Apartment complexes mixed with fine-grain fabric
6	**Shinsoo**	Irregular loosely cohesive	• General Built-up area • Housing Redevelopment Project • Housing Reconstruction Project	Apartment complexes mixed with fine-grain fabric
7	**Susaek**	Irregular scattered	• General Built-up area • Housing Redevelopment Project	Apartment complexes mixed with fine-grain fabric

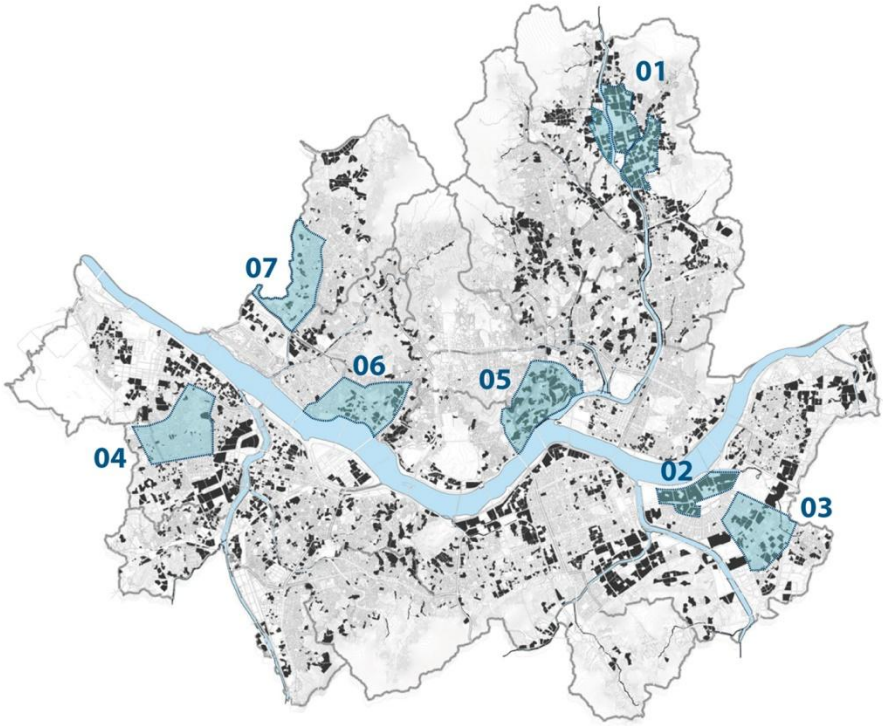


Figure 53 Seven case study areas

5.1 Analytical Framework for Case Study Areas

Table 41 presents the analytical elements for the case studies, although different emphases were considered based on the character of the case study areas. To determine the progression of agglomeration, the scale, degree of cohesiveness, and concurrency/consecutiveness are examined. Regarding the relationship with the surrounding urban fabric, the amalgamated morphological characteristics of the low-rise residential fabric and apartment complexes are studied. To investigate the transformation brought about by apartment complexes to ordinary space in the neighborhoods, physical changes in terms of parcels, buildings, road networks, and urban block space are investigated by comparing the situation before and after the construction of these complexes. Since apartment complexes occupy a large parcel and exclusive territoriality, the focus is on the spatial attributes of the complex boundary such as the border condition, access control, and the condition of surrounding pedestrian areas and roads. Finally, the morphological characteristics derived from the analyses are discussed with reference to each case study area.

A database was constructed for the seven case study areas. GIS data were available from the early 2000s and employed in the analysis of information related to the 2000s and 2010s. To document changes, periodical base maps were necessary, especially for the timeframe from the 1970s until the 2000s. Archival base maps were used, which are digitalized as image files (jpegs) by the National Geographic Information Institute[12] (NGII국토지리정보원). To calculate and visualize the elements of urban form such as parcels, buildings, urban blocks, and the street network, image-based maps from the 1970s to 1990s were manually converted to CAD files. This process involved redrawing

[12] http://map.ngii.go.kr/ms/map/NlipMap.do

multiple layers of the case areas to include all buildings, apartment complexes, urban blocks, and street information. Note that the parcel data are presented only by number and the area of the apartment complex because of the resource limitation of overall parcel data.

Table 41 Analytical elements of the case study areas

Progression of Agglomeration	Agglomeration process and pattern	▪ Scale of the case area ▪ Development method's influence ▪ Concurrent or consecutive emergence of apartment complexes ▪ Degree of cohesiveness by clustering index ▪ Morphological characteristics of apartment complexes
Relationship with surrounding urban fabric	Coexisting interrelationship between apartment complex and fine-grain fabric	▪ comparison by building, parcel, street and sub-block ▪ Bordering condition- accessibility, openness or exclusiveness, contrast etc.

5.2. Sanggye and Junggye Area - NIT Multi-tier Block Agglomeration

5.2.1 Progression of the agglomeration of apartment complexes

The Sanggye and Junggye areas are a continuous apartment complex area in the northeastern part of Seoul in the Nowon-gu and Jungrang-gu districts. The area is composed of three Housing Site Development projects: the Sanggye Development (constructed between 1988 and 1991 with an area of 3,308,000 m^2) and Junggye 1 and 2 Developments (constructed in 1988 to 1997 and 1991 to 1997 with areas of 1,596,000 m^2 and 1,345,000 m^2 respectively). This case study area represents a type of NIT (Newtown-In-Town) scale multi-tier agglomeration of apartment complexes described in the previous chapter. The Sanggye and Junggye area is a Newtown-in-town in terms of the large scale and master-planned development; thus, it is representative of morphological regions such as Goduck, Mokdong, and Gaepo, which were developed through large-scale Housing Site Development Projects in the 1980s and 1990s. They were usually developed by national and local agencies and as such, are the products of the national housing policy at the time of rapid urbanization, economic growth, and centralized political rule (Kim, K.J., 2016).

Figure 54 Sanggye Housing Site Development Project
(Source: Naver Aerial View image compiled from author)

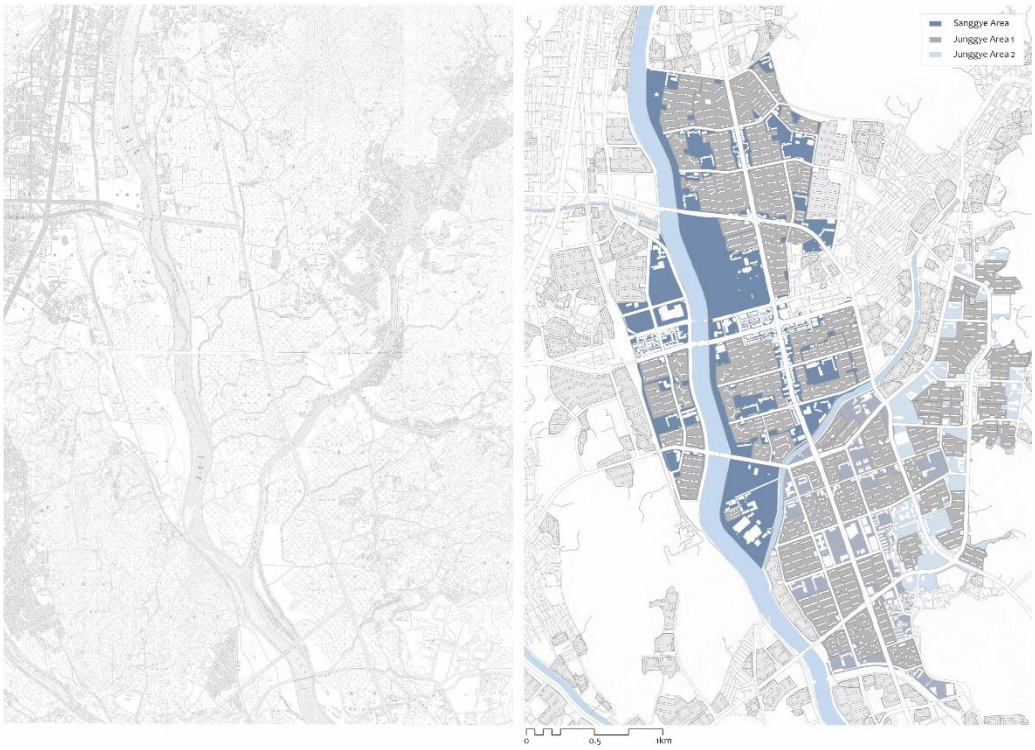


Figure 55 Sanggye area: Before (1979) and after Housing Site Development

Concurrent Formation

The Sanggye and Junggye areas were an undeveloped agricultural field named the Madeul Plain, which was located at the basin of the Jungrang and Danghyeon streams (Figure 55). As large-scale master-planned apartment districts, Sanggye and Junggye were simultaneously developed within a short period by national development agencies. The Sanggye area was developed by the then Korea National Housing Corporation (now Land and Housing Corporation known as LH), which collected the plots through their eminent domain power and developed the area within a four-year span (1988–1991). The corporation was involved in site provision and building construction (Korea National Housing Corporation, 1988). The Junggye area took longer to develop than

Sanggye. Over a period of less than ten years (Junggye 1: 1988 to the mid-1990s; Junggye 2: 1990–1998), the apartment complex sites were provided by the Korea Land Development Corporation (now LH) and then sold to private construction companies that constructed the buildings according to their plans and schedules. However, the morphological period is considered as the same, and the same forces shaped the large-scale apartment area. As such, the formation of this morphological region was concurrent, not consecutive.

Homogeneous Morphological Region

As a Newtown-in-town-scale housing development, the Sanggye and Junggye areas are comprised of multiple apartment complexes. The Sanggye project contains 21 apartment complexes, the average size of which is 66,770 m^2. The Junggye 1 and 2 projects comprise 14 and 19 complexes respectively, measuring 53,670 m^2 and 52,950 m^2. In total, the Sanggye and Junggye case area houses 54 apartment complexes with 664 apartment buildings, which provide 75,539 housing units. The population is estimated at around 200,000, considering that each unit houses 2.6 people, the average household size in Seoul in 2015. This size qualifies the Sanggye and Junggye area as an outer suburban city with its own commercial and business centers and geographical identity. As a region developed *en-bloc* under the master plan, homogeneity is evident in the urban fabric and form. A projection of the region displays an aggregation of similarly sized apartment complexes planned to conform to the road structure. The internal building groups in each complex exhibit a uniform vertical orientation and analogous physical features.

To acquire a morphological understanding of homogeneity, 54 apartment complexes were selected for the in-depth analysis: 21 apartment complexes in the

Sanggye area and respectively 14 and 19 complexes in Junggye 1 and 2 areas. Table 42 lists the morphological elements examined, which were described in Chapter 3 (Morphological Characteristics of Apartment Complexes).

Although the three areas were developed in the same morphological period, there are variations in the complex size, household density, height of the building groups, and architectural style, as they were planned and constructed by different agencies (Figure 000). The apartment complex size in the Sanggye area (A) is approximately 250–300 x 300–350 m, which has become smaller over time. The complex size of the Junggye 1(B) area is 200 m x 250 m, and Junggye 2 (C) consists of complexes sized 150 m x 150 m. A rectangular shape dominates, although the smaller complexes of Junggye 1 tend to be more square. As the Junggye 2 area is situated adjacent to the mountain area, it comprises more irregularly shaped parcels. The density (FAR) also varies between the areas, but all are within the 230–300% range. The Sanggye area includes a few low-rise apartments, with buildings ranging from 5 to 25 stories high, although most are 15-story high-rise buildings. Because of the mixture of low-rise buildings located in a parallel row configuration, the apartment buildings are spaced 45 m apart (distance between building 인동간격) on a relatively large parcel. Furthermore, the BCR is slightly less than 15%, and the FAR is also low at 169%. The Junggye area has a slightly higher density, with a BCR of 17% and FAR of 200%. Overall, the architectural style is similar, based on simple linear flat type buildings with a moderate degree of variation in width. Sometimes, a perpendicular bend forms a right-angled building in an attempt to secure the sense of community (KNHC, 1988). As the apartment complexes in the Sanggye area (A) were planned on a relatively large scale, variations in the flat type apartments are evident. The Junggye areas (B and C) are composed of smaller complexes, where flat type apartments are preferable in terms of

Table 42 Homogeneity analysis of the case areas

Site Areas	Complex Size (mean value)	Complex Shape	Household Density (mean value)	Number of Buildings (mean value)	Building Height	Architectural Style-general*	Arrangement of Buildings **	Orientation****	BCR (mean value)	FAR (mean value)
Sanggye (A) (N=21)	66,770 m^2	· Tetragon: 9.5% · Deformed polygon: 76.2% · Partially curved:4.8% · Irregular:9.6%	2.41	16.24	max: 25 min: 5 mean: 12	F: 47.6% T: 0% F+T: 52.4%	1: 52.4% 12: 9.5% 13: 28.6% 23: 9.5%	SW: 82.6% SE: 17.4% S: 0%	14.8%	169.0%
Junggye 1 (B) (N=14)	53,670 m^2	· Tetragon:35.7% · Deformed polygon: 57.1% · Partially curved: 7.1%	3.12	11.64	max:15 min: 7 mean: 11.9	F: 85.7% T: 0% F+T: 14.3%	1: 50.0% 12: 28.6% 23: 21.4%	SW: 100% SE: 0% S: 0%	17.0%	199.6%
Junggye 2 (C) (N=19)	37,150 m^2	· Tetragon:5.3% · Deformed polygon:68.4% · Irregular: 26.3%	2.43	8.42	max: 15 min: 10 mean: 12.1	F: 94.7% T: 0% F+T: 5.3%	1: 68.4% 12: 26.3% 13: 5.3%	SW: 18.8% SE: 6.2% S: 75%	17.2%	200.7%
Total (N=54)	52,950 m^2	· Tetragon: 14.8% · Deformed polygon: 68.5% · Partially curved: 3.7% · Irregular: 9.3%	2.6	12.3	max: 14.6 min: 11.6 mean: 12	F: 74.1% T: 0% F+T: 25.9%	1: 57.4% 12: 20.4% 13:13.0% 23: 9.3%	SW: 66% SE: 10% S: 24%	16.2%	188.0%

*The criteria for "Architectural Style" is based on three categories in which F= Flat, T= Tower and F+T= Flat & Tower type mixed.
**The criteria for "Building Arrangement" is based on six categories, where 1= Parallel Row, 2= Cross, 3= Dot, 12= Parallel Row + Cross, 13= Parallel Row + Dot and 23= Cross + Dot.
***The criteria for "Directionality/ Orientation" is based in three categories in which SW= Southern-West, SE= Southern-East and S= Southern direction.

providing more housing with a southern exposure. These formal differences can be interpreted as the result of different project approaches. As mentioned, the Sanggye area was planned from the site layout to architectural details by the Korea National Housing Corporation (KNHC), while the final form of the Junggye area was shaped based on the individual plans of private construction companies on sites laid out by the Korea Land Development Corporation (KLDC). However, the case study area exemplifies an identifiable morphological region with a strongly homogeneous urbanicity, as seen in the average building height of 12 stories with variations of 5 to 25 stories, similar density patterns (BCR of 15–17% and FAR of 170–200), and a south-facing flat building style.

The apartment complexes in the Sanggye and Junggye areas also demonstrate a similar pattern of strong cohesiveness based on the large portion of fairly clustered (51.9%) and heavily clustered buildings (16.7%) (Table 43). This homogeneous formation of an apartment complex region demonstrates the Sanggye and Junggye area as an apartment-driven morphological region that emerged concurrently at the northeastern fringe belt amid the rapid urban expansion of Seoul in the late 20th century.

Table 43 Cohesiveness of the Sanggye and Junggye area apartment complexes

Clustering index		Number of AC	Percentage
Clustering types	Number of adjoining ACs		
Not clustered	**0**	2	3.7 %
Somewhat clustered	**1-2**	15	27.8 %
Fairly clustered	**3-4**	28	51.9 %
Heavily clustered	**Over 5**	9	16.7 %
Total		54	100 %

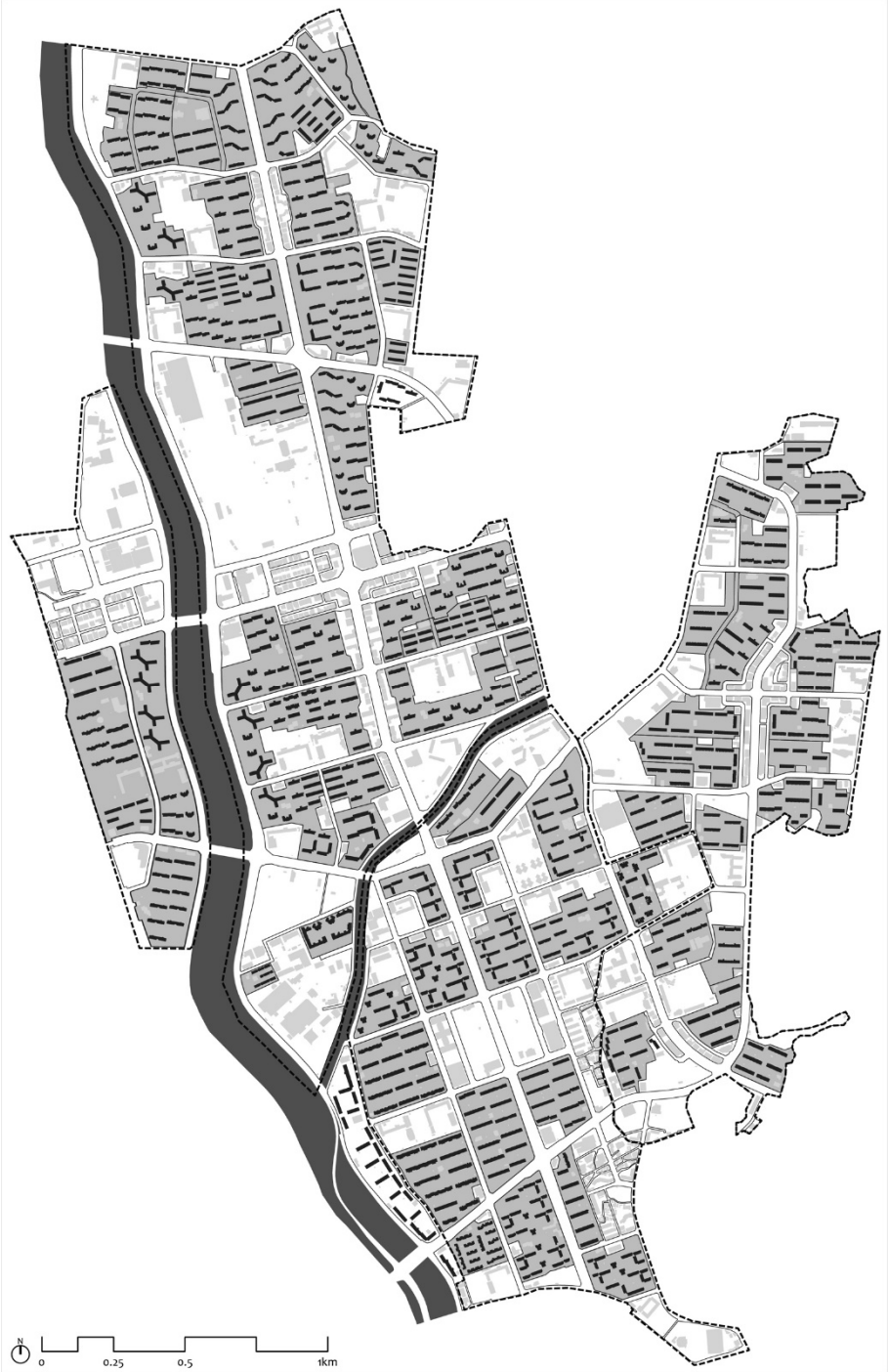


Figure 56 The Sanggye and Junggye area as a morphological region

5.2.2. Relationship with the surrounding urban fabric

As an apartment region at the Newtown-in-town scale, the Sanggye and Junggye areas are not mixed with other urban fabrics inside the project district. Thus, the internal relationship between apartment complexes is more relevant to identify the morphological characteristics of this agglomeration type. As mentioned, a homogeneous pattern is evident in terms of the parcel, building, and density of the formal character of a number of apartment complexes in the area. As such, the road network relates these multiple complexes into a unified whole. In Sanggye, a strong linear road system in conjunction with a sub-axial street network is evident, providing a perpendicular division and thereby creating urban blocks. The arterial road becomes an axis butting through the project, and the perpendicular arterial road encloses the project site area while the minor arterial road encircles it. Note that the surrounding collector or local streets, which are intricately connected, run into the encircling minor arterial; thus, multiple T-shaped intersections are seen with smaller disconnected roads, decreasing the throughways and allowing only controlled traffic through. Large-scale blocks contain mostly a single complex, and collector or local streets are thus unnecessary. For the apartment complexes, an individual access road directly connects the arterial or minor arterial road. Similarly, Junggye also has a strong grid arterial road system, although the direction varies depending on natural features and development phases, forming a rectangular urban block on which the complexes are positioned alongside minor access roads. In many cases, a single apartment complex occupies the whole block with internal roads providing building access. These apartment complexes, which are framed by wide roads, usually exhibit an exclusionary form of territoriality. Limited access points that are guarded and gated separate apartment complexes from the outside, and this is further instilled by installing boundary walls and sometimes

closing the sub-gates originally intended to link the complex to the outside world.

