Proceedings of the 2nd ITB Graduate School Conference ISSN: 2963-718X
Strengthening Multidisciplinary Research to Enhance its Impact on Society
July 21, 2022

Identification of Residual Space: A Case Study of Sumur Bandung District

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Abstract. Nowadays, the urbanization phenomenon is consistent with the increasing demand for land availability. On the other side, there is more residual space found in several cities, one of them is Bandung. This residual space is mainly caused by the conversion of land use as urbanization occurs. Moreover, this space has caused some informal appropriation which caused unsettling conditions. Using the literature review and satellite image analysis, this research is focused on the identification of residual space in Sumur Bandung District as a small sample of Bandung. Several studies are reviewed to obtain a theoretical basis of analysis such as typology, forming factors, and qualities of residual space. This research is conducted to find a new manifestation of residual space according to the context of Bandung. The access of transportation modes and pedestrians becomes the scope limitation of this study. As a result, there are six manifestations of residual space found in Sumur Bandung District, such as *space above the alley; pedestrian way without significant activities; utility box infrastructure; transitive area; unused entrance;* and *pedestrian platform*. These manifestations will become the objects of advanced study to be processed as a more efficient utilization for the city.

Keywords: *urbanization; land-demand; appropriation; sumur-bandung; residual-space; manifestation.*

1 Introduction

The massive rate of urbanization has caused a significant population increase in the cities. In 2050, United Nations (UN) has projected about 68% of the world's population will live in cities [1]. This trend will lead to a high urban density and followed by an increasing demand for urban land. The urgency of optimizing land use will intensify alongside the escalated imparity of urban density and its population. The rise in land prices is intended as this issue could not be resolved. Some of the efforts by the government is adopting the land use to the current trend. This effort is aimed to provide land for people and maintain price stability in the market. However, this will be inefficient as commercial functions increased from time to time.

Trancik [2] defines residual space (lost space) as a space that is not related to its surrounding environment and an unidentified space. Several definitions mention residual space as space that is neglected, not used properly, or space resulting from infrastructure development that is not designed or used properly. In addition, this space has the potential to be intervened due to unmaintained conditions by those who own or manage the space. Various references define residual space in various ways. The tendency of residual space in utilization is space that of lacks use and maintenance by stakeholders and shareholders thus informal communities intervene. Meanwhile, based on its physical quality, residual space is a space that is not and/or has not been well planned so it creates ambiguity that causes a decrease in the aesthetic value of urban space [2].

In line with the limited land, several actors whose conditions are unable to afford properties financially have conducted interventions in various residual spaces. Those residual spaces are alley corridors, riverbanks, sidewalks, and junctions which often become prominent locations for informal activities. Oftentimes these activities will lead to conflicts between each actor in urban areas. Feldman and Stall [2] stated this appropriation is an ownership of a space carried out by a group or individual forcibly. Rapoport (1985) in [2] states that this situation is influenced by several elements, one of which is the availability of space to be exploited.

Residual spaces become important because over time, limited space forces stakeholders and shareholders to optimize the space thus it can be utilized properly. Although residual space has been a common phenomenon in various cities in the world, this space is still considered an unwanted and unresolved issue. The contextuality of residual space becomes an important aspect to consider. This context will form different typologies from the earlier studies as the theoretical foundation. Therefore, it is necessary to learn the context of the urban area to determine the typology of the residual space from one city to another. Thus, stakeholders alongside shareholders could provide solutions precisely in the future.

2 Methodology

This study is aimed to find the typology and/or manifestation of the residual space in District (*Kecamatan)* Sumur Bandung as a sample of residual space in Bandung with several different characteristics. To obtain its purpose, this study is conducted by literature study and data collection through Google Street Map. The theoretical foundation is elaborated from several literature reviews as the main reference for assessment. Furthermore, the results of the analysis are classified based on the conclusion variables from the literature study. This study is conducted using a comparative qualitative analysis technique, which is

comparing one phenomenon with a related phenomenon [3]. The variables in the reviewed literature are compared with field data as proof of the suitability of the theory with the existing field context.

