조경학석사 학위논문

서울디지털산업단지 3단지의 공개공지에 관한 연구

Privately-owned Public Spaces in Seoul Digital Industrial Complex 3

2020년 8월

서울대학교 환경대학원

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이 논문을 조경학석사 학위논문으로 제출함
2020년 4월

서울대학교 환경대학원
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이호진의 석사 학위논문을 인준함
2020년 6월

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위 논문은 서울대학교 및 환경대학원 환경조경학과 학위논문 관련 규정에 의거하여 심사위원의 지도과정을 충실히 이수하였음을 확인합니다.

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Abstract

Privately-owned Public Spaces in Seoul Digital Industrial Complex 3

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Nowadays, most land of Seoul is covered with concrete roads and buildings. Seoul became covered with concrete within only about 50 years. Therefore, green area became scarce in Seoul nowadays. Privately owned public space(POPS hereafter) is one solution to offer a green space for public in urban area.

Building a POPS will give an incentive to floor area ratio. A building over 5000m2 in Gross floor area must include a certain amount of POPS. There are many POPS built in tall buildings in Seoul. If there was no POPS, it would have been hard to find a green space in Seoul. POPS is a space of relax and recharge in modern city. However, POPS in South Korea nowadays are mostly built as a border space around a building, isolated green space, and a space for sculpture installation. Also many

POPS built in Seoul has no connectivity with neighboring urban environment. In foreign countries like USA or Japan, architects suggest many different plans for POPS considering its connectivity with surrounding environment like roads, building limit lines, shapes of buildings, and colors of buildings.

This study was done over the Seoul Digital Industrial Complex 3(SDIC 3 hereafter), which is placed in Gasan-dong, Geumcheon-Gu, Seoul and Guro-dong, Guro-gu, Seoul. SDIC 3 is the largest complex in land area among the three complexes; SDIC 1, SDIC 2, and SDIC 3. SDIC 3 takes 57.2% of the whole area in SDIC. SDIC is the center of the industrial development in South Korea. Currently, there are many knowledge- based industrial companies in the apartment factories built in SDIC 3. Most of the apartment factories in SDIC 3 received incentives in Floor Area Ratio(FAR hereafter) by building POPS of over 10% to the building area. Nowadays, one can easily observe many POPS neighboring each other in SDIC 3.

Unlike SDIC 1 and 2, SDIC 3 is still in development. So it can be said that SDIC 3 is a precedent of future industrial complex in South Korea. Therefore, it is meaningful to study the urban structure of SDIC 3 for the development of industrial complex. This research studied about the POPS in SDIC 3. It analyzed natural condition of green spaces in the POPS, connectivity of neighboring POPS, and usage of POPS by people.

Key words : SDIC 3, POPS
Student Number : 2018-20560

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Chapter 1 Introduction

1. Research Background and Purpose

1. Research Background

Seoul Digital Industrial Complex(SDIC hereafter), which is placed in Seoul Guro-gu and Geumcheon-gu, is one of the biggest industrial complexes in South Korea. The history of SDIC begins from Guro Industrial Complex(GIC hereafter), which was built in between late 1960s and early 1970s by the government to grow labor-intensive industries in South Korea. Heavy industries, textile manufacturing, dressmaking, printing, publishing, Electro-mechanical appliances and electronics industries grew up in GIC. It maintained a stable growth until the 1980s.

However, because of the stagflation and protectionism around the world, growth of labor-intensive industries was slowed down. Moreover, international oil price shock and IMF intervention in South Korea led to collapse of many labor-intensive industrial companies in GIC. With such an economic crisis, Guro Labor Union strike happened in 1987 causing a significant shift in the structure of labor-intensive industries. Workers started to avoid dangerous, difficult, and dirty jobs, which were called as 3d-industry jobs. After the IMF intervention, land price of Seoul rose high. Enforcement of labor union rose the wage of workers. Therefore, many labor-intensive companies had to move their factories to outer regions of Seoul, or to foreign countries where they can afford the land price and wage of workers.

Only companies that have an advantage for being in Seoul stayed in GIC.

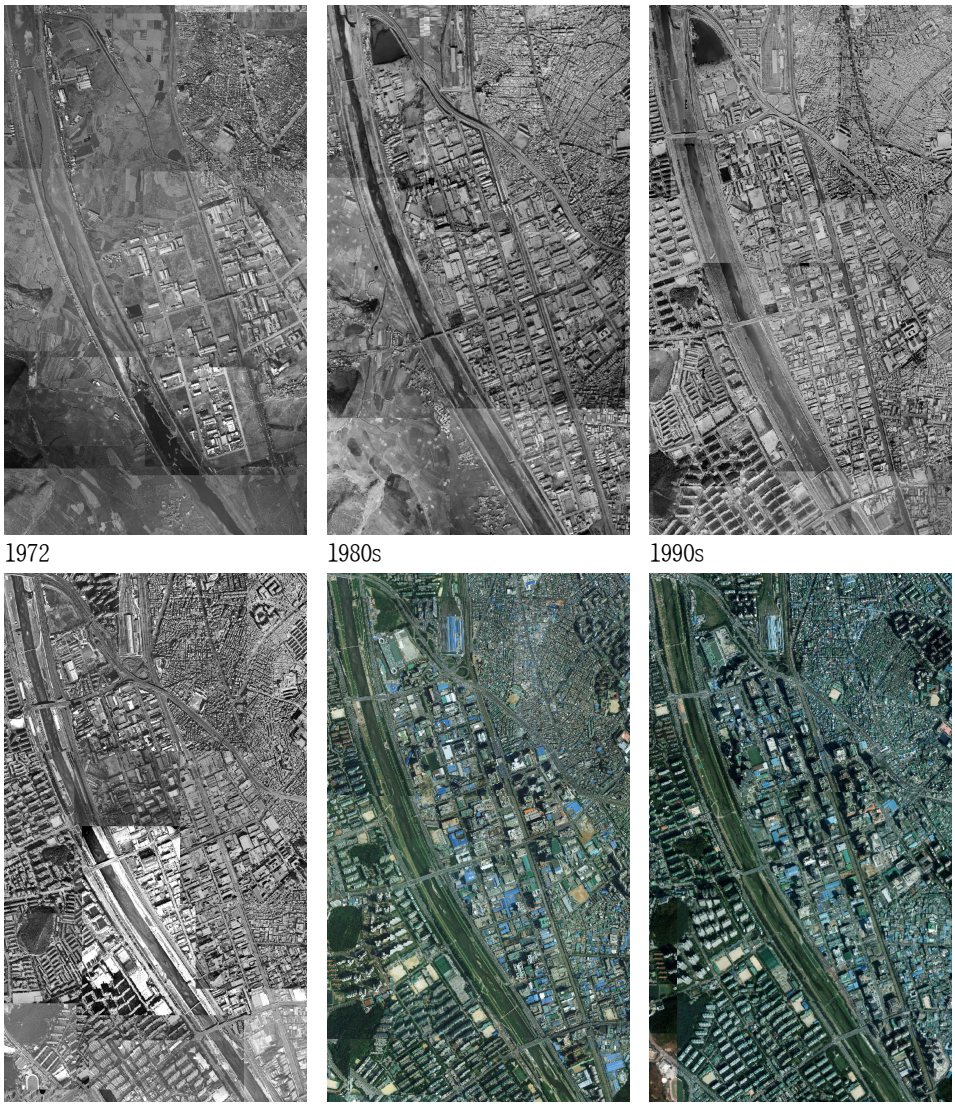
Following the change in the industry of GIC, it was time to adapt new frontier industries. However, buildings and infrastructures in GIC were old and rusty for newly rising frontier industries because GIC was originally planned for labor-intensive industries. Therefore, South Korean government decided to renovate GIC as an industrial complex, where it can support new frontier industries.

When GIC was renovated to SDIC, original labor-intensive factories were replaced by Information Technology(IT hereafter) industrial companies. To support the growth of IT industry, government policy allowed tax benefits on apartment factories. Apartment factory is a building in an industrial area where manufacturing factories can enter. Usually, when an industrial area is developed, it becomes an area filled with factories where neighbors avoid to visit. However, the apartment factory can solve this problem by containing several manufacturing companies in one tall building. The apartment factory helps creating a clean and organized industrial area where people wants to visit.

SDIC 3, the main site of this study, is placed in SDIC. It takes about 57 of the whole land area in SDIC, which is about 1,980,000m2. It is placed in Geumcheon-gu, Gasan-dong. Because it's the largest complex in SDIC, it has the most number of workers. However it still has large area that need to be renovated. Following SDIC 1 and 2, SDIC 3 has been developed mainly as an industrial area.

It was a successful renovation from GIC to SDIC. New knowledge-based industries could settle in SDIC. However, the renovation was mainly focused on the development of industry. There was no detailed guideline for the renovation in the urban structure of SDIC. There was no chance to

reorganize roads, sidewalks, and public spaces in SDIC. Such chances were disrupted by hasty individual development of each building. Therefore, weakness in the urban planning of SDIC is shown nowadays.



Reference : Smart Seoul Map (https://map.seoul.go.kr/smgis2/)

[Figure 1-1] Air map of SDIC 3, 1972 - 2019

Government' s allowing private developers in the renovation of SDIC was

one the reasons why individual development of buildings in SDIC 3 happened. Private developers developed each building for the sake of their own companies and it disconnected buildings with surrounding urban environment. However, individual development in SDIC 3 also led to a creation of mass number of privately owned public spaces(POPS hereafter) in SDIC 3. Unlike previous industrial complex developments, government allowed POPS to be built in SDIC 3 and allowed a high rate of an FAR incentive from building a POPS. Now there are high floored apartment factories with POPS over 25% of the land area in SDIC 3. ([Figure 1-1])

POPS was built in South Korea from 1991, but there is no specific guideline about a POPS construction. Currently, buildings for religion, selling, delivery, office, hotel, cultural activity, gathering of people, and exceptional cases of Total Floor Area(TFA) over 5,000m2 should build a POPS of 10% to land area. Also, in case when a POPS area is larger than the required area, in purpose of public convenience, government allows to give an incentive about the FAR and a height limit. Most of the POPS are built for the purpose of getting an incentive. Therefore POPS are built without any guideline or plan. Just building an empty public space filled with a few trees and chairs fulfill the requirement of POPS. Construction of POPS without a consideration for surrounding urban environment causes an inconvenience to people in the city.

Mass construction of POPS in a limited industrial area is an exceptional case for an urban planning. SDIC was a first attempt to build such a compact industrial area in South Korea. However, many POPS constructed in industrial areas in the future will follow the case of SDIC. Therefore a study about POPS in SDIC 3 will be a stepping stone for future construction of

POPS in an industrial area.

2. Research Purpose

While GIC was characterized by labour-intensive industry factories, SDIC is characterized by IT and knowledge-based industry companies in apartment factories. It was a successful renovation into SDIC from GIC in industrial perspective. However, individual development of each apartment factory in SDIC created an urban city structure where each apartment factory is isolated from surrounding urban environment. In between the isolated apartment factories and city structure, POPS function as connecting space. This study began from the urge to analyze the POPS in SDIC 3.

Most of the apartment factories in SDIC built a POPS and received an incentive for a FAR. Now there are lots of POPS built in SDIC. However, those many POPS in SDIC were designed individually without an unified guideline. Each POPS was designed relative to the building that it is included. Therefore POPS in SDIC are now functioning as resting areas for workers in the neighboring building, but there is no relevance with surrounding city environment.

POPS are built for public usage. To make it happen, government gives an incentive on FAR and height limit when an architect builds a POPS of certain ratio to the land area. However, a limitation of current government policy about POPS is that it only stimulates a construction of a POPS and doesn't offer any guideline for a POPS. It led to several problems about a POPS such as showing a lack of relevance with the surroundings due to an individual construction, a disconnection with surroundings because of a

parking lot entrance, a privatization of spaces by a construction of a flower bed or a sculpture that doesn' t harmonize with a flow of pedestrian, and a cavitation in low transient population area or at weekend night time.

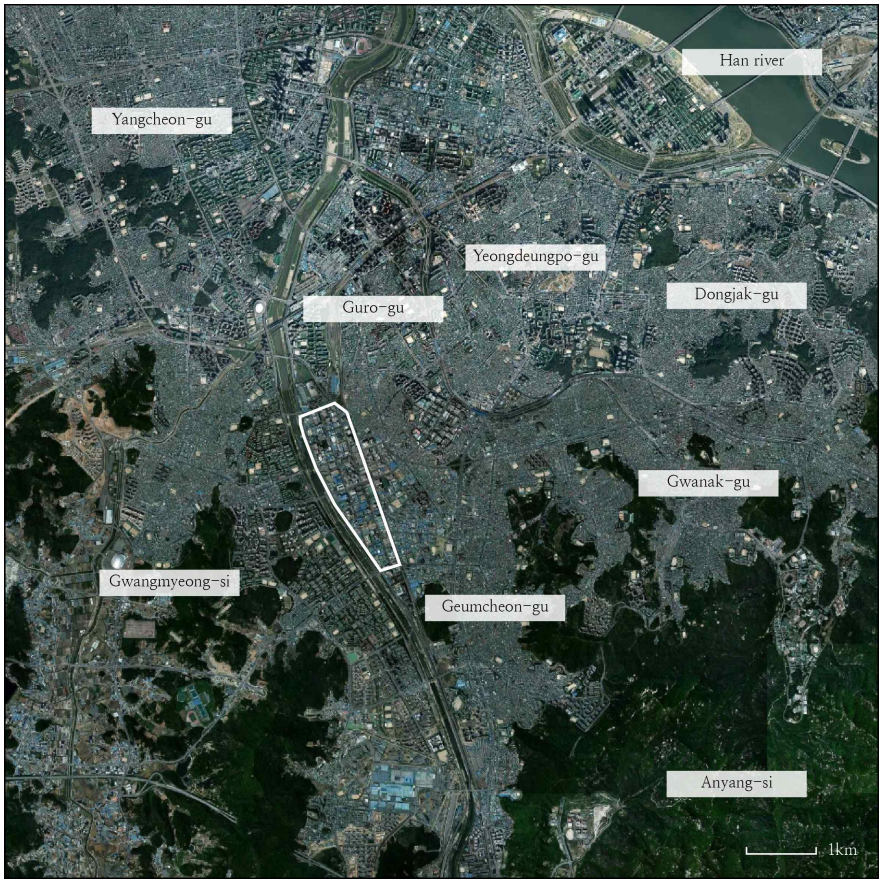
Most of the people in SDIC are working in IT or knowledge-based industries which requires them to spend most of the work time inside the buildings. Those workers who spend much time inside the buildings rather need more outdoor resting spaces. There are several public parks and welfare facilities in SDIC, but considering the wide area of the whole SDIC resting spaces are not evenly distributed and lack in numbers.

From this research, analysis on urban spaces in SDIC 3 will be analyzed. Furthermore, POPS in SDIC 3 will be analyzed. In the end, current status of POPS and future direction of improvement will be concluded.

2. Research Area and Method

1. Research Area

This study was performed on SDIC 3 placed along Gasan-dong, Geumcheon-gu and Guro-dong, Guro-gu, Seoul, South Korea. Complex 3 has the biggest land area among complex 1, 2, and 3. SDIC 3 was built in 1973 as 1,133,128 m2 in land area, which takes 52.8% of the whole Guro Industrial Complex(GIC). Complex 3 now takes about 57.2% of the whole SDIC.