This is shown in Figure 56 (Sanggye and Junggye as a Morphological Region). The relationship between the case study area and surrounding areas clearly demonstrates the area as a large-scale morphological region in terms of scale, form, and formative process. While the western side of the case area is bordered by the Jungrang stream corridor in a defined way, the eastern side adjoins the fine-grained low-rise residential area. Since this outside residential area was laid out through the Land Readjustment method before the Sanggye and Junggye Housing Site Development, it is assumed that the minor arterial road along the boundary was planned to provide for traffic on the one hand and to ensure clear separation on the other. Thus, the large apartment area of Sanggye and Junggye comprises a series of inward apartment complexes linked by road networks and distinguished from the surroundings with a clear road boundary. While apartment complexes have been developed in the surrounding area, they are linked by limited arterial roads, providing the development projects with an independent nature. As a result, today, the Sanggye and Junggye area is perceived as larger than the initial project in the 1980s and 1990s. However, it is an amalgam of independent enclaves rather than a continuous integrated organic expansion.

5.3 Jamsil Area - Large-scale Regular Cohesive Agglomeration

5.3.1 Progression of the agglomeration of apartment complexes

The Jamsil case study area represents another apartment morphological region found along the Han River. The area shows the transformation of Seoul's apartment complexes within the original morphological frame of the 1970s through the demolition and reconstruction of apartment buildings. This demonstrates the short rebuilding cycle of apartment complexes and rapid transformation of Seoul's apartment landscape into a new generation with different building styles, height, layout, and density.

Originally, the Jamsil area was new land created through the Han River Reclamation Project in the 1970s. This new land was integrated into the vast agricultural and natural land on the south to become the Jamsil Land Readjustment District as part of the 'Jamsil District Comprehensive Development Plan 잠실지구종합개발기본계획 in 1974 (Sohn, 2003). The Jamsil Land Readjustment Project was included in the Gangnam development policy enacted by the authoritative central government, who stipulated that the City of Seoul disperse its population in the city center to the south of the Han River as a defensive measure against North Korea. The Jamsil District Comprehensive Development Plan laid out the Jamsil area into superblocks for apartment and business functions. From these, vast residential areas comprising small plots extended to the south in a radiating form. Through the self-financing Land Readjustment Project, a sports complex, open spaces, and other public facilities were provided. Furthermore, to attract the population to the south of the Han River, Apartment Districts were designated to multiple superblocks along the Han River in 1976 (Kim, B.L., 2015).

Figure 57 1987 Map of the Jamsil area

Figure 58 2015 Map of the Jamsil area

The case study area includes five superblocks (Jamsil 1–5 Complexes) with an average size of 183,620 m^2. Four superblocks (then known as Jamsil Jugong Apartment Complex 1–4) were developed by the Korea National Housing Corporation as self-contained, five-story, low-income housing complexes according to the American Neighborhood Unit Plan, placing schools in the center and commercial facilities on the periphery. Another superblock (Jugong Complex 5) was developed by the Korea National Housing Corporation as the first demonstration project for a 15-story high-rise apartment complex, the highest at the time. The five apartment complexes were built on a superblock and encircled by arterial roads. The apartment buildings are all flat type constructions arranged inwardly to form a self-contained structure. This self-contained character was more intense in the Jamsil 1–4 Complexes, as they were arranged in an angled-courtyard configuration encircled by peripheral perpendicular buildings. The Jamsil 5 Complex is a more open structure in a perpendicular configuration with a north-south orientation (Figure 59).

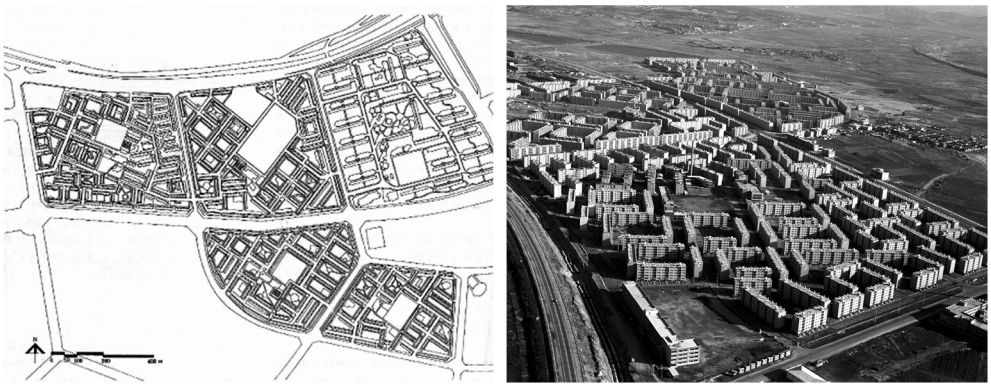


Figure 59 Jamsil Jugong Apartment Complex 1-4 before reconstruction
(Source: National Archives of Korea 국가기록원)

The Jamsil area demonstrates the transformation of the original apartment complexes (Figure 57) into new ones through the Housing Reconstruction Project. After nearly 30 years, the four low-rise apartment complexes (Jamsil 1–4 complexes) were reconstructed after complete demolition and the implementation of new design concepts (Figure 58). There are now more than 50 apartment buildings per complex, with heights ranging from 17 to 33 stories. Most are constructed in the tower type style in the compact, L/T, or V/W shape. With decreased building footage and underground parking, the ground level serves as a communal landscaped area. The density measure illustrates the recent trend in the Housing Reconstruction Project to lower the BCR and increase the FAR. In the Jamsil case, the BCR is 15% and FAR is 275%, because of the super-high-rise buildings. This changing density reflects the trend in the housing market for more amenities and ensuring the financial feasibility of reconstruction projects by increasing the FAR and profitable units with a view. Stronger self-containment was emphasized in these superblocks, which have the minimum amount of entrances and a cul-de-sac internal road structure to restrain traffic into the complexes (Bang, 2012).

The Housing Reconstruction Project in the Jamsil study area focused on each complex (1–4 complexes), and property owners' associations were formed to execute the project. Each complex drew their own plans under the city regulations stipulated in the Housing Reconstruction Project. Thus, the four complexes were individually developed. However, this does not mean that the new apartment complexes emerged consecutively. Rather, they emerged concurrently, as they preceded the Housing Reconstruction Project at the same time with only slight differences in terms of completion dates. Together, with a new form of high-rise apartment buildings, they changed the apartment landscape in the Jamsil area and along the Han River. However, the overall urban structure was maintained, since each Housing Reconstruction Project

focused on a single superblock created through the 1970s Land Readjustment Project. Therefore, in terms of apartment complex clustering, no differences are evident, as they maintained the somewhat clustered and fairly clustered arrangements. The location of schools at the center of the superblock was also retained, influencing the layout of the apartment buildings within each complex.

5.3.2. Relationship with the surrounding urban fabric

Highly Contrasting Juxtaposition

Figure 05-00 shows the extreme differences in parcel size, street layout within the urban block, building type, height, building arrangement, and green open space. The total number of households seems similar; however, the B1–B4 area is composed of a linear pattern of commercial buildings along the major roads, which may add to more components (Figure 60, Table. 44). There is also a contrast between the total number of residential buildings and households in a similar block area. In addition, the number of stories, representing the building height, also differs. This influences the shape of the urban landscape and generates a disparity between the physical, visual, and emotional elements of the urban experience at the human scale. Not shown is the underground level, a hidden layer that applies only to apartment complex superblocks (A1–A4). This accommodates approximately 135% of the households. Furthermore, a shortage of parking space in the low-rise surrounding area (B1–B4) is a critical problem.

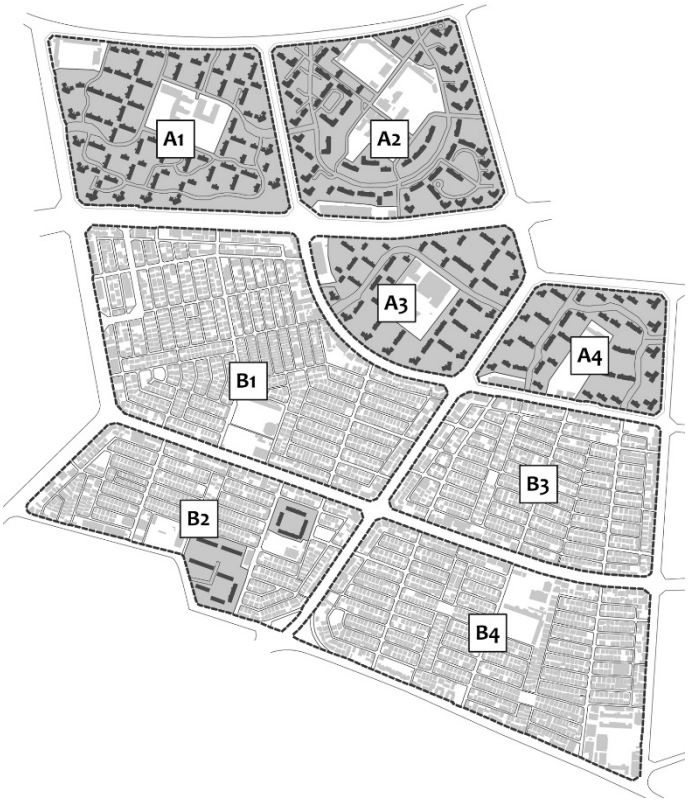


Figure 60 The contrasting urban context of Jamsil

Table 44 Characteristics of contrasting urban blocks

Complex	Year Built	Block area approx. size	Block dimension approx. length	Total Households	Total Buildings	Stories
A1	2008	276,280 m^2	600*480m	5,678	72	17~34
A2	2008	284,230 m^2	580*550m	5,563	65	21~33
A3	2007	181,850 m^2	640·350·130·570m	3,696	46	19~32
A4	2006	145,380 m^2	450*330m	2,678	35	19~32
B1	1980s	474,685 m^2	540·770·660·660·600m	7,757	5,178	3~5
B2	1970s	269,818 m^2	400*750m	4,311	2,004	3~5
B3	1980s	279,446 m^2	430*670m	5,626	3,425	3~5
B4	1980s	404,555 m^2	430*910m	8,076	5,481	3~5

The Jamsil area exemplifies the aggregation of apartment superblocks, forming a continuous fabric that was recently reconstructed. However, to make a profit, increase housing prices, and ensure sufficient green open spaces, the reconstructed apartments were built as high-rise buildings, with a distinctive configuration and uniform architectural design. The large collectively owned parcels of each apartment complex exhibit aspects that contrast the surrounding urban context, which comprises small plots with individual low-rise buildings. This clear division between apartment and non-apartment residential forms is the result of the city planning for the 1972 Jamsil Comprehensive Development Plan. As apartment complexes produced through the short-cycle reconstruction projects tend to be up-scale and heavily gated, the social division created is visually recognizable in these two juxtaposed neighborhoods.

Table 45 Spatial attributes of the apartment complex boundary in the Jamsil area

Apartment Complex Border	Elements		A (1981)	B (1983)	C (1986)	D (1990)	A4 (2006)	A3 (2007)	A2 (2008)	A1 (2008)
Surrounding Vertical Border Condition	Height	Low	●	-	-	-	-	-	-	-
		Medium	●	●	●	●	●	●	●	●
		High	-	-	●	-	●	●	●	●
	Type	wall	-	-	-	-	-	-	-	-
		fence	●	●	●	●	●	-	-	-
		landscape	●	●	●	●	●	●	●	●
		Elevated or sunken topo	-	-	-	-	-	-	-	-
	Length (m)		1500m	712m	1700m	476m	1600m	1700m	2100m	2100m
	Thickness	# layers	2	2	3	s	4	3	3	3
		Thickness	1m	1m	2.5m	1m	2.5m	3m	3m	3m
	Other Function as Buffer	Private facility	●	●	●	●	●	●	●	●
		Public Facility	●	●	●	-	●	●	●	●
Control of Access	Vehicle control		-	●	●	●	●	●	●	●
	Gate		●	●	●	●	●	●	●	●
	CCTV		-	●	●	●	●	●	●	●
	# access point		3	2	7	2	3	2	5	2
Surrounding pedestrian and road condition	Pedestrian environ-ment	Ped-road outside AC	●	◐	◐	●	●	●	●	●
		Landscape outside AC	-	-	◐	●	●	●	●	●

5.4 Munjeong and Garak - Regular Loose Agglomeration

5.4.1 Progression of the agglomeration of apartment complexes

The Munjeong and Garak area was developed under the execution of the Garak Land Readjustment Project (area of 7,455,000 m^2) from 1982 to 1988 in an effort to secure the Olympic Park site (Sohn, 2013). Different from the Land Readjustment Project implemented in the 1960s and 1970s, apartment sites were initially designated within the compartmentalization process carried out in the 1980s, reflecting the increasing popularity of apartment living. Originally, the Munjeong and Garak area was considered an outskirt of the city center of Seoul in the 1970s, where most of the land was still utilized as farmlands. The urban area had also not yet formed, although the Munjeong Jugong Apartment Complex, which was fairly large (87,655 m^2) and included 30 flat type buildings and 1,320 households, was established before the Land Readjustment Project was implemented (Figure 61). Located on a flatland, a new road system and urban blocks with regularly subdivided parcels transformed the area's urban spatial structure (Figure 66).

The case area is an urban block initially planned to include seven apartment complex sites mixed with the fine-grained fabric as part of the Garak Land Readjustment Project along with the previous Munjeong Jugong Complex. The apartment complexes are loosely adjoined and located a certain distance apart, partially bordering each other on lines and touching on the vertexes. Thus, they appear as a patchwork or mosaic configuration. According to the clustering index, the buildings are somewhat clustered (one complex is a stand-alone type, six are somewhat clustered, and two are fairly clustered). Furthermore, the apartment complexes emerged concurrently and consecutively.

After the Garak Ssangyong Apartment Complex was constructed in 1996, no new apartment complexes were built. However, in the 2000s, the original apartment complexes began to be replaced through the Housing Reconstruction Project. Munjeong Jugong was reconstructed as the Munjeong Samsung Ramian (2004), and the Halla Apartment Complex was replaced by Samsung Ramian Park Palace Apartment Complex (2007). Under the Housing Reconstruction Project, the previous row arrangement of flat type apartment buildings were replaced by shorter flat or the newer tower type buildings, which were almost twice as high, ranging from 22 to 27 stories. The density also increased to a FAR of 293% and 250% respectively, while ground-level parking was moved underground. The BCR remained low at 21.3% and 16.2%. The introduction of high, slender buildings and the new tower design brought about unexpected abruptness and contrast to the remaining low-rise fine-grained area.

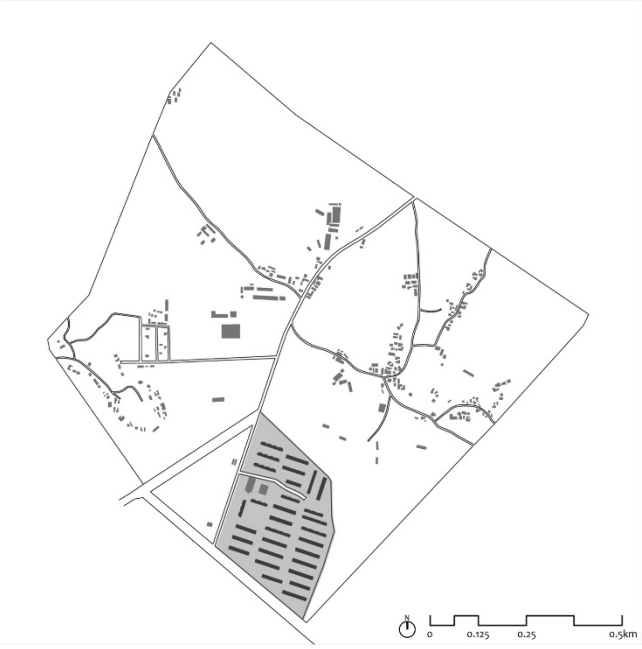


Figure 61 1976 Map of the Munjeong and Garak area

(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

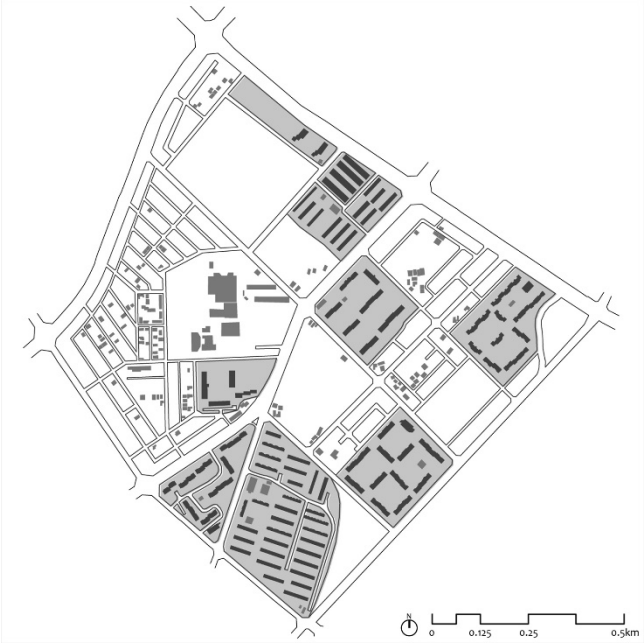


Figure 62 1987 Map of the Munjeong and Garak area

(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 63 1995 Map of the Munjeong and Garak area

(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 64 2006 Map of the Munjeong and Garak area

