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The Conceptual Origins of the Rosario Plan for Seoul in 1980
: Finding the Logical Backgrounds to the Transit-Oriented Metropolis Plan*,**

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Abstract

This study aims to discover the conceptual background of the Rosario Plan for Seoul in 1980, which is known as one of the transit-oriented metropolis plans. This historical study examines all the plans, documents, and interviews that Professor Byong-Kee Kahng, who proposed the plan, participated in, and reveals the following: The Rosario Plan was proposed to solve the urban problems of Seoul at the time, which were housing shortage and automobile traffic congestion due to rapid urbanization. Kahng advocated for a decentralized spatial structure intended for the linear city and modified it to adapt to the specific circumstance. In 1977, he proposed a transformation into a ring-shaped structure connecting the ends of the linear city, and in 1980, he presented the Rosario plan, which is a more flexible form, to transform Seoul into a multinuclear spatial structure using subway stations and networks. His 1980 plan was influenced by Christopher Alexander's semi-lattice concept to overcome the closed space structure of the ring and/or linear-shaped city. He intended to use urban design as an integrated solution for critical urban problems. This paper summarizes the historical background and conceptual basis pertaining to the historically significant plan for the further transformation and adaption of the transit-oriented plan.

Keywords Rosario Plan, Linear City, Semi-lattice Structure, Transit-oriented Development (TOD), Byong-Kee Kahngs
주제어 로사사리오 계획, 선형도시, 사다리꼴 구조, 대중교통중심개발, 강병기

Ⅰ. Introduction

The Rosario Plan for Seoul in 1980 is regarded as a synthesis of metropolitan plans from the early 20th century, following Howard's Garden City movement, and Calthorpe's transit-oriented development (TOD) framework, which gained traction in 1993 (Sung and Choi, 2017). Despite its significance, the plan has not been widely recognized internationally and even within South Korea, although recent efforts aimed at rediscovering and reevaluating it.

The Rosario Plan possesses several unique features: it adheres to the tradition of metropolitan area planning while considering district-level dynamics, proposing a flexible spatial structure that was groundbreaking for its time and remains underutilized today. It also advocated for reorganizing the entire city of Seoul around multiple stations, a novel approach given that the city was in the early stages of introducing the subway. However, there has yet to be any

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study that elucidates how this plan was ultimately developed through conceptual frameworks.

Identifying the origin of a particular planning idea is important because it allows us to understand the causes and effects of transformations in various contexts. Given the diversity of institutional situations and different stages of social and economic development, each country needs an application process that considers the idea's origins. Especially as many countries are currently adopting TOD or trying to make metropolitan areas more transit-oriented, understanding the challenges and roots of the Rosario plan could lead to more effective implementation.

This article seeks to uncover the origin and rationale behind the Rosario Plan. A recent study indicated that the concept of the Linear City by Arturo Soria y Mata evolved into the Rosario Plan (Sung and Choi, 2017). However, it is not clear that how the former had been transformed to the latter, because the Rosario Plan offered a flexible spatial structure and contained urban design concepts in district level, but the linear city is known as a representative planning concept of modernism. This study explored not only the urban plans that the late Professor Byong-Kee Kahng (강병기 in Korean and known as Heiki Koh in Japanese pronunciation of his name's Chinese characters, 康炳基)[1] participated in before devising the Rosario Plan in 1980 but also examined his articles and interviews. The aim was to discover the theoretical origins of the proposal.

To accomplish its purpose, this study focused on four perspectives as following. 1) Development from linear to ring-shaped Structure: the study first explored the transition from the linear plan to a ring-shaped structure. Prof. Kahng participated in the Tokyo Bay plan in 1960 and proposed a double ring spatial structure for Seoul in 1977. A review of these efforts illustrated how he initially pursued the linear city concept, which later transformed into a ring shape as he mentioned to an assistant that by connecting the ends of a linear city, a ring is formed (Sung and Choi, 2017). 2) Evolution to a flexible-decentralized plan: this article identified how the ring-shaped concept evolved into the Rosario Plan with a more flexible-decentralized structure. As the ring became closed and fixed, there were inherent limits to continued expansion of it. In practice, Prof. Kahng's experience in a mid-east Asia project led him to re-evaluate his own modernist beliefs in the late 1970s. He saw the necessity for a plan that accommodated people's lives in various conditions. Conceptually Christopher Alexander's original ideas on semi-lattice structure provided a critical clue to Prof. Kahng. 3) Station-centric development and metropolitan expansion: This research examined why Prof. Kahng focused on development around station areas and how this approach expanded to a metropolitan scale. The authors analyzed the 1977 plan he proposed for Seoul's spatial structure before announcing the Rosario Plan, which involved maximizing the use of the subway network. 4) Prototype of station area and his educational background: this study explored the background of the station area prototype included in the Rosario Plan by examining Kahng's education and activities. Unlike other metropolitan-scale plans, the Rosario Plan offered a district-level design similar to architect and urban designer Peter Calthorpe's "pedestrian pocket" proposal. Prof. Kahng stated that he came to Korea to work in urban design and identified himself as an urban designer (Lee, 2009).

II. Literature Review

1. Linear City and Its Successors

Arturo Soria y Mata in Spain proposed the "Linear City" concept in 1882, emphasizing improved access via trains (See 〈Figure 1〉). In this suburban city model, residential complexes, comprising houses and related facilities, are organized along a series of railroad networks, — originally horse-drawn and later by streetcars in 1909 (Hall, 2002).

Although Soria's proposal has been criticized for being less than an urban scale, it has been utilized in urban construction models worldwide (Doxiadis, 1967; Hall, 2002). The idea of the linear city was primarily applied as a decentralized urban spatial structure, aligning well with decentralized political ideologies. The concept was introduced globally by the Association Internationale des Cités Linéaires, founded in 1928 by French planner Georges Benoit-Levy (Hall, 2002). In 1930, Nikolay A. Milyutin in the Soviet Union proposed a de-urbanistic linear city for Sotsgorod (Socialist City), and his plan for Stalingrad was based on linear expansion with parallel city functions (Doxiadis, 1967).