[Figure 1-2] Satellite map of SDIC 3

SDIC 3 is now composed of industrial facilities, public facilities, and welfare

facilities. One thing important is that there is no green facilities in complex 3. Currently knowledge-based product industry, and knowledge-based service industry compose complex 3. There is a bridge named as "Bridge of export" that crosses the complex 3 in the middle. Knowledge-based service industries are placed mostly on the north side of the bridge, and knowledge-based product industry are placed mostly on the south side of the bridge. Currently more apartment factories are built on the north side of complex 3, but the number of apartment factories on the south side of complex 3 is increasing. Privately Owned Public Space(POPS)s built with buildings are the only green spaces now in complex 3. Therefore POPS is the only resting area and also the only green area in complex 3. It is great to have a POPS with each building, but POPS in complex 3 were built individually so they lack relevance with the surrounding environment. Careless design of POPS construction destroyed a potential of the POPS as an oasis in complex 3.

Until now there were many researches about types of POPS but there are not many researches about the connectivity of POPS with surrounding environment. As the number of industrial area increases, apartment factories and POPS can form a special urban space in current cities. SDIC is the most well known industrial area in South Korea and POPS in the industrial area are not fully studied as much as POPS in Jongro and Gangnam, where there are many office buildings. Moreover, previous studies about POPS in SDIC were mostly focused on complex 1, which was developed in firsthand. However, complex 3, although it was developed later than complex and is still being developed, wasn't studied a lot about its POPS. Complex 3 which takes more than the half of the whole land area of SDIC need to be

researched.

This research focuses on POPS in SDIC 3 as a target of analysis. There are many different POPS spread in complex 3, so complex 3 was distinguished into several blocks and analyzed POPS in each block.

2. Research Method

This study researched current status of POPS in SDIC 3 and analyzed each POPS' relevance with surrounding urban environment.

To begin the study, research on how to distinguish types of POPS and analysis methods in previous studies was done. Also research for urban structure, public facilities, POPS current status, and POPS direction of improvement in complex 3 was done.

Type of POPS and current status of POPS are analyzed in this research. Type of POPS was distinguished by its form and placement. Current status of POPS was analyzed by relevance with surrounding urban environment. Also people's usage of POPS in SDIC 3 was done. Along with the research about the usage of POPS in SDIC 3, if a POPS is causing any trouble in passenger's usage was done. Furthermore, research about how POPS are offering to the community was done. Through all these researches, analysis about POPS in SDIC 3 in different perspectives was done.

3. Precedent studies

[Table 1-1] Precedent research on Seoul Digital Industrial Complex

	Researcher	Title	Purpose	Conclusion
SDIC	Joon young Park (2011)	Development process and change in role of Seoul Digital Industrial Complex(G valley), Korea University, Master' s degree thesis	Acknowledgement of the roles and types of industrial areas. Analysis on the development process of Seoul Digital Industrial Complex.	Management of complex 1, 2, and 3 should be simplified. Renovation of roads and streets is needed. Green space is lacking.
	Eun kyung Jeon (2017)	A study on the urban planning of Seoul Digital Industrial Complex and the changes of the space - based on knowledge industrial center -, Seoul National University, Master' s degree thesis	Analyze how current urban planning balances knowledge-based service industry and manufacturing industry in the industrial area.	Development of industrial areas for the purpose of real estate business should be managed, and a city plan that can include manufacturing industry should be designed.
	In myeong Lee (2008)	Restructuring and managerial improvement of industrial complexes : the case of Seoul Digital Complex, Danguk University, Master' s degree thesis	Research if the renovation in SDIC helps companies during the shift from manufacture industry to knowledge-based service industry.	Management system of SDIC should be unified. Infrastructure of SDIC should be renovated.
	Han myung Kim (2006)	A Study on Urban Environment Improvement of Industrial district with change of Urban Industrial structure, Hongik University, Master' s degree thesis	Study about the change of industrial areas according to the change of types in industries. Make a master plan in industrial area as a mixed-use development different from previous simple residential complex.	Mixed-use development should be done considering the characteristic of each region. There needs a support from governmental policies for ideal mixed-use development.
	Chul Yoon (2008)	A study on the restructuring processes of the Seoul Digital Complex and the strategies for developing industrial cluster, University of Seoul, Master' s degree thesis	Look into innovative activities of businesses in the complex and then suggest strategies for further development in order to guide the Seoul Digital Industrial Complex in the right direction	SDIC is restructured in a direction of knowledge-based industry. With the industrial development maintenance and expansion of urban infrastructure is also needed.
	Teuk nyeon Kim (2015)	A study of urban typology based on city characteristics and satisfaction of small and medium-sized cities, Daegu university, Master' s degree thesis	This study examined the urban characteristics and residents' satisfaction in order to categorize type of small and medium-sized cities under a half million population.	It is important to consider residents' satisfaction when setting a governmental policy. Therefore it is necessary to provide urban policies which relects each city' s own urban characteristics.
	Seung Min Song (2015)	A study on the spatial planning and legal system responsive to the changing structure of urban high-tech industrial clusters, Phd degree thesis, Sung kyun kwan University	Changes the developing urban high-tech industrial complex is undergoing in the transition from manufacturing industry-centered to knowledge-based industry.	The space planning transformation of city high-tech industrial cluster should be reference material relevant to plan of high tech industrial complex, setting direction of aged industrial complex, and establishing strategy of industrial complex.

[Table 1-2] Precedent research on Privately Owned Public Space

	Researcher	Title	Purpose	Conclusion
SDIC	Sung Eun Choi (2013)	A study on the privately owned public spaces of guro digital complex as an apparatus for urban public environment, Seoul National University, Master's thesis	Find out characteristic of SDIC that affects usages of POPS in it. Distinguish if the physical condition of POPS in SDIC can fulfill the expected usage.	POPS can do the role of street for the passengers. It is important to make POPS to be easily observed from passengers. POPS in SDIC can be used as gathering place for towns people.
	Kyung hyun Ryu (2012)	A study on the analysis and activating plan of public of privately owned open space - focused on Teheranno, Gannamgu in Seoul, Hanyang University, Master's degree thesis	POPS is being built only in purpose of receiving incentives for buildings. Research problems in current usage of POPS and find ways to build POPS that can actually vitalize streets.	Connectivity of streets, POPS and lower floor of buildings should be considered in planning. Shape of the POPS and built in sculptures affect the usage of POPS.
	Jae Joon Choi (2017)	A study on the activation plans of privately owned public space - focusing on POPS renovation project in Seoul, University of Seoul, Master's thesis	Figure out usage of POPS for the vitalization of street. Suggest a possible way of managing POPS supporting business.	POPS should be designed considering its neighboring urban environment. Penalties should be given to POPS that doesn't meet the requirment as a public space.
	Insu Ahn (2012)	Analysis of Vegetation Structure and development of the community planting models based on the ecotype of the Pinus densiflora S. et Z. in Korea	Developing a pine tree plating model in different nature environoment	Pine tree's fitness in living in the city was identified. Pine trees tend to grow as a group. Pine trees are weak at air pollutions.
	Wybe Kuitert (2013)	The nature of urban Seoul: potential vegetation derived from the soil map	Analyze the potential of Seoul's natural landscape from the existing geographic system(GIS).	Potential vegetation gives clues for a physical image of nature that one may want to develop on a certain site. Matching plant species with potential plant community life is a first step towards a more sustainable, ecological landscape for urban Seoul.
	Matthew Castro (2013)	Using POPs to create healthy wildlife corridors in dense urban environments	Education about wildlife corridor POPS and show how to create a wildlife improvement district.	Wildlife corridors become paths of movement where urbanites may travel, walking along adjacent plots of land that foster ecology in the city.
	Jeremy Nemeth & Stephen Schmidt (2011)	The privatization of public space: modeling and measuring publicness	POPS are often criticized for diminishing the publicness of public space by restrictions. This study empiirically determines whether POPS are more controlled than publicly owned spaces.	POPS control use and are less public than publicly owned spaces. Managers of POPS tend to employ additional features that control behaviors of users within POPS spaces.
	Jaejin Choi (2012)	Analysis of morphological characteristics and actual using status of Azalea Cultivars for landscaping, Soongcheon University, Master's thesis	Suggest improvement method for Royal Azalea species by comparing their uses for landscape and prices.	Royal Azalea's fitness of living in urban space was identified. Royal Azalea is strong in city environment.

Chapter 2 Privately Owned Public Space (POPS)

1. Definition of POPS

1. Concept of POPS

POPS is built on the empty land area of a building of over 5000m2 in total floor area. A word "Public" is described as "opening something to everyone."[1] POPS is a resting space built in an empty land area letting passengers freely use of it. Also POPS is an only green space in urban cit y.[2] POPS refers to an open space built in an empty privately owned area. POPS is defined as a place that is connected with a pathway and is used for leisure activity, scenery, rest, and jogging which improve quality of lives of people.[3]

POPS was created between a deal with the city office and private real estate developers. Cities granted valuable zoning concessions and developers provided in return POPS in or near their buildings. The history of privately owned public space started in 1961 when New York City introduced an incentive zoning mechanism offering developers the right to build 10 square feet of bonus rentable or sellable floor area in return for one square foot of plaza, and three square feet of bonus floor area in return for one square foot of arcade. It can be said that the Industrial development of urban area actually led the city to introduce an incentive zoning mechanism. Industrial development increased population around urban area explosively and it

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1) "표준국어대사전," 국립국어원, 구글, https://stdict.korean.go.kr/main/main.do.

2) Pyung-Rahn Chung, "The Study on Guarantee for Public Open Space and Institutional Factor - Focused on the Gangnam-Gu in Seoul -," *Journal of the Residential Environment Institute of Korea*, Vol.8, No.1 (2010): 1.

3) 원용 권, "도시설계 I -범위와 지침에 관한 연구, " *국토개발연구원 보고서*, (1982): 79.

eventually led to an increase of population density around urban area. As population density increased, urban cities got filled with concrete buildings, and after certain period it became hard to find green spaces in urban cities. Before cities got developed, there were plenty of green spaces around. However, after cities got developed, it became hard to find green spaces in cities. People live in a city. Although a city is highly developed, if there is not enough green space, people will feel the city uncomfortable. POPS is one of the solutions for green space in a city as a resting space.

Urban designers improved the view by planning the street network in a grid, and began to form external spaces including a square. These external spaces were connected to a massive automobile road, providing a sense of openness to the city.[4] As the city grew and expanded, external spaces that provided an open feeling were needed more, but due to high land prices and installation costs, they were not sufficiently constructed. POPS was one of many ways to create an external space open to the public within private property.

The dictionary meaning of the public is "to relate to members of a country or society." Publicity can be said to be "a character that is fair and legitimate to all without bias, or a property shared by crowd." Publicity in the field of urban architecture is determined by how to interpret and reflect publicity in the process of urban construction and architecture. In other words, it depends on how the "public relations" and "public interests" that are important aspects of publicity are realized in cities and architecture.[5] Public is a representative example of the realization of

4) 윤재 양, "도시건축내 공지와 조경," *도시문제* 20권, 10호 (1985): 25-33.
5) Jae hoon Lee, "*A study to increase public spirit for the public open space on mixed-use apartment.*" (PhD diss., Hongik University, 2009).

publicity in these cities. However, in order to promote POPS, it is necessary to give private land owners an incentive when they build POPS. Although there are differences between countries and cities, in capitalist democracy, creating public open space provides an incentive for certain percentage of floor area ratio and an incentive for building height. POPS system plays a positive role in providing a space of relaxation to the public. Through incentives, land owners build high-rise buildings and create public open spaces voluntarily. Therefore it can be said POPS increase the number of valuable open spaces for citizens to rest in overcrowded modern city. After all, POPS is a valuable space like an oasis in the city center that is beneficial to both the land owner and the general public.

2. Key words about POPS

Terms that are used or mixed for similar purposes in relation to POPS include 'empty space', 'public space', and 'public open space'. These terms must be clearly defined because they are used without distinction from POPS unless they are clearly defined. In recent years, the provisions of laws and regulations have been made clear so that they do not mix with each other. Therefore, it is necessary to properly organize the definitions of these terms.

First, the dictionary meaning of the term "empty space" means "empty land or empty land".[6] In addition, in the real estate studies dictionary, the safety of the safety of the evacuation in case of disaster, the safety of the sun, wind, etc. is secured in accordance with the law as prescribed by the law. In order to do this, it is defined as the part of the area left over from

6) "표준국어대사전," 국립국어원, 구글, https://stdict.korean.go.kr/main/main.do.

the construction.[7] 'empty space' has two main meanings, one is used for 'empty space in the city' and the other is used for 'empty space in a land.' "empty space in a city" refers to an open space built in the city center, including empty land, undeveloped land, development reserves, and remaining land. In addition, roads, parks, green spaces, and plazas, which are responsible for functions such as walking and rest in the city, are also included in the 'empty space in a city'. 'empty space in a land' is a term in the construction law, and refers to a open space on an individual land that is created by building at a certain distance from the boundary between the construction line and the land. open spaces are made in the land to prevent lighting, sunlight, ventilation, noise, and combustion. This space can be said to be applicable. In addition, space used for rest, walking, etc. for the general public has been included in the land, but it can be said that the relevant regulations were deleted due to the revision of the Building Act in 1999, and it is virtually meaningless.

Second, 'public space' is the most commonly used term for POPS. Public space means "a public space that is installed to protect the main facilities or the environment in the city, maintain the landscape, prepare for disasters, pass pedestrians, and secure temporary recreational spaces." In the real estate studies dictionary, public space should be defined as 'spatial facilities, one of urban planning facilities,' and installed at the minimum required size.[8] After all, it is used interchangeably with POPS to mean public space for people within the city. 'Public' means that it is based on the public interest for all people in the country or society, while 'open to public' means that it

7) 경식 방. *부동산학사전* (부연사, 2011), 130.
8) 경식 방. *부동산학사전* (부연사, 2011), 97.

is not built for public but people can use it by opening to the public. Therefore, public space means a space for public in a public land, while POPS means open space made on private land. Although the two terms look similar, they are different concepts that are clearly divided into common and private lands.

[Figure 2-1] POPS of LG Gasan Digital Center

"Public open space" means "a space in a building that is open to the general public at all times as part of the 3rd floor or less of the building." This is defined in the city design related terms in the Seoul City Ordinance. POPS refers to the space outside the building, but public open space is also the space inside the building. However, there are also opinions on whether it is right to divide POPS and public open spaces into the inside and outside of the building. This is because POPS and public open spaces are used together in the Seoul City Ordinance, which was revised in 1998. In addition, since it is sometimes referred to as an indoor public space, it is time to clearly define the public space. Importantly, POPS is a space built on privately owned land, and the owner is a private company, not a public institution.

In addition, terms such as setback space and public walking path are used in a similar sense to POPS. The setback space is defined as "An empty space between the building limit line and a road." In terms of location, it must be between the building and the front road and not be designated as a POPS so that it can become a setback space. The public pedestrian passage is one of the passages indicated in the Seoul Metropolitan District Unit Plan Establishment Criteria, and is defined as "a passage created within the site that is open to the public and used for pedestrian traffic." This is similar to POPS in that it is created on the site and open to the public at all times, but it is different from POPS in that it is a passage for pedestrian traffic.

3. Law about POPS

Each area have its own standard of POPS construction. There is no national detailed guildeline for POPS construction but it iis affected by both architecture and urban planning laws. The laws and regulations that stipulate matters related to POPS include the Building Act and the Enforcement Decree of the Building Act, Seoul City Construction Ordinance, Special Ordinances by Local Governments, and Seoul City POPS Guidelines. The building law establishes the POPS information board, floor area ratio, height, and coverage reduction. The Enforcement Decree of the Building Act includes the target buildings, installation area, possible pilotis, installation facilities, floor area ratio, and height relief standards. The Seoul City Ordinance contains the target building, installation area, installation location, minimum area, minimum width, pilotis height, installation facilities, management, floor area ratio, and height relaxation standards.