(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

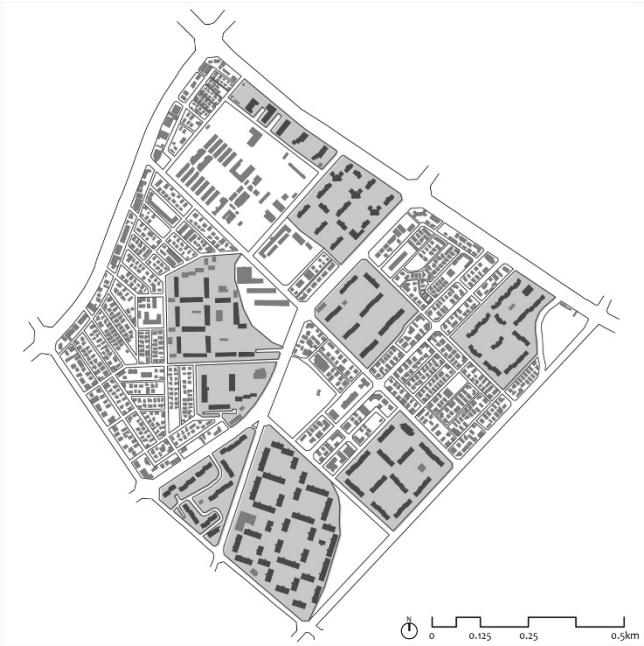


Figure 65 2015 Map of the Munjeong and Garak area

(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원

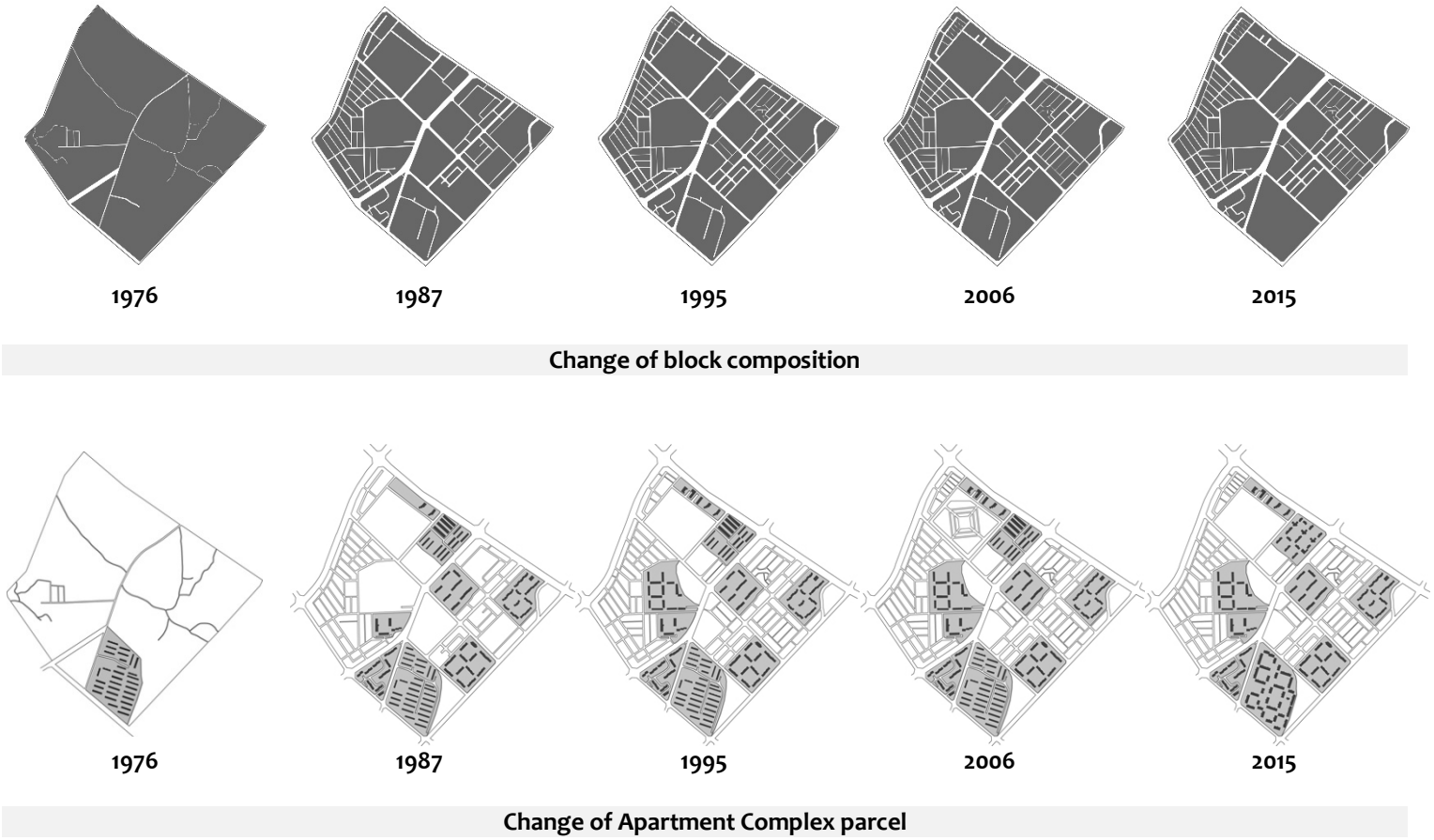


Figure 66 Morphological changes in the Munjeong and Garak urban bloc

5.4.2. Relationship with surrounding urban fabric

Looking at the time-series maps of the urban block, once the spatial structure of roads, sub-blocks, and apartment sites is laid out, individual buildings fill the space incrementally over time (Figure 62-65). No conversion of new apartment complexes has occurred by combining lots, and closely bounded individual buildings have increased the fine-grained density. For instance, while one apartment complex parcel with 14 buildings (and about 2,064 households) appeared in the 1990s, the number of individual buildings has increased from 157 to 936. Regardless of the slowing increase after that, the densification of individual buildings has been constant (Table 46).

Through the Land Readjustment Project, most access roads were converted into planned local roads around the apartment complexes. Thus, although mixed, the apartment complexes and general residential areas are well defined by various hierarchies of roads. The roads and sub-blocks are based on a grid structure that increases along with the number of intersection points. The main arterial and local roads encircling the urban block area in the case study remains unchanged. Overall, the area has retained a balanced relationship between the earlier planned apartment complexes and gradual densification of the surrounding context. However, the two recent reconstruction projects have brought about contrast. Other apartment complexes built in the 1980s still have flat type buildings arranged in rows or the shape of a cross. However, these will be reconstructed in the future. Finally, the consecutive replacement of denser apartment complexes with higher buildings is projected to intensify the degree of the disparate characteristics of the surrounding urban fabric.

Table 46 Changes in parcels and buildings in the Munjeong and Garak area

Morphological elements within the case block			Change over time				
			1970s	1980s	1990s	2005	2015
Building	quantity	# of AC buildings	**30**	**92**	**106**	**106**	**107**
		# of other buildings	**254**	**157**	**936**	**1,013**	**1,038**
		# total building	284	249	1,046	1,123	1,151
	area	(m^2) of AC buildings	15,756	62,147	74,223	74,223	75,002
		(m^2) of other buildings	24,793	31,688	115,851	127,714	148,468
		(m^2) of total building	40,549	93,835	190,074	201,937	223,470
Parcel	quantity	# of AC parcels	**1**	**8**	**9**	**9**	**9**
	area	(m^2) of AC parcels	96,601	370,261	441,663	441,663	450,322

Figure 67 Aerial view of Munjeong and Garak area

(Source: Naver Aerial View image modified by author)

Table 47 Spatial attributes of the apartment complex boundary in the Munjeong and Garak area

Apartment Complex Border	Elements		A (1984)	B (1984)	C (1984)	D (1985)	E (1986)	F (1986)	G (1996)	H (2004)	I (2007)
Surrounding Vertical Border Condition	Height	Low	●	●	●	-	-	-	-	-	-
		Medium	●	-	●	●	●	●	-	●	-
		High	-	-	-	-	-	●	●	-	●
	Type	wall	-	-	●	-	-	●	●	-	●
		fence	●	●	●	●	●	●	●	●	●
		landscape	●	●	●	●	●	●	●	●	●
		Elevated or sunken topo	-	-	◐	-	◐	-	-	-	-
	Length (m)		874m	835m	786m	869m	587m	612m	1100m	1200m	826m
	Thickness	# layers	2	2	2	2	2	2	3	2	2
		Thickness	3m	3m	2m	3m	1.5m	1.5m	2m	3m	3m
	Other Function as Buffer	Private facility	●	●	●	●	-	-	●	●	●
		Public Facility	●	●	●	●	-	●	●	●	●
Control of Access	Vehicle control		-	-	●	-	-	-	-	●	●
	Gate		-	-	●	-	-	-	-	●	●
	CCTV		-	-	-	-	-	-	-	-	-
	# access point		2	4	1	2	2	4	2	3	3
Surrounding pedestrian and road condition	Pedestrian environ-ment	Ped-road outside AC	●	●	●	●	●	●	●	●	●
		Landscape outside AC	-	●	-	-	-	-	-	-	●

In the case of the Munjeong and Garak area, most complexes are regular in shape, conforming to the spatial structure, and the size is also similar. The average perimeter length is 854 m, and the width of the complex boundary ranges from 1.5 to 3 m. Of the nine complexes, five are surrounded by a medium height fence and landscape, and the other four are demarcated through a mixture of medium and high or high border elements (Table 47). Most of the complexes have multiple layers of border elements including physical walls, fences, the landscape, or an elevated ground level. From the outside pedestrian eye level, parked cars are visually exposed in the complexes built on elevated ground. As a physical border exists, there are few access points. The Garak Kukdong Apartment Complex only has one entrance node, while the other complexes have two to four access points. In addition to the border, private and public (mostly retail buildings) facilities are located along the boundary.

There is an obvious difference between the complexes built in the 1980s and those recently reconstructed. For example, the newly reconstructed complexes have a thicker border width of 3 m, and control vehicular access through the gates. Intensifying blockage and control of visual and physical access implies increased privatization and highlights the enclave nature of the latest apartment complex design. While maintaining the original structure set out in the Land Readjustment Project in the 1980s, these regularly shaped, loosely clustered apartment complexes increase the physical and social distance to surrounding neighbors and dominate the landscape visually.

5.5 Hwagok - Regular Scatter Agglomeration

5.5.1 Progression of the agglomeration of apartment complexes

The Hwagok study area is located in the western part of Seoul along the Seoul-Incheon corridor. This area is one of the largest land readjustment projects in the 1960s, when detached houses were the dominant housing type. According to Sohn (2013), the site was re-plotted as a residential area leap-frogging the later developed Mokdong New Town area to secure the highway line between Seoul and Incheon (Gyeong-In Highway). The Hwagok case area combines two Land Readjustment Projects, namely Hwagok (1,025,000 m^2) and Gyeonin (6,918,000 m^2), which were designated and developed from the late 1960s to early 1970s. Different from the Munjeong and Garak area, which was re-plotted in the 1980s, only two small apartment complexes were embedded in the development plan, although these plots may have been allocated as simple large parcels and not apartment sites. However, during the 1990s and 2000s, numerous stand-alone apartments (not classified as apartment complexes, because they contain a single building) or small-scale reconstruction projects were constructed on sizable or assembled parcels without significantly altering the existing grid structure. The six apartment complexes in the case area block are scattered individually as 'not clustered' type.

The complex built in the 1970s still exists, and the one constructed in the 1990s was produced as part of the Housing Reconstruction Project. The other three complexes were reconstructed in the mid-2000s by collectively joining single parcels. The sizes of the apartment complexes range from 4,000 to 15,000 m^2 (average of 8,770 m^2), which is approximately the size of one or two rectangular sub-blocks (50 m wide and 120 m long). The apartment buildings are mostly of the flat type, although some are in the modified bent shape style. Although the height is within the medium range

(average of 9.5 stories), because of the small parcel size, not much open space is included (BCR: 26.2%, FAR: 229.4%). As the apartment complex occupies a territory similar to the existing context, it is adapted to the spatial structure. This process of apartment agglomeration in the Hwagok area represents the widespread pattern of the random mixture of small-scale apartment complexes within the low-rise residential areas formed in the post-Korean War urbanization in the 1960s and 1970s. Since apartments as a housing type had not yet been introduced to the public, the Land Readjustment Projects in the 1960s and 1970s were geared at small-plot subdivisions for detached houses. This small plot, small block morphological frame persists in terms of the parcel lines, block shapes, and road networks. Only inner parcel densification and minor modification through parcel assembly have occurred, sometimes accommodating small-scale apartment construction, as seen in this case area. This consecutive, scattered nature stems from the formative nature of the area (Figure 68-72).

Figure 68 1976 Map of the Hwagok area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 69 1987 Map of the Hwagok area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 70 1995 Map of the Hwagok area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 71 2006 Map of the Hwagok area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 72 2015 Map of the Hwagok area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

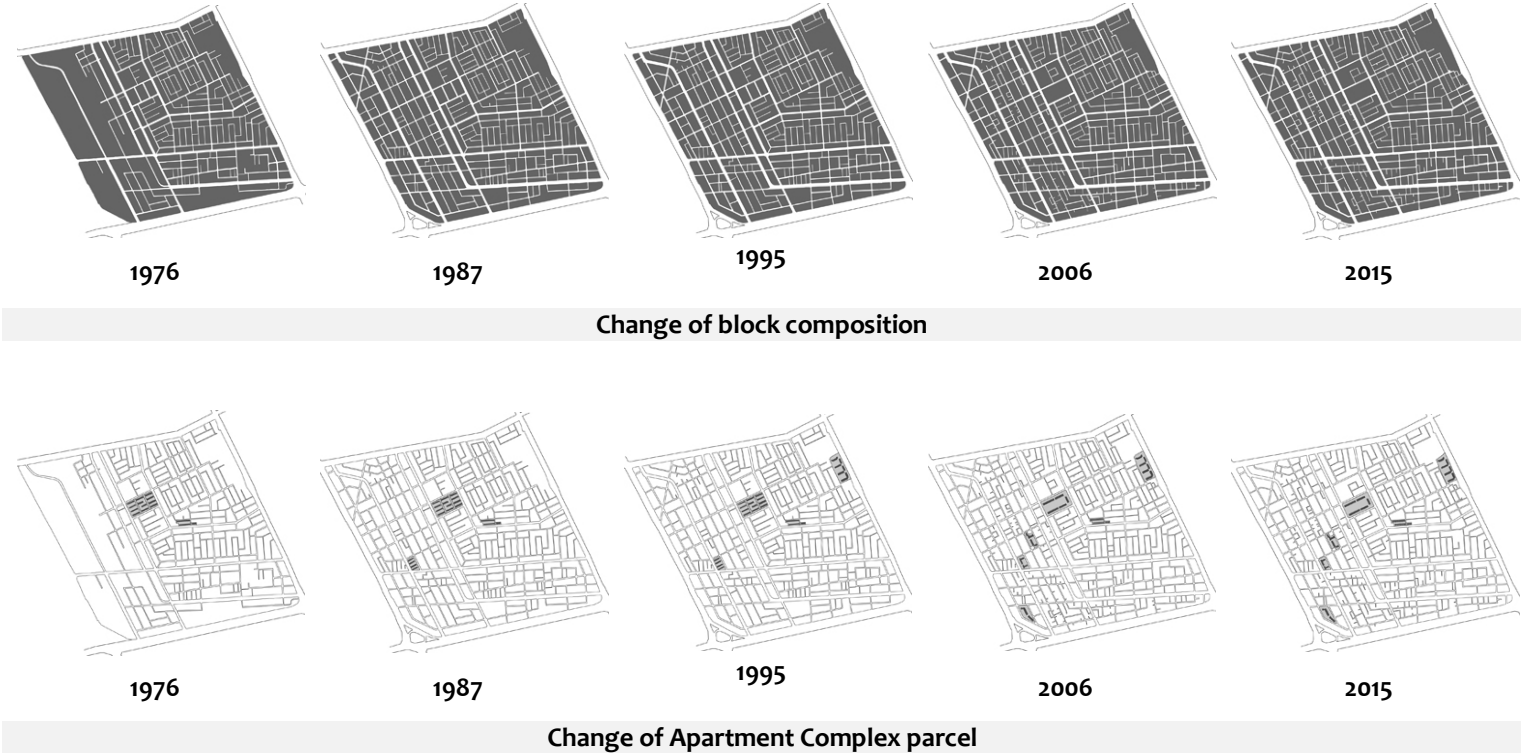


Figure 73 Morphological changes in the Hwagok urban block

5.5.2. Relationship with surrounding urban fabric

The Hwagok case area is characterized by few small-scale apartment complexes with a relatively low building height, which contributes to the fact that the fine-grained fabric dominates the apartment complexes. As mentioned, the stand-alone single apartment buildings scattered throughout the grid blocks have an intermediate role between the individual low-rise buildings and apartment complexes in a gradational hierarchy. Within the urban block, small units of open spaces, parks, or playgrounds are evenly spread, and because of the high BCR of the apartment complexes, not much difference is evident between the internal private (of the apartment complex) and external public infrastructure. Since the Land Readjustment Project was executed in the 1960s and 1970s, the other buildings rapidly filled the area from the 1980s until the present.

Figure 74 Aerial view of Hwagok case area
(Source: Naver Aerial View image modified by author)

Table 48 Changing parcels and buildings in Hwagok area

Morphological elements within the case block			Change over time				
			1970s	1980s	1990s	2005	2015
Building	quantity	# of AC buildings	2	6	11	17	17
		# of other buildings	3,180	4,630	4,774	4,594	4,693
		# total building	3,196	4,658	4,806	4,626	4,729
	area	(m^2) of AC buildings	8,158	12,550	15,934	26,200	28,596
		(m^2) of other buildings	335,078	518,825	549,743	698,190	618,191
		(m^2) of total building	343,236	531,375	565,677	724,390	646,787
Parcel	quantity	# of AC parcels	1	2	3	6	6
	area	(m^2) of AC parcels					

Unlike the Munjeong and Garak area, where apartment sites were allocated in the initial land readjustment plan, initial consideration of the construction of apartments is not evident in the Hwagok area. This difference in planning methods between the 1960s and 1980s reflects the changing housing type in Seoul over time. The Hwagok area illustrates how apartment complexes were embedded in the fine-grained residential fabrics in the Land Readjustment Project areas in the 1960s and early 1970s. Not initially planned in the land subdivision plan, apartment complex buildings here were located on a small parcel or assembled plots in opportunistic and random ways. In the Hwagok area, apartment complexes coexist with the residential fabric on small plots, although they have only a minor presence (Table 48). Thus, at the neighborhood level, the physical and social contrast between the apartment complex and non-apartment area is not as evident as in the Munjeong and Garak study area (Figure72).

Table 49 Spatial attributes of the apartment complex boundary in the Hwagok area

Apartment Complex Border	Elements		A (1974)	B (1988)	C (1992)	D (2004)	E (2005)	F (2005)
Surrounding Vertical Border Condition	Height	Low	-	-	-	-	-	-
		Medium	●	-	-	●	●	●
		High	-	●	●	-	-	●
	Type	wall	-	●	●	-	-	●
		fence	●	●	●	●	●	●
		landscape	●	●	●	●	●	●
		Elevated or sunken topo	-	●	◐	-	-	-
	Length (m)		335m	491m	568m	349m	334m	269m
	Thickness	# layers	2	3	3	2	2	2
		Thickness	1m	1.5m	2m	1m	1.5m	1m
	Other Function as Buffer	Private facility	-	-	●	●	-	●
		Public Facility	-	●	●	●	-	-
Control of Access	Vehicle control		●	●	●	●	●	●
	Gate		●	●	●	●	●	●
	CCTV		●	●	●	●	-	-
	# access point		3	1	2	1	3	2
Surrounding pedestrian and road condition	Pedestrian environ-ment	Ped-road outside AC	-	-	◐	●	◐	●
		Landscape outside AC	-	-	-	-	-	◐

5.6 Geumho - Irregular Cohesive Agglomeration

5.6.1 Progression of the agglomeration of apartment complexes

The Geumho area is representative of the irregularly shaped apartment complexes that accumulated consecutively. This area is located in the spontaneously formed hilly residential areas, where the Housing Redevelopment Projects were designated according to the official citywide residential renewal plan. The Geumho area is an inner-city working class neighborhood just outside the downtown core. The area was formed without formal urban planning during the poverty-stricken years following the Korean War, and includes multiple districts designated for ongoing redevelopment projects. The districts were converted consecutively from deteriorating detached residential areas to one or more apartment complexes. As the siting topography is hilly, the roads and overall spatial structure are highly irregular. Accordingly, the shape of the apartment complex is also irregular.

Since the Housing Redevelopment Project here was implemented on a single complex base and relied on an agreement between property owners, the progression of the agglomeration of the apartment complex is random (Figure 75-Figure 79). The Geumho case area is an intensively redeveloped area in Seoul. Within the selected case area, 13 apartment complexes constructed from the late 1980s are located. Two complexes were each built in the 1980s and 1990s, and construction intensified in the 2000s, when nine complexes were newly built. Another apartment complex is soon to be completed, contributing to the dominant apartment complex landscape and increasing the clustering index. In terms of the current clustering index, two complexes are adjoined to another five (heavily clustered), five complexes are fairly clustered, and six are somewhat clustered.

The strong cohesiveness of the apartment complexes is demonstrated through the territorial occupancy of large-scale complexes in addition to the clustering index (Figure 79). The smallest complex is Geumho Prugio 1 (2005), which occupies a 11,580 m^2 parcel and includes 8 15-story buildings. The two extremely large complexes are Geumho Byuksan (2001) with a size of 189,800 m^2 and including 20 20-story buildings and Haengdang Hanjin Town (2000) with the size of 84,300 m^2 and containing 21 of 25-story buildings. The architectural style and building arrangement differ depending on the period in which the complex was constructed. For example, flat type buildings were positioned in parallel rows in the 1980s, while a modified version of the bent flat type was introduced in the 1990s, which were positioned in a parallel or cross arrangement. Buildings with a narrower width were arranged in a cross configuration in the early 2000s, and from the mid-2000s, tower type buildings were constructed in a dot arrangement. Despite the high buildings, the building footprint has been decreasing in large-scale complexes (BCR: 21.8% and FAR: 267.2).

