

Article

Guidelines on Unused Open Spaces between Buildings for Sustainable Urban Management

Ji-ah Lee ¹, Jong-ho Lee ² and Min-hee Je ^{3,*} 

¹ Department of Urban Planning, Hanyang University, 222 Wangsimni-Ro, Seongdong-Gu, Seoul 04763, Korea; jiapooh91@hanyang.ac.kr

² Department of Future and Smart Construction Research, Korea Institute of Civil Engineering and Building Technology, 283 Goyangdae-Ro, Ilsanseo-Gu, Goyang-Si 10223, Gyeonggi-Do, Korea; leejongho@kict.re.kr

³ Department of Building Research, Korea Institute of Civil Engineering and Building Technology, 283 Goyangdae-Ro, Ilsanseo-Gu, Goyang-Si 10223, Gyeonggi-Do, Korea

* Correspondence: minheeje@kict.re.kr

Abstract: The side setback areas of buildings are generally underutilized urban spaces. Often, they are used as unauthorized commercial spaces, which lead to legal struggles and safety and sanitation hazards. However, the presence of these establishments implies a demand for using these spaces, and many argue that such structures enhance and vitalize cities. This study establishes a new direction for utilizing side setback areas that harmoniously meets the demands of city dwellers and business owners while ensuring safety and compliance with regulations. We examined the utilization status of 371 side setback areas in various districts of Seoul and surveyed 20 urban management experts. The results indicate that at least 30% of all buildings in the study repeatedly violated laws regarding the use of their side setback spaces, and 100% of the experts agreed that the current regulatory system is inflexible. Our analysis suggests that reform is needed and offers tangible guidelines so that these generally underutilized spaces may become useful when safety and sanitation requirements are met. In the context of overpopulated urban spaces, side setback areas can be repurposed to meet the needs of urban residents while ensuring safety and sanitation.

Keywords: side setback area; semi-public space; open space; commercialization; design guideline; fire safety; street vitality



Citation: Lee, J.-a.; Lee, J.-h.; Je, M.-h. Guidelines on Unused Open Spaces between Buildings for Sustainable Urban Management. *Sustainability* **2021**, *13*, 13482. <https://doi.org/10.3390/su132313482>

Academic Editor: Domenico Palladino

Received: 3 November 2021

Accepted: 3 December 2021

Published: 6 December 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Modern cities tend to over-develop and become overpopulated, forming compact urban structures. This gives rise to fire risks, as fires can spread easily between connected buildings. It also presents a sanitation issue, as direct sunshine is not secured through adjoining buildings. Securing sunshine in an indoor space reduces the psychological closeness and pressure that residents feel and provides appealing views. Sunlight is also essential for a pleasant and clean life in terms of ventilation and sterilization. To prevent fire risks, the Building Act of Korea's urban planning government office required buildings to feature a minimum setback distance (a minimum requirement of open space between buildings and structures) in between them to improve fire safety and ensure a more pleasant environment for residents. Many studies have proven that securing setback distance between buildings is a significant variable in preventing fires from spreading [1–4]. Moreover, side setback areas have been proven to be a key factor for building environments within residential areas, as they facilitate access to sunshine and ventilation [5–7].

Recently, side setback areas between buildings have been used for specific purposes, such as outdoor retail or market spaces. This is in line with the trend of urban regeneration, in which small, in-between unused and neglected spaces are created into productive spaces, since supersaturated cities do not have the option of developing large areas of land. In particular, as commercial facilities penetrate the lower levels of buildings in general

residential areas (in what is considered commercialization), the adjoining vacant lots within building sites, such as side setback areas, are also becoming commercialized. Stores on the lower levels of adjoining buildings mostly use side setback areas as their outdoor sales space. They sometimes set up small pocket gardens or separate pop-up stores.

These structures are illegal, involving the unauthorized extension or occupation of vacant lots without permission. Structurally speaking, establishing facilities within side setback areas may increase the risk of fires spreading, as the buildings on both sides may become close and connected. In other words, in terms of health management by securing sunshine and fire safety, which is the basis for policy on creating side setback areas, the establishment of other facilities within side setback areas can be considered a risk factor [8].

Alternatively, some studies argue that various activities using side setback areas may vitalize particular regions. Researchers perceive side setback areas as small unused spaces that are distributed in various parts of the city and serve as a medium for connecting individual urban elements [9–11]. It has also been pointed out that these side setback structures address the demand for finding new customized functions considering the limitations of the surrounding areas [12,13]. They have also claimed that the existing regulations that unconditionally neglect and prohibit the use of side setback areas are irrational in dense urban centers. Furthermore, they are not public open spaces but private lands and, thus, lead to property rights violations.

Nonetheless, it is clear that the setback distance between buildings is still an indispensable physical element for safety and sanitation. As long as there is a plan to safely use side setback areas without damaging their current purpose, unused space in dense and saturated urban centers can be used wisely. Therefore, this study sets specific guidelines for the use of side setback areas to obtain a common ground between public regulations and the demands of urban residents. This approach is an attempt to reflect on urban space utilization behavior in urban management planning, based on the voluntary demands of urban residents, which raises the need to reestablish existing systems.

Seoul, which is a typical example of a modern megacity in Asia that is overdeveloped and overpopulated, was selected as the analysis site. According to the zoning system in Seoul, there are regulations on “forming setback distances from the boundary lines of adjacent lots” in residential areas, pertaining to fire safety or access to sunshine. However, this law has not yet been applied to commercial areas. In the 2010s, some residential areas of Seoul showed signs of commercialization, in which commercial facilities penetrated the lower levels of buildings situated on certain streets. Stores on lower levels conduct commercial activities by using the side setback areas of the buildings. This is currently an illegal act that is subject to regulation, but store owners and pedestrians respond positively to the use of this space [13,14]. Conflicts between the system and users lead to repetitive acts of closing, demolishing, and installing these spaces, deteriorating the quality of the street environment. As such, Seoul city clearly reveals the need to establish relevant guidelines and reform the system and is, thus, suitable for analysis in this study.

The purpose of this study is to establish a new direction for utilizing side setback areas for fire safety in Seoul. The specific contents and procedures of this study are as follows. First, the relevant acts and systems in Korea are reviewed, as well as the overseas policies related to the creation and regulation of side setback areas. The scope of side setback area utilization is also assessed. We also conducted a literature review on two aspects: regulating and permitting the use of space in terms of fire safety.

Next, we selected specific sites in Seoul and conducted a case analysis. First, we examined the utilization status of side setback areas of buildings and conflicts existing within the system. Next, we surveyed and interviewed relevant public officials and experts on the management and use of these spaces. Here, we conducted in-depth interviews with a few participants so that they could provide specific system reform measures. Lee and Park [13] conducted a survey on the demand for system reform in using side setback areas among users and store owners and discovered that there was a high demand. It was also proven that, in terms of street landscape, using side setback areas increases vitalizing

factors such as street diversity and openness [14]. With discussions already complete in the private sector, this study is at the stage of establishing the direction for system reform to reach a social consensus that includes the public sector.

Finally, we intended to establish system reform measures and construct guidelines for using side setback areas rationally while meeting the purpose of their establishment (focusing on sanitation/fire hazards). This study is significant in that it establishes a new direction for urban architectural structures in sustainable cities by meeting the changing needs of urban residents. In this process, we focused on improving the structural safety of these spaces against fire, which is a risk factor in supersaturated urban spaces.

2. Literature Review

2.1. Review of Legislations Related to the Formation of Building Setbacks

In general, side setback areas are formed through the process of limiting the actions and development density of buildings. Building-to-land or floor area ratios are applied differently, depending on special-purpose areas and districts, which determine the size and layout of buildings and affect the establishment of remaining vacant lots within the land, excluding the building area. Moreover, the Building Act and other relevant laws regulate the development density and form of buildings depending on their purpose, height, and area and, in some cases, there are conditions such as securing privately owned public spaces for public use. Some countries require separated vacant lots between buildings as well as road and land boundary lines to facilitate evacuation and passage in the case of fire.

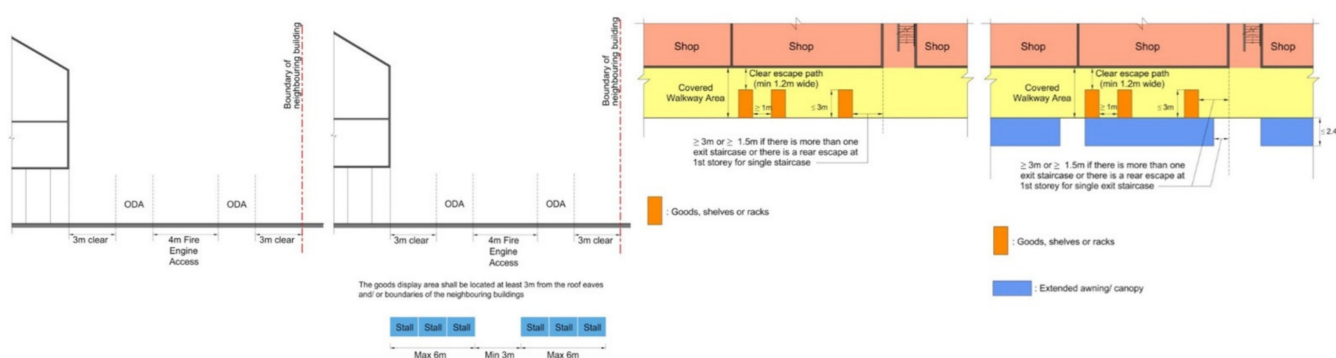
In Seoul, the subject of this study, construction restrictions are informed by legislation from the National Land Planning and Utilization Act, the Building Act, the Act on Fire Prevention and Installation, Maintenance, and Safety Control of Firefighting Systems, the Management of Outdoor Advertisements Act, the Promotion of Outdoor Advertisement Industry, and the Parking Lot Act, as they are all related to the formation and use of side setback areas (see Table 1). Additionally, there are vacant lots within the building site that are part of the process of maintaining a setback distance from adjacent buildings. It is advisable to empty the front and side spaces of buildings that are in contact with the street among vacant lots for purposes such as evacuation, safety, and sanitation.