[Table 2-1] Laws about POPS management

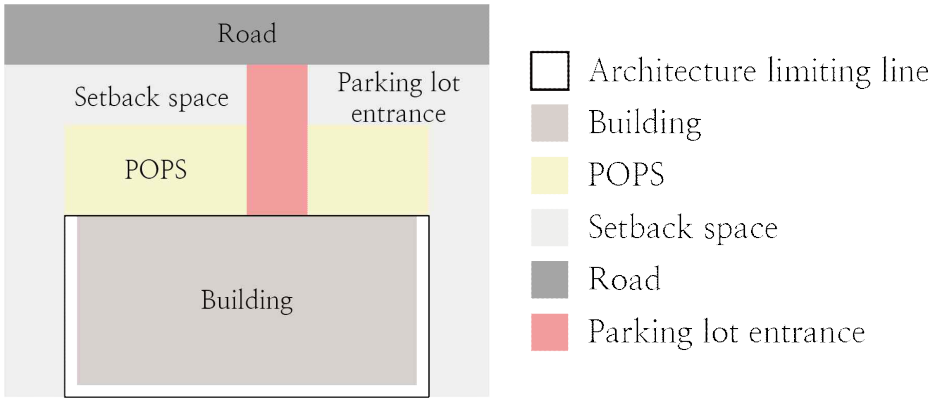
Name	Management elements
Building Act	Specify the POPS information board, ease floor area ratio, height, and cover ratio
ENFORCEMENT DECREE OF THE BUILDING ACT	Target buildings, installation area, possible pilot, installation facilities, Floor area ratio and height relaxation standard
SEOUL GOVERNMENT ORDINANCE ON URBAN PLANNING	Target building, installation area, installation location, minimum area, minimum width, pilotis height, installation facility, management, floor area ratio, height relaxation standard

Article 43 (Securing POPS, etc.) of the Building Act stated, "To make the local environment comfortable, small-scale resting facilities that can be used by the general public according to certain uses and scales in general residential, semi-hospital, commercial, and semi-industrial areas. The POPS is to be installed, and when installing, the building cover ratio, floor area ratio, and height restrictions can be applied. " [9] In addition, Article 27-2 of the Enforcement Decree of the Building Act (Securing POPS, etc.) stated, "For buildings with a specific floor area of 5,000 m2 or more, the public will use them in accordance with the building ordinance within a range of 10/100 or less. Install POPS as much as possible. In this case, do not block access by stacking or placing objects in POPS, etc, and make it possible to install with a pilotis structure. When the POPS is established, the floor area ratio and height limit can be relieved to less than 1.2 times the standard applied to the region, and cultural promotion activities for residents can be conducted within a period of 60 days or less in POPS." [10]

Article 26 of the Seoul Metropolitan City Ordinance (Securing POPS, etc.) is

9) "건축법," , 구글, www.law.go.kr.
10) "건축법," , 구글, www.law.go.kr.

set as "The setback space is excluded from the POPS, and only 1/2 of the POPS installed in the pilotis structure and the basement is considered in area calculation.



[Figure 2-2] Setback space & POPS diagram

The standard for the known area is as defined in the building ordinance. As the standard for installation and management, it is recommended that the Ssamji park form that harmonizes with the street environment in a place where the public can access and use is the widest side of the road facing the site, and it is installed within 2 places, but at least 45 square meters in area The minimum width is 5m or more, and for pilotis structures, the effective height is 6m or more. Incentives for floor area ratio and building height can be relaxed as much as the ratio of publicly available area out of the land area and should be within 20%." In addition, the size of the POPS is determined based on the area, not for the purpose of building. In the case of a total area of 5,000 m2 to 10,000 m2, more than 5% of the land area, and for 10,000 m2 to 30,000 m2, more than 7% of the land area and more than 30,000 m2 Is defined as 10% or more. The provision of the minimum size of POPS is to ensure that there is no maximum space to be thrown away.

Article 46 of the Enforcement Decree, such as Article 52 of the National Land Planning and Use Act, is defined as a "In the case of building a POPS or public space, the floor area ratio and height limitation can be relaxed and applied". Relievable FAR = FAR according to Article 43 + (FAR of the area x half of the land area of POPS above a given standard / land area), Relievable height = relieved height according to Article 43 (2) + (height according to Article 60 x half of the land area of POPS above a given standard / land area).

2. Purpose of POPS

1. Importance of POPS

In modern cities, green space is gradually decreasing due to overcrowding of population and urban structures completed by building-oriented architecture. In particular, since most of the POPS are used for roads and parking lots, it is becoming increasingly difficult to secure public facilities that can be used by ordinary citizens, such as parks and rest areas. As a result, most urban residents find it difficult to find comfort in the city center. In this situation, POPS provided by private companies have an important meaning. It is to secure insufficient green space and improve the city's living environment by using empty spaces that are easy to be discarded without incurring much cost.

Various effects can be expected when POPS are made in cities such as

1. Providing a wide sidewalk to pedestrians in connection with the pedestrian road, POPS of Jei-platz is placed between the building and the

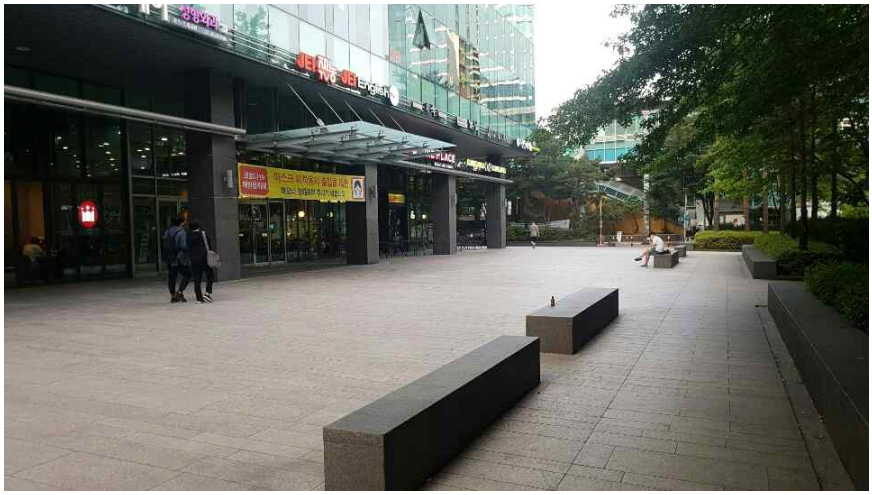
pedestrian road, so it funtions as a sidewalk for pedestrians near the building.

[Figure 2-3] POPS in Jei-platz

2. Connecting a disconnected open space and revitalizing the city center by revitalizing the pedestrian space, The center of SDIC 3 is revitalzied by placing a symbolizing sculpture in the POPS of SK V1 center.

[Figure 2-4] SDIC 3 symbolizing sculpture in POPS of SK V1 center

3. Activating streets and external spaces as mediating spaces for streets and buildings. POPS of Jei-platz offers a sitting area and the first floor of the building has a coffee shop where people gather and take a rest. Also restaurants on the first floor of the building draw people around the POPS.



[Figure 2-5] POPS of Jei-platz

4. Role of providing recreation that satisfies human physical and psychological need.

[Figure 2-6] Fountain in POPS of Ace Techno Tower 10

5. Protecting and preserving natural resources through provision of places for air, water, and plants and animals. Flower bed in POPS of Ace Techno Tower 10 provides clean air and a shaded area for workers. Also the plant communities provide shelter for birds and insects in the area. Continuous management of the officer maintains the beautiful POPS.

[Figure 2-7] Flower bed in POPS of Ace Techno Tower 10

6. Inducing urban development through receiving incentives from buildings or land of a certain size or more.[11)]

[Figure 2-8] High industrial complexes with POPS in SDIC 3

Various roles of POPS is possible in nowadays city. There is also a guidline about how POPS should be funtioning in a city. Each city have its own

11) 용주 황, *도시계획원론* (녹원출판사, 1984), 353.

version of guideline for POPS. In the research report published in Gangnam-gu, the role of POPS is summarized as follows.[12)]

1) Prevention of heat island phenomenon and air pollution: It prevents heat island phenomenon, which appears as a microclimate in the downtown area by diluting pollution by moving the stagnant atmosphere as a passage of wind and lowering the temperature in a certain area 2) Strong wind Reduction: The windproof effect in the forested area is very important in terms of landscape and quality of life. 3) Noise protection: The noise reduction effect of the forest created by the military method is very large, especially in the green. Feeling of noise smaller than the actual size due to psychological effects 4) Providing a resting space: Providing an emotional cultivation effect through the rest to the urban people in a city that is rapidly changing with the use of artificial materials 5) Creating a city landscape: in the city center Nature gives the citizens psychological stability and an appropriate order in a landscape, so that they can feel the beautiful natural scenery. If available: by acting as a link between ecosystems provide space for wildlife habitat 7) Open Space Expansion: expansion positive effects of green space, which decreased due to the development activities of different types. Consequently, the important meaning of POPS is that it is the result of a compromise between the private and public. In order to offer public spaces to citizens, a city should become a pleasant and livable space by creating public spaces where public and private can cooperate. To make a POPS that meets the need of both public and private, there should be a detailed guideline about the physical shape of POPS.

12) 강남구, "강남구 사유지의 공원녹지 공개촉진 지원방안에 관한 연구," (2003): 16.

2. Physical requirement of POPS

Public open spaces within the city serve as an important factor in inducing various street activities. In some cases, it can be used as a central square in an area or function as a core space to revitalize the area. To maintain the active usage of POPS by people, it should be made available to as many people as possible. However, compared to these original expected functions and roles, in reality, it is often misused as a simple smoking area, a parking space, or just an excessive space. Also how people use the POPS is also important. It should be a space where one can participate in various social activities and stay for a long time, not just a walking or passing space. The design and form of each element constituting the public space determines the purpose of each space.

William White summarizes the requirements of public spaces that are highly available to people as follows. 1. Location is good. It is located on a busy street with frequent traffic, so it can be accessed both physically and visually. 2. It exists as part of the public space. Separating and separating the space from the road separates it and reduces its use. 3. The road has the same or similar height to the pavement. Spaces that are significantly above or below India are underutilized. 4. There is a seat. It can be integrated with a space like a staircase or a low wall, or it can be a standalone device for sitting like a bench or seat. 5. There are removable seats. It is possible to choose and express the personality and characteristics of the place.

And to make good use of public space, the quality of space must be improved and citizens' activities must be free. In other words, the space of

the space, the access path of the space, the steps of the space, the facade, the street facilities, and the structure of the bench and the space where you can actually stay can be considered as a space that people prefer. Therefore, in order for POPS to be a socially active and functioning space for many people to stay for a long time, these physical conditions must be properly met.

3. Categories of POPS

The standard for establishing the district unit plan in Seoul stipulates detailed installation guidelines for POPS. △ Open POPS are open publicly adjacent to the main roads and pedestrian paths, and △ Public POPS are created by a technique such as Sunken, which is always available to the general public in connection with facilities such as underground shopping malls or subway stations. Open POPS, △ Pilotis type POPS are classified as POPS of an open structure without installing external walls and equipment under structures supporting the load of pillars on the ground floor.

The Seoul Metropolitan Government supplements and stipulates the construction ordinances related to the installation of POPS in the 'Building Deliberation Standards', and the 'POPS Installation Guidelines' provide more detailed information. It is divided into 6 types: horizontal rest type, park type, square type, pilotis type, and sunken type. 1. The horizontal rest type is a place where there are many pedestrians or a relatively small area of POPS, so that the pedestrian can stay for a while and rest, and the access is considered foremost in the street. It is constructed in a garden form that can be easily seen and accessed from the horizontal in industrial areas, and

has a shelter space in a part of the landscape-oriented space. 2. The park type is a large-scale public park with an open public area of 500 m2 or more and is installed in an area adjacent to a nearby park or green space. When it is created between buildings and buildings, it is designed to connect disconnected areas due to large-scale construction. Is a large-scale public space with an open public area of 500 m2 or more and installed in large shopping malls, subway stations with many floating populations, commercial areas, etc. 3. The Pilotis type is designed to avoid rain or snow and provide a shade that is cool when it is difficult to secure a site outside the building due to a commercial area with a small area or inclined site conditions. Or, it is specified to be installed in a building that maintains the terrain of the land, and a shelter used by multiple people is installed in the part connected to the subway.

There are five types of POPS according to the planar shape, depending on the location of the main entrance, the movement of people and vehicles, the planar nature of the site, the location of the road, and the surrounding buildings. 4. Front layout is located on the front of the building and placed on one side of the road. Located between the two buildings to connect the two buildings, 5. Correspondence is placed on the corner of the building and placed on the two sides of the road, 6. Cornered between buildings The elder brother is located in a place where the openness is poor, surrounded by the building, and is placed on the three sides of the building.

The five types of POPS are applied according to the condition of surrounding environment. The five types are commonly observed from POPS in South Korea. Still, there are many different forms of POPS in foreign countries.

3. POPS in foreign countries

1. POPS in USA

Historically, urban reformers, city planners, and municipal officers since the 19th century have claimed that public space serves a number of social and political ends. Early designers like Frederic Law Olmsted argued that parks would serve public health needs by acting as the 'lungs of the city' and providing access to clean air. Around the same time, park advocates and urban reformers such as John Nolan argued that parks would increase the morality and cilitiy of humans.[13] POPS is a system that include public space and park in nowadays urban space. In 1961, the system related to Incentive Zoning, which is similar to the current POPS, began to be introduced. Although this system differs slightly from city to city, POPS were installed in accordance with the rules for construction setback line according to the intended use area, and it was operated in a way that provided economic benefits to operators who installed public comfort facilities. Incentive zoning, also known as the 'Encouragement Zone District System', is a system that allows for increased construction area when providing public facilities. Common comfort factors include public plazas, arcades, connecting intermediate blocks, rooftop observation decks, developments involving houses, and connections to public transport facilities. The comfort factor is given as a score and the increase in building area and density is determined by the score.[14]

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13) Jeremy Nemeth & Stephen Schmidt, "The privatization of public space:modeling and measuring publicness," *Environment and Planning B: Planning and Design*, volume 38 (2011): 5-23.

14) Seon tae Kim, "The Characteristics of Public Open Space as an intermediate Territory in Urban Commercial Strip and a Proposal of Planning Guidelines" (Master's thesis, Chung-Ang University, 2001), 37.

The POPS system in the United States has been revised several times since 1962, and the main contents were to revise the legal provisions regarding the construction area, incentive grant criteria, installation facilities, and installation of facilities. There were many problems with the privatization of stingy POPS in using only the incentive benefits of POPS and creating spaces for citizens. Therefore, the city planning committee's inspection function was supplemented and the facilities and various facilities were properly installed to improve it.

In the case of New York City, a representative city in the United States, when the New York Zoning regulations were first introduced in 1916, regulations on height, use, and area of buildings were mainly regulated according to areas. However, with the introduction of incentive zoning and special zone designation system in 1961, zoning regulations were relaxed, bonus construction area was granted, behavioral regulations were relaxed, and allowances were used to compensate for the provision of POPS, plazas, arcades, pedestrian spaces, and non-profit facilities throughout the city. Incentives such as expansion were provided.[15] Nevertheless, in the early stage, it focused on securing the POPS quantitatively, and was created with a monotonous space rather than a creative space preferred by ordinary citizens. And to improve these problems, the POPS qualitative regulation system was introduced. According to the revised contents in 2007, New York City proposed 12 types of public spaces and semi-public spaces, and through these, qualitative regulation of POPS was enforced. The 12 types are Plaza, Arcade, Elevated Plaza, Block Penetration Arcade, Covered Pedestrian Space,

15) Hae Jin Yeo, Hee Ji Lim, Da Mi Maeng, Ce Na Baik, "Better Semi-Public Spaces for Pedestrian Flow & Pedestrian Activity," *Seoul Development Institute*, (2009): 169.