Figure 75 1976 Map of the Geumho area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 76 1987 Map of the Geumho area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 77 1995 Map of the Geumho area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 78 2006 Map of the Geumho area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 79 2015 Map of the Geumho area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

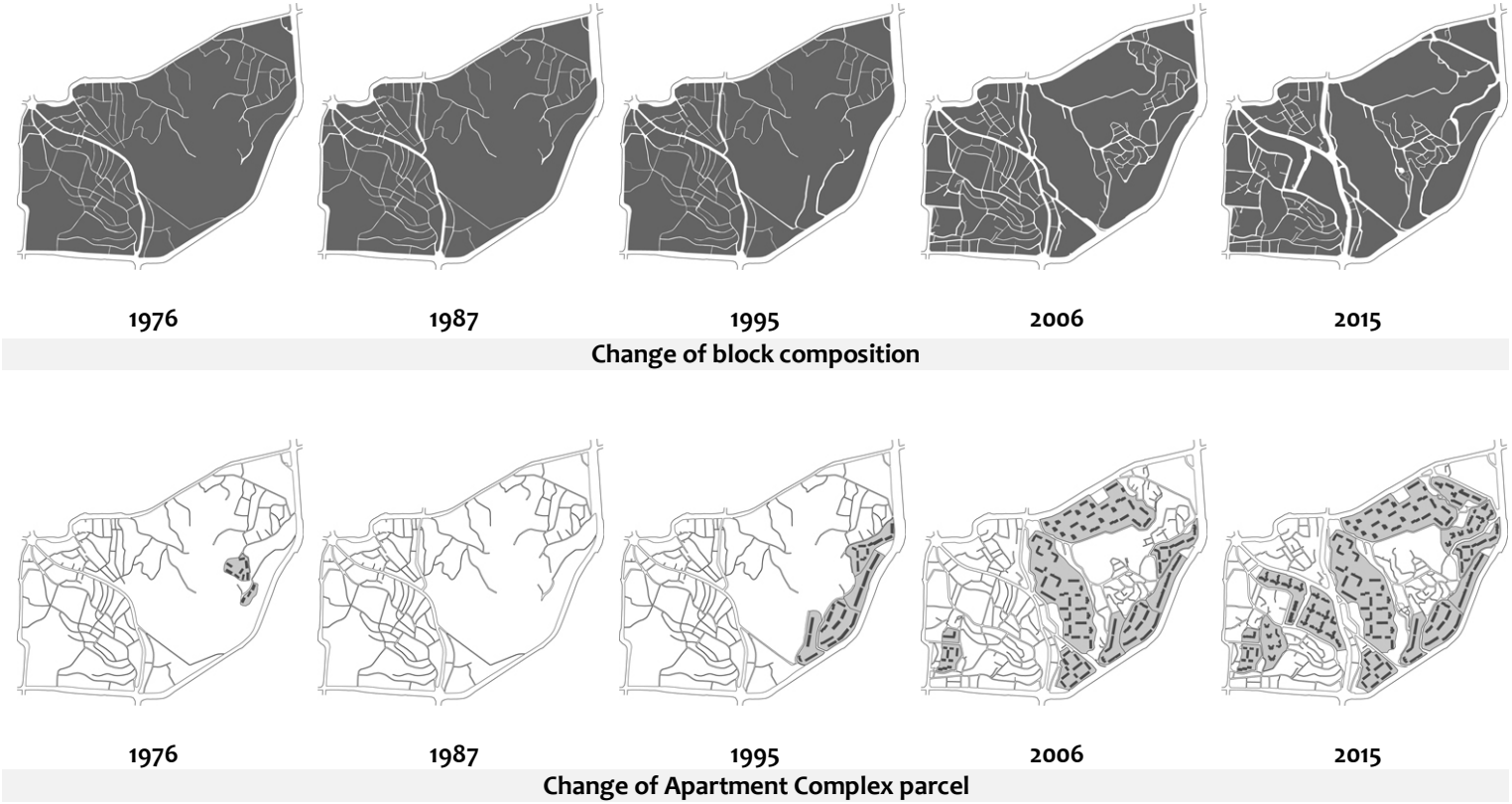


Figure 80 Morphological changes in the Geumho urban block

5.6.2. Relationship with surrounding urban fabric

While two complexes were built by 1995 comprising 23 apartment buildings, around 2,200 individual buildings disappeared and were replaced by 1,200 buildings in four new complexes completed by 2005 (Table 50). This is closely linked to changes in the length and area of the roads, whereby the number of local roads in the case block decreased by nearly 50%, while the number of access roads surrounding the apartment complexes increased ten times. Furthermore, the number of intersection points increased. It can be assumed that numerous disconnected irregular roads were repaired, reorganized, and connected. Regarding the intersections, the number of intersections in the T type increased, as seen in existing roads leading to a large area of apartment complexes, while the + type decreased, implying a decrease in the number of sub-blocks in the existing fabric. In other words, + type intersections provide pedestrians with more options, while T type intersections force them to take detours to reach their destination. Actually, the number of sub-blocks are decreasing, and when most are replaced by apartment complexes, the between road network will likely mostly be used by apartment residents, resulting in the gradual privatization of public roads.

In the cases of the two apartment complexes Ramian Geumho High River and Geumho Xi 1, a between road 15–17 m wide was constructed (Figure 81). Here, the entrance gates of the two complexes were intentionally placed on a secondary road, requiring a detour from the main road. This creates the explicit privatization of the public roads used mostly by residents of the two adjacent complexes. This shorter between road can also be used by residents of the inner detached housing as a short cut. However, in terms of spatial quality, the spatial depth of the urban block has been reduced, and multiple options in terms of routes in various directions have been eliminated. Aside from the privatization of public space through the apartment

complexes, the case of the Geumho area reveals the gating applied in these complexes. This segregation manifest in the late 1990s, but intensified in the apartment complexes built from the early 2000s until recently. There is a noticeable difference between the apartment complexes built in the early 2000s and those constructed in the 2010s. The earlier complexes are surrounded by high walls and landscaping, while those built recently have low fences or walls and avoid tall vertical elements. Rather, other functional buffering elements are deliberately placed along the peripheral boundary. Public parks or commercial programs can be public to semi-public, whereas private communal buildings or parking towers are other ways in which to deny access. To control access, recently built complexes have added vehicle control systems and erected prominent, grandiose entrance gates, as well as instated security guards, who have been employed since earlier periods (Table 51). Further studies on extended cases should be conducted to generalize the increasingly prevalent gating phenomenon; however, there is a meaningful implication for how these private enclaves intentionally mark their borders and layer their control systems to deepen the degree of segregation. This shows a lack of consideration for adhering to the existing urban context and decreases positive interaction and a shared sense of community (Vesselinov et al., 2007).

Table 50 Changing parcels and buildings in the Geumho area

Morphological elements within the case block			Change over time				
			1970s	1980s	1990s	2005	2015
Building	quantity	# of AC buildings	11	11	23	95	132
		# of other buildings	6,252	6,267	4,051	2,927	2,071
		# total building	6,263	6,267	4,076	3,022	2,203
	area	(m^2) of AC buildings	3,807	3,807	18,593	54,418	80,511
		(m^2) of other buildings	313,657	314,351	222,792	261,520	190,820
		(m^2) of total building	316,744	314,351	241,385	315,938	271,331
Parcel	quantity	# of AC parcels	2	2	4	8	13
	area	(m^2) of AC parcels		45,390	91,438	349,551	485,813

(a) Very high physical wall

(b) Elevated topo and multi-layered boundary

(c) Privatization of public road mainly used as two apartment complex entrance way

(d) Vehicular access control and branded gate with commercial program at the boundary

Figure 81 Boundary condition of recently built apartment complexes in Geumho area

Table 51 Spatial attributes of the apartment complex boundary in the Geumho area

Apartment Complex Border	Elements		A (1989)	B (1990)	C (1993)	D (1996)	E (2000)	F (2001)	G (2001)	H (2005)	I (2009)	J (2011)	K (2012)	L (2012)	M (2012)
Surrounding Vertical Border Condition	Height	Low	-	-	-	-	-	-	-	-	-	-	-	-	-
		Medium	-	●	-	-	-	-	-	●		●	-	●	-
		High	●	●	●	●	●	●	●	●	●	●	●	●	●
	Type	wall	●	●	●	●	●	●					●	●	●
		fence	●	●	●		●		●	●	●	●	●	●	
		landscape	●	●	●	●	●	●	●	●	●	●	●	●	●
		Elevated or sunken topo	●	●	●	●	●	●	●	●	●	●	●	●	●
	Length (m)		820m	715m	831m	694m	1400m	1600m	656m	626m	716m	794m	919m	622m	1200m
	Thickness	# layers	2	2	3	2	2	2	2	2	2	2	2	2	3
		Thickness	2m	2m	2m	3m	3m	3m	2.5m	2.5m	3m	2m	3m	3m	5m
	Other Function as Buffer	Private facility	-	●	●	-	●	●	●	●	●	●	●	●	●
		Public Facility	-	●	●	●	●	-	-	-	●	●	●	●	-
Control of Access	Vehicle control		●	●	●	●	-	●	●	●	●	●	●	●	●
	Gate		●	●	●	●	-	●	●	●	●	●	●	●	●
	CCTV		-	-	-	-	-	●	●	●	●	●	●	●	●
	# access point		1	1	1	2	2	3	1	4	2	2	1	2	2
Surrounding pedestrian and road condition	Pedestrian environ-ment	Ped-road outside AC	◐	●	◐	-	◐	-	●	◐	◐	●	●	◐	●
		Landscape outside AC	-	-	-	-	-	-	●	-	-	-	◐	●	●

5.7 Shinsoo Area - Irregular Loose Agglomeration

5.7.1 Progression of the agglomeration of apartment complexes

The Shinsoo area is located on the hilly side of the Han River in Mapo-gu. Similar to the Geumho case area, the Shinsoo area has been transformed through a series of Housing Redevelopment Projects, but less intensively than massive residential renewal areas such as the Geumho and Mia areas. Lacking an overall planning strategy of the area, irregularly shaped apartment complexes have emerged spontaneously and consecutively. As the Housing Redevelopment Projects continue, the Shinsoo area is likely to develop a more cohesive agglomeration of apartment complexes. Thus, only at this moment does the area exhibit an irregular and loose pattern of apartment complex agglomeration, representing widespread on-going housing renewal areas in Seoul.

The Shinsoo area was originally a spontaneously formed inner-city working-class area with a slightly undulating topography. Over time, the area has deteriorated and piecemeal enhancements were implemented through individual parcel-based redevelopment or reconstruction projects. The maps from 1977 to 1987 show that not many changes occurred, other than the reformation and partial straightening of irregular roads (Figure 82, Figure 83). However, from the 1990s, the area has witnessed the increased construction of apartment complexes. As such, another seven complexes were additionally constructed (actually eight complexes; however, the Ramian Mapo Wells Complex, built in 2016, was excluded from this study) (Figure 84, Figure 85). Originally, the apartment complexes emerged in a scattered manner; however, over time, they have become increasingly clustered. In the 1970s, there was

one apartment complex containing three apartment buildings. By 2015, the area housed 11 complexes with 52 apartment buildings (Figure 86). Based on the clustering index, three quarters of the apartments are somewhat clustered, adjoining one or two apartment complexes. In this study, this level of clustering is regarded as a loose agglomeration, which is between the scattered and cohesive agglomeration patterns. However, by 2015, if this trend continues, the area will become an example of a cohesive apartment complex.

Figure 82 1976 Map of the Shinsoo area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 83 1987 Map of the Shinsoo area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 84 1995 Map of the Shinsoo area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

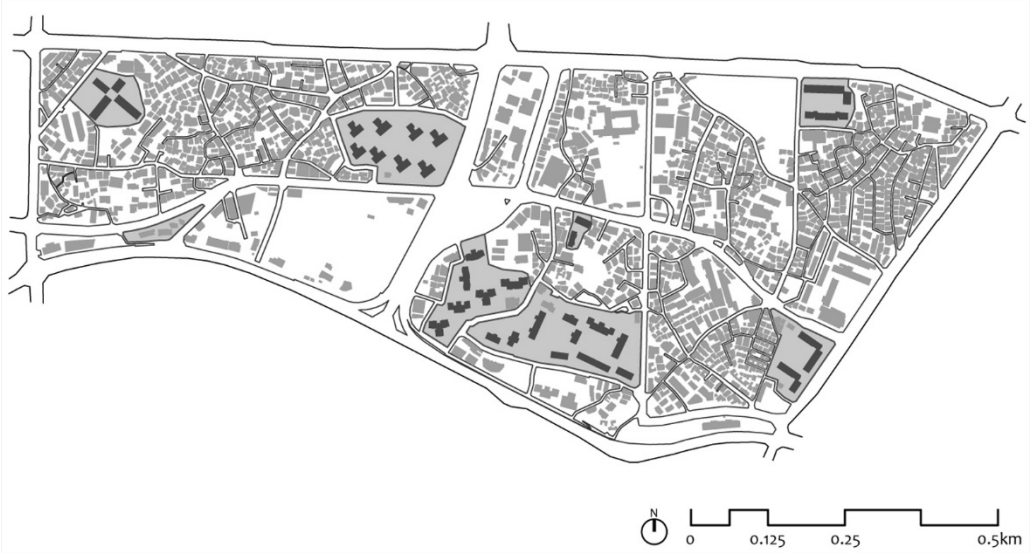


Figure 85 2006 Map of the Shinsoo area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

Figure 86 2015 Map of the Shinsoo area
(Source: Redrawn CAD map based on the archival map image provided by the NGII 국토지리정보원)

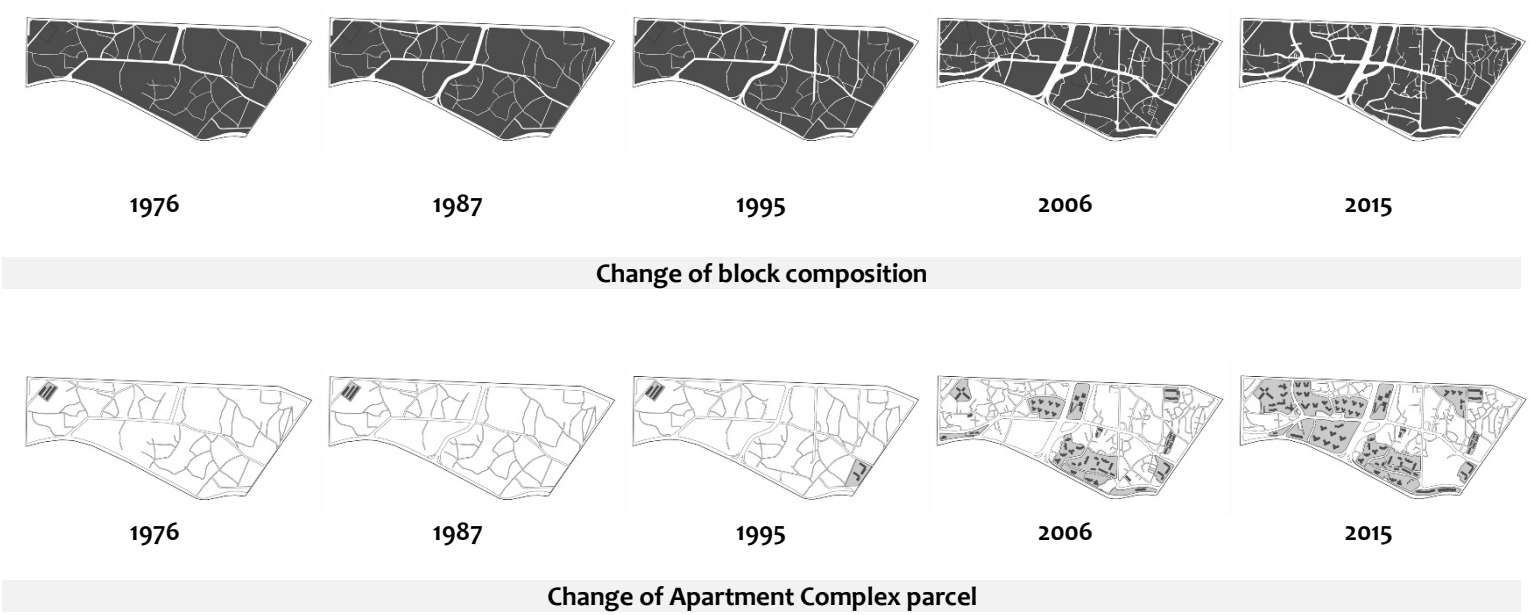


Figure 87 Morphological changes in the Shinsoo urban block

5.7.2. Relationship with surrounding urban fabric

From the 1990s, apartment complexes have encroached on this inner-city residential area, replacing detached housing through the Housing Redevelopment Project, which assembled small plots to create a single large parcel on which to construct apartment complexes (Table 52). Through this transformative process, the number of non-apartment buildings decreased significantly from 6,267 in the 1990s to 2,071 in 2015. The total area of all apartment complexes in the area is 485,000 m^2, occupying nearly 75% of the whole case area, which measures approximately 640,000 m^2. The area has been transforming into a fabric dominated by apartment complexes, and while the number of parcels is drastically reducing, apartment complexes are occupying an increasing number of large parcels.

Apartment complexes developed through redevelopment or reconstruction projects tend to have tower type buildings ranging from 15 to 25 stories. The process of assembling individual plots to spontaneously generate apartment complexes means these complexes are mostly irregularly shaped. Furthermore, the sizes range from 10,000 m^2 to 40,000 m^2, covering larger areas over time. Also due to this process, the boundaries of the apartment complex are either defined by the existing narrow alleys or adjoin other irregular small plots without any separation. The increasing parcel size and tower type buildings with lower footprints enable a lower BCR of 19.5% and higher FAR of 269.1%. This close coexistence and juxtaposition of high-rise apartment complexes and the low-rise existing residential fabric poses a strong contrast, fostering the sense of abruptness, fragmentation, and arbitrariness of the residential form (Figure 88). Moreover, well-organized spaces with relatively abundant open green space inside the complex counter the desultory surrounding low-rise context. All apartment complexes in the Shinsoo case area have high border elements, which in most cases are

combinations of a concrete wall, fence, and landscaping 2 m thick (Table 53). Furthermore, more than half the complexes are located on elevated ground. While some have positioned private and public facilities at the border, six complexes have installed private facilities only accessible by residents. All the complexes have implemented vehicle control and installed a gate at the entrance, ensuring only one or two access points to the complex area. Similarly, the capillary interconnectedness maintained through the narrow alleys of the existing neighborhood has been lost in this transformation process.

Table 52 Changing parcels and buildings in the Shinsoo area

Morphological elements within the case block			Change over time				
			1970s	1980s	1990s	2005	2015
Building	quantity	# of AC buildings	3	3	13	27	52
		# of other buildings	6,252	6,267	4,051	2,927	2,071
		# total building	6,263	6,267	4,076	3,022	2,203
	area	(m^2) of AC buildings	3,807	3,807	18,593	54,418	80,511
		(m^2) of other buildings	313,657	314,351	222,792	261,520	190,820
		(m^2) of total building	316,744	314,351	241,385	315,938	271,331
Parcel	quantity	# of AC parcels	1	1	4	6	11
	area	(m^2) of AC parcels		45,390	91,438	349,551	485,813

Figure 88 Aerial view of the Shinsoo area
(Source: Naver Aerial View image compiled by author)

Table 53 Spatial attributes of the apartment complex boundary in the Shinsoo area

Apartment Complex Border	Elements		A (1990)	B (1998)	C (1999)	D (1999)	E (2004)	F (2004)	G (2007)	H (2009)	I (2010)	J (2014)	K (2014)
Surrounding Vertical Border Condition	Height	Low	●									●	●
		Medium			●	●		●	●	●			●
		High		●	●	●	●	●	●	●	●	●	●
	Type	wall		●	●	●	●	●		●	●		●
		fence	v	●	●	●		●	●	●	●	●	●
		landscape		●	●	●		●	●	●	●	●	●
		Elevated or sunken topo		◐	◐	◐	●	◐		◐	◐	◐	
	Length (m)			335m	645m	282m	368m	718m	553m	560m	732m	690m	702m
	Thickness	# layers		4	3	3		3	3	3	3	2	2
		Thickness		2.5m	2m	2m		2m	1m	2.5m	3m	1m	2m
	Other Function as Buffer	Private facility		●	●	●		●	●	●	●	●	●
		Public Facility	●	●								●	●
Control of Access	Vehicle control			●	●	●	●	●	●	●	●	●	●
	Gate			●	●	●	●	●	●	●	●	●	●
	CCTV												
	# access point		3	3	2	1	1	2	2	2	1	1	1
Surrounding pedestrian and road condition	Pedestrian environ-ment	Ped-road outside AC	●			●		●		●	●	●	●
		Landscape outside AC					●	●		●	●	●	●

5.8 Susaek - Irregular Scatter Agglomeration

5.8.1 Progression of the agglomeration of apartment complexes

The Susaek case study area is located in Sangam-dong, Mapo-gu. Situated at the southern end of Seoul and meeting mountainous topography, this area was formed as a spontaneous urban area with irregularly shaped roads and plot division. To the east along the Bulgwang River, the study area includes a portion of the Yeokchon Land Readjustment Project area, which was developed in the 1960s-as a regular grid pattern fabric.