On the other hand, the concept of a linear city was also adapted to high-density urban areas in the capitalist coun-

(a) Spatial structure of the linear city (b) Section of the linear city

Figure 1. The linear city by Soria y Mata in 1882

Source: Palacio (1969)

tries. Aiming to create a city based on a modernistic vision, Le Corbusier incorporated the idea of the linear city in his vision for La Ville Radieuse (The Radiant City) (Hall, 2002; Cho, 2014). In the 1950s, the Brazilian government constructed Brasília, a new administrative capital that adhered closely to Lúcio Costa's interpretation of the linear city concept (Hall, 2002), and the concept was applied in the Hook New Town in the United Kingdom (Jung and Hong, 2024).

In 1960, Kenzo Tange in Japan applied linear planning principles in his plan for Tokyo (Tange, 1961). In the late 1960s, Doxiadis utilized the linear city concept while designing the master plan for Islamabad, the new capital of Pakistan. In this plan, he separated different functions and introduced a concept where superblocks are continuously expanded (See 〈Figure 2〉).

Many countries have continued to utilize the concept of a linear city in their urban planning and development efforts. In a recent study, Jung and Hong (2024) discovered that the concept of the linear city has been included in the district plans of many new towns in South Korea since the 1990s. A recent notable example is Saudi Arabia, which announced plans to build a linear city called 'The Line,' extending up to 100 miles. Inhabitants of this city will use autonomous mobility and ultra-high-speed transit for transportation (Avery, 2021).

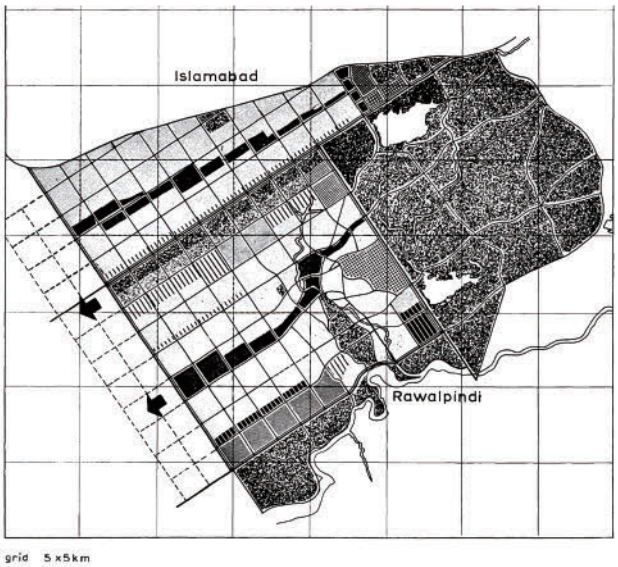


Figure 2. Linear city concept for Islamabad by Doxiadis

Source: Doxiadis (1967)

Doxiadis (1967) demonstrated that a linear city could undergo various transformations and showed that its form might vary depending on the topographical conditions or the configuration of the existing city center. A linear city is not only a modification of the methods that connect straight line or curvilinear, but also other types of figures, a representative example as a circular shape connecting the ends of lines, a ring-shaped.

Among the cities constructed with a circular-spatial structure, the representative ones are Sejong City, an administrative complex city in South Korea. In an international competition for designing a proposal for the city, five designs were selected in the design competition in 2005. The city spatial structure of the new administrative capital was decided based on two plans having a ring-shaped spatial structure (See (a) in 〈Figure 3〉): Andres Perea Ortega (2005), The City of Thousand Cities (See (b) in 〈Figure 3〉) and Jean Pierre During's The Orbital City. Interestingly, both of these proposals were put forward by Spanish architects.

The two proposals featured a decentralized spatial structure and received strong support from David Harvey, the renowned Marxist economic geographer who served as the co-chair of the competition committee at the time (Ohn, 2016: p.164-166).[2] It is uncertain to discuss whether Sejong City's spatial structure is influenced by political perspectives. Around 30 years prior to the Sejong City's ring-shaped structure proposal, Kahng (1977) suggested a plan to expand the existing downtown of Seoul in a circular layout.

(a) Spatial Structure of Sejong City (b) The City of Thousand Cities

Figure 3. Ring-shaped spatial structure of Sejong City in South Korea

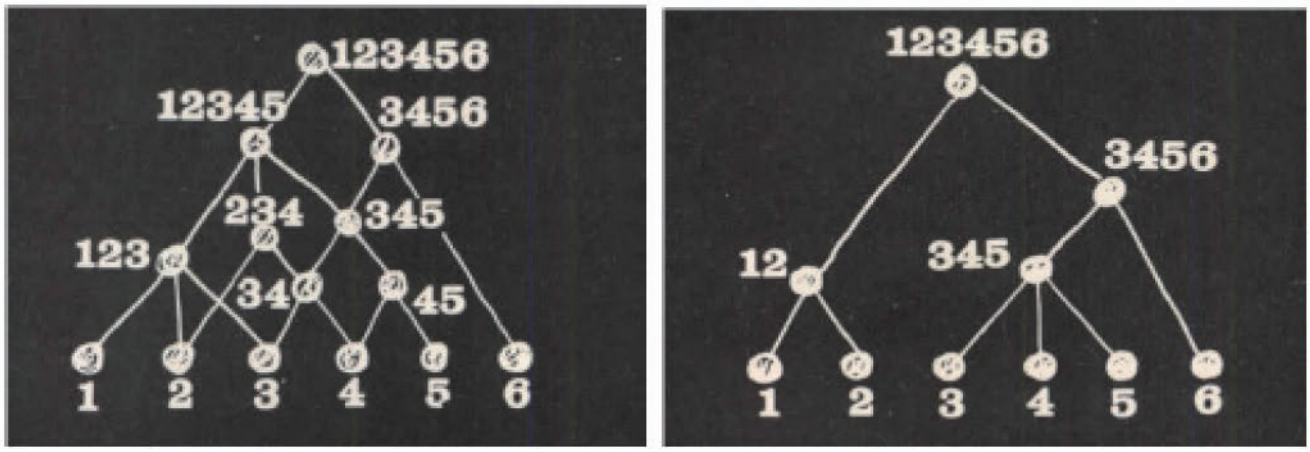
Source: (a) NAACC (2017); (b) Ortega (2005)

However, this idea remains not well unknown. According to his disciple, Kun-ho Lee, Professor Kahng described his Rosario Plan as a linear city with connected ends (Sung and Choi, 2017).[3] Like the previous example, the transition from linear cities to circular spatial structures should be recognized as a significant topic in the history of urban planning.