Opening Hall, Urban Plaza, Expanded Sidewalk, Residential Plaza, Block Penetration Connection, Block Penetration Galleria, Sunken Plaza, etc.

American cities are not satisfied with this, and have recently formulated and applied the "horizontal space design manual" (Find this designin english source) in order to create POPS desired by urban residents. It includes various design standards that make it easier for citizens to access and use them, and aims to build POPSs that enhance the convenience of local characteristics. In addition, New York City created a homepage for several P OPS scattered throughout Manhattan, allowing citizens to give free opinions and advice to each POPS. Citizens can not only understand the photos and current status of POPS in Manhattan, but also understand the history and surrounding roads of the buildings to which the POPS belong. can do. It can be said that these attempts have made each POPS a stepping stone into the space that citizens really want.

2. POPS in Japan

From 1964 on the specified block allowed for the production of Japan's first POPS. Based on a directive of the Ministry of Construction (MoC), cities with their own building authority (tokutei gyosei cho) and a population greater than 250,000 were encouraged to offer floor area bonuses and other zoning concessions to builders if they in turn agreed to provide plazas, arcades, atriums and other outdoor and indoor spaces, governed by explicit, yet minimal, design standards.[16] In 1962, the "Special Furniture System"

16) Christian Dimmer, "Re-imagining Public Space: The Vicissitudes of Japan's Privately Owned Public Spaces," in *Urban Spaces in Japan: Cultural and Social Perspectives*, ed. Christoph Brumann, Evelyn Schulz (Routledge, 2012), 105-74.

was introduced, which allows the household to set a floor space ratio(for what?) exceeding a certain floor space ratio through urban planning for households of a certain size or more surrounded by roads of a certain width. In addition, the 'high-use district system' was introduced, which is the rational and sound high-density development of urban areas in urban areas, the maximum and minimum limits of floor area ratio, the maximum limit of building coverage, the minimum of building area, and the wall This is a system that places restrictions on location. In 1971, the 'Comprehensive Design System' was introduced through the revision of the Building Standards Act, recognizing that it is impossible to control the changing urban environment and complex architecture with the minimum environmental regulations that are uniform and inflexible. It is a focused system. Through such a system, Japan was able to implement a POPS system suitable for the region utilizing the characteristics of each city.

The comprehensive design system encourages customized development suitable for the characteristics of the land and eases the floor area ratio and height limitations for buildings that include POPS that can be used by the general public within the building site to secure open space. The contents of the POPS defined by the comprehensive design system are as follows.[17] △ Scope of POPS: In the form of use, pedestrians are free to pass or use at any time. For public areas such as squares, pedestrian paths, plantings, lawns, flower beds, and public facilities that increase convenience for POPS, telephone boxes, etc. It refers to the related land, and excludes parts provided for applications other than pedestrians, such as parking lots and

17) Seon tae Kim, "The Characteristics of Public Open Space as an intermediate Territory in Urban Commercial Strip and a Proposal of Planning Guidelines" (Master's degree, Chung-Ang University, 2001), 42-43.

bicycle storage. △ Confirmation of POPS: The minimum area and minimum width of the POPS are prescribed. The minimum area of one POPS must be at least 100 m2, and the lower limit of the area applied to each use area is 1/10 or more. △ Accessibility of POPS: The road length of the POPS and the height difference between the POPS and the road are prescribed. 6m(that is very high)). △ Effective POPS in accordance with POPS In the case of a public courtyard type POPS, even if it is surrounded by buildings and is not in contact with the road, it is used to form a public community of building residents and is well-designed for hydrological(?) conditions of 300 m2 or more. It can be calculated in the effective area. △ Qualitative evaluation of POPS: Provide 'green space data maps' and 'guidelines for making green spaces, etc.' to public operators to consider POPS from the development and development stages, and use qualitative evaluation results to evaluate the performance of POPS based on volume ratio, etc. Differentiation is applied to mitigation.

3. POPS in Europe

In many european countries, office filled city area turns into first floor shops and fields for various cultural activities causing an active use of city spaces by people. With such efforts, an open city space gets love from people and eventually become a human friendly space.[18] Such human friendly space can be created within a through process of communication and discussion with city residents. In the process, people seek to build a city

18) Joung Kim, "A study on Public Open Space Design Improvement Plan Based on Analysis of users' Behaviors" (Master's degree, Konkuk University, 2014).

that reflects the opinions of residents. In the Netherlands, the "national architect system" and the "architectural center" play a central role in the creation of public spaces. National architects are selected from socially and architecturally competent private architects, who will serve as advisors to architecture, art and urban planning. National architects are at the core of creating a national spatial policy and are truly building for citizens. In this way, by entrusting public work to people who know the area well, different and unique land use plans and construction plans are established and implemented. It is possible to construct more efficient public spaces by actively reflecting the opinions of these national architects in the design and creation of public spaces such as public announcements. These national architects are not only advised on various policies related to architecture, such as urban infrastructure, spatial planning, and landscaping, but are also given the right to order public construction projects to reflect and implement their opinions. In addition, there are more construction centers in Europe than other countries, and public facilities such as POPS are being activated.

Chapter 3 Site Analysis

1. About SDIC 3

1. Description of SDIC 3

Seoul is the capital of South Korea. As the city gets developed and new buildings are built in, it gets hard for one to find green spaces in Seoul. It can be said that Seoul is in need of green space nowadays. Privately Owned Public Space is meaningful when it is built in a city where there lacks green area. Therefore POPS is responsible as a rare green space in Seoul.

Seoul Digital Industrial Complex was planned to be developed into a knowledge-based industrial area. Therefore many apartment factories could have been built right next to each other in a limited industrial area. Most of the apartment factories built in SDIC have Total Floor Area(TFA) over 5000m^2 , which means that POPS of 10% or lower to land area must be built. So now in SDIC there are many POPS placed near to each other, which is a good condition to observe connectivity between neighboring POPS.

SDIC is composed of SDIC 1, 2, and 3. SDIC 3 is the one that is developed lastly. In SDIC 3 one can easily observe newly built POPS. SDIC 3 takes the largest area among three complexes. There are 11,888 companies in SDIC. Out of 11,888 companies, 6,689 companies reside in SDIC 3. In SDIC there are 140 industrial complexes. Out of the 140 industrial complexes, 75 is in SDIC 3. Although some of them are still under construction, there are profound number of industrial complexes in SDIC 3. Therefore, there are profound cases of POPS in SDIC 3.

2. Site background

[Table 3-1] SDIC 3 background information

Category	Information	Category	Information
Street	Complex 3	Use area / Use district	Industrial area
Land area	1,133,128 m2	Laws	industrial complex renovation project
Floor area ratio / Building coverage	302~ 486 % / 31 ~ 59 %	Ratio of POPS	15% of the whole land area

Seoul Digital Industrial Complex is a government driven knowledge-based industrial area that was previously known as Guro Industrial Complex. SDIC 3 is one of the three complexes in SDIC and it' s land area is 1,133,128m2. Buildings in SDIC 3 have floor area ratio in a range of 302 ~ 486% and building coverage in a ratio of 31 ~ 59 %. The land use of SDIC 3 is claimed as an industrial area. SDIC currently is under the industrial complex renovation project to support city infrastructures like road, sidewalk, green space and cultural facilities. The ratio of POPS to the land area of SDIC 3 is about 15% of the whole SDIC 3.[19)]

2. Urban infrastructure of SDIC 3

1. Industries in SDIC 3

SDIC is composed of 3 big areas. Complex 3 is the biggest among all. SIDC is placed on both Guro-gu and Geumcheon-gu. Complex 1 is placed in Guro-gu and Complex 2 and 3 is placed in Geumcheon-gu. The whole land area of SDIC is 1,981,552m2. Among that complex 3 is taking 1,133,128m2. In

19) Joon young Park, "Development process and change in role of Seoul Digital Industrial Complex (G valley)" (Master's degree, Korea University, 2011

Complex 3, industrial area is 867,370m2, supportive facility area is 62,502m2, and common facility area is 203,256m2. GIC was an antecedent of SDIC. During the renovation of the GIC industries were distributed among the complexes. Complex 1 was specified as IT and software industry area, complex 2 was specified as fashion industry and management support service, and complex 3 was specified as research and development of knowledge-based industry and production of IT, Mechatronics, and precision machinery industry.[20)]

[Table 3-2] SDIC 3 land area information

	Industrial land area (㎡)	Support facilities (㎡)	Public facilities (㎡)	Total (㎡)
SDIC	1,506,724	131,258	343,570	1,981,552
Complex 3	867,370	62,502	203,256	1,133,128
Percentage (%)	57.6	47.6	59.2	57.2

Complex 3 takes 47.6% of all research and development and engineering in whole SDIC. Industries in complex 3 can be divided in two big categories as knowledge-intensive service industry and knowledge-intensive manufacturing industry. Knowledge-intensive service industry includes development of software and system, design of science technology, and production of a print and a media content. Software takes 61.7% in knowledge-intensive service industry in complex 3. Knowledge-intensive manufacturing industry includes electronics, mechatronics, precision machinery, and other knowledge-intensive productions. Electronics takes 52% in knowledge-intensive manufacturing industry in complex 3. Additionally fabric, clothing, and other relative industries are included in complex 3 currently.

Complex 3 is shaped long vertically. In the middle of the complex there is

20) Joon young Park, "Development process and change in role of Seoul Digital Industrial Complex (G valley)" (Master's degree, Korea University, 2011

Export bridge which is connected with Digital road. From the Export bridge complex 3 can be distinguished as north side and south side. North side of complex 3 is mostly knowledge-intensive service industry, and south side of complex 3 is mostly knowledge-intensive manufacturing industry. Also fabric, clothing, and other relative industries are mostly placed in south side of complex 3.

SDIC complex 3 is now going through an industrial complex renovation project because of the lack in numbers of cultural and welfare facilities. Most of the support facilities in SDIC were built first on complex 1, so complex 3 now lacks support facilities considering its huge industrial area. In complex 3 now there are knowledge-intensive service industry, knowledge-intensive manufacturing industry, support facility, water facility, public facility, sports facility, and electrical substation. Complex 3 renovation project built Seoul Digital Playground on a land of Korea Industrial Complex Corporation, industry university convergence center, G-valley worker welfare center and public housing on lands of labor body, and complex residential facility on a land given to public for development.

2. Roads in SDIC 3

There are three most used entrances of complex 3. A Gamasan-ro Cross road in front of Hanil U&I apartment is on the north side of complex 3. Geumcheon crossroad on the Seobu urban expressway meets with the Export bridge that crosses the middle of complex 3. An outline of Gasan-dong on the Seobu urban expressway that is placed at the lower area of complex 3. A main problem of road system in complex 3 is that an approach to complex

3 is done mostly through the Nambu beltway and the Seobu urban expressway. A limited road connection between complex 3 and neighboring areas causes heavy traffic jam around complex 3.

Road rate, which is a ratio of a total road area to a whole land area, of SDIC is low compared with other industrial complexes in Seoul. SDIC' s road rate is 13.3% while other industrial complexes are 17~19%. Low road rate and lack of roads connecting with near town cause heavy traffic jam on complex 3. Government expects the renovation project is going to improve traffic jam around complex 3 by grounding the Seobu urban expressway and building two additional bridges in between the current most used entrances of complex 3.

3. Public transportation in SDIC 3

Subway line 1 and 7 pass through SDIC and subway line 2 pass through Guro Digitall Complex station which is placed near complex 1. Doksan station of subway line 1 is placed on the south side of complex 3. About 72,622 people per day visit Gasan Digital Complex subway station, which is the 10th most visited station among subway stations in Seoul. About 30,889 people per day visit Doksan subway station, which is 116th in the number of people visited per day among subway stations in Seoul. About 123,442 people per day visit Guro Digital Complex station, which is the 7th most visited station among subway stations in Seoul. It is clear that large amount of people visit subway stations near SDIC. Areas around subway stations near SDIC are now formed as station influence areas. Guro Digital Complex station and Gasan Digital Compelx station both have strong station influence areas, but Doksan

station has a weak station influence area.

Town shuttle bus, city bus, and inter-city bus passes through complex 3. City bus passes through north side of complex 3, inter-city bus passes through south side of complex 3, and town shuttle bus passes through both north and south side of complex 3. G-valley electric car sharing program is also on going. Electric car sharing is being planned on traffic marginalized area by adding more routes and stations. Also eco-friendly car sharing program between companies is on going. Building sports facility on empty unused lands of complex 3 is also planned. Various subway stations and bus routes are passing through complex 3. However south side of complex 3 have some traffic marginalized areas. Although public transportation system of complex 3 needs further improvement, it can be said that it is functioning well.

3. POPS in SDIC 3

1. Categorization of POPS in SDIC 3

Most of the cars come through Gamasan-ro, and Chulsan bridge when entering complex 3. Most of the passengers are found around the north side of complex 3. Although there is a good public transportation system, it was observed that not many people move by walk in the complex 3.

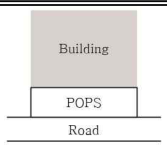
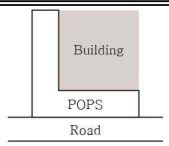
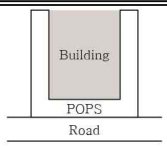
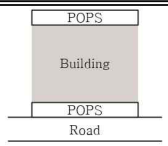
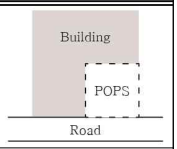
POPS in complex 3 is taking about 15% of total land area. According to the research, 80% of POPS are not adequate in its structure. POPS in complex 3 showed common weakness in that they are disconnected with sidewalk, boundary is made by having a wall or fence in between sidewalk,

and placed a structure that hinders passengers. POPS that are in good conditions shared common features like having a pocket park, connectivity with sidewalk and resting area, and easy approach to resting area from the sidewalk. POPS in complex 3 were built individually. Each POPS was designed relative to the building it is contained. Therefore some POPS show weak connectivity with side walk. Some parking garage ramps cut POPS connectivity with near placed POPS. Some POPS in complex 3 have flower bed, fence, and structure placed in between resting area and sidewalk that hinder public approaches. It is unlikely that public can easily approach POPS with borderline structures and such POPS will be mostly used by people using the adjacent building not the public. Lastly, SDIC is mostly filled with office structures that gets empty when workers go home. So during the night time and during the weekends there are not many passengers in SDIC. POPS in SDIC also gets empty when there are no passengers in complex 3. Most of the POPS in complex 3 have low connectivity with neighboring urban environment by individual development. Also 80% of the POPS in complex 3 has problems of isolation, weak connectivity with sidewalk, privatization and being abandoned.

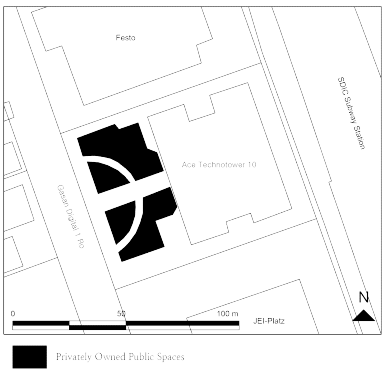
POPS in complex 3 can be classified in 5 categories. First, there are POPS formed at the front side of buildings. They meet with road on one side and building at the opposite side. Secondly, there are POPS that are placed along the front and side area of buildings. This L-shaped POPS can meet with more than one roads. Buildings built at the corners of a block usually have L-shaped POPS. Thirdly, there are U-shaped POPS. There are not many U-shaped POPS in complex 3 but when they are placed it gives openness through buildings because it will function as a pathway to area behind the

buildings. Fourthly, there are POPS separated and placed on front and back side of the buildings. There are a few POPS of this form in complex 3. POPS of this kind gives a resting area for people who approach the building from both the front side and the back side. Lastly, there are POPS in a form of pilotis.