Singapore, a large city-state in Asia with a similar urban structure, designates four types of outdoor display areas (ODAs) related to fire safety: non-roofed-over ODAs detached from buildings, roofed-over ODAs detached from buildings, ODAs along covered walkways, and ODAs with extended awning/canopies (see Figure 1). ODAs are vacant lots within building sites but are legally permitted for use, which is different from Seoul. However, there are specific items of fire safety considered applicable to all ODAs, such as bans on open-flame activities and encroachment onto fire engine accessways or access roads, and the mandatory installation of fire extinguishers within 15 m of roofed-over ODAs [15].

Another Asian city, Tokyo, Japan, also sets regulations on setback distance. However, unlike Singapore, Japan maintains a distance between buildings to guarantee the right to sunlight, rather than for the purpose of safety against fire. There must be a setback distance between roadside buildings due north, considering the angle and direction of sunbeams at noon. Table 2 is the right-of-light legal regulation standard article 56(2) of the Japanese Building Standards Act [16,17]. This regulation secures sunlight for surrounding areas by stipulating the light generated by high-rise buildings within a residential area, within a certain period of time. In Figure 2, for example, in the mid-/high-rise residential area, a distance of 5 to 10 m from the adjacent building, is required to allow enough sunlight (about 3 h to 5 h of sun-shadow time reference Table 2) to enter the building at noon. It should be noted that, when designating the sunshine time standard, guidelines on sun-shadow regulations for each use are established based on preliminary surveys so that each local government can autonomously apply them considering the regional characteristics and context (see Table 2).

Table 1. Legislations regarding the formation and use of side setback areas in Korea (Seoul).

Relevant Regulations	Details
National Land Planning and Utilization Act	<ul style="list-style-type: none"> Limits on the purposes, building-to-land ratios, floor area ratios of buildings in special-purpose areas/districts Arrangement/type/building line of buildings according to the establishment of the district-unit plan
Building Act	<ul style="list-style-type: none"> Landscaping of building sites/securing privately-owned public spaces and vacant lots within the building site Designation of building lines and restrictions on buildings by building lines Designation of special building zones/special street zones and special provisions in the building codes according to construction agreements
Act on Fire Prevention and Installation, Maintenance, and Safety Control of Firefighting Systems	<ul style="list-style-type: none"> Scope of objects for granting consent for permission to build Maintenance and management of escape facilities, fire compartments, and fire prevention facilities
Special Act on the Safety Control and Maintenance of Establishments	<ul style="list-style-type: none"> Formulation and implementation of plans for safety and maintenance of establishments
Parking Lot Act	<ul style="list-style-type: none"> Establishment standards for annexed parking lots according to the use and area of the building
Act on the Management of Outdoor Advertisements, etc. and Promotion of Outdoor Advertisement Industry	<ul style="list-style-type: none"> Permission for or reporting on advertisements, etc.
Food Sanitation Act	<ul style="list-style-type: none"> Permission of emergency exit routes and entrance plans for food businesses Facility standards by type of business and report/registration

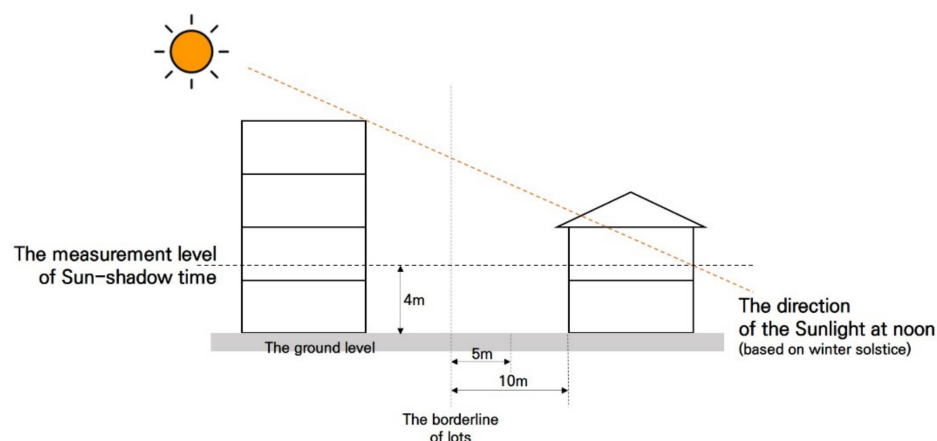
**Figure 1.** Four types of ODAs related to fire safety in Singapore (In order, from the left: non-roofed-over ODAs detached from the building; roofed-over ODAs detached from the building; ODAs along a covered walkway; ODAs with extended awning/canopies).

As in Asian countries, various Western cities also create setback distances between buildings to prevent fires or to secure sunshine. The UK has established detailed guidelines to prevent fires from spreading to nearby buildings, according to regulations that establish distances between buildings to prevent fire [18,19]. According to the guidelines, it is important to set the distance by calculating the boundary distance between buildings. Figure 3 is part of the building regulations for fire safety in the UK. The notional boundary is assumed to exist in the space between the buildings, and is positioned so that one of the buildings complies with the provisions for space separation, with regard to its total unprotected area [18]. In practice, if one of the buildings has already been established, the position of the boundary is set by the space separation factors for that building [19]. Although the exact value of the separation distance is not determined, the amount of unprotected area dependent on distance from the relevant boundary is determined according to the degree of fire resistance of the wall material, which is known as the principles of space separation.

Table 2. Selective application guide for local governments depending on special-purpose areas in Japan's sun-shadow regulations [16].

Area or District	Restricted Building	Average Height from Ground Level	Sun-Shadow Time (Unit: Hour)	
			Below 10 m	Above 10 m
Type 1 low-rise residential areas Type 2 low-rise residential areas	Eaves exceeding 7 m or at least three stories excluding basement	1.5 m	3	2
			4	2.5
			5	3
Type 1 mid-/high-rise residential areas Type 2 mid-/high-rise residential areas	Height exceeding 10 m	4 m or 6.5 m	3	2
			4	2.5
			5	3
Type 1/Type 2 residential, quasi-residential, neighborhood commercial, and quasi-industrial areas	Height exceeding 10 m	4 m or 6.5 m	4	2.5
			5	3
Districts where special-purpose areas are not designated	Eaves exceeding 7 m or at least three stories excluding ground floor	1.5 m	3	2
			4	2.55
			5	3
	Height exceeding 10 m	4 m	3	2
			4	2.5
			5	3

Bold is easy for readers to find the information.

**Figure 2.** Example of sun-shadow regulations other than low-rise residential areas [16].

The UK also has concerns over the right to light and guarantees the right to sunlight by addressing the formation of setback distance in various clauses (see Figure 4) [20–22]. In general, the angle of light entering a building should be 25 degrees, and the gap between buildings should be wide enough that the light can shine through a 2 m-high window. In addition, to obtain permission to build, the building's sunshine is measured and determined based on the design plan and detailed criteria such as the Building Research Establishment (BRE) guidelines and the British Standard (BS) Code to determine in detail the design direction related to lighting in both existing and new buildings.

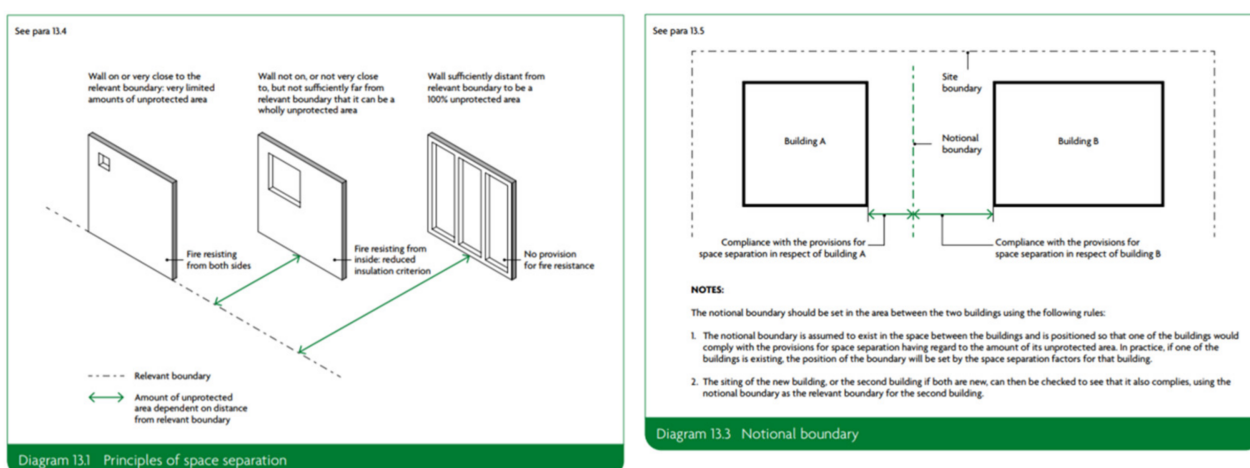


Figure 3. Principles of space separation and notional boundaries for fire safety in the UK [18].