3 Results and Discussion

Overall, residual space could be defined in terms of physical appearance and quality of its use [2]. Space that is not used properly is generally irrelevant to the situation or space demand in a city. Informal activities that intervene are usually blurred space between legal and illegal so that it will require solutions both top-down and bottom-up.

Residual space, based on its utilization, refers to an area that is not used properly, or maintained by stakeholders, and thus is intervened by private parties. Wikstrom stated that residual space is a space that could be exploited or appropriated, thus the activities characteristic is often temporary and illegal [4]. Meanwhile, the utilization qualities mentioned by Hwang [5] are about how a space is unused, exploited, and abandoned. The most common perception of residual space is about the informality and temporality of activities which becomes into conflict in several cases.

The physical term of residual space is defined as a space that has not been well planned so that it creates ambiguity, thereby decreasing the aesthetic value of urban space. The terms of ambiguity in space namely unclear geometry, space with low visibility (not visible from the movement space), and space with boundaries that are considered easy to intervene (low fences and not maintained, or spaces without fences). The definition of residual space is based on these physical appearances which are usually tangible for actors and stakeholders. According to Wikstrom himself, the existence of Residual Space is created as a background space in the ‘figure and background’ so that physically it becomes a complimentary space for the designed ‘figure’ [4]. With this ‘background’ space, it becomes a liaison between several ‘figure’ spaces surrounding it.

3.1 The Formation of Residual Space

According to the factors that form residual space, it could be concluded that an urban space that is not cared for, not controlled, and not cared for properly become the background reason for residual space [2]. In addition, a study of the factors forming the residual space was conducted based on references during the last 10 years. Overall, the residual space could be formed due to minimal maintenance, space that is not controlled by the land owner, not properly cared for by the owner, geographical factors, irrelevant initial functions, or space that is intentionally vacated for future use.

Some factors form residual space in several different contexts. Trancik, Morallis, Loukitou-Sideris, Doron, Alanyali, and Carmona describe the main factor of residual space forming as the lack of maintenance either by the stakeholders or shareholders [2]. As Winterbottom stated, a space with minimal control is mostly caused by the lack of access directly to the space. Therefore, this space is the potential to be intervened [6].

Factors as geographical and renewal utilization of land use would be other issue. The fitness of the current function of space to the demanding activities in the existing era becomes the main issue predictable in several cities. A steep topography or a different leveling of the existing environment is less preferable so that the utilization given tends to be minimal other than the flatter topography [5]. Therefore, a lot of steeper topographies become the most common residual space in several cities.

Various activities related to the issue of the changing land use trends could also be different issue regarding unused space. The flexibility of designers in responding to the issue of changing local land-use trends can also be a separate issue that can make a space unused. Evolution in the activities of the people from time to time conducted the change of space. Oftentimes the space is unable to adapt to the new function thus it is inflexible to be reused. The scarcity of form and scale relevance have formed a leftover space in an urban context.

The surplus landscape is the most common factor as the intended space allocated as the expansion space of a property. This unplanned space has resulted from space being left over from the surrounding development. Prediction of future land use or expansion allocation which often takes a long time will decrease the value of this space so that it is intervened as an informal activity.

3.2 Qualities of Residual Space

Kevin Lynch in The Good City Form [7] stated that the performance of urban space can be measured by several aspects, namely *Vitality; Sense; Fit; Access*; and *Control*. Meanwhile, according to M Khalil and D. Eissa [2], a residual space can possess physical qualities and utilization qualities. These qualities will be juxtaposed with the performance of urban space by Lynch (Table 1) and thus could be elaborated to the existing conditions.