2. Christopher Alexander's Alternative to Modernistic Urban Planning

Christopher Alexander, a prominent figure in critiquing modernism in architecture, urban planning, and design while proposing alternatives, is best known for his 1977 book, "A Pattern Language." In this work, he identified the characteristics of spaces that existed prior to modernism and offered various design methods for creating meaningful 'places.' Alexander's proposals have since been adopted by many planners (Bhatt, 2010).

His ideas have sparked focused discussions around urban design that many experts are currently engaging in and are widely recognized. However, Alexander's 1965 proposal for urban structure remains relatively obscure, and subsequent designs based on his concepts have yet to be validated. Alexander (1965) published an article in the Architectural Forum titled "A City is Not a Tree," in which he argued that the "artificial cities" created by urban planners lack the organic structure inherent in "natural cities." Alexander illustrated his argument with a diagram, shown in 〈Figure 4〉, contrasting



(a) Semi-lattice structure (b) Tree structure

Figure 4. Comparison of semi-lattice structure and tree structure

Source: Alexander (1965)

the rigid and hierarchical structure of planners' designs, which he referred to as a tree structure, with the more flexible and interconnected relationships found in a semi-lattice structure. He contended that artificial cities fit the former category, while natural cities exemplify the latter. The semi-lattice structure is said to generate a more diverse array of urban forms compared to the tree structure. Alexander criticized the rigidity of urban designs such as Costa's Brasília and Tange's plan for Tokyo, which are typical examples of linear planning (Alexander, 1965: p.58-61).

3. Transit-Oriented Development (TOD) and Metropolis (TOM)

TOD is a planning principle introduced by Calthorpe (1993) as an alternative to address urban challenges caused by excessive road traffic and urban sprawl in the United States. This concept is centered around transit hubs and a network of public transportation. Calthorpe advocated for urban forms characterized by high density, mixed land use, and walkable designs, aiming to reduce dependence on automobiles while enhancing the vitality of neighborhoods. His approach encompasses not only the idea of "pedestrian pockets" but also considers the regional scale of development. Despite being primarily small-scale and focused on district development around transit, discussions have emerged emphasizing the need for a metropolitan and/or regional development strategy. This involves transitioning to transit-oriented corridor and transit metropolis (e.g., Cervero, 1998; Cervero and Sullivan, 2011; Belzer, 2011).

Calthorpe (1993) introduced the concept of TOD and its main components, while Cervero and his collaborators further developed the planning elements. Initially, Cervero and Kockelman (1997) refined these into the "3Ds" (density, diversity, design), focusing on high-density mixed land use and walkable urban design. Later, Cervero and Murakami (2009) and Ewing and Cervero (2010) added "2Ds" (distance to transit and destination accessibility), highlighting the importance of public transportation accessibility in TOD implementation.

Sung and Choi (2017) introduced the term Transit-Oriented Metropolis (TOM) to highlight efforts in developing a metropolitan-area railway network amid urban expansion.[4] This concept, which originated in England, developed at the metropolitan level through various plans, including Copenhagen's 1947 Finger Plan, Stockholm's 1952 Plan, Paris's 1965 Plan, and Tokyo's 1923 Plan (Cervero, 1995; Hall, 2002; Watanabe, 1977). Recently, Kahng's Rosario plan has been recognized as a crucial connection between metropolitan-level planning focused on transit and new towns in the early to mid-20th century and the contemporary discussions surrounding TOD (Sung and Choi, 2017).

III. Metropolitan-scale Plans by Kahng before and after 1980 Rosario Plan

1. Tokyo Plan in 1960

Kahng participated in Kenzo Tange's 1960 Tokyo plan and began extensive research on cities in the late 1950s (Lee, 2009). The plan was completed by Tange along with his five young disciples and architects from the University of Tokyo: Koji Kamiya, Arata Isozaki, Sadao Watanabe, Noriaki (Kisho) Kurokawa, and Heiki Koh (Byong-Kee Kahng) (Lin, 2010). At that time, Tange's lab focused on integrating all aspects of city design, with Kahng presumed to be responsible for transportation planning.[5]

The Tokyo Plan 1960 identified issues with Tokyo's existing centripetal spatial structure and proposed a new linear development (see 〈Figure 5〉). To address the limitations of the previous radial city model, it recommended an open linear urban structure achieved through the organic integration of cities, transportation, and architecture (Tange, 1961). For Kahng, the Tokyo Plan 1960 was a pivotal moment in his urban research, instilling the concept of the Linear City, a modernist design by Soria y Mata that would influence the spatial structure of many urban plans he worked on after the 1960s.

2. Seoul Spatial Structure Proposal in 1977

In the 1970s and 1980s, Seoul was seeking a decentralized policy for two main reasons. First, the city faced planning challenges due to its mono-nuclear structure, which concentrated commercial, office, and educational facilities in the center. Most bus routes passed through this central area, and rapid automobile growth, fueled by economic development, was expected. However, the possibilities for

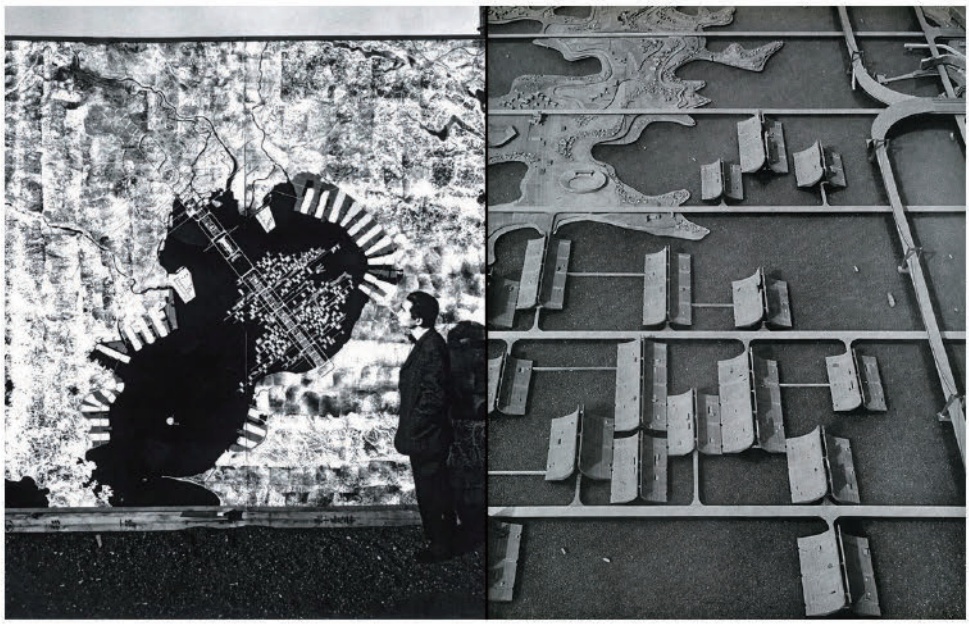


Figure 5. Tokyo Plan 1960 by Kenzo Tange

Source: Archeyes (2022)

road expansion in urban areas were limited (Kim, 1977).