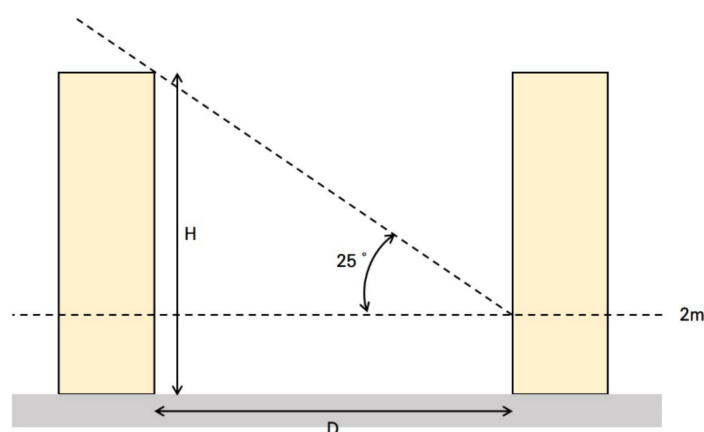


Figure 4. Review of possible daylight in new buildings [19].

After reviewing the grounds and regulations for forming setback distances in various other cities and nations, we surmised a few implications that must be applied in Seoul. First, detailed guidelines must be established to guarantee fire safety. Singapore categorized the physical form of side setback areas into four types and provided suitable fire prevention guidelines for each form. Because buildings are already equipped with escape routes and firefighting facilities, user safety is guaranteed even when the setback area is occupied and used. The UK set detailed rules for building materials and layouts to prevent the spread of fires to adjacent spaces. In other words, instead of unconditionally forming side setback areas, they set guidelines for various elements of planning to exclude risk factors while maintaining the utility value of these spaces.

Next, it is necessary to consider locational characteristics when considering sunshine. Both the Japan and the UK guidelines make distinctions depending on the building location and regional characteristics while calculating the distance so that access to sunlight is ensured. Japan considers the use of these areas and decides whether to apply such regulations after considering whether sunshine can be secured. In Seoul, on the other hand, side setback areas are used in residential areas that are becoming commercialized. In other words, buildings have certain uses for which urban residents do not necessarily need sunshine. Therefore, it is necessary to individually review the need for side setback areas for securing sunshine in each special-purpose area.

2.2. The Scope of Side Setback Areas (Definition of the Research Subject)

In the previous section, the legislation on side setback areas was reviewed based on different cities and cases, and we defined the specific scope of “side setback areas” to be analyzed in this study (See Figure 5). First, a side setback area is a vacant lot within the building site and is a private area. However, it must be formed depending on public purposes, and because it is connected to a public walkway between buildings, it is defined as a semi-public area that includes public functions as well.

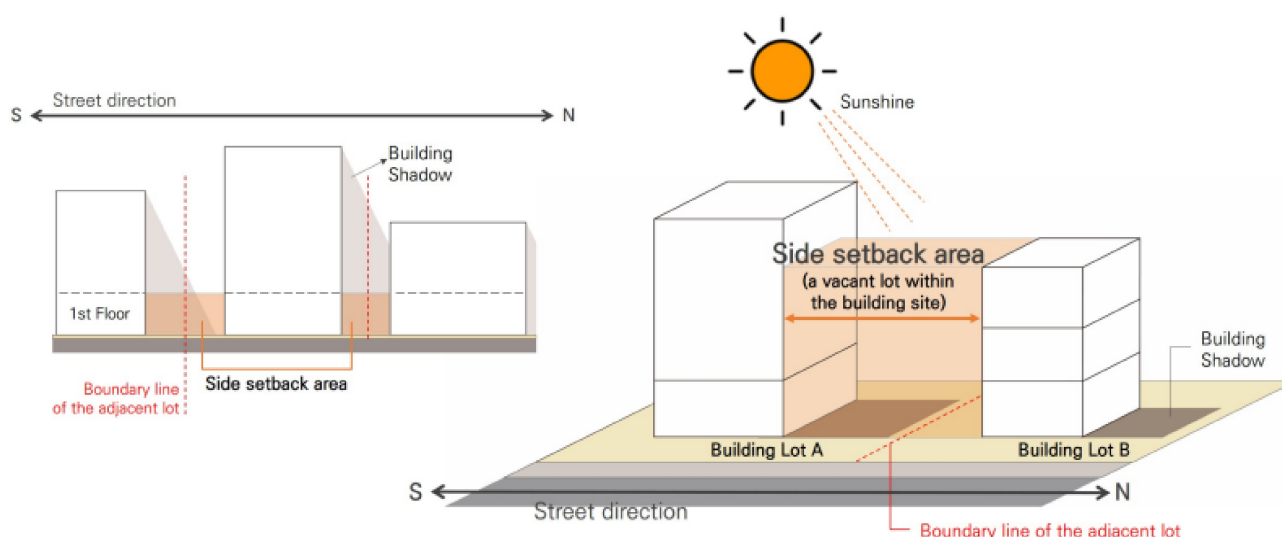


Figure 5. Definition of the subject (side setback area: separated space).

Second, side setback areas connected to public walkways are used by expanding the use of the lower levels of the building or by installing facilities, thereby showing high spatial utility. On the other hand, the fronts of buildings offer limited space and is considered only in terms of expanding the walkway, and thus the space cannot be independent of the store. Therefore, this study limits the side setback area to the side space of the building and defines it as an in-between space secured by the distance from the adjacent lot.

2.3. Literature Review on Side Setback Areas

There are two academic approaches to side setback areas: (1) studies analyzing side setback areas as significant physical factors that can prevent hazards such as fire, and (2) studies considering its utility value as a small idle land that is discarded.

The first perspective focuses on determining physical factors that prevent building fires as an urban problem. These studies approach research questions in terms of their architectural structure. Himoto and Tanaka [1] explored solutions for the urban fire-spread model based on physics. In the process of analyzing various factors affecting heat transfer in fires between adjacent buildings, they proved that the “separation of buildings,” such as side setback areas between buildings, plays a significant role. Cheng and Hadjisophocleous [2] conducted 12 fire experiments and calculated the optimum setback distance between buildings considering time as a factor.

Cicione et al. [4] also experimented on unauthorized squatter settlements from a similar perspective, and Yun et al. [8] did so similarly on traditional markets, discovering that setback distance is the most important factor in minimizing the spread of fires. Nishio et al. [3] tested horizontal fire spread to prevent their spread in high-density residential areas in Japan. Since it is already assumed that the setback distance is very short, they presented insulation systems and materials to minimize the spread, presuming that there is a high risk.

The second perspective includes studies presenting side setback areas as unused spaces with utility value. Shojai et al. [5] examined the characteristics of side setback areas

in residential districts in Japan. They argued that side setback areas adjacent to public walkways are public in nature and are, thus, perceived as open space by pedestrians. Moreover, since they are located between buildings, they are perceived as spaces that facilitate various events in streets and increase the frequency of social contact [11]. Some Western researchers defined the empty space between buildings as in-between spaces [9–11,23–26]. This is not just an outdoor space, but a special space whose significance depends on how it is used. Ubeyrathne [26] termed small urban units such as side setback area, which are disappearing due to indiscriminate development, urban pockets. According to his research, urban pockets are physical components of cities that provide social and cultural experiences depending on how they are used.

Side setback areas can be used in two ways. First, side setback areas adjacent to residential buildings within a residential district can be used as green spaces or air shafts, which affects housing prices and satisfaction with the residential environment [5–7,27–30]. Kilnarova and Wittmann [30] compared the closed courts in the urban block from the 19th central and the open spaces in the housing estates constructed under socialism in the 20th central. They proved that the configuration of open spaces between residential buildings affects the quality of environment, and the quality of life of local residences. In addition, residents are highly aware of large green open spaces in terms of sustainability.

Meanwhile, studies on commercial districts have pointed out that side setback areas in commercial districts reduce street comfort due to negligence [12–14,31]. Therefore, it is necessary to be aware of neglected side setback areas and provide them with more active roles, using them as an element to vitalize the city. This study focuses on the research by Lee and Park [13]. These authors categorized the use of side setback areas in commercialized streets, as residential areas in Seoul are becoming more commercialized. A satisfaction survey on users and store owners in each category showed that the participants were satisfied with the use of space. Participants also claimed that system reform is needed and that they were willing to use side setback areas at a cost, if necessary. The researchers argued that the right to sunlight is not necessary for commercialized roadside buildings and side setback areas, and with variable and flexible installations, facilities can be easily removed, and people can evacuate quickly in the event of a fire. Thus, side setback areas must be used for various purposes, instead of being neglected.

From another point of view, Mahdzar [32] analyzed the characteristics that commercial streets should include to activate outdoor activities for people in Malaysia. As a result, it was revealed that densely populated stores have a variety of interfaces with impressive physical characteristics, and the space between buildings is a potential place to play such a role.