The physical characteristics of a residual space is differentiated one space from another. There are two types of factors that affect the quality of the residual space, *internal* and *external*. *Internal quality* is an inward orientation and thus could be intervened either by the designer or informal actors. Otherwise, *external quality* is an outward orientation to the urban macro scale. In urban space, this physical

quality can be associated with urban design elements as the main identification of quality.

There are indicators for identifying the physical quality of the residual space. Those are accessibility; level of security; visibility; site boundaries; site topography; uniformity of shape; the scale of site location; site location; facilities/assets that support activity generation; and proximity to high-intensity movement activity. These indicators serve as a reference for designers to intervene in the residual space in urban area. Meanwhile, the utilization qualities of residual space are divided by accessibility; security level; visibility; site boundaries; site topography; uniformity of shape; the scale of site location; site location; facilities/assets that support activity generatio; and proximity to high-intensity movement activities [2]. These indicators become the baseline of intervention analysis for designers and stakeholders to resolve the residual space issue.

Juxtaposing qualities indicator with Lynch's performance dimensions in The Good City Form, it is stated in Table 1 that the total performance highlighted in residual space is *Fit; Access;* and *Sense*. This also proves the perception of the surrounding community which focuses on visual aspects, affordability, and usability. These aspects are considered contradictive to the vision of the impacted city. Apart from these dimensions, other aspects also take a role in keeping the residual space intervention under control. Meanwhile, the *vitality* aspect is an additional performance that is the output of the other such as *control* from stakeholders and access to areas that will create a sense of security for users. In the end, the solution of the residual space as an urban space could be conducted by improving the quality according to the performance preferred to highlight according to the context. So that the interventions taken can be adjusted to the indicators that have been found in the related references.

Table 1 Physical Qualities of Residual Space by Khalil and Eissa [2] and Lynch [7]

	Physical Qualities									
	Internal Factors							**External Factors**		
Khalil dan Eissa	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Accessi-bility	**Security**	**Visibility**	**Boundary**	**Topo-graphy**	**Uni-formity**	**Scale**	**Site Location**	**Asset**	**Access to circulation**
	High	High	Exposed	Defined	Flat	Regular	Wide	Edge	Views	Road
	Low	Low	Hidden	Undefined	Sloped	Irregular	Narrow	Center	Facilities	Pedestrian Way
Lynch	Access	Vitality	Access, Sense	Vitality, Control	Fit	Sense	Fit	Sense	Sense	Access, Control
	Utilization Qualities									
Kh	**11**		**12**		**13**		**14**			

	Current Activities	Users	Time	Late Land-Use	
	Merchant	Local	Morning	Industrial	
	Recreation		Afternoon	Commercial	
	None	External Visitor		Residential	
	Etc.		Night	Green Area	
				Etc.	
Lynch	**Fit,** the function suitability with the current activity that is relevant to the time, users, and social activities in it.				

3.3 Typology of Residual Space

The typology of residual space is divided into several terms, such as urban voids; leftover space; to residual space. According to Winterbottom [6], residual space is discovered in the residential context of Seattle and it is classified as non-spaces; leftover space; and dual/multi-purpose space. By this typology, Winterbottom also mentions the solutions of the three typologies, namely Re-adapted; Re-inhabited; and Re-imagined.

Doron in [2] classified residual space based on the affected area, such as *dead zones* and *dead edges*. More detail on the typology mentioned by Villagomez in [8] classified residual space based on the type and location of the affected infrastructure. There is *void space, infrastructure that is not re-used, space under the circulation path*, and so on in Table 2. Different contexts create different types of residual space manifestations. This is reflected in the publication by Khalil M. [2] which has summarized the residual space manifestations based on the existing reference set.