The case area was characterized by only one apartment complex containing four apartment buildings in the 1970s. Over the years, apartment complexes were developed, totaling 12 complexes containing 49 apartment buildings in 2015 (Figure 89-Figure 92). These apartment complexes were developed before 2005, and since then, no complexes have been added. Among the 12 apartment complexes, 3 were built in the 1980s and 1990s, and 6 were newly constructed or reconstructed by the mid-2000s in a consecutive manner. Half are not clustered complexes, and the others are clustered, adjoining another complex. Generally small-scale apartment complexes, they were developed as part of either the Housing Redevelopment Project or a general building process. The agglomeration pattern is dispersed with a weak degree of cohesiveness. The area is dominated by the fine-grained fabric, not by apartment complexes, although closer attention will be needed if new apartment complexes proliferate through various redevelopment projects. The area was designated as the Suseak and Jeungsan Renewal Promotion District 수색증산재정비촉진지구 in 2005 under New Town Policy of the City of Seoul. Thus, in 2015, the Susaek area demonstrated an irregularly shaped,

scattered agglomeration pattern, which is also found in many General Built-up Areas and spontaneously formed neighborhoods along the mountain tips encircling Seoul.

Figure 89 1976 Map of the Susaek area
(source: Redrawn CAD map from archival map image provided by the NGII국토지리정보원)

Figure 90 1987 Map of the Susaek area
(source: Redrawn CAD map from archival map image provided by the NGII 국토지리정보원)

Figure 91 1995 Map of the Susaek area
(source: Redrawn CAD map from archival map image provided by the NGII 국토지리정보원)

Figure 92 2015 Map of Susaek area
(source: Redrawn CAD map from archival map image provided by the NGII 국토지리정보원)

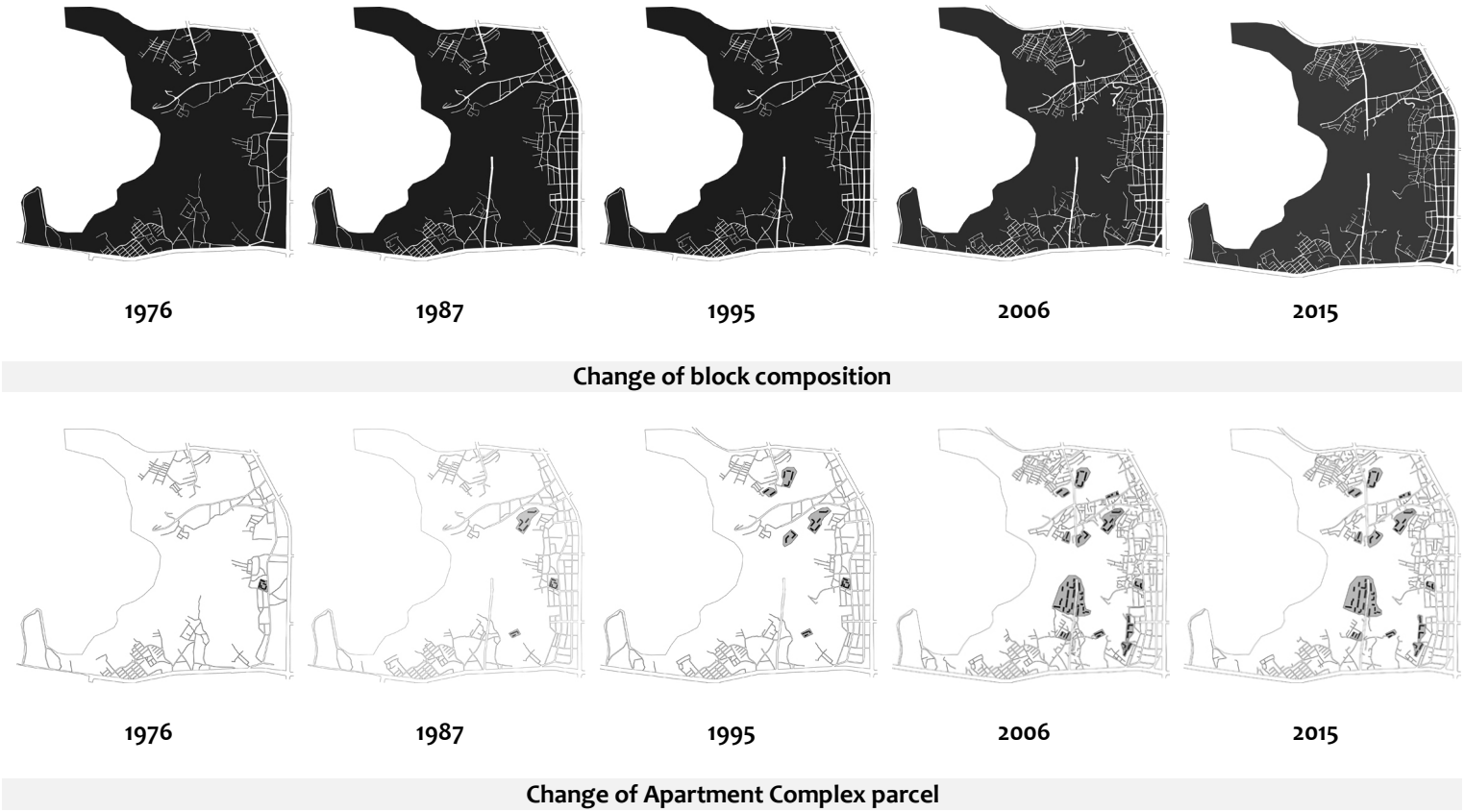


Figure 93 Morphological changes in the Shinsoo urban block

5.8.2. Relationship with surrounding urban fabric

As seen in Figure 92, the apartment complexes here were developed in various sizes, shapes, and orientations. While clustering has increased, they remain scattered. Furthermore, these small-size complexes comprise apartment buildings laid out to ensure the maximum utilization of scarce land resources. The average complex size is around 13,000 m^2, while five complexes are less than 10,000 m^2 with only two buildings. Located against the mountains and hilly areas, the shape of the complexes is irregular with zigzagging boundaries. The size and shape of the parcel has constrained the apartment building style to a shortened-width flat type or modified bent flat type buildings. In addition, the outdoor space is limited. As such, the BCR is not that low (21.7%). The height is mostly less than 15 stories, although some recently built complexes range from 16 to 23 stories. The lower height of the apartment buildings means the FAR (235%) is lower than in the other case areas.

While these apartment complexes emerged consecutively over time, the other buildings have not changed much. Similar to the Hwagok case area, Susaek also consists of numerous stand-alone apartment buildings, row houses, and small-scale row-house complexes. These housing types act as a buffer between detached housing or low-rise individual buildings and small to medium-sized apartment complexes in terms of the two-dimensional territory and three-dimensional variations in height. However, the irregularly shaped, scattered apartment complexes do bring a strong contrast or abruptness to the surrounding context. Because they are usually located at higher elevations on the mountains, the resultant urban form is characterized by an arbitrary building orientation, abruptly rising tall buildings, obstructed mountain views, and a general lack in the sense of coordination.

Table 54 Changing parcels and buildings in the Susaek area

Morphological elements within the case block			Change over time				
			1970s	1980s	1990s	2005	2015
Building	quantity	# of AC buildings	4	13	21	49	49
		# of other buildings	4,530	5,231	5,418	4,904	5,153
		# total building	4,536	5,247	5,449	5,002	5,262
	area	(m^2) of AC buildings	2,892	9,118	19,495	54,706	58,901
		(m^2) of other buildings	328,349	433,091	494,285	551,647	561,189
		(m^2) of total building	331,241	442,209	513,780	606,353	620,090
Parcel	quantity	# of AC parcels	1	3	6	12	12
	area	(m^2) of AC parcels					

While the apartment complexes emerged consecutively over time, the other buildings have not changed much (Table 54). Rather, the slight increase in the number of sub-blocks has increased the road length, area, and number of intersection points in places where the urban area and general built-up area were extended. The sizes of the scattered apartment complexes, which are almost the size of a sub-block or slightly larger, create a strong contrast or abruptness against the surrounding context.

Similar to the Hwagok case area, Susaek is composed of numerous stand-alone apartment buildings, row houses, and small-scale row-house complexes. These housing types act as a buffer between detached housing or low-rise individual buildings and small to medium-sized apartment complexes in terms of the two-dimensional territory and three-dimensional variations in height. Overall, the area remains dominated by the fine-grained fabric, not apartment complexes, although closer attention is needed when new apartment complexes proliferate as part of the earmarked redevelopment projects. The area has been designated as the Suseak and Jeungsan Renewal Promotion

District 수색증산재정비촉진지구. However, since there are few apartments within the adjacent Yeokchon Land Readjustment Project, the transformation of the area depends on whether the Shinsoo process will be repeated or a broader planning vision implemented for the area. This will determine the speed of development and spatial outcome.

Figure 94 Aerial view of the Susaek case area
(Source: Naver Aerial View image compiled by author)

Table 55 Spatial attributes of the apartment complex boundary in the Susaek area

Apartment Complex Border	Elements		A (1987)	B (1987)	C (1988)	D (1992)	E (1993)	F (1994)	G (1999)	H (1999)	I (2001)	J (2003)	K (2004)	L (2005)
Surrounding Vertical Border Condition	Height	Low						●						
		Medium					●	●	●	●	●		●	●
		High		●	●	●	●			●	●	●		
	Type	wall		●	●	●	●	●		●	●	●		
		fence		●	●	●	●	●	●	●	●	●	●	●
		landscape		●	●	●	●		●	●	●	●	●	●
		Elevated or sunken topo		●	●	●	●	◐	●	●	●	●		●
	Length (m)			724m	436m	560m	325m	343m	534m	592m	1557m	476m	323m	334m
	Thickness	# layers		2	2	2	2	2	2	2	2	2	2	2
		Thickness		2m	1.5m	3m	2m	0.5m	2m	1.5m	2m	3m	1.5m	1.5m
	Other Function as Buffer	Private facility		●		●			●		●	●		●
		Public Facility									●	●		●
Control of Access	Vehicle control								●		●	●	●	●
	Gate			●					●	●	●	●	●	●
	CCTV										●	●	●	●
	# access point			1	1	1		2	1	2	2	1	1	1
Surrounding pedestrian and road condition	Pedestrian environ-ment	Ped-road outside AC			●	◐					◐	●		●
		Landscape outside AC				◐						●		

5.9 Interpretive Conclusion

The case study areas represent the seven agglomeration types and clarify how the agglomerations formed over time and the impact thereof on the neighborhoods in which they are located. Together, these seven types illustrate how Seoul became an apartment complex city and the apartment morphological regions formulated in different morphological periods. As ascertained, Seoul's apartment complexes agglomerated in various ways, ranging from scattered to loosely clustered to cohesively agglomerated depending on the development methods in urban and housing policies between 1970 and 2015. Also depending on the planning approaches adopted for each development method, apartment complexes were developed either concurrently or consecutively in regular or irregular shapes. While apartment complexes have matured since their initial development in the 1970s, their demolition and reconstruction have been planned from the 1990s, demonstrating the 20-year rebuilding cycle in Seoul. Although this reflects the ill-equipped heating systems of the initial apartment buildings, this short rebuilding cycle symbolizes the aspirations of the Korean people for a perceived better life. This aspiration explains the aggressive proliferation of apartment complexes across the city, as seen in the seven case areas discussed in this chapter.

In master-planned apartment towns such as the Sanggye and Jamsil area, the agglomeration of apartment complexes formed their own morphological region, which is clearly separated from the adjoining urban areas. On the other hand, numerous apartment complexes were built in the general built-up area (Susaek), land readjustment district (Munjeong/Garak, Hwagok), and residential renewal areas (Geumho, Shinsoo, Susaek). Regardless of whether apartment complexes were developed based on city planning or in more spontaneous ways, their location, size,

and shape demonstrate an arbitrary and opportunistic morphological character. Depending on their formative history, the areas have different degrees of agglomeration and formal regularity. The consecutive development of apartment complexes creates various degrees of dominance, juxtaposition, territoriality, and interconnectedness in the mix of the surrounding existing residential fabric.

Table 56 shows the increasing and decreasing elements as the neighborhoods are occupied by the increasing number of apartment complexes. As the number of apartment complexes increases, so does the private collective property area with controlled access. Accordingly, the length of the walled boundary also increases. Recently, the width of the complex border has thickened as multiple layers of elements are adopted, such as a fence, brick or concrete wall, and landscapes varying in height. On the other hand, while apartment complexes increasingly replace the existing fabric, the number of individual buildings and associated plots decreases along with public spaces such as roads, sidewalks, open spaces, and other neighborhood facilities. This change is more conspicuous in areas where the fine-grained fabric is mixed with consecutively emerging apartment complexes, such as the Munjeong/Garak area and Shinsoo. This will likely also occur in areas like Hwagok and Susaek.

The impact of apartment complexes on the surrounding neighborhoods can be determined from diverse perspectives. First, as many urban critics suggest, the territorial separation between the public and private realm is remarkable, as apartment complexes take an exclusive, inward form even in the master-planned development of the greenfield area. The privatization of urban space is more evident when housing renewal projects erase the existing street network to form a large assembled parcel for apartment development. Through apartment complex buildings, Seoul has increased the number of gated communities in which residents enjoy their lives using the amenities inside. Furthermore, the interconnectedness of the residential community is

Table 56 Transforming ordinary space by apartment complex proliferation

Increasing aspects	Decreasing aspects
· Number of apartment complexes · Number of access gate (private entrances) · Sub- blocks taken over by complexes · Control points and security system · Length of walled boundary · Thickness of boundary with multiple layers · Increasing detour · Privatized exclusive apartment amenities	· Access points into the urban block · Number of sub-blocks · Number of individual buildings · Number of individual plots · Access road, alleys and street connections · Intersections (options to walk through) · Public space (road, walkway, open space etc.) · Substandard urban environment · Communal relationship · Openness, accessibility, route options

also lost. A large apartment complex parcel disrupts the small-block street continuity, forcing residents to take detours. This is especially evident in the renewal areas where narrow streets weave through spontaneously formed neighborhoods. Furthermore, fewer interconnections between streets could decrease opportunities for social contact between neighborhood residents. As such, the long, exclusive boundary lines of apartment complexes foster a sense of social segregation.

Although some remain indifferent to the morphological consequences of apartment complexes, they also entail various aspects of the visual experience of people. As discussed for each case, when apartment complexes encroach the existing neighborhoods, the morphological character intensifies as an uncoordinated mixture, fragmented juxtaposition, abrupt scale change, and sensual lack of order and stability. This is especially true in the land readjustment areas, housing renewal district, and general built-up areas where the fine-grained low-rise nature has been destroyed by apartment complex developments. Even in case of concurrent, cohesive, master-planned apartment communities, this contrast is unavoidable at the district and urban scales.

CHAPTER VI

CONCLUSION

This study examined the construction of apartment complexes in Seoul during the period of rapid urbanization. The premise was that apartment complexes, rather than apartment buildings, provide a relevant conceptual window from which to examine Seoul's urban form and landscape to better understand apartment urbanism in the city. In Seoul, apartment buildings first appeared in the 1950s, and the first large apartment complex in the 1960s. In the 1970s, apartment complexes began to shape Seoul's urban form by popularizing apartment living, and within half a century, replaced the dominant mode of housing from the centuries old traditional detached houses. This study aimed to understand the spatial and morphological consequences of apartment complex buildings in a period of 45 years from 1970 to 2014. Employing the formal concerns of the school of urban morphology, this study focused on the materialized physical manifestation of apartment complexes. Focusing on apartment complexes, defined as consisting of two or more apartment buildings on a site, the study examined their development over time and morphological characteristics. It is believed that this work lays the foundation from which the distinctive character of Seoul's apartment urbanism can be better understood from domestic and inter-cultural perspectives.

6.1. Emergence of Apartment Complex City and Morphological Consequences

Instant apartment complex city

From 1970 to 2014, Seoul accumulated 2,172 apartment complexes containing two or more apartment buildings. (Complexes consisting of a single apartment building, namely stand-alone apartments were not included in this study.) Starting from a couple of demonstration apartment complexes in the early 1970s, considerable amount of apartment complexes have been constructed and among them, several complexes have been demolished while some has been replaced through reconstruction. The production rate accelerated within 45 years and given the accumulation of apartment complexes in such a short period, Seoul may deserve the title of "Instant Apartment Complex City."

Seoul's active construction of apartment complexes was promoted through various development methods and strategies supporting the urban and housing policies of the central government and City of Seoul. During the 1960s and 1970s, Land Readjustment Projects were widely applied for the purpose of urban expansion in all directions from the city center, providing small-plot residential subdivisions. Furthermore, apartment complexes began to emerge at larger sites as a result of the Han River Reclamation Project and Yeouido Development in the 1970s. The development of Gangnam supported the provision of apartment complexes by providing large parcels for the Yeongdong and Jamsil Land Readjustment Project in the 1970s to 1980s. In addition to providing large parcels for apartment construction, the central government and City of Seoul promoted the construction of apartment complexes through Apartment District zoning to attract the middle class to the Gangnam area, partly for defensive purposes. The involvement of the central government in housing supply in the 1980s further laid the foundation for the large-

scale Newtown-in-town developments as part of the Housing Site Development Project. Outlying farmlands and forests were transformed into master-planned apartment communities and small and medium-scale apartment complexes. During the same period from the late 1980s, the Housing Redevelopment Project gained momentum, becoming a major supplier of apartment complexes in numerous hillside and general neighborhoods in Seoul. In the 2000s, the Housing Reconstruction Project began to emerge, transforming the old apartment complexes built in the 1970s and 1980s, as the demand for quality housing remained strong consequent to sustained economic growth. Since the 2000s to date, the last vacant lands on the city periphery such as the Eunpyeong, Magok, and Gangil districts, were developed through Urban Development Projects through heavy public involvement, providing a new style of apartment complexes. While these institutionalized development methods were in motion, numerous small-scale, privately initiated apartment complexes arose in the general neighborhoods through the individual building permit process under the zoning regulations. In fact, among Seoul's 2,172 apartment complexes, 534 were developed in the General Built-up Areas. Furthermore, consequent to the development of apartment complexes, traditional detached houses lost their long-held dominance as the prime living mode of the Korean people.

Morphological characteristics of apartment complexes

The most direct spatial and morphological consequences of Seoul's apartment complex construction for the last 45 years is its ubiquity. Although the 2,172 apartment complexes occupy less than one fifth (18.4%) of the residential area, these complexes are widely scattered across the urbanized area, because the residential area (88% of the

built-up area) dominates the space in which most are located. This pervasiveness is evident in their spatial dispersion over Seoul's 605 km^2 terrain, not only in general urban areas, but also along the Han River and other tributary streams, bordering mountains, and hilly areas. This ubiquity forms the unique visual pattern of the urban grain, spatial configuration, skylines, and general collective form. It provides Seoul with its image of an apartment city, as the clustered tall apartment buildings hide the more widespread low-rise areas, dominating the city's visual exposure.

Individually, apartment complexes display various morphological characteristics. Many arise from the fact that apartment buildings are constructed on a single large parcel. The size of the parcel (complex site) averages 26,888 m^2, and an average apartment complex contains eight apartment buildings. Although half the apartment complexes accommodate 2 to 4 buildings, more than 100 sites consist of more than 20 buildings. In extreme cases, more than 100 buildings were developed as part of a single apartment complex. This suggests that a substantial grouping of apartment buildings constitutes the morphological character of Seoul. The shape of a parcel can be in a regular form in planned development methods such as the Land Readjustment Project, Housing Site Development Project, and Urban Development Project, although irregularly shaped parcels are also significant when these methods were applied to mountainous or greenfield areas. An irregular parcel shape is more prominent in the Housing Redevelopment Project area and General Built-up Areas.

Although Seoul's apartment buildings are becoming higher, slimmer, and shaped more freely in terms of architectural style, the traditional south-facing, regularly shaped, flat building form is still pervasive. The mixed building styles springing up in groups provide Seoul its urban form, which may not be as stable or homogenous as that in Western or other East Asian cities. This character is more evident when considering the various parcel shapes of the apartment complexes in Seoul. It is notable

that the parcel shape of more than half the complexes is irregular, even though most were planned and developed by the government or through local public intervention. Even when regularly shaped, many exhibit deflecting or zigzagging forms. This irregular characteristic is affiliated with the arrangement of buildings, resulting in an indefinable urban form with confusing apartment building orientations.