The second reason was related to military defense. The excessive population concentration north of the Han River was seen as a significant military vulnerability (Son, 2005). During the Korean War in 1950, North Korea captured Seoul within three days, leading to numerous casualties, injuries, and abductions among South Koreans who could not evacuate. This situation was deemed undesirable for South Korea, which was positioned as a political outpost during the Cold War. Throughout the 1970s, the Korean government continued efforts to decentralize functions in Seoul (Choi et al., 2019).

In the mid-1970s, Seoul Mayor Ja-chun Koo adopted Professor Hyung-man Kim's proposal for a three-nuclear city to disperse the mono-centric central business district (CBD) of Seoul, South Korea (Kim, 1977; Son, 2003). To formalize and implement Kim's suggestion, the mayor organized idea competitions (Son, 2003). During this competition, Kahng was invited to submit a proposal (Lee, 2009). He suggested a polynuclear structure characterized by a "gathering and distribution shape" (集散形) (see 〈Figure 6〉).

Kahng proposed a circular structure near the city center, combined with a radial system for the city's periphery. He emphasized that the subway network would be crucial in restructuring the urban layout and argued that it should

(a) Transportation planning concept (b) Spatial structure diagram

Figure 6. Ring-shaped spatial structure proposal for Seoul by Kahng in 1977

Source: Kahng (1977)

support a ring shape, which he termed the "action ring" (Kahng, 1977). In this plan, Kahng first introduced a ring-shaped transport network and demonstrated how the linear city concept, aimed at a distributed spatial structure, could be transformed into a ring form.

3. New Administrative Capital Plan for South Korea in 1979

Since the late 1960s, concerns about population concentration in Seoul have grown due to its proximity—only 40 km from the border with North Korea. In response, the South Korean government wanted to decentralize the spatial structure of Seoul and move administrative functions to the southern part of the country. As part of this effort, the government initiated a new administrative capital plan, with one team led by Kahng. His research, published in "A Study for Urban Problems and Urban Patterns," addressed the challenges faced by the city and proposed potential countermeasures (Kahng et al., 1979; Lee, 2009).

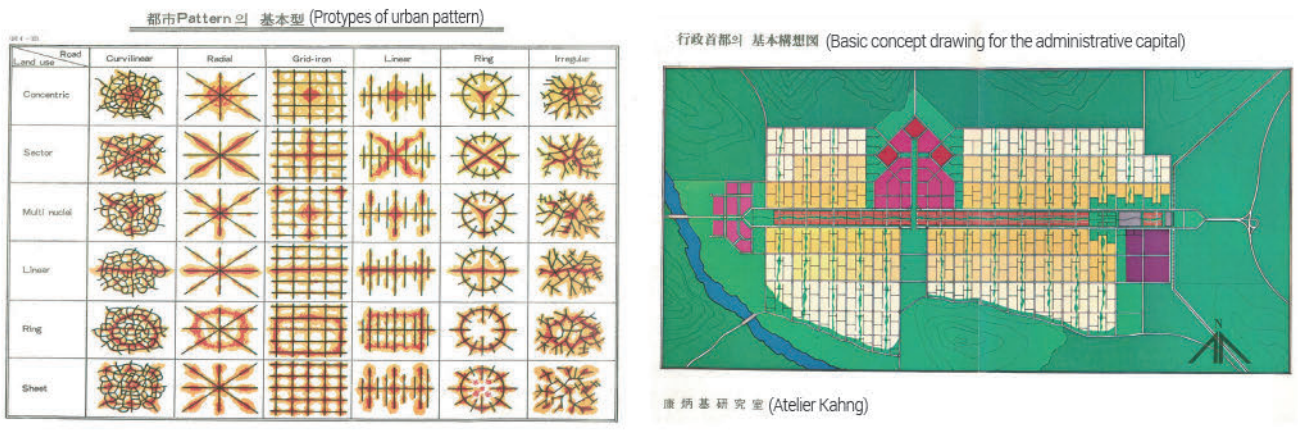
This study identified the basic types of land use and road network of cities and aimed to analyze the relationship between urban problems and urban patterns (see (a) in 〈Figure 7〉). Kahng concluded that linear patterns held the greatest potential for addressing urban issues (Kahng et al., 1979). The findings of this analysis likely reinforced his belief in a linear city concept. At the end of the report, he proposed a plan for a linear commercial area to accompany the proposed new administrative capital (see (b) in 〈Figure 7〉).

4. Rosario Metropolis for Seoul in 1980

In addition to addressing the need for spatially distributed structures as 1977 plan by Kahng, there was also a pressing need to tackle the housing shortage and car-centric transportation. When Kahng (1980b) unveiled the Rosario plan, it was titled "ROSARIO METROPOLIS FOR SEOUL 2001," and he referred to the plan's figure "the ROSARIO metropolis of tomorrow", clearly indicating that the plan was essentially a metropolitan-level initiative. This plan was based on the idea of "transit and housing," linking subway construction with housing supply through a "value-capture" strategy, which is crucial for developing countries with limited capital (Sung and Choi, 2017).

Kahng criticized Seoul's existing decentralization strategy, which relied on a radial network based on the current road system (Kahng, 1980a; 1980b). Instead, he proposed constructing a distributed structure in Seoul using the multi-directional magnetic fields created by each station: "the Rosario system with several series of crystallized beads they are; however, they do not converge into any single center. They are different from underlying road patterns which converge into the center focus. They may seem converging into a point where "strings" will meet, but there is not only one, but might be numerous" (Kahng, 1980b: p.502).