Table 2 Typology of Residual Space

Author	Year	Category	Typology		
Winterbottom [6]	2000	**Forming Factor**	**Non-Spaces** The residual space due to proximity to the movement corridor	**Leftover Spaces** An improperly programmed space that is separated from its surroundings. Example: odd geometry space adjacent to the intersection, the front of the setback, and the traffic island	**Dual Spaces / Multipurpose Spaces** Areas with scheduled activities, which become residual space at different time
Doron [2]	2007	**Location**	**Dead Zones** Residual space is created due to the absence of relevant functions		**Dead Edges** Residual space is connected to corridors and is usually located along roads, railroads, riverbanks, and sidewalks.
Villa	2010	**Infra struc**	**Void Spaces** Unused spaces between buildings		**Redundant Infrastructure** Unfunctional infrastructure

Author	Year	Category	Typology	
			Oversized Infrastructures An infrastructure with excessive space for traffic (over-estimated	**Rooftops** The unused part of the roof in a building
			Spaces around A space between new development in an old context (intermediary zone) or between the public street and the interior area of the building.	**Spaces Below** Spaces under infrastructure such as elevated railroad tracks, motorcycle flyovers
			Wedges Result of conflicting intersections such as urban grids or infrastructure lines	

Various studies show that there are different manifestations according to the urban spatial context discussed. This difference also makes the residual space a distinctive feature of other cities. Trancik in [2] mentioned several residual spaces related to movement spaces such as areas under bridges and plaza areas that are far from pedestrian activity. Aside, Rivlin in [2] discussed the manifestation of residual space far from movement space, such as lanes that are in line with the public environment, road medians and junctions, and squares that are intervened by merchant activities. Campbell [9] added parking space as one of the residual spaces related to movement space. This is due to the scheduled use of parking spaces depending on the function it serves, which causes activities at other times. Other manifestations also found in this large-scale public space are closely related to the movement area and visibility to pedestrians. For instance, a park and playground which is fenced and damaged thus create an isolated public space. In addition, open spaces which conflicted between scale and usability are also reasons for abandonment by users [2].

Residual space is also often found in areas that are intentionally vacated by land owners or power holders. This space is usually a buffer space, from conservation activities such as rivers, railroads, and other zones that are eventually intervened by informal activities. This is also related to former industrial zones, ports, and barracks which are not relevant to the needs of existing functions due to reduced land vitality. The essence of this buffer zone will also be disrupted by the intervention of external parties which will end up reducing the effectiveness of this buffer zone. Transitional zones are also intervened by informal activities, such as transitions between districts, buildings, and boundaries between land use. This zone becomes ambiguous due to the vacancy of land which can be a gap for certain elements. In addition, Campbell stated that corridors and alleys that tend to be narrow and invisible are examples of in-between space [9].

There are some studies about residual space in Indonesia, one of them is located in Kebayoran Lama, Jakarta Selatan [10]. Based on the context of urban space, the main typology (location) found in the related context are under the bridge, sidewalk, roadside, and in-between space. These residual spaces are spread out in a linear and clustered pattern. A hypothesis is conducted grounded on this finding in Kebayoran Lama as the similar context found in Sumur Bandung District, Bandung.

3.4 Identification of Residual Space in Sumur Bandung District

According to the literature review of residual space, the hypothesis presented by the author is: There is a possibility of new manifestations of different typologies from both theory and case studies that have been discussed. This hypothesis is conducted based on the contextuality that has been stated in many references before. That context of residual space could be related to the form of residual space. As a discussion of the hypotheses above, the process of analyzing the urban spatial structure of Sumur Bandung District is carried out partially through Google Street Map satellite imagery. Overall, the identification process is conducted by distributing observations based on the village (*kelurahan)*, namely Braga, Kebon Pisang, Merdeka, and Babakan Ciamis. Identification is done in the form of a typology, physical quality, and quality of use according to the theoretical study in the previous chapter.

