

The Shifting Preferences of Private Outdoor Spaces for Future Healthy Housing

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ABSTRACT

Private outdoor spaces were found to have contributed to residents' health and well-being and become an important aspect of achieving a healthy house. The aftermath of the lockdown period changed the behavior of residents and also their perspectives toward the living environment. The purpose of this study is to identify the shifting preferences of Indonesian residents toward their private outdoor spaces in order to understand the future of healthy housing design. This study examines residents' outdoor activities during lockdown and compare existing and preferred types and access to the outdoor spaces. This research used mix-method approach by using online questionnaires to collect data from 231 respondents across Indonesian urban areas. The analysis was conducted qualitatively by distribution analysis, and quantitatively by comparing mean and standard deviation values. The study finds that in general Indonesian residents were dissatisfied with the existing quality of private outdoor spaces. They also shifted their preferences of private outdoor space types with increase in privacy (i.e., indoor terrace, garden, and front terrace). The private outdoor spaces also more preferably need to be linked to common areas of the house (i.e., living room and dining room). The results emphasized the need to improve the quality of residential outdoor space to support a healthy, sustainable, and resilient future living environment. The study from the point of view of residents as the end users, can give valuable insights for architects, urban planners, and even policymakers in shaping healthier housing environments.

Keywords: healthy housing, private outdoor spaces

1. Introduction

The health and well-being of residents have become one of the main priorities in sustainable and resilient housing due to the COVID-19 pandemic [1][2][3]. Previous studies have found that several aspects of housing influence the health of its residents, both physically and physiologically [1][3][4][5][6][7]. The effect can be positive but it can also be negative. Poor conditions in the living environment could have negative impacts on health such as allergies, immune system, and also irritation of the skin, eyes, nose, or throat [7][8]. The long period of staying indoors also caused complaints of mental illness to emerge during the lockdown, such as boredom, loneliness, stress, anxiety, and even depression [3][4][5][6][9].

One of the aspects of the living environment that contributed to residents' physical and physiological health during the lockdown was the presence of private outdoor areas. The presence of green elements, which are known to be associated with mitigating impacts of urban climates and improving ecological-climatic conditions, brings a wide range of health benefits for people [5]. Many studies related to the pandemic and post-pandemic highlighted the importance of green spaces in houses, either visible or better, can be accessible

in various forms, such as terraces, inner courtyards, gardens, balconies, etc. [3][4][5][6][10][11][12]. In the recommendation of sustainable and resilient homes, a lively space facing green areas is favored [2][4][5]. Torres et. al. [6] found in his study that after the pandemic most residents in Mexico desired to have improvements in their green spaces and view to outside. Not being able to go outside and access public green spaces, made the residents depend on their private outdoor spaces to relax and enjoy nature [1][13].

As green areas are known to have effects on residents' health and well-being [1][11][13][14][15], therefore it is an important aspect of achieving a healthy house. The availability of outdoor spaces in houses enables the opportunities for openings that allow fresh air and indoor airflow, as one of the solutions to prevent virus transmission [1][9][11][13][16]. Another ability of outdoor space is being able to penetrate natural light into the house, which is also another aspect of passive strategies to achieve indoor thermal comfort besides other factors like natural ventilation and humidity [13][14]. Access to greeneries has also been proven to reduce mental health issues, such as loneliness, stress, anxiety, and other negative emotional states [1][13][14][15].

Private outdoor areas also encourage residents to do outdoor activities to reduce boredom and stress thus increasing immunity and supporting healthy lifestyles. Common activities that were found during lockdown were sunbathing, relaxing, work, exercise, and even hobbies like gardening [1][3][4][17]. Due to the limitation for socializing outside, known as social distancing, private open spaces become a choice of space for socializing with other family members [18]. On the other hand, the outdoor area can also be a personal space when all family members are indoors and the room feels overly crowded [5][6].

Today, urban areas become more densely populated and access to public green spaces is often limited, making private outdoor spaces an increasingly vital component of housing design [6]. In Indonesia, Badan Pusat Statistik noted [19] that in 2035 more than half, or around 66.60% of Indonesia's population is projected to live in urban areas. Apart from being characterized as being more exposed to high levels of noise from traffic, housing located in urban areas is known to have low levels of greeneries [1][20][21]. The limited plot of land that is common in urban areas makes it almost impossible to provide adequate green outdoor space in the living environment. These conditions become challenges to achieve healthy housing in urban areas that can support the residents' physical and physiological health. A previous study by Yin et al [21] mentioned how living in urban areas increases the possibility of residents experiencing stress, anxiety, and depression compared to those who lived in rural areas..