In summary, studies from the first perspective argue that it is necessary to form setback distances in dense urban spaces, implying that certain requirements must be met, such as escape routes for fire safety. They also imply that it is important to use non-flammable materials when the side setback areas are too small or when installing certain facilities. Studies from the second perspective focus on the possibility of bigger urban problems if side setback areas are neglected and prove that a region's vitality increases by using those spaces. In particular, Lee and Park [13] discovered the positive effects of using side setback areas on urban residents.

Studies from these two perspectives present different arguments about the same type of space. However, it is necessary to consider that the utility of a side setback area is nonetheless important and that there are fundamental requirements regarding fire safety and access to sunshine. In other words, side setback areas must be approached in terms of both urban design and urban management. Therefore, based on Lee and Park [13], focusing on urban residents' demand for the use of space, this study gathers opinions from experts who regulate and manage the actual space. To this end, we (1) identify the status and illegalities of using side setback areas and (2) conduct a survey and interview with experts, thereby establishing a direction for guidelines for using side setback areas based on their intended purpose.

3. Analysis Site: Seoul

3.1. Selection of Analysis Sites

The subjects of this investigation are commercialized streets of general and quasi-residential zones in special-purpose areas, where architectural planning was mostly performed for residential purposes, and in which the lower levels have been commercialized. These streets have naturally formed side spaces due to the initial architectural plan that was aligned to the special-purpose area, and at the same time, they face demands for the expansion of commercial activities. We selected some areas that meet these criteria in Seoul as test sites to analyze the formation and utilization status of side spaces.

As a result, we selected the following famous commercial districts: Seochon, Bukchon, and Daehangno within the Jongno district; Gyeongnidan Street and the neighborhood of Itaewon in Yongsan district; the Hongdae and Hapjeong neighborhoods in Mapo district; and the Sinsa neighborhood in Gangnam district. We conducted an on-site survey and checked online street view images to select sites that are suitable for walking and where side spaces are actively used. As a result, we selected certain zones within the Sinsa and Hapjeong neighborhoods in Gangnam and Mapo districts as the optimum sites for the analysis. We limited the scope to roadside lots, where the lower levels were completely commercialized (see Figures 6 and 7).

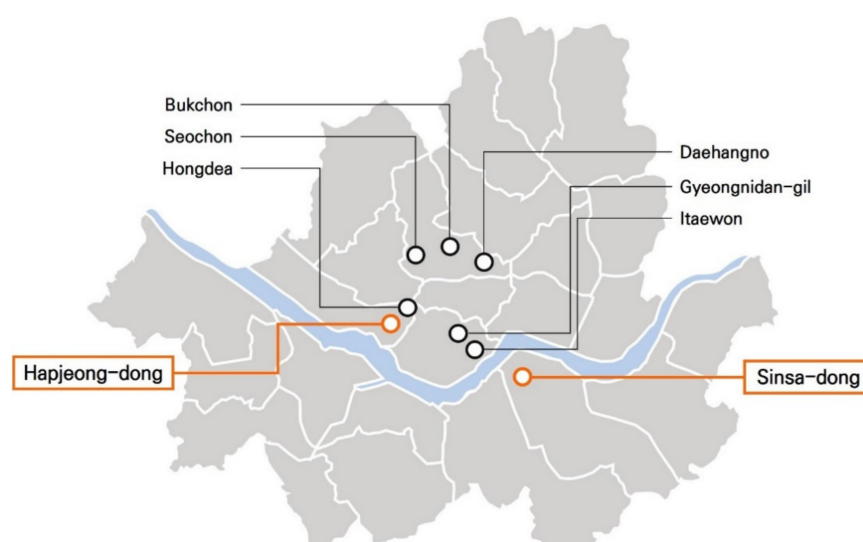


Figure 6. Analysis site candidates and final sites.

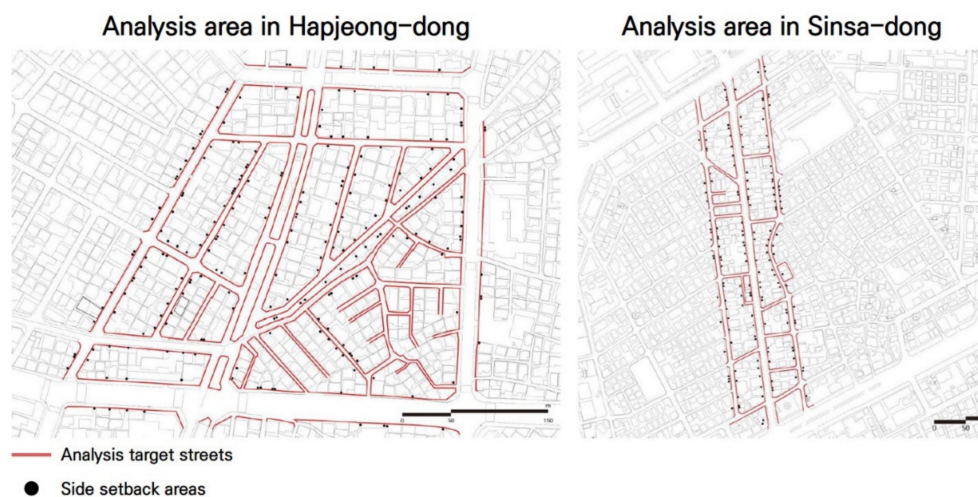


Figure 7. Analysis range.

3.2. Laws Regarding Restriction and Permission on the Use of Side Spaces in Seoul

3.2.1. Legislations Related to Regulations

To analyze the use of setback distances in Seoul, Korea, this study examined the legislation related to the use of side spaces according to the Korean system. The laws regarding the limited use of side spaces are as follows (see Table 3). First, privately owned public spaces generally limit activities that restrict the public's use. A sign must be posted in the privately owned public space so that the public may use it. Rest areas such as benches and pavilions or facilities specified by the building ordinance can be installed, but other facilities that block the public's access are restricted, such as warehouses, parking lots, storages, and fences. If the landscape and rest areas are demolished or damaged, they are subject to control. As prescribed by the building ordinance, cultural events for residents or sales promotion activities are permitted during 60 days of the calendar year.

Table 3. Legislations regarding restrictions on the use of side spaces.

Classification	Deregulation Details	Criteria for Limited Installation of Facilities
Related law	Building Act, Article 43-2 (Securing Privately-Owned Public Space)	Building Act, Article 43-4 (Securing Privately-Owned Public Space)
Privately-owned public space	Relaxing restrictions on building-to-land ratio/floor area ratio/height	<ul style="list-style-type: none"> Prohibiting installation of facilities that block access or have many objects piled up high Installing facilities prescribed by the building ordinance such as long benches or pergolas for user convenience
Related law	Building Act, Article 46 (Designation of building lines)	Building Act, Article 47 (Restrictions on buildings by building line)
Building lines	Applying building-to-land/floor area ratios to retreated space when retreated by building lines	Prohibiting the installation of facilities or construction beyond the vertical plane of building lines for buildings and walls
Related law	Act on Fire Prevention and Installation, Maintenance, and Safety Control of Firefighting Systems, Article 10 (Maintenance and Management of Escape Facilities, Fire Compartments, and Fire Prevention Facilities)	
Vacant lot within the building site	Prohibiting the act of piling goods around evacuation or firefighting facilities or disrupting firefighting activities or purpose	

Second, space secured by the designation of building lines restricts actions that disturb walking or streetscape formation. The building line retreat space (a front vacant lot) is designed to secure the continuity of the streetscape and walkway, thus restricting actions such as installing facilities that disturb walking or damaging the streetscape. However, boundary lines between the road and land within general residential areas are accepted as building lines in most cases, except in new towns or housing development districts.

Third, vacant lots within the building site restrict actions that disrupt evacuation. This law regarding the restriction on the use of side spaces is the closest to fire safety. The vacant lot within a building site is a privately-owned space intended for securing an escape route rather than for public use, such as passing or resting. Thus, landscapes, privately owned public spaces, and basements can be established unless evacuation is disrupted. Moreover, parking stalls can also be installed if the vacant lot is not between the building entrance and the road.

There are also other permissions and regulations regarding advertising and specifications for food businesses depending on the use of the buildings' lower levels. To attach or install advertisements on a building, one must obtain permission or place an advertisement, depending on the size or height of the installation, in accordance with the Act on the Management of Outdoor Advertisements and the Promotion of Outdoor Advertisement Industry. Most signs and awnings installed on commercial buildings must be reported and standing signboards must be set up in spots that do not disturb the passing of pedestrians. If the building is used for a food business, it must be reported for business after meeting

facility requirements, such as building emergency exit routes, entrance plans, and business areas, according to the Food Sanitation Act. The outdoor area must also be reported as a business area, but in most cases, it is not included.

3.2.2. Legislations Related to Permissions

On the other hand, there are legislations in place regarding permission to use side spaces. First, the Tourism Promotion Act allows businesses to utilize these spaces if they are located in special tourism zones or places designated by authorization holders. Most local governments do not issue a separate standard for outdoor business facilities, but the district of Songpa in Seoul, for example, has an ordinance with a separate facility standard in operation. Furthermore, there is a possibility that the use of side spaces is permitted depending on various district regulations and programs.

Moreover, general regulations regarding the lower levels of buildings by the district unit plan can be redetermined. Construction can also be limited through the designation of fine-view districts and special street zones. Construction can be separately regulated through construction agreements in building, substantial repair, or remodeling; plans can also be made to form streetscapes, such as building exterior, outdoor facilities, or outdoor spaces through landscape agreements.