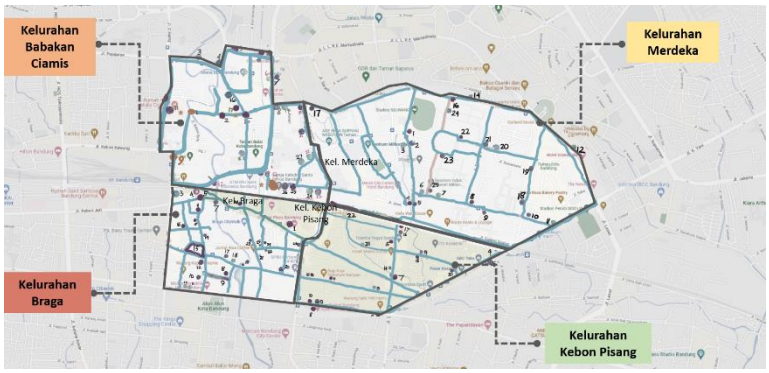

Figure 1. Observation Area of Sumur Bandung District

Land use in Sumur Bandung tends to be mixed with the majority composition of housing/complex, followed by institutions, then stadiums/fields, industry, and the lowest in the form of mixed gardens [11]. As the result, it was found that the dominance of land use in the four *kelurahan* is;

- Braga with a mixture of residential complexes
- Kebon Pisang with a mixture of complexes and settlements
- Merdeka with a mix of institutions
- Babakan Ciamis with a mixture of residential complexes – institutions

Sumur Bandung is also crossed by the Cikapundung River which is one of the regional attractions. The land use around the Cikapundung River is dominated by housing and trading services. The highest intensity of road is located on the streets of Kebon Pisang and the lowest intensity is located in Merdeka. Sumur Bandung sub-district has 12 (twelve) *Rukun Warga* (RW) with a high-density level, 5 (five) of which are located in Kebon Pisang. The highest density is found on roads leading to arterial roads. On the other hand, low density was found in the center of the sub-district in clusters of central government offices. In addition, low intensity is also found in a wider area. The highest road accessibility is found in Braga with tourism activities and its surroundings, as well as Babakan Ciamis with commercial trading activities. [12]

The first observation area is **Braga** with 34 samples of the residual space documented according to the *Google Street Map* shown in Figure 2. Mostly, the typology found in Braga is *non-spaces*, which is a leftover space as a result of proximity to the movement corridor. *Dead edges*, namely the residual space connected to corridors such as river banks, railroads, roads, and sidewalks.

Figure 2. Samples of Residual Space (A3, A9, & A20)
Source: Google Street Map, 2022.

The building density in Braga also causes residual space with the typology of *spaces around*. As shown in Figure 2, sample A3 with *space above* the movement corridor is the manifestation of rooftop typology. It is different from sample A9 where the residual space is in the form of a courtyard which is an intermediary room for the old building (BCA KCP Suniaraja) with the residential area of RW 07 Braga. This residual space is often used as a parking lot equipped with semi-permanent buildings as a business area for residents. With high accessibility and visibility, this residual space is very easy for the community to intervene. Another interesting asset of this sample is the riverbank which is often a 'utility' area for residents. The impression of disorder is very closely related to this residual space considering the non-uniformity of the surrounding buildings and also the furniture of the facilities that are left in the middle of the residual space. Another manifestation of the residual space found in the context of Braga is the utility box in sample A20 which is usually not covered with pavement materials. This space with dimensions ranging from 1.00 to 1.50 meters is easy for the community to intervene as a motorbike parking or street vendor that fits the dimensions of the related space as in sample A20. These samples from Braga show one of the

characteristics of the intervention on the use of the residual space in the city of Bandung to the micro-scale. Overall, there are 3 (three) new manifestations of residual space, such as *space above the alley gate* (A3 & A16), *sidewalks with minimal pedestrian activity* (A9), and *utility boxes* (A20).

Figure 3. Sample of Residual Space in Babakan Ciamis (B6, B7, and B9)
Source: Google Street Map, 2022.

In the observation area of **Babakan Ciamis**, 4 (four) new manifestations were found in the type of residual space in urban areas. With the characteristics of Babakan Ciamis, the residual space in this area is mostly in the form of *non-spaces* and *leftover spaces*. Leftover spaces are not properly programmed and separated from their environment. Usually, it is a space with odd geometry adjacent to the intersection, so that is not easy to put it to good use.