The Rosario Plan also incorporates district-level details of TOD. Sung and Choi (2017: p.519-520) evaluated the Rosario Plan based on the five Ds of TOD, asserting that the station area prototype closely resembles Calthorpe's TOD (see



(a) Analysis on land use and road

(b) Spatial structure proposal

Figure 7. Study and proposal for new administrative city

Source: Kahng et al. (1979)

〈Figure 8b〉). To meet the rising population and housing demands in Seoul, the plan calls for the development of high-density apartments in the station area. This area should feature mixed commercial and residential uses to achieve land use 'diversity,' while also allowing for the presence of light industrial facilities. A district-level approach is necessary, accompanied by a comprehensive 'design' for the station area. If the plan's target population density is reached, it could accommodate about 8.6 million people, ensuring 'distance to transit.' Additionally, the proposal includes measures to limit vehicle traffic and enhance the pedestrian environment in the subway station area to achieve effective 'demand management.'

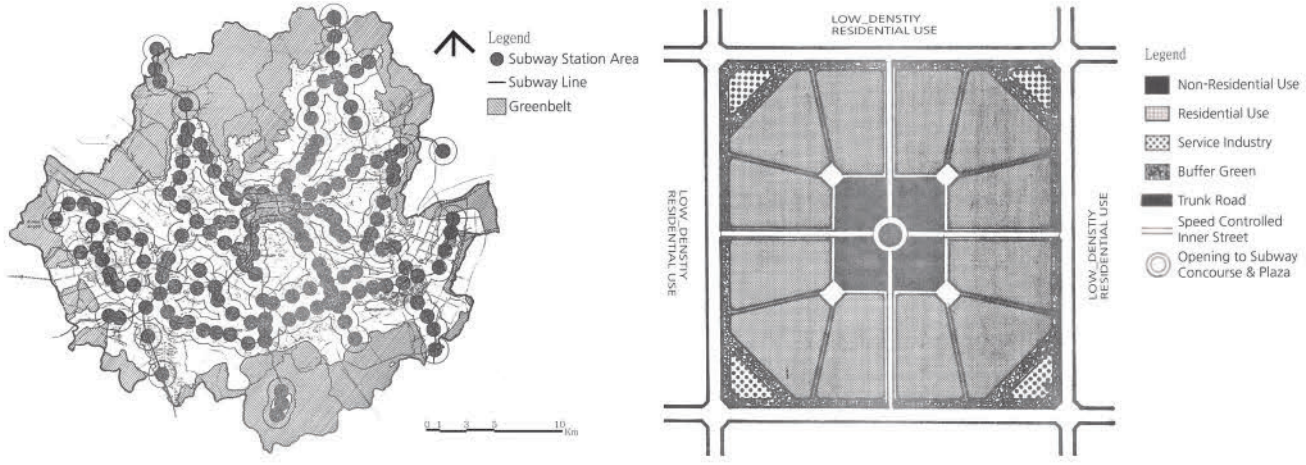
The Rosario Plan was included in the first official comprehensive plan for Seoul in 1990, established under South Korea's urban planning law. In this plan, Prof. Kahng contributed to the planning of land use and spatial structure. His proposal focused on the development of the station center, and it was included in the Seoul city plan (Seoul City Government, 1990). Since 1995, Seoul City has been up-zoning areas around subway stations for over 20 years, encompassing a total of 252 sites and covering an area of about 39 hectares (Yun and Choi, 2021). Recent studies have quantitatively shown that the floor area ratio in the up-zoned catchment areas of subway stations has increased more than in other areas (Yun and Choi, 2021; Kim, 2022). While not directly linked to the Rosario Plan, Seoul City has been actively promoting development around subway stations in recent years.

5. Mok-dong New Town Concept in 1983

In 1983, the city of Seoul began developing a large-scale new town spanning approximately 430 hectares in the Mok-dong area, which was a low-lying region prone to flooding and challenging for development, in response to rapid population growth. At that time, the city sought to select a design team through a design competition, a practice that was quite rare in Korea. Byeong-Kee Kahng and Oswald Nagler, who served as an advisor to the Housing and Urban Research Planning Institute (HURPI) from 1965 to 1967, were commissioned by the city of Seoul to create a basic concept design prior to the design competition (Kahng, 1993). The design developed by the two was based on the 'linear city' model.[6]

Whether it is merely a coincidence is unclear, but two proposals based on the linear city model in the Mok-dong design competition were considered superior.[7] As a result, the actual planning and development proceeded by creating an integrated design that capitalized on the strengths of both proposals while addressing their weaknesses (Kahng, 1993).

Recently, Jung and Hong (2024) confirmed that the linear structure implemented in the new development of Mok-dong significantly influenced the district planning of new towns in the Seoul metropolitan area, as well as Sejong City. They revealed that Mok-dong's design concept had a significant influence on Bundang's 'service axis' concept through their conversations with Yeong-Te Ohn, the urban



(a) Schematic image of spatial structure (b) Prototype of station area

Figure 8. Rosario Metropolis of Tomorrow for Seoul

Source: Kahng (1980b)

designer of Bundang, which is the most iconic and largest of the first-generation new towns in the Seoul metropolitan area. They further show that this concept has evolved into a 'community corridor' in the second-generation new towns.[8)]

Ⅳ. Conceptual Origins of the Rosario Plan

1. Linear City

A review of the plans prior to Prof. Kahng's proposal of the Rosario Plan indicates his strong conviction in the linear city concept. His belief evolved according to the given conditions. The 1977 proposal was based on the assumption of a metropolitan city with a population of about ten million which was reflected in the two rings connecting both sides of the line, including the existing city center. In contrast, the new administrative capital plan for a one million population in 1979 adhered to the traditional linear city model, developing linearly along the axis of urban growth.

Since Soria y Mata, many planners have embraced and implemented the concept of linear cities; however, proposals for a circular spatial structure have been rare. Aside from the 1977 plan and the Rosario concept, there are two plans that coincidentally emerged from the 2005 international competitions for the new administrative capital of Korea.

Prof. Kahng described the basic concept of the Rosario Plan as a "string," suggesting that it could resemble a necklace by connecting it like beads (Kahng, 1980b; Sung and Choi, 2017). He proposed a ring structure that more actively links Soria y Mata's original proposal to a subway network. However, as illustrated in 〈Figure 8a〉, it is challenging to fully explain all the distributed structures centered around the various transitions in the Rosario Plan.