In terms of special provisions, when the street is designated as a car-free street or a pedestrian-only street, the standard for installing annexed parking lots can be relaxed to 100% for application. When designated as a special street zone or special tourist zone by the authorization holder, special provisions may apply or the regulation may be relaxed (when designating a certain region within the fine-view district as a special street zone, the regulations prescribed by the enforcement decree may be relaxed).

According to the regulations on planning vacant lots within building sites, regulations can be relaxed when approved by the Architectural Committee of the Local Government within the scope of regulations, such as relaxing the rules in the enforcement decree of Article 42 (Landscaping of Building Sites) and Article 58 (Vacant Lot within a Building Site) of the Building Act as well as the management of privately owned public spaces in Article 43 (Securing Privately-Owned Public Spaces) of the Building Act, the installation of firefighting equipment, and a passage necessary for evacuation and firefighting within the site in Article 49 (Evacuation Facilities of Buildings and Restrictions on their Use) of the Building Act.

3.2.3. Issues within the System Regarding Side Spaces in Seoul

First, various laws are applied simultaneously to buildings, parking lots, and outdoor advertisements. Most buildings forming commercial streets are neighborhood living facilities and sales facilities subject to legislation on the installation of annexed parking lots by the Parking Lot Act or reporting for business and outdoor advertisements. There are difficulties in rationally using these spaces, however, since each legislation is under different departments and applies to different spaces.

Second, there are no regulations regarding business activities on vacant lots within building sites, and business is prohibited in privately owned public spaces. Regarding the occupation of vacant lots within building sites or privately owned public spaces, facilities or business activities that restrict access for pedestrians are prohibited. On the other hand, vacant lots within building sites allow the installation of parking stalls as long as they do not block the main entrance by the official announcement of the Ministry of Land, Infrastructure, and Transport; however, there are no specific announcements regarding business activities. The owner has the obligation to inspect the land, but there are regulations only on matters regarding fire and safety control.

Third, there are complicated legal systems and insufficient facility standards related to outdoor businesses. Matters of outdoor business activities are specified by various legal systems. There are standards set by the Tourism Promotion Act and the Food Sanitation Act; however, the head of the local government must officially announce the facility standards

that do not violate or conflict with other legislation, and relevant legislation must be amended.

Fourth, there are limitations in related districts and agreements for supporting projects. Autonomy in the vacant lot within a building site that is a private space can be partially secured by the designation of special street zones according to the Building Act, but this can be designated only within the fine-view district and requires the construction of a new building, alteration, or remodeling. Matters regarding a building's exterior or outdoor space can be determined by the landscape agreement; however, the scope of the parties in the agreement is to be prescribed by the local government ordinance aside from landowners according to the current legislation. Most stores on commercial streets are run on a lease; thus, the scope of parties in the agreement must include the tenants of the building as well, and most district regulations do not control construction or business activities separately. Additionally, roadsides encourage projects that support the improvement and creation of walkways.

4. Methods

4.1. Setting the Scope of the Analysis

The spatial scope of analysis is in the research sites selected, such as the Hapjeong and Sinsa neighborhoods. In the construction plan, the setback distances must be maintained between adjacent buildings within the zone; thus, many side spaces that are at least 1 m wide are formed within the sites. To analyze the status of side spaces, we conducted a complete enumeration of 547 lots and buildings in which the lower levels are fully commercialized. The temporal scope of the analysis is as follows. To determine the utilization status of spaces in the selected sites, we selected a time range between 12:00 p.m. and 6:00 p.m. on August 11th and 18th in the summer of 2017, when the sun was up, and most stores were open.

The contents of the analysis are as follows. First, we examined and categorized the utilization status of the side spaces of the sites and identified their illegalities in each category. This was achieved by collecting records of crackdowns due to law violations and analyzing their characteristics. Second, we conducted a survey and interviewed experts on the use of side spaces for discussions in terms of urban management. The following section provides details of the specific methods of analysis and variable selection.

4.2. Variable Selection and Expert Survey

4.2.1. Survey on the Use of Side Spaces

We conducted a complete enumeration, as shown in Table 4, on 371 spaces of a certain size out of 547 lots and buildings examined. Based on the above, we analyzed the functional, physical, and institutional characteristics and categorized them according to their use. In addition, we checked for any violations of the Building Act, including side spaces within the sites in the building ledger, and extracted violation items in the urban building regulations.

4.2.2. Feasibility Study on Experts Regarding the Use of Side Spaces

Next, we gathered the opinions of actual public officials managing the spaces based on social demands on the use of side spaces. The survey was conducted over the course of a month in September 2017, and the interviews were conducted by visiting 20 experts in departments related to housing, city, and architecture in the Mapo district office and the Gangnam office of the analysis sites. The survey items pertained to the managing body of side spaces and the demand for system reform, as well as the detailed items, as shown in Table 5.

Table 4. Variables in the use of side spaces.

Classification	Detail	
Functional characteristics	Expansion of existing stores	
	Independent store location	
	Access route to store	
	Other	Parking lot, vacant lot, closed, gap
Physical characteristics	Form	Indoor/outdoor
	Correlation with adjacent stores	Connected/not connected
Institutional characteristics	Relevance with commercial activities	Commercial/non-commercial

Table 5. Survey and interview items on experts.

Classification	No.	Survey Content
Explanation of the research summary	-	Brief summary of the definition of side spaces and examples of use
Opinions about use of side spaces	1	Public opinions about business activities carried out in vacant lots outside the building
	2	Public opinions about the installation of advertisements, landscaping, terrace, or outdoor clothing stands using side spaces
Questions about crackdown on use of side spaces	3	Type and content of crackdown in charge <ul style="list-style-type: none"> • Occupation of annexed parking lots without permission (unauthorized change of use, unauthorized extension, etc.) • Business activities in vacant lots within a building site • Installation of outdoor staircase and accessway in vacant lots within the building site • Period and application subject of crackdowns, standard, cycle, and penalty for each category
		Difficulties and advantages/disadvantages of a crackdown
		Opinions about insufficient effectiveness of the current system
		Reason why the current legislations cannot follow the actual demand from the public sector's perspective
Questions about demand for use of side spaces	6	Reason why the current legislations cannot follow the actual demand from the public sector's perspective
	7	Opinions about system reform and the possibility of administrative support for rational use of side spaces

5. Results and Discussion

5.1. Survey Results on the Use of Side Spaces

5.1.1. Categorization of Space Use

We surveyed 372 side spaces found at the study sites. Approximately 48.7% (Type G) maintained their original function as an outdoor annexed parking lot installed according to the Parking Lot Act. Other spaces were vacant lots formed as an annexed parking lot or remaining vacant lots within the building site that were used for business activities, closed or neglected. To determine the patterns of use, we conducted a complete enumeration and categorized the spatial characteristics according to the standards of the legal system, the functional characteristics according to the current use, and the physical characteristics, such as form and size. Spaces with a frontal width of less than 1 m were excluded as they were perceived as gaps blocked by green space.

The first-level classification was based on physical, functional, and institutional characteristics. The functions were divided into different categories, but then reclassified into

the following, considering the business type and form: existing stores, independent stores, parking spaces, vacant lots, closed spaces, and gaps. They were ultimately classified as Types A–G (Table 6). Other than the sites that maintained the current function as an annexed parking lot, 31.8% of the sites (Types A–E) were engaged in active commercial activities using side spaces (see Table 7).

Table 6. Classification by form of use.

Form of Use (Type)					Number	Frequency by Type (%)
Expansion of existing store	Indoor	1	Extension	Indoor space	3	48 (12.9)
		2	Temporary building	Form of temporary building, use of materials such as plastic cover	10	
	Outdoor	3	Terrace	Outdoor terrace, bench/table and landscape	19	
		4	Display stand, exhibition	<ul style="list-style-type: none">When there are products to sell on the display standDecoration (for landscaping around stores)	16	
	Store entrance	5	Store access way and entrance in the rear lot		20	16 (4.3)
		6	Store entrance underground or at least two stories		34	
Independent store	Indoor	7	(Extension or temporary building) When the store is on the side		12	181 (48.7)
	Outdoor	8	Terrace, display stand, exhibition, etc. (temporary sales space such as flea market or pop-up store)		4	
Parking		9	Parking		145	9 (2.4)
		10	Underground parking lot entrance, parking tower entrance		36	
Vacant lot		11	Empty lot		9	63 (16.9)
Closed		12	Completely closed doors/shutters/walls		51	1 (0.3)
		13	Closed but with advertisement attached (advertising effect)		12	
Gap		14	Blocked space of less than 1 m, such as storage and green space		1	372 (100)
Total					372	

Table 7. Characteristics by type: mimetic diagram, example image, characteristics.

Side Space Type	Example Image	Usage	Form	Relationships with Adjacent Stores	Commercial Relevance
A		Expansion Space of Existing Store	Indoor	Related	Commercial
B			Outdoor	Related	Commercial Related

Table 7. Cont.

Side Space Type	Example Image	Usage	Form	Relationships with Adjacent Stores	Commercial Relevance
C		Entrance to Adjacent Store	Outdoor	Related	Commercial Related
D		Independent Activity Space	Indoor	Non-related	Commercial
E			Outdoor	Non-related	Commercial
F		None	Closed	Non-related	Non-Commercial
		None	Empty	Non-related	Non-Commercial
G		Parking Lot	Empty	Non-related	Non-Commercial

Type A is the form that expanded the indoor space of lower-level stores to the side by extending or establishing a temporary building. Type B additionally secured an outdoor space of lower-level stores by installing an outdoor terrace or display stand. These types were mostly occupied and used via the annexed parking lot on the side for business activities without permission. This shows that many stores preferred to secure retail space over using the space as a parking entrance, which increased the continuity of roadside stores.