In this observation area, 3 (three) contextual manifestations were found. Sample B6 shows the existence of an unlimited transitive space, which is a space between buildings that is not in the form of a corridor. The boundary of the B6 is blurred as a result of semi-permanent stall activities intervening in the building area. The actor's activity as a form of intervention is the activity of street vendors attached to one wall of the building with the orientation of access to other buildings (Figure 3 left). Meanwhile, sample B7 (figure 3 middle) is a narrow space measuring approximately 1(one) meter below the pedestrian crossing bridge which is one of the spaces intervened by street vendors. Hence, sample **B9** is one of the residual spaces caused by changes in the owner's land requirements. As result, the late entrance route is closed and unused by the land owner. This results in the death of movement activities and makes the space an easy space to be intervened as a car park and street vendor space. In addition, some shades such as trees make this residual space easy for certain elements to intervene if not controlled properly.

Figure 4. Sample of Residual Space in Kebon Pisang (C9 and C15)
Source: Google Street Map, 2022.

Kebon Pisang possesses 22 samples of the residual space with many characteristics and office typologies found. These residual spaces are shown in *non-spaces* and *dead edges* like the samples in Braga. In addition, several samples were found in the form of *redundant infrastructure* that is no longer used. Street vendors as actors who intervene in the residual space are often found in Kebon Pisang. Several materials of the green spaces have been switched into pavements for merchant activities. The characteristics of Kebon Pisang as an observation area also have a tourist attraction at Asia Africa St. In this area, the residual space tends to be a *multi-purpose space*, namely a space with a different use at certain times. These spaces are communal parking spaces (as shown in sample C9) reserved for local office workers. Besides, street vendors are found in the corridor of this road. Street vendors tend to intervene in the narrow alley without interrupting the traffic in this corridor.

The last observation is conducted in **Merdeka** with 25 samples of the residual space. These spaces are dominated by *leftover space* which tends to be unsuitable with the 'background'. In addition, the residual space associated with the high-density road is commonly found in this area. Merdeka is characterized by its military service, namely, Siliwangi Military Regiment Area. Interestingly, the common typology of its residual space is *leftover space*. There are many odd geometries found in this area, for instance, samples D1, D3, D9, and the other ten samples. These spaces are the residual parcels of buildings that are usually developed into green spaces. Moreover, no intervention such as street vendors was found in the area within a radius of 5 km from military parcels. Utility Box is left open by the community thus it could not generate residual space as in the previous areas. Merdeka did not exhibit any new manifestations compared to those discussed in the literature review. The residual space conditions discussed in Merdeka also tend to be in regular shape. The only weakness of this area is the lacking of regular maintenance such as vegetation and pavement. As a result of the externality of this military area, this area would likely have an effective residual space organization.

Figure 5. Sample of Residual Space in Merdeka (D1, D3, and D9)
Source: Google Street Map, 2022.

3.5 Findings

As the results of the analysis and discussion in the previous chapter, there are 7 (seven) new manifestations of the residual space from the four observation areas. These manifestations will be classified according to the quality assessment of the residual space in the previous literature review. These findings provide insight into the solution of residual space in the city of Bandung and as an answer to the hypothesis stated before.

The first manifestation is *space above alley* with characteristics such as high accessibility and visibility. Samples A3 and A16 are located close to major roads with high vehicle activity. The type of boundary that limits it is the alleyway itself, so it depends on the thickness of the surrounding buildings. The thicker the surrounding buildings, the larger the scale of the residual space above the gate. The shape of the residual space also tends to be a square geometry alongside the boundaries of the building. Its location tends to be in the middle of the city with a high density of buildings. This is due to the factors that form the residual space due to the lack of land that can be utilized.