[Table 3-3] Classification of POPS in complex 3

	Front	L-shaped	U-shaped	Separated	Pilotis
Figure					
Building	7,9,16,17,18,19, 20,21,22,23,25, 26,27,28,31,33, 34,37,40,42,44, 45,49,50,51,52, 54,56,57,59	1,3,4,5,6,8,10,11,12,13,14,15,24,29,30,32,35,36,38,39,41,43,46,47,48,53	x	2,55	58

POPS in SDIC showed mostly front or L-shaped. Buildings with front shaped POPS usually had entrances at the front side of the building. Their pathway into the POPS was only 1.

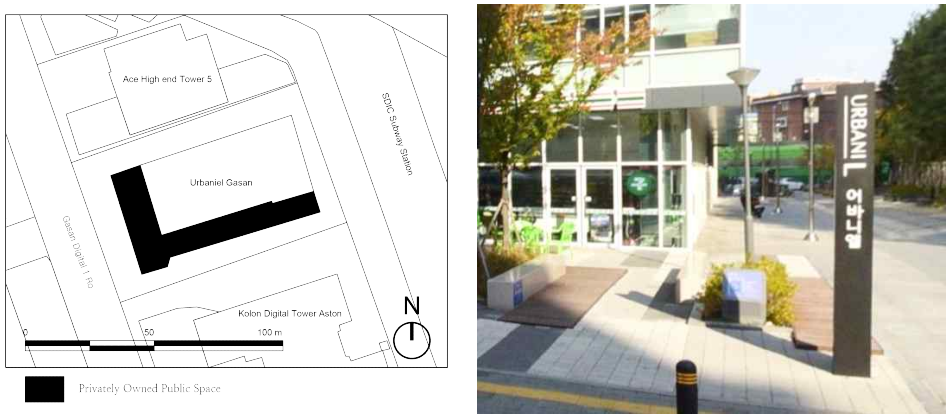


[Figure 3-1] POPS of Ace Technotower 10

Ace Techno tower 10 (7) is one good example of a front shaped POPS. It has several different kinds of plants in it. It has a small park. It also has a

fountain in the POPS. It is connected with the sidewalk and it is neighboring another POPS next to it.

Front shaped POPS have the seating area at the front side of the building. So passengers pass by and take a rest if they feel tried at the front shaped POPS. However L-shaped POPS usually have the seating area at the side of the building, which leads to less usage of POPS by passengers. These area is more likely to be used only by the workers in the buildings. Urbaniel Gasan is a L-shaped POPS in SDIC. POPS in Urbaniel Gasan has seating area both at the front side and at the corner side. However, seating area at the corner feels more like a resting area. Also because there is a limit in the area of the POPS L-shaped POPS have narrower shape of POPS at the front side. Which leads to the seating area at the front feels more like just a pathway not a place for a rest.



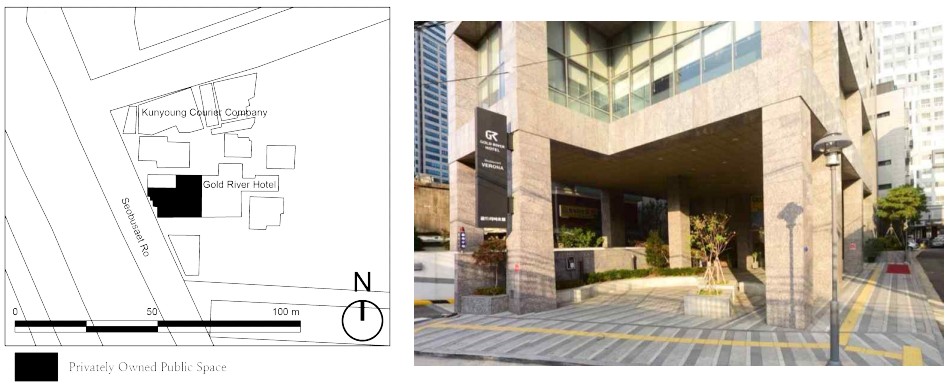
[Figure 3-2] Urbaniel Gasan L-shaped POPS

Separated form of POPS was found in only two buildings in SDIC. Separated for of POPS was placed where both sides of a building is meeting with a pathway. Ace Highend 5 is one of the buildings with a seperated form of POPS. The POPS placed at the frontal area of the building was filled with a few seating area and trees. It was more like a welcoming space

of the building. However, the POPS placed at the back side of the building was filled with several seating area and a small garden where people can take a rest. It was mostly used as a resting or smoking area for the workers in the building.

[Figure 3-3] Separated POPS of Ace Highend 5

Lastly there was POPS of a pilotis form. POPS in Gold River Hotel has a form of pilotis. The land area of Gold River Hotel is not enough to build POPS so pilotis form of the POPS was built.



[Figure 3-4] POPS of Gold River Hotel in pilotis form

A pilotis form POPS offers a roofed area where people can take a rest regardless of the weather. However, because the trees are roofed a tall big trees with much leaves can't be planted in the pilotis form POPS. Therefore, a pilotis form POPS has a weak natural environment.

Chapter 4 Analysis of POPS in SDIC 3

1. Standard for analysis of POPS

1. Major issues for the analysis of POPS in SDIC 3

Based on studies about POPS in SDIC 3, further questions can be asked. First, SDIC 3 is a heavily populated area with 146,333 daily workers. However, when you visit the SDIC 3 during daytime you can't see people working on the streets because most of the workers in SDIC 3 are participating in knowledge-based industry which is to work in the buildings running machines and computers. For the workers in SDIC 3, it is necessary to have a space of refreshment like where they can sit a while after lunch time or take a break during the work. However, there is no green space in SDIC 3 except Seoul Digital Green Life Center. Currently, POPS is the only green space in SDIC 3. Surprisingly, POPS in SDIC 3 has multiple roles as a public park, building entrance, walking street, green area and natural habitat. POPS is important for the nature aspect of SDIC 3. Considering the importance of POPS in SDIC 3, it is worthwhile to research about the trees now planted in the area. It can be said that plants currently planted in POPS of SDIC 3 are doing a main role in defining the quality of the green space in SDIC 3. Therefore one should research about the natural attractiveness of the POPS in SDIC 3.

Secondly, there are many closely neighboring POPS in SDIC 3. Because SDIC is a government driven industrial park, industrial complexes could have been built next to each other in a limited area. Newly built industrial

complexes in SDIC all have POPS. It is mainly because building a POPS gives an incentive for the FAR. POPS are planned together with the building. Currently, SDIC 3 is filled with POPS that are planned individually with the buildings although many of them are neighboring each other. Some POPS are well connected with surrounding environment, but most of them are not. Although POPS are planned and built individually their presence is not solitary in the city space. It is important to figure out how POPS in SDIC 3 are connected with their neighboring urban environment. Especially in SDIC 3 where many POPS are built next to each other, connectivity of POPS must be studied.

Thirdly, POPS is meant to be used by people. No matter what a POPS is built perfect, it is no use if there is no one using it. It can be said as much as the physical shape of the POPS, people's usage of the POPS is important. SDIC 3 is a semi-industrial area where most of the buildings are built for knowledge-based industries. House or shops can be built in the semi-industrial area, but still most of the buildings in the area are built for the purpose of industry. So most of the workers in SDIC 3 live away from this area. Although SDIC 3 is a densely populated at daytime, there is not much people left when the daytime is over. Such emptiness of the area is also observed during the weekend when most of the workers are at rest. Accordingly POPS in SDIC 3 gets empty when there is no worker coming to his/her workplace. One can overlook such phenomenon and not pay much attention, but POPS in SDIC 3 are not meant to be used only by the workers. Any POPS is a part of a city space. It is also built for the people living around it. The ultimate goal of each POPS in SDIC 3 is being a place where those who living around feel attractive of the space and spend time

in it regardless of the industry. It should be a place where people living around SDIC 3 can come and visit during night time and during the weekend when there is no much worker left in the area. Therefore it is worthy to study the overall usage of POPS in SDIC 3 by people.

Questions above can be summarized as a following [Table 4-1], and each task has a standard of analysis.

[Table 4-1] Standard of analysis for each task

Issue	Standard of analysis
Attractiveness of natural space	Are POPS supporting attractive natural environment?
Connection with urban environment	Are POPS connected with neighboring urban environment?
Public open space for neighborhood	Are POPS functioning as public open spaces for the people living near not just a resting area for the workers?

2. Standard of analysis for issues

(1) Attractiveness of natural space

People like to enjoy natural space. POPS is a place that offers the natural environment in a city. It is important to know how natural environment is formed in the POPS in SDIC 3.

There are 59 POPS In SDIC 3. All the POPS have their own form of natural space. Some of them have small parks, some have flower beds, and some have grass fields. For the green space of POPS to function as an attractive space for the people, creative and abundant plantation of trees must be offered. Also the nature inside POPS should correlate with surrounding environment so that the natural space can be sustained without

any intervention of human force.

[Table 4-2] Criteria for the attractiveness of natural spaces in POPS

Objective	Criteria	Issues	Spatial range
Natural environment	Ecology of nature space	Types of trees	green space
		Small plants	
	Physical shape	Shape of flower bed	
		Attractive natural space	

(2) Connectivity with urban environment

POPS is a space where one' s experience on a street can be extended. It is a space that can offer a different urban experience from a sidewalk. Such urban experience can be broaden if POPS has a connectivity with neighboring urban environment. For example, one can imagine of several neighboring POPS being connected with each other and eventually recognized as a big open space. However, POPS in SDIC 3 have been developed individually. Although POPS in SDIC 3 are placed closely next to each other, they are not connected as one big open space with each other. Connectivity of POPS with surrounding urban environment will broaden the usage of POPS and it will increase the activities of people in the area. Especially POPS in SDIC 3 are neighboring each other a lot more frequently than POPS in other area. So the connectivity of POPS in SDIC 3 must be more effective than that of other area. Rather than a solitary POPS, a POPS that is well connected with surroudning urban environment can form much more interesting urban space in the area.

Functioning of POPS is affected by the shape and surrounding urban environment. Therefore it is necessary to figure out if POPS in SDIC 3 have a connectivity with surroudning urban environment.

[Table 4-3] Criteria for the connectivity of POPS

Objective	Criteria	Issues	Spatial range
Connectivity of POPS	Connectivity with POPS	Neighboring POPS	POPS and surrounding urban environment
		Fence	
	Connectivity with urban environment	Circulation with building	
		Parking lot entrance	

(3) Public open space for neighborhood

Planners build POPS so that they can earn an incentive of FAR for buildings. Until now construction of POPS didn' t have a guideline about its function as a public open space in the neighborhood. The only requirement of POPS was to build a eco-friendly space where anyone visiting can use free. Therefore most of the POPS were built in similar shape and program that only satisfies the minimum requirement as a public open space. In the past, Guro industrial complex was concerned as somewhere dangerous and dirty full of hard working workers and machines. It was a place where citizens wouldn' t visit for a relax, a short walk, or a leisure time. Now the GIC is changed into SDIC with POPS that offers public open spaces. Therefore it is important to check if the POPS is functioning as a public open space that attracts people in neighborhood. It can be people living near the SDIC, it can be workers working in another area, or just random people who just visited SDIC.

For POPS to be recognized as an attractive space for neighbors, it should be recognized as a place where people can enjoy many diverse activities, Therefore it is important to observe if POPS in SDIC 3 can function as a public open space for all people not just a resting area for the workers.

[Table 4-4] Criteria for the usage of POPS

Objective	Criteria	Issue	Spatial range
Attractive public open space	Good usage	Resting area	Industrial Complex
		Culture space	
	Bad usage	Emptiness of SDIC	
		Smoking area	

2. Analysis of POPS in SDIC 3 according to issues

1. Ecology of natural space

(1) Trees living in POPS of SDIC 3

SDIC 3 is built on an alluvial soil. Guro industrial complex, the precedent of SDIC was built on a crop field where people used to grow rice and barley for living. Nowadays, SDIC 3 is covered with concrete roads and buildings, and people can't even find a small trait of a crop field in this area. The potential of nature under the asphalt and concrete of the city is best understood as an abiotic pattern of soil. If asphalt and concrete are taken away, plants will grow and thrive independently. If given time, it will develop through natural succession into climax vegetation.[21] When Guro industrial complex was renovated into Seoul digital industrial complex, there was an effort to revive the green space in SDIC. POPS is one of the effort to revive the green space. Because POPS is a place where the natural plant species of SDIC 3 area can grow and make a habitat. Therefore, a research about the types of trees was done for 59 POPS of SDIC 3. Each POPS were visited and analyzed by personal experience.

21) Wybe Kuitert, "The nature of urban Seoul: potential vegetation derived from the soil map," *International Journal of Urban Science* Vol. 17. No. 1 (2013): 95-108, https://doi.org/10.1080/12265934.2013.766505.

[Table 4-5] Number of trees planted accoring to type

Name	Number of POPS with the plant
Pine tree	50
Maple tree	41
Yoshino Cherry	40
Rhododendron indicum	40
Boxwood	36
Ginkgo tree	10
Zelkova tree	9
Rose	8
Swamp Spanish oak	5
Crape Myrtle	4

From 59 POPS, about 10 main species of tree were observed. Others include Crape Myrtle (4), Magnolia liliiflora (3), Cercidiphyllum japonicum (3), Euonymus japnicus (3), Liriope platyphylla (2) and so on.

While researching the types of planted trees in SDIC 3, several types of trees were repeatedly observed. The most frequesntly observed tree was a pine tree. Pine tree was observed in 50 places out of 59 POPS.

Pine tree is the most common national tree in South Korea. It is a evergreen tree that shows green leaves during the entire year. Pine tree symbolizes evergreen, longevity, perseverance, courage, and wisdom in eastern culture. Pine tree can adapt to various range of temperature and moisture. That is the reason why pine tree can survive on high rocky cliffs in mountains. In a desperate land with limited nutrition pine tree can survive while other plants can’t. POPS of SDIC 3 are artificial gardens with a limited biodiversity level. Where the POPS are now was previously an industrial factory area. All the soil in the flower beds was brought from somewhere else for the construction of POPS in SDIC 3. So planting a pine tree in the POPS of SDIC 3 might be a good decision considering the pine tree’s adaptability in a wide range of condition.

However, pine tree has a low CO2 absorption level among other often

used garden tree species. If a pine tree is exposed to an air pollution for a long time, its growth level goes down and gets weak. Moreover, pine tree grows as a group. Pine tree usually make a forest of it. Considering that a pine tree should grow in a forest, planting a few numbers of pine trees in the POPS of SDIC 3 doesn' t seem right for the ecology of pine trees.

[Table 4-6] Pine trees in SDIC 3

Objective	Information
Name (Common name)	Pinus densiflora (Pine tree)
Photo	 Photos of pine tree taken from POPS of Ace high end tower 9 (left) and Ace high end tower 10 (right).
Characteristics [22]	- Shade-intolerant, evergreen - Easily adapt to various range of temperature and moisture - Low CO2 absorption level, weak at air pollution - Grow up as a group

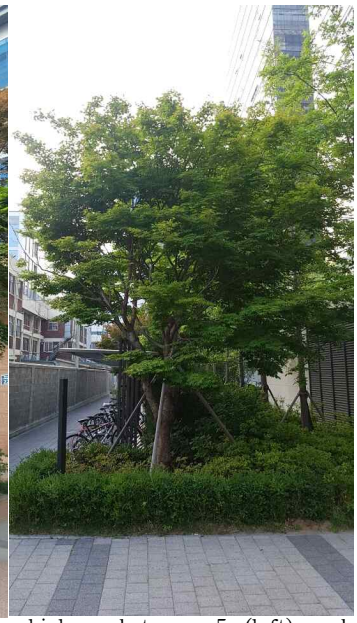
In POPS of SDIC 3, pine trees were planted near the entrance of the buildings. It seemed like pine trees were only planted for scenery because

22) In su Ahn, "Analysis of Vegetation Structure and development of the community planting models based on the ecotype of the Pinus densiflora S. et Z. in Korea" (PhD diss., University of Seoul, 2012).

they are very tall and only leaves at high area were left. Pine trees in nature have many more branches at lower part but pine trees in SDIC 3 didn’t have any making them all look unusual in shape.