However, the parcel size and shape do not play a role in the morphological frame influencing subsequent building actions. The data-based correlation analysis indicated that parcel size is a simple container of apartment buildings, not an internal force framing the subsequent building form. Despite the variety in parcel shape, the architectural style and arrangement of apartment buildings remains simple. The little to no influence of internal forces on morphological elements indicate that Seoul's apartment construction was influenced by external forces emanating from outside the form. Many urban thinkers highlight market forces as the key determinant shaping the form of apartment complexes in Seoul. Consistent is the pursuit of the maximum building height and FAR allowed by the regulations in specific periods, regardless of the morphological frame. It is also likely that architectural styles and building layout have been subordinate to this goal, more likely to reflect the changing housing market situation and planning regulations.

The morphological patterns of each development method reconfirm this evolutionary process of the development of Seoul's apartment complexes. Only the shape of the parcel and bordering street is connected to the development methods, which involve different degrees of public intervention and planning approaches and apply to different topographical and local contexts. Other elements demonstrated only a weak relationship with development methods, reflecting that these are determined based on the financial feasibility of the project in the market-driven, privately initiated construction mechanism of Seoul's apartment complexes. The private sector nature of

the construction of apartments in Seoul is accompanied by the weak provision of roads and other community infrastructure. In many cases, apartment complexes were poorly serviced in terms of the hierarchy and bordering portion of the roads, even though most complexes were planned and developed through the development methods for which the government provided legal foundations.

The locational and agglomeration patterns of apartment complexes also provide Seoul with a unique morphological character. Among the 2,172 apartment complexes, more than half (53.5%) are located at an altitude of between 0 and 25 m, 824 (37.9%) at an altitude between 25 to 50 m, and 195 (8.6%) at an altitude of more than 50 m. Although exceptional, 40 complexes are located at an altitude higher than 75 m. Over the years, the apartment complexes in Seoul have been constructed at higher elevations. Among those located above 50 m, more than 50% were developed in the 2000s and later, mostly as part of the Housing Redevelopment Project. This trend coincides with the increasing topographical gap between the highest and lowest points in an apartment complex. Approximately 53% of the 2,172 apartment complexes in this study were developed on flatlands that did not differ topographically. However, 27% of these complexes are constructed on inclined sites with level differences of 5 m, and 20% on slightly inclined sites with less than a 5 m topographical difference. Furthermore, 121 complexes (5.6%) are constructed on sites with a 25 m difference between the highest and lowest points, and 27 (1.2%) on sites that differ by 45 m within an individual complex. Thus, on many Housing Redevelopment Project sites, multi-terraced grading is common with zigzagging internal roads and stepped building placement. Since they are located on the hillside or hilltop, a mass of tall, plank apartment buildings create Seoul's unique, multi-layered, cascading hillside apartment landscape. As these apartment complexes have multiple buildings, a grouped mass replaces the natural topography with a manmade skyline, obstructing the mountain views. This siting

pattern sometimes exaggerates the natural topography, enclosing the general residential neighborhood in the lower part of the city.

Diverse patterns in terms of apartment complex forming or siting are evident within the urban block. At times, the apartment complex becomes an urban block or single or multiple complexes are contained within the urban block. In total, 615 urban blocks were identified as containing the 2,172 apartment complexes investigated in this study in Seoul. Of these, 217 urban blocks (35.3%) could not be defined as an urban block the remaining 398 urban blocks (64.7%) were of various sizes and shapes as influenced by the development methods applied. Among the 615 urban blocks, 2.5% of the complexes constitute the whole block, such as the Jamsil 1–4 Apartment Complexes. The rest are embedded in the urban blocks in some way. Nearly 80% of the apartment complexes are positioned with other complexes, creating a fragmented composition when detached or abruptness when multiple apartment complexes are grouped. In terms of the occupational relationship with other apartment complexes, other than those developed as part of the master-planned housing site development and urban development methods, a mixture of detached and adjoined complexes is evident. This means that regardless of the block size, most complexes are embedded alone or with other complexes in large urban blocks adjoining the non-apartment urban fabric, mostly fine-grained, low-rise residential neighborhoods.

This provides the mixed nature of the residential area in terms of housing types such as detached houses, small multi-unit flats, and apartments of varying heights. The diversity of housing types in residential neighborhoods may be advocated by design theories as desirable. However, in reality, in Seoul, this mixed nature means that apartment complexes dominate the urban blocks in which they are embedded in terms of building mass, height, and territoriality. The resulting urban form manifests a formal character of contrast, fragmentation, incongruence, and heterogeneity. Furthermore,

this morphological character extends across the city, as diverse types of urban blocks containing apartment complexes are pervasive at the citywide level.

Diverse morphological regions forming Seoul's urban form

The present pervasiveness of apartment complexes is the result of continuous, piecemeal development at various scales over the last half century. In fact, the locational progress of apartment complexes accompanied the urbanization of Seoul, in which aggressive annexation expanded the built-up area in all directions in 1963 to the current area of 605 km^2. In many cases, apartment complexes were at the forefront of this territorial growth; thus, they have formed various types of morphological regions, a homogeneous urban form developed in a particular or morphological period. Given that the city is a spatial combination of various morphological regions, these agglomerations provide the urban landscape of Seoul with a unique morphological quality.

Planned development at the Newtown scale, such as Mokdong, Sanggy, Gaepo, Godeok, and large apartment complexes along the Han River constitute the unique morphological region produced through the governmental urban and housing policy in the developmental 1970s to 1990s. Developed *en-bloc*, these morphological regions showcase the mass production of a strongly homogeneous form and lifestyle. This homogeneous form of apartment complexes should be regarded as Seoul's unique formative process of urban form, which is comparable to the 19th century modernist urban expansions in European cities, 20th century Levittown suburban development, and master-planned communities in American metropolises or the more recent urbanization developments in Asian urban centers. Equally significant and unique is

that these agglomerations are dispersed in all directions of the city, from the inner riverside to outer fringe. These morphological regions accommodated the rapid urbanization of undeveloped areas on the fringe of the built-up area. Expanding the built-up area through land conversion is a typical process to ensure the growth of a city and internalize undeveloped fringe areas into the city. The dispersed large-scale apartment complex agglomeration areas demonstrate this internal history of Seoul's built form.

In addition to these large-scale, concurrent agglomerations, Seoul's unique morphological character stems from the evolutionary agglomeration of apartment complexes. As developments occur individually, the resultant degree of aggregation varies. Large-scale agglomerations have been achieved in areas such as the Geumho, Oksu, and Mia Housing Redevelopment areas. Less agglomeration is evident in the Shinsoo, Gwanak, Hapjeong, and Banghwa areas, although they will become more agglomerated over time. Since most Housing Redevelopment Projects were implemented on hilly locations, the agglomeration of these apartment complexes strongly impacts the morphological character of Seoul's urban form. The clustered tall apartment buildings are grouped in various orientations, architectural styles, and topographical levels, often without a clear logic of coexistence. Topographical variations and mountain ridgelines are subdued by the apartment buildings occupying high altitude areas, dominating Seoul's skyline.

Loosely clustered apartment complexes are another morphological consequence of agglomeration. Neither heavily agglomerated nor completely scattered, in this pattern, there is some distance between apartment complexes, which are juxtaposed with the non-apartment residential fabric. This pattern materialized mainly in Land Adjustment Project areas such as the Munjeong and Garak area, which was developed in the 1980s, and the Yeongdeungpo Semi-industrial district where vacant factory sites were

converted into apartment complexes in a piecemeal manner. This formative process provides Seoul with a unique morphological character in which apartment complexes are intermingled with the low-rise, fine grained residential fabric in a fragmented way. Because of this character, Seoul presents a heterogeneous and abrupt urban form.

The most scattered or least clustered pattern emerges when small apartment complexes are individually dispersed among the prevailing low-rise, fine-grained residential areas. This pattern resulted from the development of individual apartments through the assembly of small plots or land conversion of sizable plots in residential areas plotted when apartments were not a widely accepted housing type. These areas were plotted under the Land Readjustment Project or spontaneously formed until the 1970s. Later, the Housing Reconstruction Project and Housing Redevelopment Project produced the individual apartment complexes located in low-rise residential areas. This scattered pattern is evident in residential areas in Seodaemun-gu, Eunpyeong-gu, Mapo-gu, Gangseo-gu, Guro-gu, Seocho-gu, Gangdong-gu, Seongdong-gu, Gwangjin-gu, and Seongbuk-gu. In these areas, individual apartment complexes arose in an opportunistic way, creating abrupt scale changes and distinct territorial areas. As such, the unplanned mixture and juxtaposition with low-rise, fine-grained residential fabric is likely determined by individualistic values rather than the community vision.

These distinctive morphological regions comprise apartment urbanism in Seoul. While these suggest Seoul's unique morphological nature, Seoul is also unique in that these morphological regions are constantly changing. Large-scale agglomeration regions are being transformed through Housing Reconstruction Projects focused on individual apartment complexes, and the development of complexes is intensifying in general and hillside neighborhoods, advancing from scattered agglomeration to loosely clustered and heavily clustered states. From the city center to the city limits, morphological regions are being partially or entirely encroached on, mixed, and

replaced by newer areas. Therefore, it is difficult to map the morphological regions of Seoul, as through constant change, they become entwined with different morphological areas in a fragmented manner. Perhaps this indefinable amalgam or hard to distinguish patchwork of different urban fabrics is the morphological nature of Seoul's apartment urbanism.

6.2. Critical Reflection on Seoul's Apartment Complex Urbanism

The construction of apartment complexes over the last half a century brought up the unique morphological character of Seoul's urban form and landscape. This study intended to provide an evidence-based interpretation, using judgmental terms in a neutral sense rather than highlighting positive or negative implications. However, as noted in Chapter 5, apartment complexes increasingly determine the communal lives of the people living in Seoul. As the number of apartment complexes increases, the number of private collective property areas with controlled access has also increased. Accordingly, the length of walled boundaries has increased and the width of the complex borders have thickened after adopting multiple layers of elements including fences, brick or concrete walls, and a landscape varying in height. On the other hand, while apartment complexes continue to replace the existing fabric, the number of individual buildings and associated plots and collective sub-blocks is decreasing along with public spaces such as roads, sidewalks, open spaces, and other neighborhood facilities. This change is more conspicuous in areas where the fine-grained fabric is mixed with consecutively emerging apartment complexes. However, the recent discourse on global urbanism considers this tendency to be a widespread urban reality in post-modern world cities, not uniquely a Korean phenomenon. Therefore, it is

relevant to highlight generalizable social implications based on the morphological understanding of apartment complex urbanism.

Large unit of change and long-term adaptability

Apartment complexes are characterized as a single large parcel of land under joint ownership or control. As a large urban cell, apartment complexes equate to what Colquhoun (1969) calls a superblock. According to him, the controlling agencies—corporations, speculators, or local authority—create large pieces of land, in other words, a superblock, within the city. These superblocks and related emerging issues represent the disconnection between the urban tissue composed of individual dwellings and the superblocks that partially take over. Furthermore, the incongruity between the existing urban context and representation of the superblock break the existing continuity. Gauthier (2006) argues that rapid transformation and disruptive development resulted in fragmentary patterns and a plurality of urban configurations. Large-scale housing complexes have been developed as a self-contained entity that contributes towards fragmenting urban contextual continuity, thus intensifying incongruity (Colquhoun, 1969).

However, along with the physical implications, a large parcel implies "large unit" urban change, wherein decisions and actions will be made collectively. Urban scholars emphasize that large-scale complexes are less flexible in adapting to future urban transformation than detached, semi-detached, or multiplex housing, which is replaced through the "incremental change" brought about through the infill development of individual parcels (Kim, 2001; Park, I.S.,2013; Park, C.S., 2013). Further, joint decision-making often entails social conflicts between complex members (An, 2017).

The owner or government may harm the ability of the city to heal itself incrementally through small organic changes. Sheers (2017) adds that a large parcel may become a long-term problem, since it now requires a powerful or resourceful entity to adapt it to the new way of life when the time comes to do so. She emphasizes the importance of a fine-grained tissue plan in establishing and maintaining typological and morphological order over the generations. This global view on urban change requires a fuller debate as to Korean cities that have its own morphological dimensions and patterns in terms of parcel, building and street.

Urban fragmentation and discontinuity

The proliferation of enclosed private residential communities, referred to as gated communities or "quasi-autonomous socio-spatial entities," is a conspicuous global phenomenon closely affiliated with the issue of urban fragmentation in many ways (Coy, 2006; Farah and Teller, 2012). Spatially, the agglomerations of private enclaves are changing road structures to match their preferences, creating archipelagoes that interrupt the reciprocity of the existing urban fabric (Landman, 2006). Physically, large-scale private territories with walled boundaries diminish access to various public realms and create inefficiencies such as detours. The privatization of urban space creates social issues concerning the public's right to access the city, and as only residents can enter these private enclaves, this may affect communal solidarity among different social groups (Banerjee, 2001; Kirby, 2008). Urban fragmentation is a term that emerged in the urban socio-spatial discourse. It is associated with concepts such as segregation, marginalization, disintegration, and relegation, and poses extensive challenges to urban planning (Farah and Teller, 2012; Michelutti, 2010). According to

Farah and Teller (2011), quasi autonomous socio-spatial entities disconnect networks by rather relying on internal resources.

When an apartment complex takes over a large territory within the existing fine-grained urban site, it inevitably causes disconnectedness and discontinuity. Large complexes sometimes alter traffic patterns or obstruct access to the public spaces that were once an intricately connected fabric. Moreover, the total length of physical barriers is increasing, as well as the differentiation and discrepancy in infrastructural resources between internal complex environments and their vicinity, which promotes a sense of incompatibility and disconnects the two neighboring spatial systems (Le Goix, 2005). In addition, highly contrasting urban fabrics result in generating an abrupt and random urban form.

> When the densifying process takes place, it may be phased sequentially, coherent with the existing city or represent a break with previous configurations and give rise to random building development that impairs the continuity of the grid. The inherent adaptability of the grid may thus lead to the disruption of the urban coherence established in the initial stages. … Sudden changes in volume, often due to the skyscrapers of arbitrary height, lead to imbalances in the urban structure that are detrimental to the value of the city block as an entity (Busquets, 2013).

From the perspective of the existing urban fabric, the public should propose a master plan for the area that is less destructive or fragmentary and more an integrated vision. For instance, well-connected passageways and various public or buffering spaces should be provided (Bahk et al., 2009).

Privatization to exclusivity

Apartment complex have become a common residential type more or less transformed into enclosed, self-contained communities that include housing, an internal road network, open spaces, and communal facilities. As privately owned land, access to internal amenities is allowed only to residents, and signs of exclusion proliferate. Segregating the area is accomplished through security gates, building boundary fences that resemble ramparts, installing closed-circuit television for video surveillance, and implementing exclusive landscapes and environmental designs. Recent research shows that the many recently built apartment complexes have been part of a public agenda to provide an enhanced infrastructure and preferred public space through private developers. However, the design of these complexes lacks careful consideration of space in terms of harmony with the existing community and urban fabric (Park, 2013b; Gelézeau, 2007). At the same time, attention has grown on the increasingly exclusive and isolated features of gated housing in terms of physical and socioeconomic aspects (Park, 2013a). This has resulted in a strong distinction between the privacy of internal dwellings and outer public territory (Rowe, 2005).

Gating and access restrictions have been progressively reinforced by each apartment complex, especially in the past decade. A simple way to mark a boundary, such as installing a low wall or fence and placing a security guard, was the norm since these complexes were first constructed in the 1970s. However, Gelézeau argues that the neo-liberal transformation of Korean housing construction since the mid-1990s has led to the emergence of "gated community-style residential environments" (Gelézeau, 2008). Borders have evolved into a complicated layering of various barriers, and access control has become excessively fortified. This has ushered in a steady decline in overall public spaces and increased the number of privatized, privileged quality spaces

for the internal community. These communities are comprised of families with similar social status, making the private enclaves more homogeneous and intensifying the degree of socio-spatial segregation, resulting in "spatial stratification" and urban fragmentation (Gelézeau, 2008; Ha, 2004; Kirby, 2008; Low, 2003; Shin, 2009). Yoon points on the intensifying discriminative neighborhood effect that embeds strong exclusive homogeneity notably conspicuous among large-scale apartment complexes (Yoon, W.S., 1991). The overall urban environment has been enhanced, while not all the residents are privileged to the well-organized gentrified space (Kim, S.H, 2011).

Globally, it has been addressed that increasing the privatization of territory raises complicated issues and concerns in terms of spatial, physical, and social dimensions. Banerjee points out that the deferred substitution of private participation for the government's role has led to the "commodification of urban space and public good," and a constant decline in the quality and supply of public spaces (Banerjee, 2001: 12). This results in the extensive privatization of public spaces and expanding privately controlled spaces (Blakely and Snyder, 1997; Kirby, 2008). The continuous use of walled boundaries has diminished access to streets and former public spaces and amenities, causing inefficiencies. Here, income and social status also come into play in terms of denying entry. These concerns regarding spatial justice or social exclusion are acknowledged as "one's right to the city"(Mitchell, 2003).

> … Gated communities deepen the fragmentation of urban society and urban space. Due to their totally privatized organization, they form new extraterritorial spaces beyond public management and control, and consequently, they render the boundaries between public and private space increasingly irreconcilable (Coy, 2006: 122).

Urban issues regarding private enclaves involve not only spatial and physical issues, but most important, the social aspects associated with urban residents. As spatial and social polarization intensifies along with the continuous agglomeration of private enclaves, the issue must be approached from both perspectives. Essentially, the isolating gated exclusiveness of apartment complexes must be reconsidered and reconfigured in alternative ways to connect and maintain a degree of privacy.

Different views on morphological consequences

Despite these negative views on the social consequences of apartment complex building in the discourse of global urbanism, the apartment living continues its popularity among Korean people. There is increasing expectation toward living in an apartment complex in terms of purchasable infrastructure and quality of life such as access to green open space, high level of security and privacy, quality communal space, and various other benefits. Recently, underground parking is widely employed in apartment building allowing plentiful programmed outdoor spaces for resting, exercising, taking a walk along with playgrounds and communal facilities including elderly welfare center and childcare center for the apartment complex residence (Kim, D.H., 2008). Innovations in unit plan, interior design, electronic equipment and various eco-friendly features support the continuing building of apartment complexes. As mentioned earlier, despite the critical scholarly views, the apartment building has thrived in the market and public policy. Capitalist and neo-liberal thinkers and government housing planners maintain that apartment building should be credited in providing quality housing in such a short period of rapid urbanization. They also think that its market-centered, private-sector-initiating mechanism of mass production was

effective and efficient as a means of achieving goals of housing policy.

As to the resultant urban form, the morphological character of apartment complexes has rarely been on social issues among the general public. Comprehensive plans, landscape management plans and development guidelines of local governments do address the height and design issues of apartment. Yet, their regulatory implementation has been largely minimal in the sense that it could not determine the morphological consequences examined in this study. Rather, morphological dominance of apartment buildings is often viewed as a symbol of sustained economic achievement of Seoul and Korea. It is also portrayed as new mighty urban form only observable in the world's largest mega-cities. One might view them as urban form that is dynamic, diverse and free from central control, rather than fragmented, abrupt and arbitrary. Thus, as Marshall (2004) implied, while Seoul might deserve being characterized as a less-planned city due to the lack of the visual order and stability, it may simply be a self-justifiable cultural production of determining its own urban destiny, which is different from Western culture and value. The pros and cons of morphological consequences of apartment complex building remain on the realm of planning agenda and public debate.