Type C is the form that installed an accessway and outdoor staircase leading into the store in either the rear lot, from underground, or from at least two stories high. This type is not related to the store on the first floor that is adjacent to the space and secures an accessway; thus, the width of the space bordering the street was 3 m or smaller. In other words, because this type requires a relatively small space, most stores used the remaining vacant lot within the building site. Moreover, they installed plantations, display stands, and terraces on the accessway itself, which appeared to be decorated when seen from the sidewalk.

Type D is the form in which a small independent store was set up in the side spaces separately from the physical building through an extension of the space or by establishing a temporary building. Type E is the form in which temporary business activities (such as a flea market) were carried out separately from the stores in the building by installing an outdoor terrace or display stand. Type D mostly featured independent sales facilities, such as street vendors, using materials that are easy to set up and tear down. Type E changed the annexed parking lot or remaining vacant lot that was usually empty into a temporary commercial space on weekends or at night, constructed with the same type of materials as Type D.

Type F was a case of passive use of space, where the space was too small and, thus, remained closed or was left as an empty lot for the storage of goods. This study focused on Types A–E because our intention was to determine the possibility of system reform for the active use of side spaces.

5.1.2. Violation of Legislations

To determine the conflicts of the current legal system and the use of space more accurately, we analyzed the violations of legislation in the building ledger for roadside buildings in the research sites (see Table 8). As a result of extracting only violations in side setback areas, 93 (39%) out of 238 buildings in the Sinsa neighborhood were listed as illegal buildings. Of the 309 buildings in Hapjeong, 98 (32%) had records of violations, most of which were categorized as multiple violations. In both sites combined, there were approximately 1.79 cases of violations on average per illegal building.

Table 8. Violation of legislations in the sites.

Classification	Sinsa-Dong	Hapjeong-Dong
Parking lot occupation without permission (unauthorized change of use, extension, etc.)	111	109
Illegal business activities in vacant lots within the building site	39	80
Installation of outdoor staircase vacant lots within the building site	2	3
Total number of violations	152	192
Total number of buildings	238	547
Total number of illegal buildings (%)	93 (39)	98 (32)
Average frequency of violation per building	1.61	1.95

The specific details of the violations were classified into three types. First, most cases were unauthorized changes in the use of parking spaces. Owing to the nature of the architectural plan within general residential areas, there were many cases in which there was at least one side of an outdoor annexed parking lot that was installed, mostly located on the side of the building. Some stores illegally changed the use of these parking spaces to extend the indoor space of the building or installed a terrace or deck to use as a restaurant, or café, or to sell clothes. They used materials or facilities that were easy to demolish and reinstall, thereby possibly repeating the violation after a crackdown.

Second, business activities were carried out by expanding sales space through unauthorized extensions to the side vacant lot or by installing temporary facilities, such as tables. This was mostly found inside side spaces adjacent to the street, aside from the rear of the building, among vacant lots based on the Building Act (Articles 58, 61, and 49) and Article 242 of the Civil Act. These spaces were used not only for direct business activities but also for functional commercial uses such as storage, a kitchen extension, a maintenance office, and stowage.

Third, there was an unauthorized occupation of space by installing an outdoor staircase to access the store from underground, at least two stories high. The general residential

areas in which the sites are located feature many detached or row houses distributed in terms of architectural planning. As the streets are commercialized, semi-basements or spaces from at least two stories high are changed into commercial spaces, starting with the lower levels. There were many cases in which an outdoor staircase was built, occupying the side space, to create an access way from the outside.

To summarize the features of the studied sites, at least 30% of all buildings in the sites violated the law regarding the use of side spaces, and similar violations occurred constantly in the same space. Moreover, the same violations occurred after crackdowns, even when the store owners were aware that they were illegal. This was generally used to secure lower-level retail spaces and access ways. This shows that there is a constant conflict between the demand for the use of these spaces and the legal system.

5.2. Results of the Feasibility Study with Experts

The twenty experts who participated in the survey coincidentally took part in the crackdowns on the sites and had experience of conducting research on legal systems regarding the use of space. The responses for each survey item were as follows.

First, there were opinion items regarding the use of side spaces. The experts responded that business activities in vacant lots outside the building were clearly illegal and, thus, undesirable. However, this was also something to be reviewed positively (as long as there were no safety issues) if legitimate standards are established for operation. Next, they were asked about the commercial use of side spaces, such as the installation of advertisements. They responded that this is also an illegal act, and the law cannot be operated flexibly in this environment. However, the participants conceded that some acceptable utilizations could be allowed to operate, such as a mobile cart or temporary trailer for business by the hour, if it does not present a safety hazard such as a fire hazard or the hindrance of evacuation or if it does not disrupt the streetscape. Some experts argued that there may be encouragement at the administrative level in the guidelines prior to a system reform.

Second, there were questions about crackdowns on the use of side spaces. Most of the experts responded that crackdowns are for unauthorized changes in use, and the intention is to promote public welfare, settle civil complaints, maintain urban aesthetics, and establish law and order. Law enforcement normally visits the scene when there is a complaint, and the crackdown is carried out through the following procedures: corrective order, correction demand, notice on imposing a charge for compelling the execution, and pressing charges on the building owner after 10 days, 20 days, 30 days or more. The penalty is imposed on the building owner; however, law enforcement is not aware of who pays the penalties in the end, which implies insufficient institutional measures regarding the protection of store owners.

The experts also pointed out other difficulties, such as the challenge of cracking down on a violation that involves the entire street rather than an individual structure. In fact, crackdowns can be meaningless in this context because violations continue regardless. Therefore, there is a need for the drastic reform of regulations to apply new laws for when the entire street is changed for commercial use. The experts all agreed that the current system lacks effectiveness and that a new system is needed. Although it is important to comply with related laws, they acknowledged the demand for amending the Building Act that enables the use of space as long as there are no safety issues, such as a hindrance of evacuation.

Third, there were questions about the demand and direction for system reform regarding side spaces. First, they expressed a public perception that the current legislation fails to meet actual demand. The participants expressed an understanding of the current demand of urban residents and the difficulties in meeting these demands; thus, the public sector must consider public interests above those of agents. However, they said there were cases in which some people requested amendments to the Ministry of Land, Infrastructure, and Transport for system reform. Moreover, institutional support under the current legislation seems impossible, and it is necessary to establish a systematic policy plan that may activate

the use of side spaces by boldly adopting the cases in advanced countries. The experts emphasized that this demand and improvement must be based on public welfare and safety.

Overall, the experts responded that it is unreasonable to use side spaces while violating current laws and systems. However, they pointed out that the sites changed from a residential area to a more commercialized area, and that the current system is inflexible. Therefore, the current system must be reformed so that it can be used when safety and sanitation requirements are met.

5.3. Setting the Direction for System Reform and Guidelines

This section summarizes the results of examining the use of side spaces, reviewing the relevant laws and systems, and an in-depth survey of the experts based on social discussions. At this point, there is a need for a system reform for the rational use of side spaces; thus, we establish the direction for this reform as follows, based on the key considerations already outlined.

5.3.1. Directions for System Reform

The results of the analysis revealed that Korea still does not have a separate official announcement on management plans or regulations regarding specific actions for business activities on vacant lots within building sites, such as the use of side spaces. Thus, a new urban space management system must be considered to meet the changing demand for space.

First, it is necessary to rationalize the regulations by changing social awareness about the commercial use of side spaces. Other countries have occupation permits for large and small facilities related to commercial use, such as terraces, display stands, souvenir stands, and outdoor billboards (e.g., ODAs in Singapore). This is based on the collective awareness that commercial activities vitalize the region and contribute to improving the city's appeal. Therefore, using unused space commercially may be one way to achieve harmonious coexistence with the demand for more space.

Second, procedures must be established for district designations to consider and apply the unique characteristics of each place. The commercialization of idle space may contribute to regional vitalization, but it may also raise conflicts with nearby residents, since the district is also a residential area [13]. Therefore, to permit the commercial use of side spaces, the spatial scope must be limited, and standards must be established, such as the type of facilities or business hours. Thus, it is necessary to improve the general system for the rational use of vacant lots within building sites and to establish district designation requirements and procedures for effective implementation.

Third, equity and procedural legitimacy must exist while applying the system to reach social consensus. Despite the increasing demand for system reform, there are still conflicts between relevant parties, such as complaints raised by nearby residents or controversies regarding public officials. Merchants want to actively use the space to increase their operating income, and users enjoy dining or shopping in a pleasant, open space, whereas nearby residents complain about various problems caused by these business practices. Thus, it is necessary to reach a social consensus by adopting adequate regulation plans.

5.3.2. Setting the Direction for Guidelines

Under the assumption that system reform will be implemented, the specific guidelines for regulations and the use of space can be set as follows. First, there must be specific standards for layout, size, elements, maintenance, and management. Various activities such as sales, promotions, and pedestrian rest spots separate from traffic in commercial streets contribute to street vitalization and landscaping. However, when permitting the commercial use of the lower levels and side spaces of buildings, specific standards must be provided regarding layout, size, elements, maintenance, and management to maintain public safety, private property rights, and a pleasant environment.