2. Transit for Metropolis (TOD and TOM)

Howard's "Garden Cities of Tomorrow" carries significant meaning as a social movement (Fishman, 1982). From a spatial perspective, it envisions a metropolitan area connected by a canal and railroad network, with cities designed to achieve self-sufficiency within walking distance of factories, shops, farms, and more. So, Hall (2002) argued that Calthorpe's TOD may have drawn inspiration from Howard's ideas as well as European metropolitan plans developed in line with Howard's spatial planning concepts.

When expanding a metropolitan area, it is crucial to address the transportation network. Tange's 1960 Tokyo Plan emphasized the smooth flow of automobile traffic, while TOD and TOM advocate for utilizing public transit networks and organizing activities and land use around transit station nodes. Three years prior to the announcement of the Rosario Plan, Kahng recognized the limitations of car traffic in his spatial plan for Seoul and proposed creating a spatial structure based on a railroad network (Kahng, 1977). His analysis highlighted the clear limitations of expanding the road network in existing urban areas, confirming that a significant shift toward a railroad system is necessary to address transportation challenges in the metropolis (Kahng, 1977).

If Howard's proposal, along with Europe's and Japan's TOM, utilized a railroad network to connect new and old towns, the Rosario Plan not only encompasses this concept but also serves as a means to facilitate change within existing towns. The Rosario Plan suggested that the station and its surrounding area should be leveraged as catalysts for urban renewal and redevelopment.

Kahng's continuous studies in Japan from 1947 to 1970, spanning high school to his Ph.D., likely had a significant impact on the development of his Rosario concept. During this period, he witnessed numerous post-war restorations and urban developments in Japan. Tokyo has a prominent example that has integrated the Garden City movement with mass transit. While the Japanese concept of TOM incorporates aspects of urban development by private railroad companies (Yorihusa, 1987), the Rosario Plan distinguishes itself by emphasizing public development, urban planning, and value capture (Sung and Choi, 2017).

3. Semi-lattice Spatial Structure

Before proposing the Rosario Plan, Kahng moved away from the Cartesian perspective he held in his youth and developed an understanding that urban diversity should focus more on people's daily lives (Kahng, 1993). His skepticism toward modernist architecture and urban planning began in 1977 when he participated in the affordable housing

plan for Jahra, Kuwait (Lee, 2007). In this project, he oversaw the planning of a housing complex for indigenous people, realizing the necessity for planning and design to align with the users' needs rather than the designer's viewpoint (Kahng, 1993). This experience spurred significant changes in his thoughts on urban design and planning from the late 1970s onward.

His two articles from around 1980 demonstrate a complete transformation in his thinking. "Loose System" (Kahng, 1979) introduced the semi-lattice structure originally proposed by Alexander, while "From Mono to Multi" (Kahng, 1981) embraced diverse and pluralistic values. This shift in perspective led him to explore the potential of using the subway as a means of public transportation to effect change.

This idea was incorporated into the first comprehensive plan for Seoul in 1990, which included the Rosario Plan and reflected Alexander's semi-lattice structure (see 〈Figure 9〉). The plan aimed to distribute the centers of both large and small city activities through the use of public transportation, while emphasizing the subway and road networks as essential elements for structuring developed living spaces (Seoul City Government, 1990).

4. Urban design

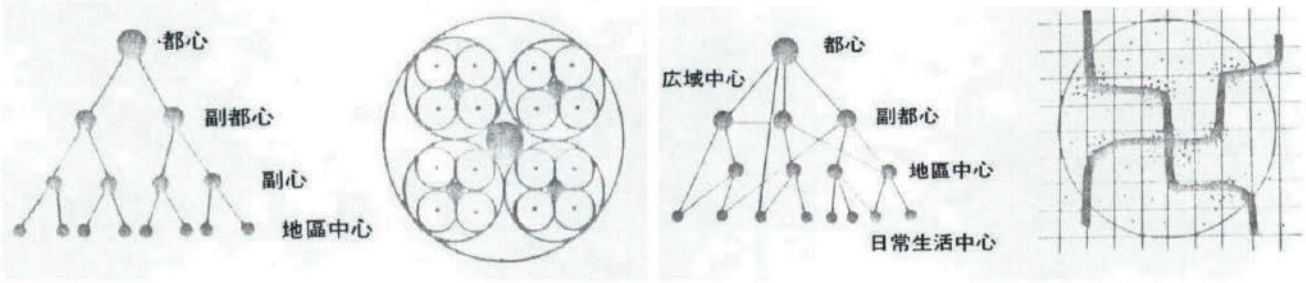
The Rosario Plan included diagrams that provided a detailed design of the station area (see (b) in 〈Figure 8〉). The prototypes featured in this plan discussed the Ds of TOD, incorporating more thorough urban design at both the district and metropolitan levels, as elaborated in previous sections of this article. Kahng himself identified as an urban designer (Kahng, 1980b) and developed an interest in urban design during his time at Tange's lab around 1960. He stated that his motivation for returning to Korea in 1970 was to practice urban design in his homeland, and he made various efforts to introduce urban design concepts to the country throughout the 1970s and 1980s (Kahng, 1993; Lee, 2009).

Just before proposing the Rosario Plan, Kahng published "Definition and Range of Urban Design" (Kahng, 1980a). This article provided a comprehensive introduction to urban design in Korea, outlining its significance and necessary actions with detailed explanations. As one of the pioneers of urban design in Korea, he became the first president of the Urban Design Institute of Korea in 2000, which was the country's first academic association dedicated to urban design. His diverse interests and expertise in urban design are reflected in the concepts of density, diversity, and design included in the Rosario Plan.

Ⅴ. Conclusion and Discussion

This study thoroughly examined the conceptual background behind the design of the Rosario Plan. In addition to his belief in Soria y Mata's 'Linear City' as a form of decentralized spatial structure, Kahng sought to incorporate Alexander's 'Semi-lattice structure,' envisioning a flexible framework supported by the subway and its stations. By adding this metropolitan-level spatial structure, he utilized his urban design expertise to create a pedestrian-friendly and vibrant station area that also addresses the need for high-density housing.

It is undeniable that Kahng's Rosario Plan was influenced by the linear city concept in Tange's Tokyo Plan of 1960.