6.3. Limitations of the Study and Future Research

A noted interpreter of the Korean urban landscape, Lee Kyu Mok (2002) observed that East Asian cities, especially the Korean cities that experienced rapid transformation, have a unique character of duality rarely found in European cities. By duality, he meant the western influence on eastern culture and the resultant hybrid built form. He calls for a sincere understanding and interpretation of the historicity and "placeness" of

Korean cities to improve cities and buildings based on the indigenous regional and urban context. The English urban morphologist Larkham (2005: 24) also notes that "we should be learning from past forms" by retrieving lessons from the accumulated form of the city and integrating these into urban design. He also highlights several problems in the field of urban morphology. While contemporary cities have been developing at an unprecedented scale and speed, there is little documentation, recording, and reference to the urban form and context. Larkham (2005) insists that there is also a lack of genuine comparative research in the global context within the study of urban morphology. Future studies may extend understanding of the evolving shape of urban forms, including the inherent differences, similarities, mutual implications, and diverse strategies and applications. This study intends to address these research needs. As mentioned in the introductory chapter, this study adopted the theoretical and methodological perspectives of urban morphology, as the main concern was to know the form as a historical product and the physical consequences of the time-bounded actions of apartment complex building. However, the research is also an applied morphological study addressing its own research inquiries and limited information. Thus, recommendations for areas of future study are provided to ensure a deeper morphological understanding of Seoul's apartment urbanism.

Most important, the building dimension is only schematically examined in this study. The types of apartment buildings have evolved significantly in terms of unit layout, unit plan, building mass, and exterior design, reflecting the changing demographic, economic, and market situation. A study on apartment building typology is needed for a more systematic documentation of apartment complexes in Seoul. Likewise, the internal form of apartment complexes is also worthy of further study. Again, this study covered the schematic building layout, and did not focus on the formal organization of internal roads, open spaces, parking, other common facilities,

and building layout. Excluding these important aspects of apartment complexes from this research is acknowledged as a limitation of this work as a morphological study.

Another limitation, although intentional, is that this study did not include complexes with single apartment buildings, namely stand-alone apartments. Since one third among the total apartment site number (approximate total around 3,800 apartment sites) is stand-alone apartment complexes, it is important to study them to understand Seoul's apartment morphology in more depth. Also needed is research on apartment complexes constructed through the development method classified as the 'General Built-up Area' in this study. This method was classified as such because it was not identifiable in the available city information. Of the 2,172 apartment complexes examined in the study, 534 (around 25%) were developed through this method. Their formative process and morphological character is worthy of further systematic study.

Given these limitations, this study can be distinguished from the exiting scholarly examination on Seoul's apartment urbanism in some aspects. The comprehensive coverage of entire 2,172 apartment complexes (two and more apartment buildings) is the first attempt of which information value can serve the domestic and cross-cultural urban form studies. Analytical nature and typomorphological approach may be not new as many domestic journal articles often employ these epistemological orientations. Yet what is new in this study is the systematic, data-based application of them in order to fully document the morphological consequences of apartment building from the inception years to date (1970-2014). Thus the morphological consequences of apartment complex building are treated as a historical product, rather than certain issue-based subject. The study is also distinguishable in terms of morphological dimensions employed. In addition to formal characteristics of individual apartment complexes, their geographical siting, urban block formation and agglomeration patterns are mapped and analyzed in the wider context of Seoul's urban growth. By

viewing apartment complex building as a generator of morphological regions representing the urban form change of over time, the study contributes to expand the perspectives on Seoul's apartment urbanism to the city scale and geographical dimensions.

Thus, it is author's hope that the documentation and findings of this study serve as basic, grounded information upon which the fuller examination of apartment urbanism in Seoul and Korea can be built. From academic and planning points of view, the various issues can be raised from this study. From the point of urban morphological study, the explanatory dimension of why Seoul's apartment complexes looks the way they do is of particular interest. It needs to go beyond this study's simplified examination of development methods and time period. Who made apartment complex looks this way, in other words, the agent of change should be investigated in detail – developers, designers, planners, regulators and general consumer will be under study as the agent of change over time. In doing so, the planning and design ideas, public policies, regulatory contents and changing market trend is to be incorporated into the explanatory discussions. As apartment complex building continues, the mutation process of residential neighborhoods is also important area of academic study. Their continuous occupation in the neighborhood calls for the on-going documentation and research as to the neighborhood change and their cumulative impacts. The cycle of reconstruction of apartment complex is also the key scholarly interest as they much represents Seoul's urban form change in recent and presumably in the coming years. In urban morphology, the rebuilding cycle is regarded as one of important aspects in understanding the urban form change in one city as well as in comparing the morphological difference with other cities (Whitehand, 1994).

From practical side, how to manage apartment complex construction and its neighborhood impacts is an essential planning issue. This study shows, despite heavy

involvement of the national and local governments, the assessment of the resultant environmental qualities can be mixed. While the apartment complexes contributed in providing the quality housing and residential amenities for those who afford them, they did not much contributed to the improvement of the neighborhoods in which they are located. And territorially, they fostered the sense of exclusiveness and segregation, although there is a certain degree of social acceptance to this phenomenon in Korean context. As apartment complex building continues through Housing Redevelopment Project, Housing Reconstruction Projects and other development methods, planners are with significant opportunities of tuning individual apartment complex construction into making a better residential neighborhoods and overall urban form. Reducing the degree of exclusiveness through increasing the level of shared realm can be pursued – for example, less exclusive border lines, more shared common facilities, neighborhood-respecting building design and others can be implemented even in the current development procedures. Keen attention and efforts toward how the apartment complex will reproduce new interrelationship by maintaining physical and social points of contact with the surrounding urban neighborhoods may contribute in stabilizing an overall sense of community.

In the citywide plan-making, more specific site designation and design guidelines is necessary in consideration of local connectedness, site boundary served by appropriate roads, and relevant site planning and design. These planning guidelines should be area-based, not uniform, as this study shows that apartment complexes are in the variety of locational, topographical, clustering and neighborhood situations.

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Daum Map다음지도	http://map.daum.net/

APPENDICES

Appendix 1. Overview of Seoul

1.1 Basic Information of Seoul Administrative district

1.2 Land Use of Seoul

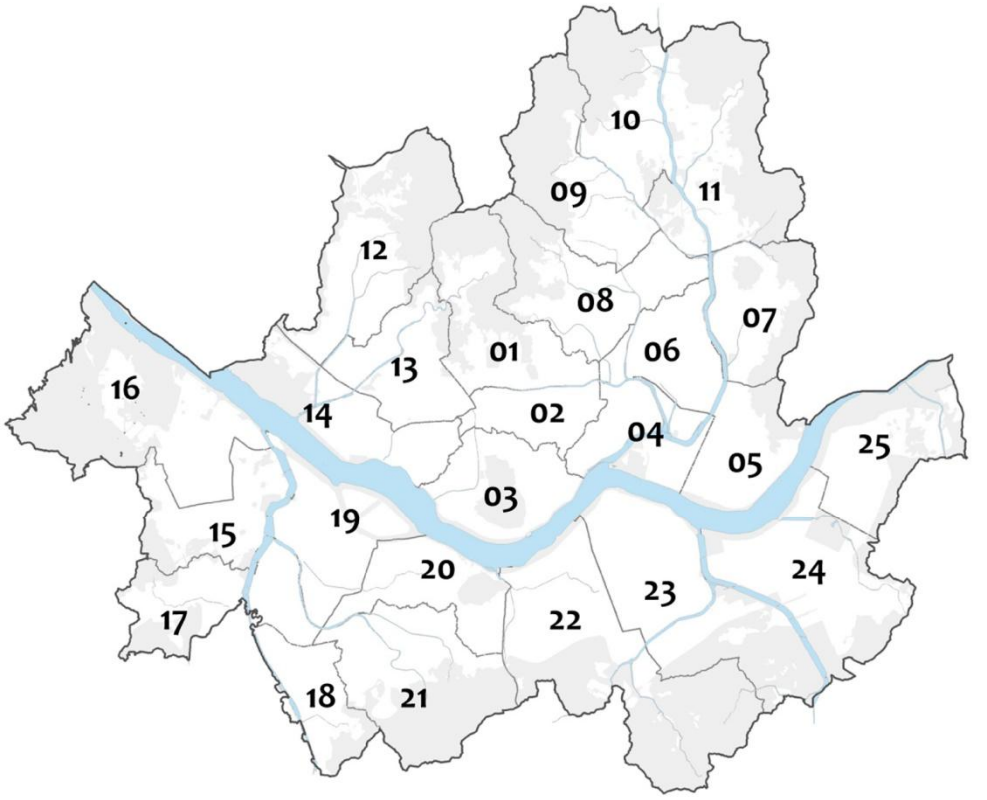
1.3 History of Urban Planning Policy and Legislation

Appendix 2. Supplementary Materials of Apartment Complex Cases in *Chapter 2*

Appendix 3. Morphological Characteristics of Apartment Complexes by Development Methods (graphical representation) in *Chapter 3*

Appendix 1. Overview of Seoul

1.1 Administrative district of Seoul | 25 Boroughs (gu)



01	Jongno-gu	06	Dongdaemun-gu	11	Nowon-gu	16	Gangseo-gu	21	Gwanak-gu
02	Jung-gu	07	Jungnang-gu	12	Eunpyeong-gu	17	Guro-gu	22	Seocho-gu
03	Yongsan-gu	08	Seongbuk-gu	13	Seodaemun-gu	18	Geumcheon-gu	23	Gangnam-gu
04	Seongdong-gu	09	Gangbuk-gu	14	Mapo-gu	19	Yeongdeungpo-gu	24	Songpa-gu
05	Gwangjin-gu	10	Dobong-gu	15	Yangcheon-gu	20	Dongjak-gu	25	Gangdong-gu

1.2 Land Use of Seoul

1.3 History of Urban Planning Policy and Legislation

	1960	1970	1980	1990	2000
Political Agenda	• Government lead urban development under president Park Jung-Hee • 1st Economic Development Plan1차경제개발계획 (1962-1966) • 2nd Economic Development Plan2차경제개발계획 (1967-1970)	• Housing Construction 10 Year Plan8대건설10개년계획 (1972-1981) to provide 2.5 million houses • 3rd Economic Development Plan3차경제개발계획 (1971-1975) • 4th Economic Development Plan4차경제개발계획 (1976-1980) • 1st National Comprehensive Development Plan1차국토종합개발계획 (1972)	• Hosting global events (1986 Asian Games & 1988 Seoul Olympic) • 5 million household construction plan8대500만호 건설계획 (1981) • 2 million household construction plan8대200만호 건설계획 (1988) • 2nd National Comprehensive Development Plan2차국토종합개발계획 (1981) • 5th Economic Development Plan5차경제개발계획 (1981-1986) • 6th Economic Development Plan6차경제개발계획 (1987-1991)	• Resolving disparity of infrastructure and maintenance between Gangnam and Gangbuk • 7th Economic Development Plan7차경제개발계획 (1992-1996) • 3rd National Comprehensive Development Plan3차국토종합개발계획 (1991)	• Housing stabilization strategies for working-class (2000~) • 200 thousand National Public Housing3만호영구임대주택 construction (2001) • Additional 500 thousand National Public Housing and 1 million Long-term Public Rental Housing장기임대주택 (2002) • Introduction of New Town Project뉴타운사업 and Balance Development Promotion Project균형발전촉진사업 (2003)
Socio-economic	• Rapid influx of population and increase rate accompanied with urban squatter problems	• High growth of national economy brings middle-class expansion • Oil Crisis (1973)	• Constant concentration of population toward Seoul • Increasing housing demand and insufficient housing supply	• Income polarization intensifies • Gating & segregation: branded apartment complexes appeared • Property Real-name system부동산실명제 (1995) • IMF fund withdraw (1998)	• Sudden rise of real estate and housing price (2000~2003) • Signs of decreasing population, restructuring industry and housing deterioration • National income (per capita) $20,000 • Global Financial Crisis세계금융위기 (2008)
Demographic /Urbanization	• 1960: 2.45 million • 1965: 3.47 million	• 1975: 6 million • 1969: 8 million • Gangnam region development plan • Designation of the development restriction zone (1972)	• 1980: 8.5 million • 1988: 10 million • Improving urban infrastructure and city appearance through Han River maintenance, subway construction, and residential redevelopment.	• Satellite cities (Bundang, Ilsan etc.) development outside Seoul (1995)	• urgency on urban regeneration and revitalization • Built Environment Renewal Development Act도시재생촉진법정비법 (2002) • Restoration of Cheongy River청계천복원사업 (2003) • Special Act on Urban Improvement Promotion도시재정비촉진을위한특별법 (2006)

Housing Construction	• Planar expansion of residential area planned by grid pattern • Housing provision through detached housing type • Apartment housing type introduced	• foundational housing construction acts were established under state intervention • 'Apartment District' specified zoning regulation established	• Clearance and redevelopment of squatter settlement, reconstruction for obsolete area.	• Active 'Housing Reconstruction Projects' in the city due to signs of obsolescence	• Active 'Housing redevelopment' & 'Housing Reconstruction projects' • Expansion of High-rise residential buildings with commercial mix
Housing Policy	• Urban Planning Act도시계획법 (1962) • Land Expropriation Act토지수용법 (1962) • Public Housing Act공영주택법 (1963) •Land-Compartmentalization and Rearrangement Projects Act토지구획정리사업법 (1966)	• Housing Construction Promotion Act주택건설촉진법 (1972) • 10 year period 2.5 million housing provision plan250만호건설10개년계획 (1972) • Urban Redevelopment Act도시재개발법 (1976) • Apartment District아파트지구 legalization (1976)	• Housing Site Development Promotion Act택지개발촉진법(1980) • Temporal Act for Low-income Resident's Residential Improvement Project 도시서민 주민의 주거환경개선사업을 위한 임시조치법 (1989)	• Urban Development Act도시개발법(2000) • Built Environment Renewal Development Act도시 및 주거환경 정비법 (2000) • National Land Planning and Utilization Act국토이용계획및이용에관한법률 (2003) • Special Act on Urban Improvement Promotion도시재정비 촉진을 위한 특별법 (2006) • Rental Housing Act임대주택법	• National Land Planning and Utilization Act국토이용계획및이용에관한법률 (2002) • Special law on urban revitalization and support 도시재생 활성화 및 지원에 관한 특별법 (2013) • Housing Act주택법 (2003)
Housing Development Projects	• Land Readjustment Project토지구획정리사업 • Housing Site Preparation Project영단의 주택지조성사업 (1962) • Citizen Apartment시민아파트 construction (1968)	• Land Readjustment Project토지구획정리사업 • Housing Site Preparation Project영단의 주택지조성사업 • Urban Redevelopment Project도시재개발사업 • Site Formation Project택지조성사업	• Land Development Project택지개발사업 • Joint Urban Renewal Project합동재개발사업 (1985) • Housing Reconstruction Project재건축사업 • Residential Improvement Project주거환경개선사업 • Introduction of Multiplex housing다세대다가구주택도입(1985)	• Introduction of Multi-family house 다가구주택도입 • Newtown Project뉴타운사업 • Housing Redevelopment • Housing Reconstruction	

Appendix 2. Supplementary Materials of Apartment Complex Cases in *Chapter 2*

Main Category of 7 DM			Specific Category of 14 DM			AC
1	HLR	Reclamation Project한강공유수면매립사업	1	HLR_HSP	Housing Site Preparation Project	Yeouido Sibeom
			2	HLR_LRA	Land Readjustment Project	Jamsil Hyundai
			3	HLR_GBA	General Built-up Area	-
2	LRA	Land Readjustment Project토지구획정리사업	4	LRA	Land Readjustment Project	-
3	HSD	Housing Site Development Project택지개발사업	5	HSD_NIT	NIT-scale Housing Site Development Project	Gaepo Jugong Apartment 4
			6	HSD_L	Large-scale Housing Site Development Project	Shinae Shiyoung Apartment 9
			7	HSD_SM	Small and medium-scale Housing Site Development Project	-
4	UDP	Urban Development Project도시개발사업	8	UDP_NIT	NIT scale Urban Development Project & Newtown over-layered	Eun-Pyeong Newtown Hyundai Hillstate
			9	UDP_SML	Other Urban Development Projects	Gangil Riverpark 3 & 4
5	GBA	General Built-up Area일반시가지조성	10	GBA	Without layering of development method(s)	-
6	HRD	Housing Redevelopment Project주택재개발사업	11	HRD_NT/O (Newtown Overlay)	Newtown strategy overlaid	Gileum Newtown Prugio
			12	HRD_N/O (No Overlay)	Only Housing Redevelopment Project	Raemian Sangdo
7	HRC	Housing Reconstruction Project주택재건축사업	13	HRC_DM/O (DM Overlay)	Reconstruction within development project sites	Raemian Firstage
			14	HRC_N/O (No Overlay)	Reconstruction within general built up area	Gochuck Daewoo

Yeouido Sibeom Apartment

Locational and Non-spatial	Locational dispersion		South-Western flat area of Seoul
	Construction period		1992.8.31
	Sales type		Lot-solid apartment
	Number of household (density)		416 (234.5)
	Parking		319 (0.8)
Morphological	Parcel (complex)	Parcel shape	Regular
		Parcel size	Small (17,741 m^2)
	Building	Building arrangement	Parallel row +cross
		number of building	5 buildings (3,948 m^2)
		height range	Medium high (15 stories)
		Architectural style	Plank-type
	Street	Street shape	Regular
		Bordering percentage	100% (all four sides)
		Bordering hierarchy	Local and alleys
	Density	BCR	22.3%
		FAR	251.6%

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Jamsil Hyundai

Locational and Non-spatial	Locational dispersion		South-Western flat area of Seoul
	Construction period		1990.8.17
	Sales type		Lot-solid apartment
	Number of household (density)		336 (253.8)
	Parking		345 (1.0)
Morphological	Parcel (complex)	Parcel shape	Regular
		Parcel size	Small (17,741 m^2)
	Building	Building arrangement	Parallel row +cross
		number of building	3 buildings (2.207 m^2)
		height range	Medium high (15 stories)
		Architectural style	Plank-type
	Street	Street shape	Regular
		Bordering percentage	75% (three sides)
		Bordering hierarchy	Local and alleys
	Density	BCR	16.7%
		FAR	257.6%

Gaepo Jugong Apartment 4

Locational and Non-spatial	Locational dispersion		South-Eastern outskirt within Seoul
	Construction period		1982.11.30
	Sales type		Lot-solid apartment
	Number of household (density)		2840 (160.8)
	Parking		1136 (0.4)
Morphological	Parcel (complex)	Parcel shape	Regular
		Parcel size	X-Large (176,649 m^2)
	Building	Building arrangement	Parallel row
		number of building	58 (26,930 m^2)
		height range	Low (5 stories)
		Architectural style	Plank-type
	Street	Street shape	Regular
		Bordering percentage	100 % (all four sides)
		Bordering hierarchy	Arterial + Collector
	Density	BCR	15.2 %

Shinae Shiyoung Apartment 9

Locational and Non-spatial	Locational dispersion		North-Eastern outskirt within Seoul
	Construction period		1995.12.4-22
	Sales type		Lot-solid apartment
	Number of household (density)		1244 (150.8) / 763 (258.3)
	Parking		2488 (2.0) / 763 (1.0)
Morphological	Parcel (complex)	Parcel shape	Regular
		Parcel size	Medium (82,512 m^2) / Small (29,534 m^2)
	Building	Building arrangement	Parallel row+cross
		number of building	(18,441 m^2) / (5,997 m^2)
		height range	Medium high (15 stories)
		Architectural style	Plank-type + deformed Plank-type
	Street	Street shape	Regular
		Bordering percentage	More than 50%
		Bordering hierarchy	Arterial + Local
	Density	BCR	22.4% / 20.3%
		FAR	236.6%/ 241.8%

Eun-Pyeong Newtown Hyundai Hillstate Complex 12

Locational and Non-spatial	Locational dispersion		Northern outskirt within Seoul
	Construction period		2009.1012
	Sales type		Lot-solid apartment
	Number of household (density)		660 (194.4)
	Parking		764 (1.16)
Morphological	Parcel (complex)	Parcel shape	Regular
		Parcel size	Small (33,943 m^2)
	Building	Building arrangement	Parallel row+ dot
		number of building	11 buildings (5,508 m^2)
		height range	High (20 stories)
		Architectural style	Plank + tower-type
	Street	Street shape	Regular
		Bordering percentage	100 % (all four sides)
		Bordering hierarchy	Collector+local
	Density	BCR	16.2%
		FAR	189.8%

Gangil Riverpark 3 & 4

Locational and Non-spatial	Locational dispersion		Eastern outskirt within Seoul
	Construction period		2009.3.11
	Sales type		Mixture of lot-solid and rental apartment
	Number of household (density)		1,735
	Parking		1,936 (1.12)
Morphological	Parcel (complex)	Parcel shape	Regular
		Parcel size	Medium (85,361 m^2)
	Building	Building arrangement	Cross + dot
		number of building	23 buildings (14,965 m^2)
		height range	Medium high (15 stories)
		Architectural style	Cross + tower-type
	Street	Street shape	Regular
		Bordering percentage	100 % (all four sides)
		Bordering hierarchy	Arterial + Alley
	Density	BCR	17.5%
		FAR	176%