Second, public agreement procedures must be established. The process of forming, using, maintaining, and managing commercial roadside or building lower levels and side spaces involves various agents, such as administrative agencies, residents, building owners, store owners, and consumers, with many conflicts of interest. Thus, it is necessary to set a direction for the use and establishment of relevant standards based on public agreement procedures.

Third, the direction of long-term management must be reestablished. Two rules must be followed before establishing a management direction. First, the head of the local government must select streets where a certain number of buildings' lower levels are commercialized in residential areas. Second, in vacant lots within a building site, activities that disrupt escape routes are prohibited. To permit business inside side spaces for long-term management based on these two rules, it is necessary to establish space utilization plans, assuming that the purpose of the business is to improve pedestrian convenience or street aesthetics and to vitalize the regional economy. For the efficient management and safety of space, rules must be established, such as street conditions for permission, facility location or type or safety standards, space management, and the collection of fees.

5.3.3. The Basic Content of the Guidelines

Based on the above, we designed the following basic content for the guidelines. The guidelines for the use of side spaces provide a reference for establishing facility standards in each autonomous district. Autonomous districts use these guidelines to revise and supplement specific items and criteria depending on the site characteristics and conditions. The main contents of these guidelines include permissions and basic directions for the use of side spaces, categories, and key items to consider in facility standards and minimum facility requirements.

The purpose of the commercial use of side spaces is to contribute to efficient land use and street vitalization using small pieces of land in the city, which are formed within general residential areas and promote urban regeneration and vitality. Furthermore, such activities are permitted as long as they do not violate matters regarding safety or sanitation.

The specific contents of the guidelines are listed in Table 9. First, they include construction and facility safety standards, suggesting criteria that secure the safety of users directly or indirectly using them according to the Building Act and the Act on Fire Prevention and Installation, Maintenance, and Safety Control of Firefighting Systems. Second, they establish facility standards, which include the type of facilities that can be installed within side spaces, installation principles, and detailed criteria. Third, they provide maintenance standards, or the duties of business managers, such as business hours and cleaning periods, so that the use of side spaces does not hinder the sanitation of street spaces or surrounding living environments.

In addition, it is necessary to implement step-by-step management and operation plans. For example, in the initial step, the current system must be aligned with the district unit plan or environmental improvement project to enable autonomous management underlined by resident agreements (landscape agreements or merchant community projects) and meet the relevant legal requirements. Next, the phased maintenance of the relevant system is included, such as system reform on the formation or limited use of vacant lots limited to areas that are fully commercialized among those with the characteristics of residential areas.

Table 9. Detailed criteria and contents of the guidelines.

Criterion	Detailed Content	
Installation of the passage for firefighting and evacuation	<ul style="list-style-type: none">According to the installation of a passage necessary for evacuation and firefighting within the site in Article 41 of the Building Act, the evaluation passage that leads from the building entrance to the road or public space must be installed in the vacant lot within a building site.Houses in the general residential area must include a passage that is 0.9 m wide; for other buildings, this passage must be 1.5 m wide.	
	If there is an entrance on the side of the building	The remaining vacant lot can be used after installing the 0.9–1.5 m wide passage within the side setback area according to the standard on securing the escape route.
	If there is no entrance on the side of the building	The entire vacant lot can be used.
	For annexed parking lots	The entire vacant lot can be used. Parking pass transfer system is recommended.
Limits on heights for solar access	* This standard is applied when installing closed-type temporary facilities using the entire vacant lot.	
	<ul style="list-style-type: none">In general, residential areas must have setback distance considering the height and solar access according to Articles 60 and 61 of the Building Act. However, according to the construction of party walls and connecting corridors in Article 59 of the Building Act, two or more walls can be constructed at a distance of 50 cm or less from the boundary of the building site for urban aesthetics as an exception.This can be applied when there is an agreement between the building and the landowner regarding the construction of party walls in residential areas.	
	<ul style="list-style-type: none">When installing closed-type temporary facilities similar in form to the building by applying this bill to side setback areas, the height of the facility installed must be limited so that it does not exceed the first floor of the adjacent store, and it must be installed in materials that are easy to demolish.	
Facility standards; facility installation principles and types	Basic direction for facility installation considering publicness and street aesthetics and standards for types and installation of permitted facilities.	
	Publicness	<ul style="list-style-type: none">Side setback areas are used in private land, but since they also touch the streets, the constructive features must also be included.Therefore, installing a fixed facility is prohibited, and only simple mobile facilities can be installed.
	Street aesthetics	<ul style="list-style-type: none">It is necessary to install facilities in designs that are harmonious with the street environment and can promote street attractiveness.
	Permitted facilities	<ul style="list-style-type: none">The types of permitted facilities must be minimized, but can be adjusted depending on the management conditions such as separate management planning or physical characteristics such as width or depth of side setback areas.
Minimum installation requirements for each facility	Facility standards are based on safety, accessibility/mobility, context, protection of settlement environment, sustainability, visual excellence, and cost-efficiency.	
	Installing permanent structures is prohibited; flexible installation plans to install only during business hours (mobile/flexible/demolished).	
	Nonflammable materials: No plastic.	
	The façade must be colorless, nonreflecting, and transparent material with openness.	
Business hours and period	Limited to business hours for outdoor business sites (For outdoors) The recommended business period is generally April–September, which is spring, summer, and fall suitable for outdoor activities.	
Cleaning	Wastes from the side space business areas must be disposed of indoors (trash cans must not be installed outdoors).	
	Must remove all facilities (mobile) into an indoor area after business hours, and clean up even the nearby areas.	
Obligations of business owners	Must restore the sales space to its original state after the permission period.	
	Take immediate measures for improvement if a complaint occurs (if corrective measures for violations are delayed or not taken, there will be administrative measures, such as business suspension or complete restoration).	
	Facility standards must be considered at all costs.	

6. Conclusions

This study examined the significance of side setback areas (the open side spaces of buildings) in the dense urban architectural structure of the overpopulated city of Seoul, South Korea. This open space between buildings is a significant physical urban component in minimizing the spread of fire. In actual usage in Seoul, which was the research subject, urban citizens tend to voluntarily use such spaces. Side spaces are small, unused, and often neglected spaces in overdeveloped cities that can be used for various purposes; however, they were originally formed to ensure fire safety and to guarantee access to sunlight. Therefore, even if the utility value of side spaces is proved by this research, it is necessary to consider their original purpose, such as safety and sanitation, as well as how they are actually used. This study conducted in-depth interviews and surveys with 20 experts in charge of managing actual side spaces and studied the related regulations.

The analysis proceeded as follows. First, we undertook a full investigation of 371 spaces and inspection of violations of the building law. As a result of the analysis, violations were classified into seven types; among them, five types (A–E) consisted of active engagement in commercial activities in such spaces. These were violations, in that the business space and the access road had been secured. Second, the feasibility of using the spaces was investigated for the 20 experts, collecting opinions on business activities, facility installation, and gathering opinions on the bases for crackdown, effectiveness, and improvement of the system. Most of the experts pointed out that the current laws and systems should be improved, while safety and sanitary conditions must be implemented. Therefore, it is apparent that the current system must be reformed so that it can be used for the demands of residents if and when all safety and sanitation requirements are met. Based on the above, this study establishes a new direction for system reform and suggests the basic features and guidelines to implement this reform.

Through the results of this study, we established a guideline for utilizing the side setback areas, while accepting basic sanitary conditions such as fire safety guarantees and the right to sunlight. The guidelines are general documents referenced to establish standards for facilities using separate spaces in each autonomous district, and include specific standards for arrangement, scale, element, maintenance, and management. First, the width of the passage (0.9 to 1.5 m) for evacuation and firefighting was set, and the degree of availability of the remaining vacant lot was suggested. Second, for solar access, the size and height of temporary facilities installed in the remaining vacant lot were set to be less than the first floor of the adjacent store. Third, it was established that allowed facilities shall be installed in consideration of publicity and street aesthetics. In addition, only facilities considering publicity and street aesthetics are allowed. Fourth, in order to maintain a pleasant street environment, the available time, period, and cleaning condition of the side setback area were set. Finally, it was established that, in situations such as the expiration of the business license period and the occurrence of civil complaints, the business shall be immediately suspended and the space shall be restored to its original state. If institutional improvement is made based on the guidelines presented in this study, economic, social, and cultural significance can be created in the following areas.

First, small open spaces can be generated and used at a low cost. Using vacant lots for this purpose increases land-use efficiency. This also enhances the efficiency of public management by reducing the social costs of crackdowns on violations. It is also possible to gain added tax revenues and reinvest in other public projects by legalizing the use of side spaces, which ultimately forms a virtuous cycle. Street aesthetics also improve when side spaces are used in this way. The landscape value is increased by creating continuous and diverse commercial streetscapes, while also securing local safety and a pleasant environment by clearly establishing the standards for facilities that can be installed within side spaces.

Second, in the case of Seoul, the study site, there was no consideration for such residual spaces, and the act of simply occupying space itself was judged to be illegal. Therefore, recognizing the existence of the space and creating a system that can manage it,

is considered a new approach for Seoul in urban space management. Likewise, it is believed that the effectiveness of related support projects, such as permitting outdoor business, will be strengthened. Seoul's land use system can be supplemented from a modern perspective via the guidelines in this study.