(a) Schematic image of spatial structure (b) Prototype of station area

Note) 都心: city center, 廣域中心: regional center, 副都心: sub-city center, 副心: sub center, 地區中心: district center, 日常生活中心: daily life center

Figure 9. Concepts for spatial structure for Seoul in 1990

Source: Seoul City Government (1990)

However, by the end of the 1970s, his planning philosophy sought to move away from modernism, aiming to develop designs tailored to specific regions and situations, which ultimately led to the creation of the Rosario Plan. Tange's influence on Kahng in this context is not reflected in a hierarchical spatial structure typical of the linear city model, but rather in a comprehensive approach that addresses the broader challenges of urban planning (Kahng, 1993; Lee, 2009). It is evident in the Rosario Plan through the integration of traffic, housing, and land use into a cohesive system, rather than treating them as separate elements. While many urban planners and designers are aligned with Alexander's 'Semi-lattice structure,' implementing this concept in practice can be challenging. Planners often gravitate toward a hierarchical structure, likely because it is easier to design, explain to others, and gain acceptance. In contrast, Kahng emphasized the potential of the subway and its stations, prioritizing them over conventional road transportation systems and suggesting a more flexible spatial structure.

Proposals for a metropolitan-level spatial structure are unlikely to be realized without a district-level approach. While the former provides a general framework, it often lacks specificity, whereas district-level proposals can enhance the feasibility of the overall plan, but may not provide direction for the entire metropolis. Therefore, urban design and planning should be discussed and developed in conjunction with practical realization aspects, even in metropolitan-level plans.

This study has contributed to the understanding of the historical Rosario Plan for Seoul in 1980 by uncovering previously undiscussed documents and exploring its significance; however, it has several limitations. First, although many new records have been discovered, there are still areas where specific evidence is lacking. For instance, while Kahng's 1977 plan appears to share similar concepts related to TOD and TOM, concrete evidence has yet to be confirmed. Second, regarding the development of concepts, the study did not specifically highlight how Kahng's ideas differed from those of other proposals. For example, the conceptual distinctions from other participants in the 1977 competition were not clearly articulated. Third, the reasons behind the 1980 Rosario Plan—an essential precursor to current station area developments and proposals in Seoul and South Korea—being forgotten by the public and experts remain unexplored, as well as why the 1993 TOD concept from the United States became more prevalent. Although "compact and network" spatial structure and TOD have gained widespread acceptance in recent years, few individuals in the country are familiar with the Rosario Plan from 1980.

Note 1. One of the authors contacted Prof. Kahng's wife in September 2021 to confirm the Japanese pronunciation, as he passed away in 2007.

Note 2. Harvey (2011), in his explanation on the Sejong City design competition, did not mention whether his political views on spatial planning influenced selection process. However, he did express a preference for structures that can evolve over time, as opposed to fixed structures. The authors of this paper interpret this preference as indicative of a favoring for 'linear structures'.

Note 3. During the judges' discussions for the Sejong City competition, it appears that there was no mention of Kahng's 1977 plan or his 1980 Rosario Plan for Seoul. It is presumed that the judges were likely unaware of these proposals.

Note 4. To be honest, in 2017, Hyungun Sung and Chang Gyu Choi did not know that Cervero (1998) already had called this concept "a transit metropolis". In this study, we continued to use the term transit-oriented metropolis to maintain consistency with similar concepts and words.

Note 5. In November 2017, corresponding author Chang Gyu Choi encountered Prof. Sadao Watanabe, one of five young architects involved in the Tokyo Plan of 1960 and a senior to Kahng at the time. Choi inquired about Kahng's role in the plan, to which Watanabe recalled assigning Kahng transportation-related tasks. Additionally, Kahng's Ph.D. dissertation in 1970 focused on transportation and immigration in the metropolis.

Note 6. Nagler sought to implement the linear model in urban development in South Korea in the late 1960s, and Mok-dong became the first and only project in which a linear structure was realized among the initiatives he was involved in (Jung and Hong, 2024).

Note 7. Son (2003) pointed out the possibility that Kahng and Nagler's design concepts may have been leaked by someone.

Note 8. Kahng was one of the first experts to introduce urban design to South Korea, and he led the Urban Design Research Group within the Korea Planning Association from the late 1980s to the early 21st century. In addition to the influence of HURPI and Nagler's linear city model study, as noted by Jung and Hong (2024), it is also highly likely that the linear structure proposed by Kahng influenced the design of the new towns in the country in various ways.

References

1. Alexander, C., 1965. "A City Is Not a Tree", *Architectural Forum*, 122(1): 58-62.
2. Belzer, D., 2011. *Corridor-Level Approaches to Creating Transit-Oriented Districts*, Strategic Economics and Center for Transit-Oriented Development.
3. Bhatt, R., 2010. "Christopher Alexander's Pattern Language:

An Alternative Exploration of Spacemaking Practices", *The Journal of Architecture*, 15(6): 711–729.