Gileum Newtown Prugio Apartment Complex 2

Locational and Non-spatial	Locational dispersion		Northern outskirt within Seoul
	Construction period		2005.4.20
	Sales type		Lot-solid apartment
	Number of household (density)		1,634 (225.1)
	Parking		2,088 (1.28)
Morphological	Parcel (complex)	Parcel shape	Irregular
		Parcel size	Medium (72,580 m^2)
	Building	Building arrangement	Cross + dot
		number of building	28 (12,431 m^2)
		height range	High (18 stories)
		Architectural style	Plank + tower-type
	Street	Street shape	Irregular
		Bordering percentage	More than 50%
		Bordering hierarchy	Collector +Alley
	Density	BCR	17.1%
		FAR	254.4%

Raemian Sangdo Apartment Complex 3

Locational and Non-spatial	Locational dispersion		Northern outskirt within Seoul
	Construction period		2005.4.20
	Sales type		Lot-solid apartment
	Number of household (density)		1,634 (225.1)
	Parking		2,088 (1.28)
Morphological	Parcel (complex)	Parcel shape	Irregular
		Parcel size	Medium (72,580 m^2)
	Building	Building arrangement	Cross + dot
		number of building	28 (12,431 m^2)
		height range	High (18 stories)
		Architectural style	Plank + tower-type
	Street	Street shape	Irregular
		Bordering percentage	More than 50%
		Bordering hierarchy	Collector +Alley
	Density	BCR	17.1%
		FAR	254.4%

Raemian Firstage

Locational and Non-spatial	Locational dispersion		Adjacent to Han River
	Construction period		2009.7.14
	Sales type		Mixture of lot-solid and rental apartment
	Number of household (density)		2,444 (175.7)
	Parking		4,368 (1.79)
Morphological	Parcel (complex)	Parcel shape	Regular
		Parcel size	Large (139,149 m^2)
	Building	Building arrangement	dot
		number of building	28 (16,981 m^2)
		height range	Very high (32 stories)
		Architectural style	Tower-type
	Street	Street shape	Regular
		Bordering percentage	More than 50%
		Bordering hierarchy	Arterial + Collector
	Density	BCR	12.2%
		FAR	258.2%

Gochuck Daewoo Apartment Complex

Locational and Non-spatial	Locational dispersion		Southwest central
	Construction period		1999.2.24
	Sales type		Lot-solid apartment
	Number of household (density)		987
	Parking		1,179
Morphological	Parcel (complex)	Parcel shape	Irregular
		Parcel size	Small (28,587 m^2)
	Building	Building arrangement	cross
		number of building	13 buildings (7,351 m^2)
		height range	Very high (21 stories)
		Architectural style	Plank-type
	Street	Street shape	Irregular
		Bordering percentage	More than 50%
		Bordering hierarchy	Local + Alley
	Density	BCR	25.7%
		FAR	342.2%

Appendix 3. Morphological Characteristics of Apartment Complexes by Development Methods (graphical representation) in *Chapter 3*

Legend description

• Morphological elements

Parcel	**P_size**	Parcel size
	P_shp_g	Parcel shape (general)
	P_shp_s	Parcel shape (specific)
Building	**B_num**	Number of buildings
	B_height	Building height
	B_arch_g	Building architectural style (general)
	B_arch_s	Building architectural style (specific)
	B_arrang	Building arrangement
Density	**D_BCR**	Building Coverage Ratio (BCR)
	D_FAR	Floor Area Ratio (FAR)
Street	**S_shp**	Street shape
	S_border	Bordering street proportion
	S_hiear	Bordering street hierarchy

• Degree of relevancy

	Significantly dominant	80 – 100 %
	Considerably dominant	60 – 80 %
	Relative percentage	40 – 60 %
	Slightly relevant	20 – 40 %
	Insignificant percentage	10 – 20 %

Han River Reclamation Project - Housing Site Preparation Project										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Han River Reclamation Project - Land Readjustment Project										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Han River Reclamation Project - General Built-up Area										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo
Land Readjustment Project										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Housing Site Development Project - NIT-scale										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Housing Site Development Project - Large-scale										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Housing Site Development Project - Small and medium-scale										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo
Urban Development Project - NIT scale										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Urban Development Project - SML scale										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo
General Built-up Area										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Housing Redevelopment Project - Newtown strategy overlaid										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Housing Redevelopment Project- no overlay										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Housing Reconstruction Project – within development project sites										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

Housing Reconstruction Project - no overlay										
P_size	PS-1	PS-2	PS-3	PS-4	PS-5		PS-6		PS-7	
P_shp_g	Regular					Irregular				
P_shp_s	Trilateral	Tetragon	Deformed Polygon	Partially curved	Partially irregular		Completely irregular		Extremely irregular	
B_num	Few (2-4)		Average (5-9)		Somewhat Large (10-19)		Significantly Large (20-39)		Exceptionally large (40 and more)	
B_height	Low (5)		Medium (6-10)		Medium high (11-15)		High (16-20)		Very High (over 21)	
B_arch_g	Flat-type			Tower-shaped-type			Mixed-type of and tower			
B_arch_s	Row	Stepped Row	Bent 0-1	Bent 2	Intersect	Combined	Compact	L/T Shape	H/X Shape	V/Y Shape
B_arrang	Parallel Row	Cross	Dot		Parallel Row + Cross		Parallel Row + Dot		Cross + Dot	
D_BCR	under 10%		10-20 %		20-30 %		30-40%		40% and higher	
D_FAR	under 100 %		100-200 %		200-300 %		300-400 %		400% and higher	
S_shp	Regular					Irregular				
S_border	100%		> 50%		< 50%			point		
S_hiear	Arterial	Minor Arterial	Collector	Local	Ar+MA	Ar+Co	Ar+Lo	MA+Co	MA+Lo	Co+Lo

박사학위논문 국문초록

서울의 아파트 단지 개발에 따른 도시형태 특성 연구

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지난 반세기 동안 서울의 주거환경은 대규모 아파트 단지 또는 개별 필지 단위의 대비되는 형태의 개발로 이루어져 왔다. 이러한 개발이 확산되면서 다양한 유형과 변화된 공간구조 및 도시조직을 보여주고 있다 (서울연구원, 2009). 급격한 도시화에 따른 주거 수요에 따라 다양한 주택정책과 개발방식들을 통해 아파트는 대량으로 공급되었고 서울은 '아파트공화국 (Gelézeau, 2007)' 또는 아파트도시로 불리고 있을 정도로 고층·고밀의 아파트로 인하여 도시 경관이 급격하게 변화되어 왔다. 아파트 개발은 주거개발사, 도시설계와 건축, 공공주거정책 그리고 사회문화적인 분야에 이르기까지 다양한 분야에서 주목 받아왔다. 최근에 들어서 아파트라는 주거형태보다는 '아파트단지'가 공공계획, 도시공간, 사회적 측면에서 더 큰 영향력을 미치는 것에 대한 논의가 활발하다 (이규목, 2002; 박인석, 2013; 박철수, 2013). 본 논문은 아파트단지의 발생과 확산으로 인해 형성된 서울의 도시형태 변화와 특성을 살펴보고자 한다.

도시형태학 (Urban morphological studies)에서 필지, 건물, 도로의 분석을 통해 도시조직의 진화를 분석하는데 아파트단지는 하나의 개별 필지로 규모가 크고 고층의 건물집단을 가지고 있어서 서울의 도시조직의 변화를 설명하는

중요성이 있다. 형태유형학 (typomorphology) 에서와 같이 아파트단지들에 관한 형태요소들에 대해 도시차원, 지역 및 동네차원 등 다양한 스케일에서 시간의 변화에 따라 변화를 분석하면서 공간적인 특성을 살펴본다. Whitehand (1992)에 따르면 도시의 형태는 형태적 동질지역 (Morphological Region)이 시간에 따라 어떻게 형성되었는가를 파악함으로써 이해할 수 있는데, 서울에서 아파트 단지의 대규모 군집은 특정시기에 형성된 동질적 형태지역 형성을 하고 있어서 이러한 군집양상 분석을 통해 서울의 도시형태를 이해하고자 한다. 또한 도시의 형태가 시간에 따라 점차적으로 확장되면서 시가지 경계의 외곽지역 (fringe belt)이 도시로 통합되는 과정을 거쳐 형성되는 것으로 이해하고 이러한 관점에서 대규모 아파트 단지 군집패턴과 형성과정은 외곽지역이 도시시가지로 내부화한 (internalization) 서울의 도시형태 형성과정과 특징을 나타낸다 (Whitehand, 1988; Conzen, 2009).

연구범위는 본격적인 아파트개발이 이루어진 70년대부터 2014년 12월까지 45년간 서울 전역에 걸쳐 개발되어 현존하는 아파트단지 전수 (2,172 단지)에 대하여 분석을 진행하였다. 본 논문에서 아파트단지 데이터베이스는 서울시에서 제공받은 “2015년 서울시 공동주택현황자료”와 국가공간정보포털에서 제공받은 공간자료인 “2015년 새주소기본도”을 기반으로 여러 공공기관들을 통해 수집된 자료들을 건축대장과 온라인 지도정보 등 확인을 거쳐 구축하였다. 그 외에도 국토지리정보원에서 제공하는 구기본도와 수치지형도파일을 활용하여 지도 및 도면작업들을 통해 형태적 변화를 기록하였다.

단지는 하나의 부지에 복수의 주택건물들이 공동시설과 함께 접근도로가 포함되어 일체적으로 계획 및 개발되어 형태적으로 강한 동질성을 가지는 공동주거단위이다. 일제강점기 때부터 도시형한옥, 영단주택을 비롯해서 한국전쟁 이후에도 집단적 개발이 이어졌지만, 작은 블록으로 도로는 주변시가지와 연결되고 폐쇄적 경계부 없이 기존 시가지와 공존하는 구조가 대부분이었다. 이처럼 1960년대 이전까지는 개발의 단위로서 일단의 부지를

의미하는 단지식 개발이었다. 1962-1964년에 지어진 마포아파트의 경우 개방된 외부공간, 단지전용시설, 6층 높이의 판상형과 Y자형 아파트건물 10개동과 함께 경계부는 구획되어 담장이 설치되고 진입은 하나의 출입구에서만 가능한 주변의 한옥주택지의 도시조직과는 완전히 다른 단지의 영역 형성하였다. 아파트단지는 1960년대 시범적으로 건설되기 시작하여 1970년대에 접어들면서 본격적으로 개발되었다. 본 논문에서는 경계부가 있으며 단일 필지에 5층 이상의 아파트건물이 두 동 이상 있는 주거단위를 아파트단지로 보고자 한다.

2장에서는 지난 50여년간 도시성장, 도시계획, 도시확장 등의 역사적인 개관에 이어 아파트단지가 건설되게 된 주요 개발방식들을 크게 7가지로 정리하고 개발전략들의 중첩, 개발사업규모 등을 감안하여 14가지로 세분화하였다. 3장에서는 개별 아파트단지의 형태적 분석은 필지, 건물, 밀도, 도로 등 형태요소 차원에서 살펴보면서 형태요소 간 (internal force)의 영향에 대해서 분석하였다. 또한 시장수요, 건축 규제 또는 다른 사회문화적 요인들이 작용한 결과 아파트 단지의 형태적 특성을 보일 수 있는데, 본 논문에서는 개발시기와 개발방식을 외부세력 (external force)로 간주하고 그에 따른 영향도 분석하였다. 개별 단지들이 도시 내 공간적으로 어떻게 분포하며 어떠한 양상으로 모이는가에 따라 기존 도시조직과의 관계 속에서 도시형태 특성을 이해할 수 있다. 따라서 4장에서는 아파트단지들의 (1) 수평적·수직적 입지 및 분포, (2) 도시 블럭 내 입지 양상 그리고 (3) 군집양상을 통한 군집유형을 다루고 있다. 밀집도 분석 (clustering index)을 공간적으로 분석하여 분포와 아파트단지 군집의 공간적 크기 그리고 군집된 모양을 파악할 수 있다. 5장에서는 전 장에서 도출한 아파트단지의 군집유형에 대한 대표적인 지역을 선정하여 아파트단지의 발생과정과 군집양상, 그리고 아파트군집과 주변도시조직과의 관계에 대해 분석을 진행하였다.

1970년대 한강변의 몇 개 단지들을 시작으로 현재 2,172개에 이르는 아파트단지의 발생과 확산으로 급격한 도시변화가 진행 중이며 빠른 속도로 인해 'Instant Apartment Complex City'로 볼 수 있다. 아파트 단지의 생성은

서울의 도시성장과 긴밀히 연관되어 있고 개발정책, 개발방식, 공공과 민간의 개입 정도 등에 따라 형태적 특성을 가지고 있다. 그러므로 시기별 개발방식에 따라 서울 아파트 단지의 형태적 기원 (morphogenesis) 을 확인할 수 있다. 형태적 요소간 내적 영향 (internal force) 에 대한 상관관계가 전반적으로 약하게 나온다. 외부적인 세력 (external force) 인 개발방식에 의해서는 전반적으로 형태요소들 간의 차이는 있는 것으로 보아 개발방식 별 형태특성은 상이하다는 것을 검증 할 수 있다. 가용지의 한계와 그에 따른 지가상승으로 인하여 주택건설업체의 택지구입 비용부담을 가중시켜왔고 사업수행의 효율성은 고밀 개발을 통해 달성되어 용적률, 건물 높이, 건폐율, 부지면적 등 형태요소들이 다양한 계획기법 없이, 고층아파트로 일관하는 획일적 재생산, 형태적 경직성 문제를 다시금 확인할 수 있다 (공동주택연구회, 1999; 박인석, 강인호, 2001).

아파트단지의 공간입지적 분포에서 먼저 수평적 입지 및 분포 보게 되면 집중도에 있어 차이는 있으나 시가지 전역에 고른 분포를 통해 아파트 경관의 보편성을 나타낸다. 또한 경사지에 위치한 아파트들을 보게 되면 1950-60년대 형성된 도심주변 구릉지의 자연발생적 주거지가 재개발되면서 높은 표고에 위치하고, 단지내의 표고 차가 큰 경사지에 위치하면서 산 경관을 차폐하는 서울의 경관 특성 가져온다. 또한 표고가 낮은 시가지에는 격자형 소필지 주거지가 있고, 표고가 높은 구릉지에는 아파트 단지가 위치하는 서울의 경관특성 가져온다. 서울에서 아파트단지를 포함하고 있는 도시 블럭은 615개 정도가 있고 아파트 단지는 도시블록을 형성하기도 하고 도시블록 내에 자리잡기도 함으로써 다양한 양상으로 도시블록을 형성하고 있다. 그러므로 그 결과로서 형성된 도시블록의 공간적 특성은 서울의 도시형태를 이해하는데 중요하다 점을 확인한다. 아파트 단지의 군집패턴 (agglomeration pattern)의 경우, 서울의 도시형태 특성과 밀접히 연결되어 있는데, 개발방식의 종류와 사업의 규모에 따라, 개발시기에 따라, 정형 또는 부정형의 형태특성을 가지며 동시에 또는 순차적으로 발생함에 따라 크게 7가지로 분류되는 아파트단지들의 군집유형은 서울의 다양한 동질적인 형태지역들을 만들었다.

신시가지급의 강한 군집유형인 상계의 경우 아파트단지들은 단지규모, 층수, 건물 수, 건축형태, 배치방식 및 배치방향 등 높은 유사성을 보이며 강한 동질성의 거대 도시조직 (homogeneous morphological region) 을 이룬다. 잠실의 경우에는 강하게 연접한 초고층의 수퍼 블럭 아파트단지와 저층의 격자 블럭 사이에 완충되는 중간 단계 없이 바로 인접하면서 강한 형태적 대비성 (highly contrasting juxtaposition) 이 사람의 스케일 (human scale)과 도시 경관적인 측면에서 극명하게 드러나고 있다. 느슨하게 정형으로 군집하는 문정·가락의 경우 초기에 아파트 부지들이 구획되어 개발되면서 필지들이 존중되면서 저층조직이 계속해서 infill되며 밀도를 채워나갔고 아파트단지와는 균형을 맞추며 지속적인 공존성을 보여주고 있다. 반면 부정형의 느슨한 군집양상을 보이는 신수동의 경우, 자연발생적인 조직들 내 2000년대부터 갑자기 재개발 및 재건축으로 아파트단지들이 확산하면서 개별적인 개발로 인한 돌발성, 단절성, 대비성 등의 특성이 관찰되었다. 기존의 건물, 필지, 도로들을 대체하면서 미세한 도로가로망은 효율적으로 변화하였지만 골목길, 교차점들이 없어지고 단지를 둘러싼 길이 만들어지면서 보행에 있어서 우회도로가 증가한 것을 볼 수 있다. 정형과 부정형의 분산된 군집양상을 보여주는 화곡과 수색의 경우에는 저층주거지 또는 도시조직이 아직 아파트단지보다 우세하며 분산되어 산발적인 병치, 파편적, 돌발성 등의 특성을 찾아볼수 있다.

결과적으로 시간이 지남에 따라 아파트단지가 계속적으로 발생하여 확산하는 경우, 공공도로, 보행로, 공원 등의 공공공간이 개별필지 및 건물과 함께 단지로 대체되면서 줄어들고 사유공간이 증가하게 된다. 단지면적과 함께 경계부 길이가 길어지고, 교차점이 감소하면서 거주민이 아닌 도시민에게는 우연한 사람들의 만남의 기회와 길의 선택권이 감소하고 우회도로가 증가하였다, 단지의 경계부 또한 시간에 따라 그 두께가 다양한 담장, 펜스, 조경 등의 기법들이 층화 (layered)되면서 두꺼워졌고, 이는 7개 사례지역에 걸쳐 최근 생긴 단지들에게서 공통적으로 발견된다. 또한 게이트의 설치로 인한 차량 및 보행 등 접근의 통제성이 강화되고, 주변부에 단지전용시설을

배치하여 주변지역과의 차이를 심화되었다. 반면 공공공간과 함께 근린시설도 단지발생으로 인하여 대체되는 경우도 많아서 점차적으로 단지 내부와 단지경계부의 환경은 개선되는 반면, 주변부는 기반시설이 더 열악해지면서 도시불평등성 (urban inequality) 문제도 야기될 수 있다. 결국 공공도로와 소블럭도 감소하면서 도시블럭 내 내부연결성 (interconnectedness)는 감소하는 반면 대규모필지로 인한 사유공간의 증가와 함께 새로 만들어진 단지 주변 공공도로가 단지의 진입도로로 사용되는 등 공공공간의 사유화문제도 발생하고 있다.

대규모 필지의 아파트단지가 개발되면 강한 존속성을 가지면서 결과적으로는 점진적인 개발과 비교하여 도시적응성이 감퇴하고 공간구조가 단순화된다. 기존의 복잡하게 연결된 골목길을 대체하고 교차점들을 없애버리면서 일상공간에서의 접점공간은 점점 사라지고 있다. 물리적인 단절성뿐만 아니라 단지 내부의 질 좋은 기반시설과 환경은 단지 밖에의 유지 또는 느린 속도로 개선되는 환경과 기반시설의 격차가 심화되면서 위화감 (incompatibility)이 증가하면서 사회적인 단절성도 가져올 수 있다. 한편으로는 불가피한 고밀개발 하에 전반적인 주거 질의 기준을 향상시키고 혁신적인 기술을 적용하면서 친환경 주거단지로 거듭하는 긍정적인 측면도 충분히 존재한다. 서울의 고유한 도시성으로 받아들이면서 형태적으로 긍부정적인 논의는 지속되어야 할 것이다. 서울은 급격한 속도와 규모로 빠르게 진화했지만 도시공간에 대한 이해를 위해서는 과거로부터 배우는 과정도 중요한 만큼, 도시에 대한 관찰, 기록, 분석과 해석이 필요하다. 논문은 많은 요소 중에서도 특히 필지차원인 아파트단지의 발생과 확산으로 변화한 서울의 도시주거지의 형태를 기록하고 해석하고자 했고 여러 한계점도 내포하고 있다. 이는 형태적 특성이 사회문화, 정치, 경제 측면에서의 다양한 접근과 함께 더 체계적으로 연구되어야 할 것이다.

주요어: 아파트 단지 개발, 개별 아파트 단지 형태특성, 아파트 단지 군집 양상, 도시 블럭 내 일상적 공간 특성의 변화, 서울의 도시형태, 아파트 단지 도시성

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