Second most found tree species was a maple tree. Maple tree is one of the most common tree in South Korea. Every spring and fall mountains in South Korea get filled with maple trees with autumn colored leaves. Out of 59 POPS in SDIC 3, maple trees were found in 41 places.

[Table 4-7] Maple trees in SDIC 3

Objective	Information
Name (Common name)	Acer palmatum (Japanese maple tree)
Characteristics	- shade tolerant - strong at air pollution - adapt well on most soil type
Photo	  Photos of maple trees at Ace high end tower 5 (left) and Gasan SK V1 (right).

Maple tree is one of the mostly used tree for garden design because of its

beautiful autumn leaves. Unlike pine tree maple tree is a shade-tolerant species. It is a good street tree because it is strong at air pollution and adapts well on any type of soil. In SDIC 3 maple trees were observed in flower beds.

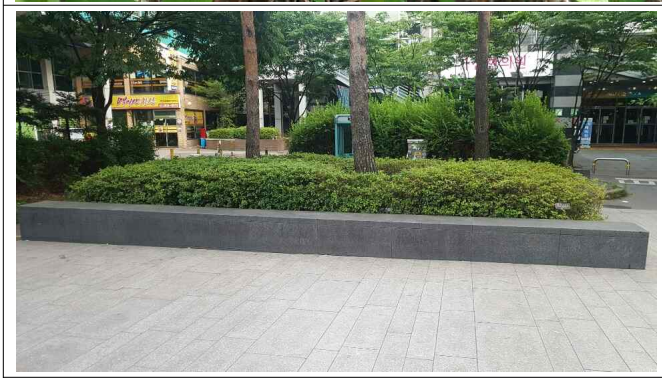
The third most observed tree was Yoshino cherry. Yoshino cherry was observed in 40 places out of 59 POPS in SDIC 3. Yoshino cherry is called as cherry blossom tree. In the spring time, POPS of SDIC 3 get filled with white cherry blossoms. People stop by at the POPS and take pictures of the cherry blossoms.

[Table 4-8] Cherry blossom trees in SDIC 3

Objective	Information
Name (Common name)	Prunus x yedoensis (Yoshino cherry, cherry blossom)
Characteristics	- shade-intolerant - strong at air pollution - tolerant of a variety of soil type
Photo	 Photos of Yoshino cherry trees at Jei-platz (left) and LG Digital center (right).

Yoshino cherry tree is one of the most used street tree. Yoshino cherry tree is strong at air pollution and tolerant of various soil type. Also Yoshino cherry tree blooms beautiful in spring time creating an easy tour site. Moreover Yoshino cherry trees have many leaves that create a shadowy space underneath it in summer time. In POPS of SDIC 3, Yoshino cherry trees with many leaves were easily observed near sitting area.

[Table 4-9] Rhododendron indicum trees in SDIC 3

Objective	Information
Name (Common name)	Rhododendron indicum (Azalea)
Characteristics	- shade-tolerant - strong at air pollution - tolerant of a variety of soil type - Easy and fast to grow for selling
Photo	
	
	Photos of Rhododendron indicum at Ace techno tower 10 (up) and Jei-platz (below).

The fourth most observed tree was Rhododendron indicum. It is a short heightened tree with beautiful flowers. In countryside where there is no air pollution people eat the flowers of it. It was observed in 40 places out of 59 POPS in SIDC 3. It was planted almost every place where there is a flower bed. It was planted as a barrier between trees in flower bed and streets.

Rhododendron indicum is a shade-tolerant species. It is also strong in air pollution, tolerant of a variety of soil type, and grows fast. Especially it is a good pair with a pine tree because it strong at acidification of a soil caused by a pine tree. Rhododendron indicum is one of the most common tree in South Korea. It can grow anywhere. In the POPS of Jei-Platz, Rhododendron indicium is planted in a flower bed with pine trees. They are mostly short in height and planted as a wall between trees and a street.

Fifth most observed plant is box wood. It is one of the most commonly observed tree in city areas. Box wood was observed in 36 places out of 59 POPS in SDIC 3.

Box wood tree is a shade-tolerant species. It is also strong at air pollution, and tolerant of a variety of soil type and temperature. Box wood grows very slowly. It is used as a border plant in POPS of SDIC 3. Except the 5 most observed plants in POPS of SDIC 3, Ginko tree (10), Zelkova tree (9), Rose (8), Oak tree (5), and Dwarf Japanese yew (5) were observed.

Now it is important to check if these plants observed in the POPS of SDIC 3 match with the expected natural plant communities of this area. SDIC 3 is built on an alluvial soil. For a river plain area in Seoul, Miscanthus community, Persicaria community, Salix gracilistyla or Salix graciliglandis community, Salix koreensis community, Ainus japonica community, and Salix chaenomeloides community are expected to be observed.[23] Surprisingly, none

of the most observed trees in the POPS of SDIC 3 is included in the expected natural plant communities, which proves that plant communities in the POPS of SDIC 3 is not communicating with surrounding nature environment.

[Table 4-10] Box wood trees in SDIC 3

Objective	Information
Name (Common name)	Buxus Koreana (Box wood)
Characteristics	- shade-tolerant - strong at air pollution - tolerant of a variety of soil type and temperature - Grows very slow
Photo	  Photos of Box wood trees at Jei-platz (up) and Ace highend tower 9 (below).

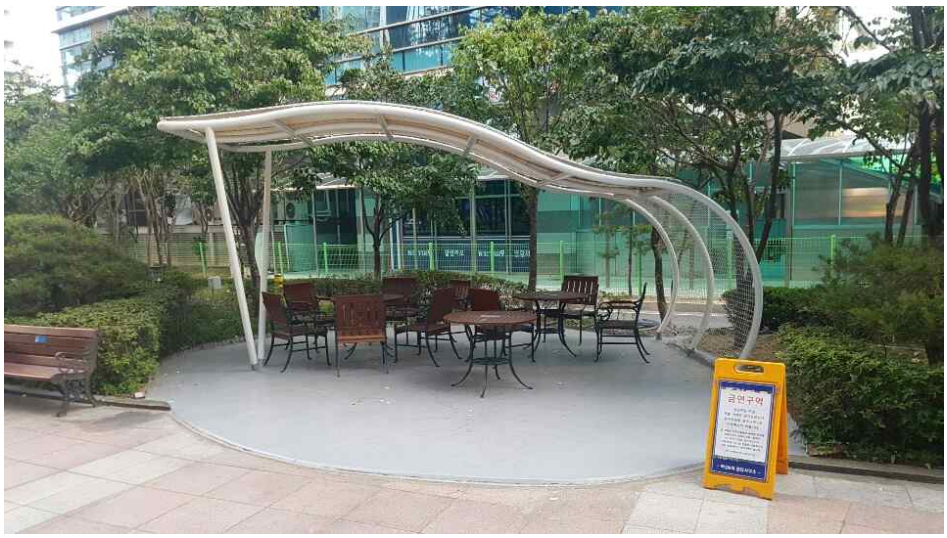
Common factor for the most found 5 tree species is that they are all

23) Wybe Kuitert, "The nature of urban Seoul: potential vegetation derived from the soil map," *International Journal of Urban Science* Vol. 17. No. 1 (2013): 95-108, https://doi.org/10.1080/12265934.2013.766505.

trees fit for city growing. Natural life of SDIC 3 is more about easy management not about true original natural species.

(2) Accessibility of green space

Pocket parks in POPS of SDIC 3 are observed to offer green refreshing spaces for the people. Pocket park is a place where people can take a rest watching the scenery of trees and plants planted in the POPS. Considering that SDIC 3 is an industrial area, such green space is definitely a refreshing space for workers.



[Figure 4-1] Pocket park in Byuksan Digital valley 6

Byuksan Digital valley 6 have a pocket park in its POPS. It is placed in between flower beds. During the summer time, when trees are full of leaves they offer a shading on the pocket park. This pocket park in Byuksan Digital valley 6 is placed away from the street on the right corner of the building so it is hard for passenger to find it. Most of the users for this place are workers in the building. This place is used often during the break time and

lunch time.

There are another form of a pocket park in the POPS of same building. This pocket park is placed next to a street on the front side of the building.

[Figure 4-2] Pocket park in Byuksan Digital valley 6

Because it is placed right next to a street, it can be approached easily by passengers. There is no shading from the trees because pine trees behind have not much leaves.

[Figure 4-3] Pocket park in Ace Techno Tower 10

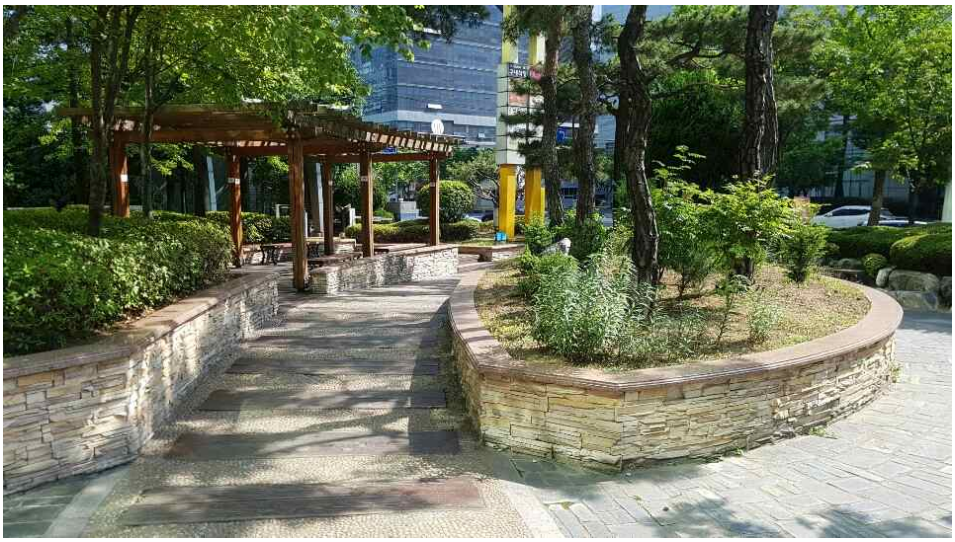
The pocket park in Ace Techno tower 10 is well designed compared with other places. It is covered by several flower beds that is functioning as a wall, a sitting area, and a shading area. In summer time this pocket park is covered with shades of tree leaves offering a cool temperature park during a hot weather. Flower beds surround the pocket park screen the air pollution from roads and offer a beautiful scenery which lets users forget that hey are now in an industrial area.

[Figure 4-4] Pocket park in Daeryung Techno Town 8

Pocket park in Daeryung Techno Town 8 is covered with many tall trees. When the leaves start to grow in spring time this POPS gets covered with tree leaves so the whole POPS is turned into a tree tunnel. There are many seating areas in this POPS so workers and passengers can all use this place freely. Walking through a tree tunnel in the middle of an industrial park makes one forget about the barrenness of the city and take a rest in the nature space.

Most of the trees and plants are planted in flower beds in the POPS of SDIC 3. Some have height difference with a street and some are not. A well designed flower bed makes people feel comfortable and offers a seating

area. It is a border between plants and streets. It makes a pathway inside a POPS and blocks air pollutions from cars.



[Figure 4-5] Flower bed in Ace Techno Tower 10

This is a well designed flower bed in a POPS of ace techno tower 10. Flower beds in this POPS has a fair height that is fit for people to sit. The flower beds are built with yellowish colored stones that matches well with the trees in it. Also spacing between the flower beds are functioning as walls creating a pathway in POPS.

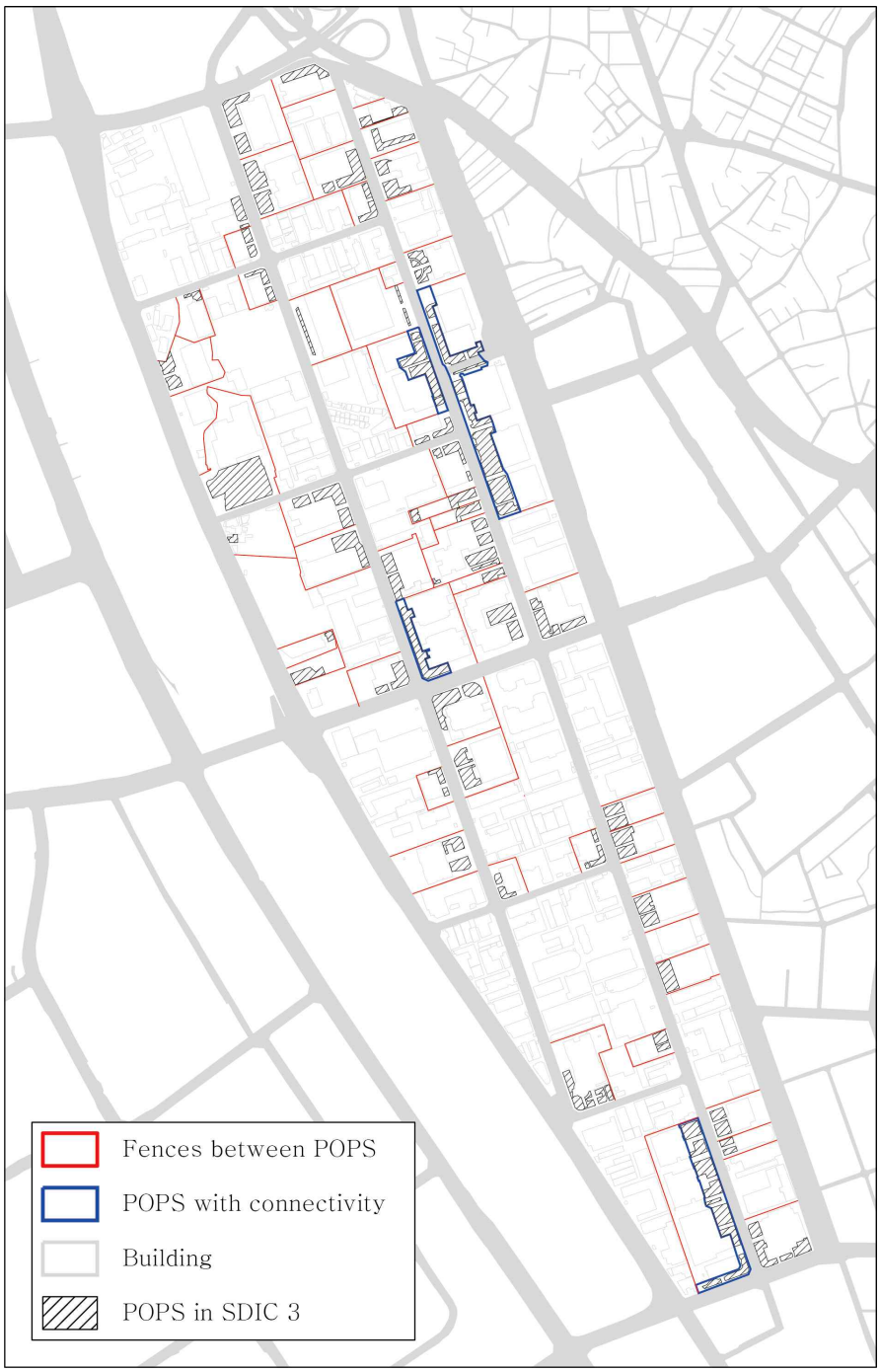
[Figure 4-6] Flower bed in KCC Welltz valley

Flower beds in KCC welltz valley is spaced too closely with each other. This flower bed in the POPS of KCC welltz valley is placed right next to a side walk. The width of a pathway around the flower bed is less than 1m. It causes people hard to pass through. Moreover the width of the side walk near is narrow so during a day time one might confront a random stranger passing through this space.