4. Calthorpe, P., 1993. *The Next American Metropolis: Ecology, Community, and the American Dream*, New York: Princeton Architectural Press.
5. Cervero, R. and Murakami, J., 2009. "Rail and Property Development in Hong Kong: Experiences and Extensions", *Urban Studies*, 46(10): 2019-2043.
6. Cervero, R., 1995. "Sustainable New Towns: Stockholm's Rail Served Satellites", *Cities*, 12(1): 41-51.
7. Cervero, R., 1998. *The Transit Metropolis: A Global Inquiry*, Washington D.C.: Island Press
8. Cervero, R. and Kockelman, K., 1997. "Travel Demand and the 3Ds: Density, Diversity and Design", Transportation Research Part D: Transport and Environment, 2(3): 199-219.
9. Cervero, R. and Sullivan, C., 2011. "Green TODs: Marrying Transit-oriented Development and Green Urbanism", *International Journal of Sustainable Development and World Energy*, 18(3): 210-218.
10. Cho, H.J., 2014. "A Plan for Tokyo, 1960: Tange Kenzo's Technocratic Utopia", *Journal of Association of Western Art History*, 41: 259-284. (In Korean)
11. Choi, C.G., Lee, S.G., Kim, H.S., and Seong, E.Y., 2019. "Critical Junctures and Path Dependence in Urban Planning and Housing Policy: A Review of Greenbelts and New Towns in Korea's Seoul Metropolitan Area", *Land Use Policy*, 80: 195-204.
12. Doxiadis, C.A., 1967. "On Linear Cities", *The Town Planning Review*, 38(1): 35–42.
13. Ewing, R. and Cervero, R., 2010. "Travel and the Built Environment: A Meta-Analysis", *Journal of the American Planning Association*, 76(3): 265-294.
14. Fishman, R., 1982. *Urban Utopias in the Twentieth Century: Ebenezer Howard, Frank Lloyd Wright*, Le Corbusier, Cambridge: The MIT Press.
15. Hall, P., 2002. *Cities of Tomorrow*, Oxford, UK: Basil Blackwell 3rd edition.
16. Harvey, D., 2011. *The Enigma of Capital: And the Crises of Capitalism*, England: Oxford University Press, Inc.
17. Jung, S. and Hong, N., 2024. "From HURPI to Community Corridor: The Evolution of the Central Linear Axis in South Korean New Towns", *Planning Perspectives*, 39(4): 815-833.
18. Kahng, B.K., 1977. "A Study of Seoul Urban Structure", in *A Study of Seoul Urban Structure*, edited Seoul City Government, 213-232. Seoul, Korea (in Korean)
19. Kahng, B.K., 1979. "Loose System", *Journal of Korea Planners Association*, 15(2): 2-3. Seoul, Korea (in Korean)
20. Kahng, B.K., 1980a. "Definition and Range of Urban Design", in *Urban Problem*, edited by Korea Local Administration Officials' Mutual Fund, 84-101. Seoul, Korea. (in Korean)
21. Kahng, B.K., 1980b. ""ROSARIO" Metropolis for Seoul 2001: A Strategic Frame for Joint Development along Subway System", in *The Year 2000: Urban Growth and Perspectives for Seoul*, edited by Korea Planners Association, 492-511. Seoul, Korea. (in Korean)
22. Kahng, B.K., 1981. "Mono to Multi", *Journal of Korea Planners Association*, 16(2): 2-3. Seoul, Korea (in Korean)
23. Kahng, B.K., 1993. *Culture of Life and Urban Planning*, Seoul, Korea: Nanam. (in Korean)
24. Kahng, B.K., Lee, K.S., Lee, J.W., Shin, B.S., Lee, H.K., Jin, J., and Sohn, C.K., 1979. *A Study for Urban Problem and Urban Pattern*, Seoul, Korea: Heavy and Chemicals Industry Promoting Committee. (in Korean)
25. Kim, H.M., 1977. "A Study of Seoul Urban Structure", in *A Study of Seoul Urban Structure*, edited by Seoul City Government, 1-211, Seoul, Korea. (in Korean)
26. Kim, S.H., 2022. "Up-zoning Impact on Land Use Pattern Change in Catchment Area of Subway Stations", Ph.D. Degree Dissertation, Hanyang University. (in Korean, unpublished)
27. Lee, K.H., 2009. "Interview with Byong-Kee Kahng on His Urban Planning and Life", in *Oral history of Urban Planning of a Half Century of Korea*, edited by Korea Planning Association, 147-207, Seoul, Korea: Bo-sung-gak. (in Korean)
28. Lin, Z., 2010. *Kenzo Tange and the Metabolist Movement: Urban Utopias of Modern Japan*, London: Routledge.
29. Ohn, Y.T., 2016. "Urban Planning and Urban Design", in *Sejong City Was Made Like This*, edited by Sang-sang-hoe, 165-173, Seoul: Boseong-gak. (in Korean)
30. Palacio, P.N., 1969. "La Ciudad Lineal de Arturo Soria", *Villa de Madrid*, 28: 49-58. Accessed on 25th April 2017 at http://oa.upm.es/7682/ (in Spanish)
31. Seoul City Government, 1990. *Comprehensive Plan for Seoul toward the 2000s*, Seoul: Seoul City Government. (in Korean)
32. Son, J.M., 2003. *The Story of Seoul's Urban Planning 3*. Paju, Korea: Hanul. (in Korean)
33. Son, J.M., 2005. *The Story of City in Korea for 60 Years 2*. Paju, Korea: Hanul. (in Korean)
34. Sung, H. and Choi, C.G., 2017. "The link between metropolitan planning and transit-oriented development: An examination of the Rosario Plan in 1980 for Seoul, South Korea", *Land Use Policy* 63: 514-522.
35. Yun, E.J. and Choi, C.G., 2021. "A Study on the Effects of Up-zoning on the Floor Area Ratio and its Variation", *Journal of the Korean Regional Development Association*, 33(2): 81-96. (in Korean)
36. 丹下健三, 1961. "東京計画-1960, その構造改革の提案", 「新建築」, 79-120.
Tange, K., 1961. "Tokyo Plan-1960: Proposal for Its Structural Reform", *Shinkenchiku*, 79-120. (in Japanese)
37. 渡辺俊一, 1977. "日本的田園都市論の研究(1): 田園都市株式會社 (1918-28)の場合", 昭化52年度第12回日本都市計画學會學術研究発表会, 千葉市: 千葉大学西千葉キャンパス.
Watanabe, S. 1977. "Study on Japanese Garden City (1): Gar\-

den City Corporation (1918-28)", Japanese Urban Planning Association Conference, Chiba-shi: Nishi-Chiba Campus Nishi-Chiba Campus. (in Japanese)

38. 石田頼房, 1987.「日本近代都市計画の百年」, 東京: 自治体研究社.
Yorihusa, I., 1987. *100 Years of Japanese Modern Urban Planning*, Local Government Institute. (in Japanese)

39. Archeyes, 2022.10.09. Kenzo Tange's Vision for Tokyo in 1960: A Master Plan, Archeyes, https://archeyes.com/plan-tokyo-1960-kenzo-tange/

40. Avery, D., 2021.01.26. Saudi Arabia Building 100-Mile-Long "Linear" City, Architectural Digest, https://www.architecturaldigest.com/story/saudi-arabia-building-100-mile-long-linear-city

41. National Agency for Administrative City Construction (NAACC), 2017. Spatial Structure of Admisnistrative City in South Korea, Accessed on 25th April 2017 at http://www.naacc.go.kr.

42. Ortega, A.P., 2005. The City of Thousand Cities, Accessed on 25th April 2017 at http://andrespereaarquitecto.com/english/proyectos/concursos-nternacionales/)

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