Table 3 Quality Assessment of Space Above Alley

Physical Qualities					
Accessibility	Security	Visibility	Boundary	Topography	
High	High	High	Defined	Flat	
Uniformity	Scale	Location	Assets	Proximity to Circulation	
Regular	Narrow	Center	Road, Commercial	Sidewalk, Main Road	
Utilization Qualities (Pre-Intervention)					
Land-use	Users	Time	Frequency		
Seating area	Local	All-day	Not routine		
Source: Google Street Map with personal analysis, 2022.					

The second manifestation is *pedestrian way without significant activities*. This manifestation is usually located on the sidewalk at a different level from the road. With this level difference defines the limit of the residual space that can be intervened by street vendors. The scale of the residual space is linear following the existing sidewalk path. However, there are specific characteristics of the sidewalks to be intervened by an informal activity. The residual space characteristics for this manifestation are activity assets, accessibility, and visibility of the sidewalk. Examples of this manifestation are samples A9 and B4. In sample A9, it was found that the access quality is high with asset activities in the form of office and commercial activities. With the lack of pedestrian activity, street vendors can easily appropriate this sidewalk. The forms of appropriation in

this manifestation are semi-permanent stalls and street vendors carts lined up along Belakang Factory St.

Table 4 Quality Assessment of Pedestrian Way Without Significant Activities

Physical Qualities					
Accessibility	Security	Visibility	Boundary	Topography	
High	Moderate	High	Defined	1 step rise level	
Uniformity	Scale	Location	Assets	Proximity to Circulation	
Linear Patterned	Narrow	Center	Commercial, Office	Less Traffic Road	
Utilization Qualities (Pre-Intervention)					
Land-use	Users	Time	Frequency		
Seating area	Local	Work Hour	Work Days		
Source: Google Street Map with personal analysis, 2022.					

Third manifestation found in the observation area is a *utility box infrastructure*. The location of this manifestation is adjacent to pedestrian paths and highways. With the characteristics of utility lines that usually follow the circulation of the path, the scale of this residual space is linear along the way. However, the points usually depend on the activity assets, accessibility and visibility of the location. In samples A20 and B15, residual space was found on the line of utility box. The cover with dimensions of approximately 1 (one) meter can accommodate one street vendor cart so that it is easy for street vendors to intervene.

In this sample, the accessibility of the location is fairly high, with the location of the residual space at the intersection of Markoni St. However, due to the isolated location of the road, the distribution of street vendors is only approximately 100 meters from the entrance of the alley. The furnitures and equipment from these street vendors are often placed at the location of the residual space due to the high intensity of sales activities. In locations that do not have utility covers tend not to be intervened by street vendors.

Table 5 Quality Assessment of Utility Box Infrastructure

Physical Qualities					
Accessibility	Security	Visibility	Boundary	Topography	
High	Low	Low	Undefined	Flat	
Uniformity	Scale	Location	Assets	Proximity to Circulation	
Linear Patterned	Very Narrow	Center	Commercial, Road	High Traffic Road	
Utilization Qualities (Pre-Intervention)					
Land-use	Users	Time	Frequency		
Merchants	Local	Varied	All day		
Source: Google Street Map with personal analysis, 2022.					

Transitive area is a space whose boundaries cannot be defined. The factor that generates this residual space is the intervention of informal commercial activities. The transition in this space tends to be blurred according to the intervention area of the semi-permanent building. Accessibility and visibility of this residual space is quite high with minimal pedestrian activity.

Table 6 Quality Assessment of Transitive Area

Physical Qualities					
Accessibility	Security	Visibility	Boundary	Topography	
High	High	High	Undefined	Flat	
Uniformity	Scale	Location	Assets	Proximity to Circulation	
Nodal Patterned	Narrow	Center	Commercial, Road	High Traffic & Pedestrian way	
Utilization Qualities (Pre-Intervention)					
Land-use	Users	Time	Frequency		
Merchants	Local	Work Hour	Everyday		
Source: Google Street Map with personal analysis, 2022.					