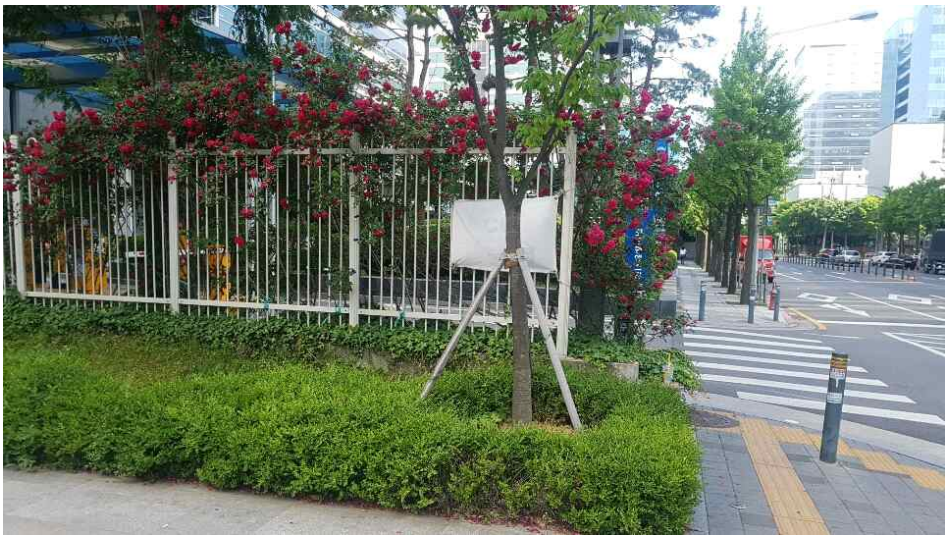
2. Connection with urban environment

(1) Connectivity with POPS

Although POPS in SDIC 3 are neighboring each other, they are disconnected by fences. There are three big reasons of building fences around the buildings. First, there is a sewage problem. People build fences to block sewage from other buildings, in case when it rains. Second, there is a pollution problem. There are many outdoor units on the first floor of buildings in SDIC 3. Owners of the buildings doesn' t want air pollution from neighboring buildings. Third reason is a garbage problem. If there is no wall the borderline of buildings gets vague. Owners of the buildings doesn' t want any dumping of garbage from other buildings. Because of the problems that comes from a vague definition of territory people build fences around the buildings although it blocks POPS connectivity. However, connectivity of POPS is meaningful because it can create new pathways in a city. Currently because most of the buildings in SDIC 3 have fences around them, walkway behind the buildings are blocked. Also possibility of several POPS forming a big -public open space is blocked.

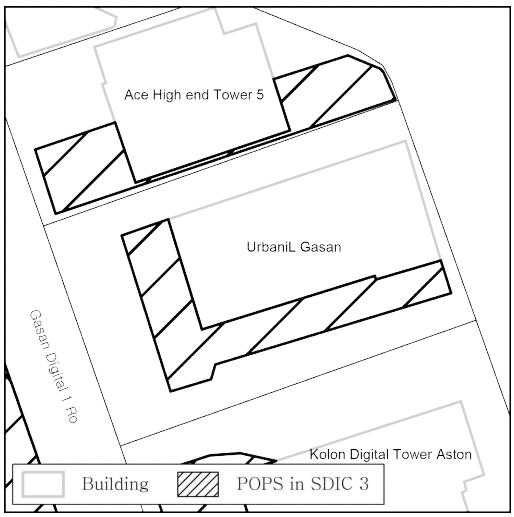


[Figure 4-7] Connectivity of POPS in SDIC 3



[Figure 4-8] Fences around UrbaniL Gasan

UrbaniL Gasan is an example of a POPS with fences around it. On the right side of UrbaniL Gasan there is Ace high end tower 5. On the left side of UrbaniL Gasan there is Kolon Digital Tower Aston. Both buildings around



[Figure 4-9] Map of UrbaniL Gasan

UrbaniL Gasan have a POPS on the front side of the buildings. The only pathway from UrbaniL to neighboring POPS is through a sidewalk. Also, the

fences block sight seen through the POPS. The screening of sight by the fences make people feel they are stuffed in the space. If there were no fences people could see a wide open scenery of SDIC 3 through the Gasan Digital 1 Ro.

Parking lot entrances at the front side of the buildings also blocks connectivity of POPS in SDIC 3. When SDIC was renovated from Guro Industrial Complex, the old city block structure remained. Also when developing SDIC 3 government policy ordered developers to build parking lots at the undergournd of every building. Therefore there had to be parking lot entrances at the front side of the buildings.

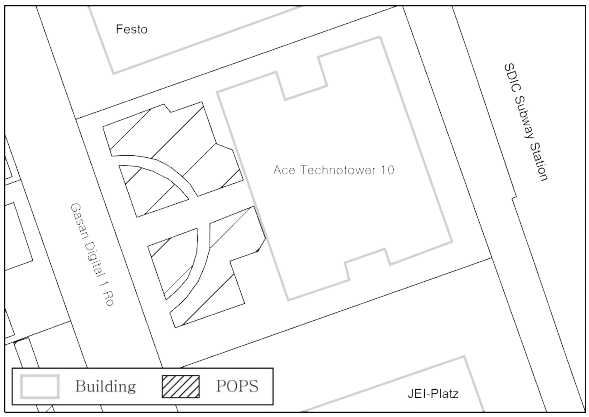
[Figure 4-10] Parking lot entrance and exit of Ace Techno Tower 10

On the side of the parking lot entrance and exit flower bed is placed so that it can function as a barrier between people and vehicles.

On the side of Ace Technotower 10 there is a Festo building and Jei-Platz building. Jei-Platz is a building with a POPS so if there was no parking lot entrances for both buildings, they could have created a big public open space.

Among 59 POPS in SDIC 3, there was no building without an entrance. Construction of the parking lot entrance and exit was inevitable from the beginning. However, there were a few places where they showed a connectivity between POPS. Gasan W center and Gasan SK V1 center is one

example. Gasan W center and Gasan SK V1 center were developed by a same planning company, haeahn architecture, at the same time in 2015. Therefore now they have a connected POPS although they are different buildings. Both buildings have a POPS on the front side and corner.



[Figure 4-11] Map of Ace Techno Tower 10

Two POPS meet at the middle and create a pathway leading behind the buildings.

[Figure 4-12] POPS of Gasan W Center and Gasan SK V1 Center

In the connected area of two POPS there is a wide open space that is now used as a main plaza of SDIC 3. The connected POPs leads to the backside of the buildings and let people to go to the opposite side of the block.

[Figure 4-13] Connected POPS of Woorim Lion' s valley

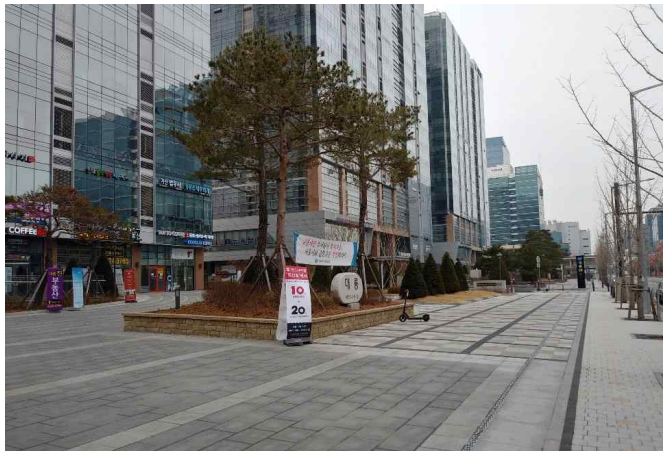
POPS in Woorim lion' s valley and Lotte IT castle also show connectivity of POPS. Woorim lion' s valley is separated in 3 buildings as Woorim lion' s valley A, Woorim lion' s valley B, and Woorim lion' s valley C. Three consecutive buildings have a long connected POPS.

POPS of Woorim lion' s valley are attached with a side walk on one side. On the sidewalk along the Woorim lion' s valley, there are several snack shops that hinders the walkway of people on the sidewalk. Therefore people are using POPS of Woorim lion' s valley as a side walk and a sitting area for a rest. On the right behind corner of Woorim lion' s valley there is a SDIC subway station. Sidewalk along the Woorim lion' s valley is the most

crowded area in SDIC 3. therefore there are lot of population using POPS of Woorim lion' s valley as a pathway. Considering the mass number of public usage there is a big flower bed built in between the side walk area of the POPS and the entrance of the buildings. In the POPS of Woorim lion' s valley there is a big empty space Some people come to practice skateboard on it. Some people do a research survey to the public in the empty space of POPS. POPS of Woorim Lion' s valley is an example of a new space created by the connectivity POPS.

[Figure 4-14] Connected POPS of Woorim Lion' s valley

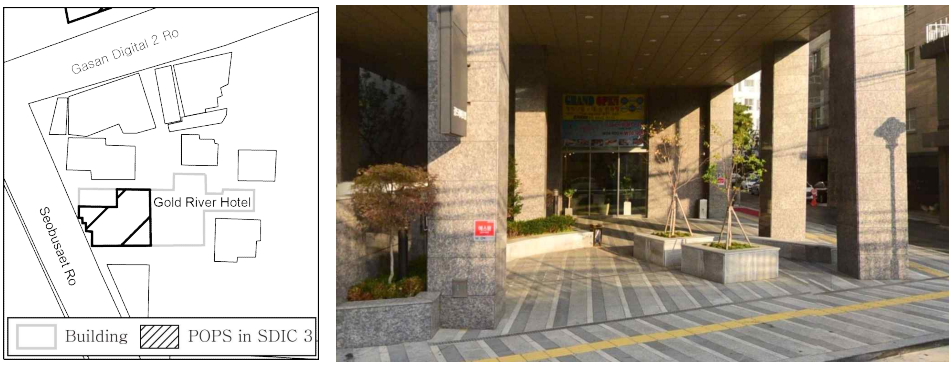
As a last example of connectivity of POPS in SDIC 3, there are Daeryung techno town 17,18,20 and the Ruben' s valley. These buldings are placed near Doksan subway station. POPS of these 4 neighboring buildings are disconnected by the parking lot entrances, but still they are not strictly disconnected by any fence. Because there is no fence built in between the POPS, one can see far away through the POPS and feel clearing up of a sight. Also the width of the possible sidewalk has increased. Although POPS are disconnected by parking lots, just removing fence can offer more comfortable urban environment. People will feel more comfortable to walk along the connected POPS than disconnected ones.



[Figure 4-15] POPS in Daeryung Technoo town 17,18, and 20

(2) Connectivity with urban environment

POPS of SDIC 3 are not connected with buildings. Among 59 POPS in SDIC 3, none of them was connected with the first floors of the buildings. It is mainly because of a simple design of the buildings. There can be a POPS built inside a building so that people can take a rest inside but none of such type was found in SDIC 3. As a similar type there is a POPS built under a pilotis area of a building.

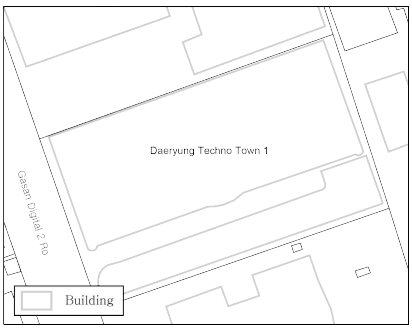


[Figure 4-16] Map and photo of Gold river hotel POPS

Although the POPS is not built inside the building, it is still built under the

pilotis so no large trees were observed. Gold river hotel is placed in a quite small area next to houses and factories away from the main street. Considering that other POPS in SDIC 3 are large in land area, POPS of gold river is small in size. However, neighboring environement of Gold river hotel is in need of renovation. The well developed side of SDIC 3 is along the main road. However, buildings along the Seobusaet-ro are still in old conditions without any well designed green space. Therefore POPS of Gold river hotel is a meaningful green space in the old town area.

All 59 POPS in SDIC 3 are attached to a street in many ways. All the buildings have their entrances built toward the direction of streets. In between the entrance of a building and a street there is a POPS. However from old buildings there is no POPS observed. Entrance of old buildings are directly connected with streets without any POPS in between.

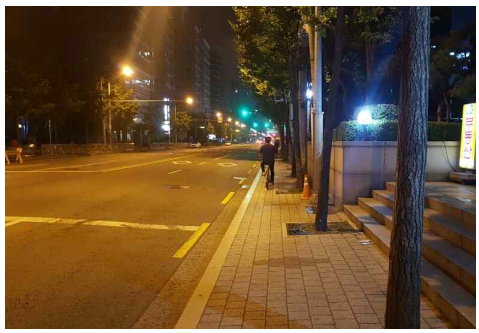


[Figure 4-17] Map and photo of Daeryung Techno town 1

The sidewalk of Gasan Digital 2 Ro is narrow compared with renovated sidewalks along the main road of SDIC 3. It hasn't been renovated since the Guro industrial complex. It is too narrow so only one person can pass through at a time. If Daeryung Techno Town 1 had a POPS, people could walk through the POPS although the side walk is narrow. However, because there is no POPS in Daeryung techno town 1, people have to be careful of

getting hit by trucks walking along the narrow sidewalk.

A height difference of a POPS may cause people hard to approach the POPS. Most of the 59 POPS in SDIC 3 doesn' t have a height difference with a sidewalk. However there is a POPS of Daeryung Techno town 3 that has a height difference with a street.



[Figure 4-18] Map and photo of Daeryung Techno town 3

Daeryung Techno Tower 3' s entrance is placed a few meters above a sidewalk and the stair cases are surrounded by walls. POPS of Daeryung Techno Tower 3 is placed behind the flower bed so one has to go up the stairs to use the POPS. As seen from figure 4-14, sidewalk along the Daeryung Techno tower 3 is very narrow. There is a high chance of a accident. Also the stone walled flower bed hides the existence of POPS from the passengers. It is hard to find a POPS as a passenger walking along the side walk. POPS of Daeryung Techno tower 3 doesn' t help much about the circulation of people along the side walk. It is more of a space for the workers in the building. There is a flower bed created in the POPS of Daeryung Techno tower 3. However, it has a narrow pathway so when people are smoking in the flower bed, it is hard for people to walkthrough it. Such POPS doesn' t function as a public space but more as a resting space for the workers in the building.

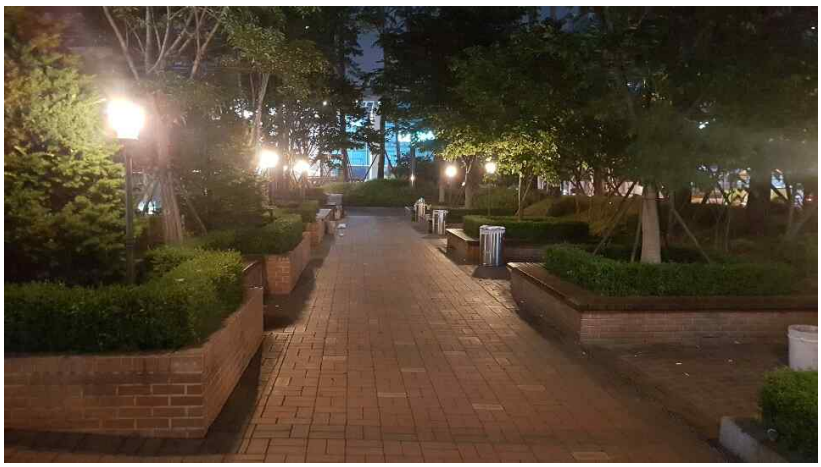
3. Public open space for people

(1) Good usage of POPS in SDIC 3

Developers build POPS mainly for the incentives in FAR and height limit of the building. However, POPS is a place of rest for people using it. Whether a POPS is built for incentives, its main function is offering a resting space to people. POPS in SDIC 3 are offering resting spaces to the people. POPS in IT Premiere tower shows how POPS is offering a resting area.