Third, the results of this study meet not only the fundamental purpose of using side spaces productively in overpopulated urban spaces, but also the general needs of urban residents in the utilization of unused space. Discussions on side spaces presented two conflicting views: one, that they are necessary for fire prevention and, two, that they must be used and not neglected. The significance of this study is that, first of all, it reminds us of the importance of separation spaces. The second is that it proposes a fire prevention function and, at the same time, a practical use of the space between buildings.

This study analyzed Seoul, where many activities were carried out on side spaces. Thus, the guidelines and system reform direction are provided based on legal systems applicable only to the city of Seoul. However, the results of this study can be applied to a variety of cities exhibiting a similar tendency, in order to establish regulations or activation systems for the management of side spaces, after considering their unique characteristics. Furthermore, it is necessary to conduct a feasibility study on the direction provided by experts from diverse fields, thereby laying the groundwork for an actual system reform.

Author Contributions: Conceptualization, J.-a.L.; data curation, J.-a.L. and J.-h.L.; formal analysis, J.-a.L. and J.-h.L.; funding acquisition, M.-h.J.; investigation, J.-a.L., M.-h.J. and J.-h.L.; methodology, J.-a.L.; project administration, M.-h.J.; resources, J.-a.L. and J.-h.L.; software, J.-a.L. and J.-h.L.; supervision, J.-a.L. and M.-h.J.; validation, M.-h.J.; visualization, M.-h.J. and J.-h.L.; writing—original draft, J.-a.L.; writing—review and editing, J.-a.L. and M.-h.J. All authors have read and agreed to the published version of the manuscript.

Funding: This research was conducted within the research project “The Development of Fire Risk Assessment Method with Fire Vulnerability of Building”, which is funded by Korea Institute of Construction Technology, grant number (20210198-001).

Acknowledgments: The authors would particularly like to thank the experts from industry who agreed to be interviewed and Korea Institute of Construction Technology for the research funding.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

1. Himoto, K.; Tanaka, T. Development and Validation of a Physics-based Urban Fire Spread Model. *Fire Saf. J.* **2008**, *43*, 477–494. [\[CrossRef\]](#)
2. Cheng, H.; Hadjisophocleous, G.V. Dynamic Modeling of Fire Spread in Building. *Fire Saf. J.* **2011**, *46*, 211–224. [\[CrossRef\]](#)
3. Nishio, Y.; Yoshioka, H.; Noguchi, T.; Kanematsu, M.; Ando, T.; Hase, Y.; Hayakawa, T. Fire Spread Caused by Combustible Facades in Japan. *Fire Technol.* **2016**, *52*, 1081–1106. [\[CrossRef\]](#)
4. Cicone, A.; Walls, R.; Sander, Z.; Flores, N.; Narayanan, V.; Stevens, S.; Rush, D. The Effect of Separation Distance between Informal Dwellings on Fire Spread Rates Based on Experimental Data and Analytical Equations. *Fire Technol.* **2021**, *57*, 873–909. [\[CrossRef\]](#)
5. Shojai, A.; Mori, S.; Nomura, R. Developing Terminology for Side Facades and Side Setback Areas in Japanese Neighborhoods: A Study on Utility and Perception. *City Territ. Archit.* **2016**, *3*, 6. [\[CrossRef\]](#)
6. Shojai, A.; Mori, S.; Nomura, R. Side Setback Areas as Side Yards Architectural and Psychological Evaluation of Side Setback Areas in Residential Buildings Using a Multidimensional Measure—Case Study of Sapporo Neighbourhoods, Japan. *Urban Policy Res.* **2017**, *35*, 275–297. [\[CrossRef\]](#)
7. Shojai, A.; Nomura, R.; Mori, S. Side Setback Areas in Residential Zones in Japan—A Socio-psychological Approach Towards Studying Setbacks, Case Study of an Inner Osaka Neighborhood. *J. Asian Archit. Build. Eng.* **2017**, *16*, 589–596. [\[CrossRef\]](#)
8. Yun, H.S.; Nam, D.G.; Hwang, C.H. An Experimental Study on the Fire Spread Rate and Separation Distance between Facing Stores in Passage-Type Traditional Markets. *Energies* **2020**, *13*, 4458. [\[CrossRef\]](#)
9. Gehl, J. *Life between Buildings: Using Public Space*; Island Press: Washington, DC, USA, 1987.
10. Dovey, K.; Polak, K. Urban Slippage: Smooth and Striated Streetscapes in Bangkok, Loose Space: Diversity and Possibility in Urban Life. In *Becoming Places: Urbanism. Architecture/Identity/Power*; Dovey, K., Ed.; Routledge: London, UK, 2006; pp. 168–193.

11. Can, I.; Heath, T. In-between Spaces and Social Interaction: A Morphological Analysis of Izmir Using Space Syntax. *J. Hous. Built. Environ.* **2016**, *31*, 31–49. [[CrossRef](#)]
12. Im, Y.K.; Oh, S.H.; Im, G.R. *Commercialization Redevelopment of the System for the Rational Use of Low-Floor and Frontal Spaces*; AURI: Seoul, Korea, 2014.
13. Lee, J.A.; Park, J.A. Study on the Rational Use of Side Space between Buildings along the Commercialized Street as a Small Vacant Space. *J. Korea Plan. Assoc.* **2018**, *53*, 67–83.
14. Seo, K.Y.; Lee, J.A.; Park, J. Analysis of Landscape Image of Pedestrian According to Whether Side Space is Utilized as Space Between Buildings-Focused on Commercial Street in General Residential Area. *J. Urban Des. Inst. Korea* **2018**, *19*, 21–37. [[CrossRef](#)]
15. SCDF. Fire Code 2018: Chapter 9.5 Purpose Group V Occupancy. Singapore Civil Defence Force Official Website (SCDF). 2018. Available online: <https://www.scdf.gov.sg/firecode/table-of-content/chapter-9-additional-requirements-for-each-purpose-group/clause-9.5> (accessed on 5 December 2021).
16. IIBH. *Building Control in Japan: Introduction to the Building Standard Law*; Institute of International Harmonization for Building and Housing (IIBH): Tokyo, Japan, 2019.
17. Building Standards Act, Japan (Act No. 201 of 1954). Available online: <https://elaws.e-gov.go.jp/document?lawid=325AC0000000201> (accessed on 5 December 2021).
18. HM Government. *The Building Regulations 2010 Fire Safety: Volume 2-Buildings Other than Dwelling Houses*; Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government: London, UK, 2019; pp. 96–101.
19. HM Government. *The Building Regulations 2010 Fire safety: Volume 1-Dwellings*; Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government: London, UK, 2019; pp. 79–95.
20. The British Standard Institution. *BS 8206-2:2008 Lighting for Buildings. Code of Practice for Daylighting*; British Standards Institution (BSI): London, UK, 2008.
21. OCSC Consulting Engineers. *Daylight Sunlight Report*; Sandyford Central: Dublin, Ireland, 2019.
22. BRE (Building Research Establishment) Guidelines. *Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice*(BRE209); IHS BRE Press: Watford, UK, 2011.
23. Hillier, B.; Hanson, J. *The Social Logic of Space*; Cambridge University Press: Cambridge, MA, USA, 1989.
24. Skjaeveland, O.; Garling, T. Effects of Interactional Space on Neighbouring. *J. Environ. Psych.* **1997**, *17*, 181–198. [[CrossRef](#)]
25. Stevens, Q. *Between and Between: Building Thresholds, Liminality and Public Space*; Routledge: London, UK, 2006.
26. Ubeyrathne, N. Urban Pockets: A Study on Small Spaces between Buildings and Their Implication to the Urban Space. Ph.D. Thesis, University of Moratuwa, Moratuwa, Sri Lanka, 1999.
27. Shojai, A.; Fattahi, K. Left open spaces—Light shafts in Iran and side setbacks in Japan: A socio-spatial approach to study awareness in open spaces in urban residential blocks. *City Territ. Archit.* **2021**, *8*, 2. [[CrossRef](#)]
28. Gao, X.; Asami, Y. The External Effects of Local Attributes on Living Environment in Detached Residential Blocks in Tokyo. *Urban Stud.* **2001**, *38*, 487–505. [[CrossRef](#)]
29. Azad, S.P.; Morinaga, R.; Kobayashi, H. Effect of Housing Layout and Open Space Morphology on Residential Environments—Applying New Density Indices for Evaluation of Residential Areas Case Study: Tehran, Iran. *J. Asian Archit. Build. Eng.* **2018**, *17*, 79–86. [[CrossRef](#)]
30. Kilnarová, P.; Wittmann, M. Open Space between Residential Buildings as a Factor of Sustainable Development—Case Studies in Brno (Czech Republic) and Vienna (Austria). *IOP Conf. Ser. Earth Environ. Sci.* **2017**, *95*, 052008. [[CrossRef](#)]
31. Baek, S.H.; Lee, E.J.; Kim, B.M.; Lee, S.H. A study on the Problem and Condition of the Space between Building. *J. Archit. Inst. Korea* **2013**, *33*, 263–264.
32. Mahdzar, S.S.B.S.; Baghi, M.H.; Baghi, M.H. Influence of Physical Conditions on the Outdoor Activities at the Street Level: A Case Study of Wong Ah Fook Street in Johor Bahru, Malaysia. *Int. J. Sci. Technol. Res.* **2015**, *4*, 1–7.