Another manifestation found is *unused entrance*. Usually building parcel has 2 (two) entrances and exits to create continuous circulation. However, over time and changes in land use, one of both entrances is often unused. The decision to close the door made the allocated space in front of it become the residual space. Alongside the boundaries of building, the definition of scale and the boundaries of the residual space depends on the pavement. In sample B9, this residual space is supported by the presence of shade and low visibility of the location, making it easy to intervene either as a car park or as a stall for street vendors. The activity assets of the B9 location are in the form of government agency facilities on Kebon Sirih St., such as the Sumur Bandung Police Station and Pakuan Building.

Table 7 Quality Assessment of Unused Entrance

Physical Qualities					
Accessibility	Security	Visibility	Boundary	Topography	
High	High	Low	Defined	Sloped	
Uniformity	Scale	Location	Assets	Proximity to Circulation	
Nodal Square	Narrow	Center	Commercial	Less Traffic Road	
Utilization Qualities (Pre-Intervention)					
Land-use	Users	Time	Frequency		
Car Parking, Merchants	Local	Everyday	Everyday		
Source: Google Street Map with personal analysis, 2022.					

Pedestrian Platform is the last manifestation found that is formed due to the minimal effectiveness of the sidewalk. Sidewalks with different pavement levels and the dimensions of the sidewalks is relatively small (approximately 1.5 x 1.5

meters) creating the impression of a stage compared to other sidewalks. In sample C15, the quality of accessibility and site visibility is very high with space connection with Sunda St. The intervention of this residual space tends to be nodal or point in accordance with the existing 'platform' dimension. The generation from the location that became the asset is Sunda St. itself and the surrounding commercial area. With the availability of shade from trees, possible interventions that can be carried out can be in the form of temporary furniture and stalls from street vendors.

Table 8 Quality Assessment of Pedestrian Platform

Physical Qualities					
Accessibility	Security	Visibility	Boundary	Topography	
High	Low	High	Defined	1 step rise level	
Uniformity	Scale	Location	Assets	Proximity to Circulation	
Nodal patterned	Narrow	Center	Commercial, Green space	High Traffic Road	
Utilization Qualities (Pre-Intervention)					
Land-use	Users	Time	Frequency		
Merchants, Street Furniture	Local	N/A	Everyday		
Image Source: Google Street Map, 2022.					

4 Conclusion

The tendency of residual space in terms of use is a space that is not used properly nor maintained by stakeholders and shareholders so that it is intervened by informal actors. Residual space is a space that is not well planned so that it generates ambiguity which causes a decrease in the aesthetic value of urban space. In its application in urban areas, the performance dimensions that need to be highlighted are the performance of *Fit; Access;* and *Sense*. Another dimensions would be *Vitality* and *Control* as an addition dimensions.

There are several variables of physical quality such as accessibility, security level, visibility, site boundaries, site topography, uniformity of shape, scale of site location, facility assets, and proximity to circulation. Besides, there are utilization qualities that can be identified with current activities, users, times, and previous land uses. There are various typologies that have been studied by previous authors, that becomes the base theory of this study.

This study learns residual space located in District (*Kecamatan*) Sumur Bandung with 2 (two) limitations of accessibility level and diversity level of land use. The typology of the residual space in Bandung is similar to the previous study, with slight difference in manifestations. There are six new manifestations found in the city of Bandung, namely:

1. Space above alley
2. Pedestrians way without significant activities
3. Utility box infrastructure
4. Transitive area
5. Unused Entrance
6. Pedestrian Platform

This study still has many shortcomings, such as the lack of primary data as data validation to be used in further research. Primary data is needed to provide recommendations for handling residual space in the city of Bandung. This study only targeted in finding contextual residual space in the city of Bandung (Sumur Bandung District). This study requires another variable as limitation other than accessibility and land-use, such as open space and activity assets for 24 hours.

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