[Figure 4-19] POPS of IT Premiere tower

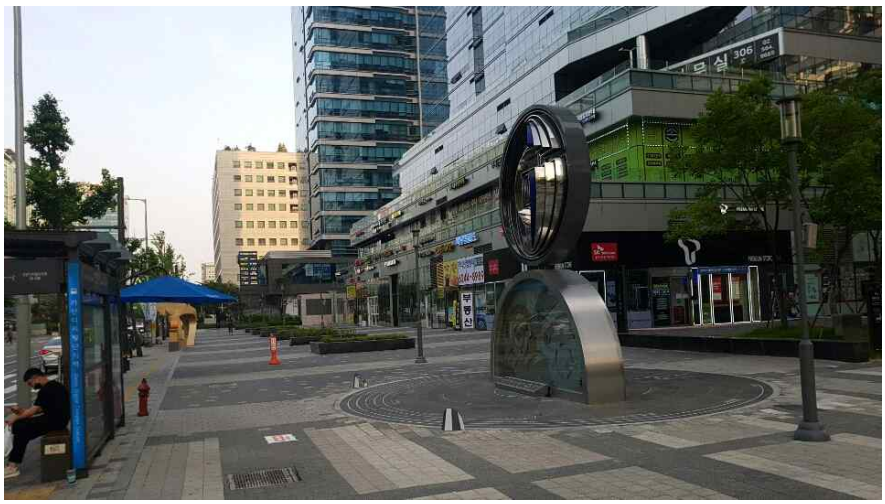
IT Premiere tower is surrounded by factories and there is no space where passengers can take a rest. Workers in the building can ride to the building but people who visit the area have to walk all the way to find a place to sit and rest. So after a long walk, the well constructed POPS of IT Premiere tower is a very relaxing space for people. The size of the POPS of IT Premiere tower is big compared with other POPS making it feel more like a resting and relaxing area.



[Figure 4-20] POPS of BYC High city

People were using POPS of BYC High city as a gathering place during night time. If this area was still a factory area, there wouldn't be any people gathering with their friends.

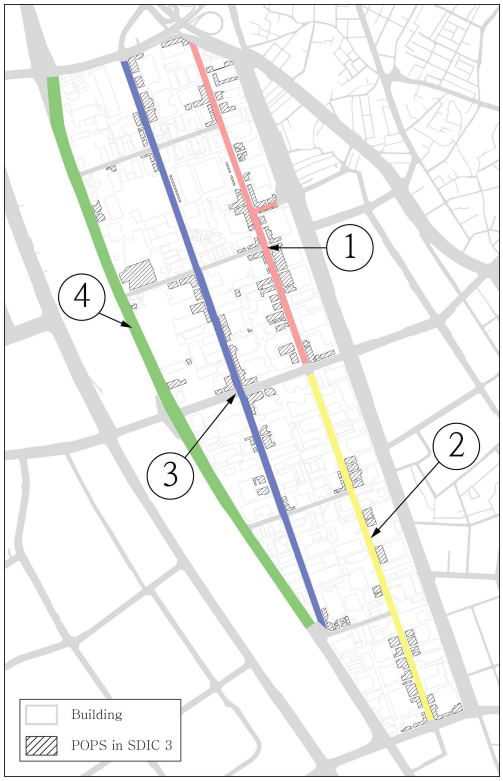
POPS in SDIC 3 are also used as cultural activity spaces. There is a tour walk in SDIC 3 along the sculptures placed in POPS of SDIC 3. The SDIC 3 walk tour starts form Seoul Digital Industrial Complex station. Then it visits G-time machine that is placed in the POPS of Gasan SK V1 center. Following the POPS people can meet "connecting the memory", a sculpture that symbolizes a sewing industry. After that people can walk all the way up to Ace High end tower 3. There people can find the digital Momentree. Moment tree is a sculpture that symbolize past memories in SDIC 3. Each cube symbolized part of memories in SDIC 3. The tour walk along the POPS in SDIC 3 is not beneficial economically. However, it is still worthwhile to try such cultural movement in the industrial area. By trying non-industrial activities in the POPS, people can make the industrial area as much lively and welcoming place for people. That is the ultimate goal of every POPS built in SDIC 3.



[Figure 4-21] Sculpture that symbolizes SDIC 3 installed in POPS

(2) Bad usage of POPS in SDIC 3

People use POPS in day times but when the workers go home there is not much people visiting SDIC 3. When workers go home and buildings start to close, it becomes hard to find people on the street. Industrial complexes in SDIC 3 are knowledge-based factories, not a living area. Therefore when it becomes night time the whole SDIC 3 complex buildings become empty. Such emptiness of the complex is also observed during the weekend. During the weekend, when there is not many workers in the complex, shops and restaurants in the complex 3 close. City is not a space that is meant to be empty. If there is a good design and well structured programs, people will still visit SDIC 3 during night time or during the weekend. POPS in SDIC 3 are built for the workers in the complex. However, they are also built for the people in Gasan-dong, where SDIC 3 is placed. Therefore, it is important to analyze the emptiness of SDIC 3 while the workers are absent.

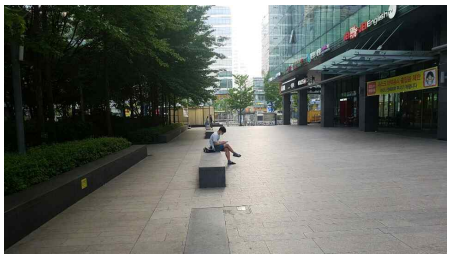


[Figure 4-22] Map of SDIC according to the crowdedness

SDIC 3 can be divided in 4 big area according to the crowdedness. First area 1 is around SDIC subway station, which has the most number of people in use. Also there are many shops and restaurants around area 1. Second area 2 is blocks around the bridge of export, which has the second most number of people. Doksan subway station is included in this area. Also there are apartments around Doksan subway station, so neighbors in the town often visit this area. Area 3 is the area one block behind area 1 and 2. There are several shipping factories and manufacturing factories in the area. Because area 3 is filled with several factories, it is mostly visited by workers in SDIC. Non-workers have no attraction to visit this area. Area 4 is along the Gasan Digital 2-ro. Here is where the least number of people are in use

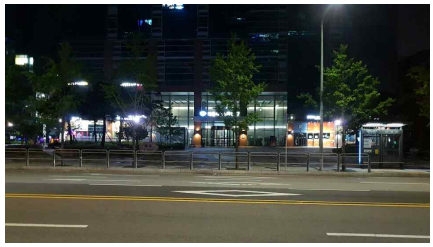
among all the areas in SDIC 3. Some old shipping companies and factories are placed in this area. Also un-renovated area from the past still exist in this area along the Seobusat-ro.

Area 1 is where the SDIC subway station is. There is also bus stations near the subway station. SDIC subway station is a transfer station for line number 1 and 7. Therefore many workers in SDIC 3 use public transportation in the area 1. Relative to the large amount of people in use coffee shop, restaurant, and grocery store are observed on the ground floor of the buildings in area 1. Many people taking a rest and visitng POPS in the area 1 were observed during the day time. Although it was a weekend, several shops in area 1 were open and many people were visiting. Even during the night time some people are still observed in area 1.



[Figure 4-23] People using POPS in area 1 during a weekend

POPS in area 2 were in similar condition with POPS in area 1. POPS in area 2 have a good connectivity of POPS and were built recently so the condition of POPS were good. However because there are not many people visiting the Doksan station it was hard to find people around POPS compared with area number one. Also the shops were mostly closed in area 2 except several grocery stores. But still a few people were observed in POPS of area 2 during the weekend and night time because there are apartments near the Doksan station. Neighbors living in the apartment visited shops around Doksan station in the night time.

[Figure 4-24] Empty POPS of area 2 in night time

Less number of people were observed in POPS of area 3. Several factories are placed in area 3, so area 3 was more empty with people during the weekend and night time.

There was no one in the POPS of area 4 during the weekend and night time.

Other than the emptiness of POPS in SDIC 3, smoking is one big reason of people avoiding using POPS in SDIC 3. During the lunch time there are many workers observed smoking in the POPS. If one who wants to use the POPS is a smoker he/she should be fine with it but there are also non-smokers. For the non-smokers it is hard for them to use the POPS when there are people smoking. Therefore it is important to set a policy for the smoking area in POPS.

Out of 59 POPS in SDIC 3, there are 36 POPS that have a smoking area. 23 POPS banned smokinig in the area.


[Figure 4-25] Non smoking area in Byuksan Digital valley 6 POPS

POPS of Byuksan Digital valley 6 was one of the smoking banned POPS.

There were several pagoras where they could be distinguished as for smokers and for non-smokers, but all the pagoras were banned for smoking. The smoking area of the building was placed behind the building which is hidden from the streets. It was hard to find any wasted cigarettes in the POPS of Byuksan digital valley 6. Also the POPS was clean and well maintained.

POPS of Jei-platz is banned from smoking. However there were people smoking ignoring the sign banning the cigarette. POPS of Jei-Platz is connected with the entrance of the SDIC train station.

[Figure 4-26] Smokers and wasted cigarettes

Although it was a smoke banned POPS people didn’ t care much about it. It was easy to observe smokers and wasted cigarettes in the POPS of Jei-Platz. When smokers were smoking in the POPS, only smoking people were in the POPS. Non-smokers just passed by it.

Chapter 5 Conclusion

1. Meaning of Research

Through this research, overall judgment about the POPS in SDIC 3 was possible.

First, POPS of SDIC 3 have several attractive natural spaces that can attract people. However, the trees planted in the POPS of SDIC 3 were focused on the survival in a city space. POPS designers favored trees that can survive easily in city space and also that is easy to maintain. Consideration for the natural habitat and life cycle of the landscape was not considered.

Second, there are several POPS that show connectivity with the neighboring POPS. With several POPS showing connectivity, it was possible to observe that a joint development of POPS can create a space more than a resting place that supports the urban structure. However, there are still many POPS that need to be renovated because of the fences that surround them. Also in future renovation, a new city block design should be planned so that POPS don't have to be disconnected by the parking lot entrance.

Thirdly, POPS of SDIC 3 were partly functioning well as a public space for the neighborhood. Only POPS around crowded area, such as the SDIC train station, were visited often by people. If POPS in SDIC 3 can be used for cultural activities of neighborhoods, people will visit more often. The reason neighborhoods visit POPS in weekend and nighttime is because of the restaurant and train station around it.

Also there needs a control for the smokers in POPS because non-smokers

will hesitate to visit POPS if there are smokers smoking in it.

As a result, POPS in SDIC 3 show a new paradigm as POPS in that several of them show connectivity with neighboring POPS. However, in perspective of nature management and usage control there are still more development to be done.

2. Limit of the research

There needs to be more objective explanation about the POPS in SDIC 3. Most of this research was based on subjective analysis. In further studies about POPS in SDIC 3, there should be objective data supported for the research.

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초록

서울디지털산업단지 3단지의 공개공지에 관한 연구

1950년대 서울의 위성사진을 보면 서울의 많은 부분이 논과 밭으로 구성된 것을 볼 수 있다. 하지만 지난 50년간의 꾸준한 경제성장으로 이제는 서울의 많은 면적에 건물들이 들어서 있는 것을 볼 수 있다. 불과 50년여 만에 서울의 많은 부분이 콘크리트로 뒤덮인 것이다. 이에 따라 서울에서는 오히려 녹지공간이 부족하게 되는 상황이 발생했다. 공개공지는 이러한 상황에 제시된 도심 내 시민들을 위해 건설된 공공공간이다.

공개공지는 건축면적의 일부를 공공을 위한 공공공간으로 조성함으로써 건축설계시 연면적을 늘려주는 제도이다. 이러한 공개공지는 건축면적 5000m2 이상의 건물설계시 필수적으로 포함되어야 한다. 그렇기에 서울의 대형빌딩들에는 공개공지들이 필수적으로 포함된 것을 볼 수 있다. 만약 공개공지라는 제도가 없었다면 빌딩들이 숲처럼 모여있는 서울을 몇몇 도시 중심부에서는 녹지공간을 찾아보기 힘들었을 것이다.

공개공지는 이처럼 도심 속에서 녹지공간과 휴게공간 그리고 재충전의 공간으로써의 역할을 할 수 있는 장소이다. 하지만 현재 건설된 대부분의 공개공지들은 건물주변의 울타리 역할이나 작은 정원 또는 빌딩 앞의 대형 시설물 설치공간으로 사용되고 마는 것이 현실이다. 또한 빌딩들이 모여있는 서울 도심 중심부에서는 몇몇 공개공지들이 서로 맞닿아 있는 것을 볼 수 있다. 하지만 이렇게 인접한 공개공지들은 서로 간의 연결성이 없고 각 공개공지가 속해있는 건물들의 울타리 역할에 그치며 오히려 인접한 공개공지들끼리 서로를

구분 짓는 형태로 설계된 것을 볼 수 있다. 이는 공개공지의 설계시 공개공지와 주변공간과의 연계성에 대해 고려하지 않고 설계가 진행된 결과이다. 해외에서는 건물설계시 공개공지의 인접도로 연결성 또는 지역특색에 맞춘 공개공지의 건축선 지정, 건물의 배치, 형태, 색태를 고려한 공개공지 확보 등 공개공지 설계에 이용자들을 고려한 여러 방향들을 제시하고 있다. 이에 따라 공개공지가 단순히 건물에 포함되어 있는 부수적인 공간이 아닌 판매시설, 미술관, 음식점처럼 이용자들에게 흥미를 주고 독립된 도심 공간으로써 시민들을 끌어들일 수 있는 장소로 사용되는 것을 볼 수 있다.

이번 연구는 서울시 구로구 구로동과 금천구 가산동 일대에 걸쳐 조성된 서울디지털산업단지 3단지를 대상으로 진행되었다. 3단지는 서울디지털산업단지 3개 단지중 가장 큰 규모로 조성된 단지이다. 서울디지털산업단지는 한국산업발전의 핵심지역이라고 할 수 있다. 현재 이곳에는 많은 지식기반산업 기업들이 입주해 있다. 그리고 이러한 지식기반산업 기업들의 입주를 위해 이곳에는 많은 수의 아파트형 공장들이 들어서 있다. 이곳의 대부분의 아파트형 공장들은 대지면적의 10% 이상을 공개공지로 건설하며 이에 해당하는 용적률의 인센티브를 받아서 건설되었다. 그렇다보니 여러 아파트형 공장들이 몰려있는 사이에 그 앞마당에는 여러 공개공지들이 서로 인접해있는 모습을 볼 수 있다.

서울디지털산업단지 3단지는 이미 개발이 완료된 1단지, 2단지와 다르게 아직도 개발이 이루어지고 있는 장소이다. 서울디지털산업단지 3단지의 개발은 앞으로의 산업단지의 개발에 좋은 예시가 될 것이다. 이에 따라 이번 연구에서는 서울디지털산업단지 3단지의 공개공지 설치 현황을 조사하고 그 안의 자연환경, 공개공지 간의 연결성, 시민들에 의한 사용에 관한 조사를 하였다.

주요어 : 서울디지털산업단지 3단지, 공개공지
학 번 : 2018-20560