Despite the growing recognition of private outdoor spaces in housing and its impact on residents' health and wellbeing, still narrow research has explored how this topic evolved in the Indonesian housing context. There have been several recent studies conducted to examine the importance of green space in Indonesia but none have focused in depth on occupant preferences for private outdoor spaces in housing typologies [22][23][24]. Indonesia's urban housing landscape presents unique challenges, including high-density living, limited green space availability, and varied socio-economic conditions that influence housing choices. Also, the changes in behavior and needs of residents' post-lockdown period are thought to affect the perspective on healthy housing, including the design of private outdoor spaces within it.

This study aims to bridge the gap by identifying the shifting preferences of the Indonesian residents toward their private outdoor spaces in order to understand the implications future of healthy housing design in Indonesia. Comparison will be made on the residents' evaluation results on their existing homes' private outdoor spaces and their preferences on their future house. This study examines residents' outdoor activities during lockdown and compare existing and preferred types and access to the private outdoor spaces. In addition, this study also aims to discover which rooms of the house do the Indonesian residents need to have close proximity to the private open space. Studying preferences from residents' perspectives is important as guidance for stakeholders in planning and designing the housing market [1][2][18]. This research is continuous research from Sakina & Setiawan [18] and this study will focus on the private outdoor spaces as one of the important aspects in housing environment that affect residents' health and wellbeing.

2. Method

This mix of qualitative and quantitative research used online questionnaires to collect data. The data was gathered mostly by social media (e.g., WhatsApp, line, and Instagram) through snowball random sampling, which takes advantage of respondents' interrelationships to reach others [6]. The total number of respondents received was 231 respondents, where all of the respondents was drawn from several cities in Indonesia. In this study, the respondents' cities of origin were not limited with the aim of being able to see general trends among residents in urban areas in Indonesia.

The online questionnaire used close-ended questions to gather information. Respondents were asked to provide their background information regarding demographic data and their housing profile. As this research focuses on knowing the shifting preferences of the private outdoor space, therefore the respondents were requested to evaluate the existing condition along with their preferences regarding the qualities of view-to-outside and green space, the private outdoor space types, and the access to the private outdoor spaces. The results then will be compared to see whether the pandemic has shifted their preferences or not. To have a better understanding of the use of private outdoor space during the pandemic and the reason why they shifted their preferences, the respondents were also asked to give information on what outdoor activities they conducted during the quarantine period. The detailed information on the variables asked in the online questionnaire can be seen in Table 1.

Table 1 Variables in this research

Variables		Information	Question Type
Respondents' Data	Demographic	Gender, age range, education, marital status, employment	multiple choice (close-ended)
	Housing Profile	Ownership, residential type, number of floors, number of occupants, duration of residence, indoor and outdoor surface area (m ²)	multiple choice (close-ended)
Housing Satisfaction and Preferences	Green space qualities	View-to-outside quality and green space quality	semantic-differential (SD) method
Private Outdoor Space Types		The types of private outdoor space (front terrace/ indoor terrace/ garden, etc.)	multiple choice (close-ended)
Private Outdoor Space Access		How to access the private outdoor spaces (from the bedroom/ bathroom/ parlor/ kitchen/ dining area, etc.)	multiple choice (close-ended)
Private Outdoor Space Activities		Respondents' activities during the pandemic on their private outdoor space (gardening/ relaxing/ exercise, etc.)	multiple choice (close-ended)

As seen in Table 1, most of the questions used close-ended questions, either multiple choice or multiple answers. As for housing satisfaction and preferences for green space qualities, the semantic-differential method (SD method) was used. The scale used one (1) to four (4), where the smaller number on the left is for negative adjectives (very dissatisfied/ very unimportant) and the bigger number on the right represents positive adjectives (very satisfied/ very important). The example of SD-method questions can be seen in Table 2.

Table 2 Example of SD Method questions

Variables	Example of SD Method questions						
Housing Satisfaction	Your level of satisfaction with the quality of the green space in your home during the pandemic.						
	Very dissatisfied	0	1	2	3	4	Very satisfied
Housing Preferences	Your level of priority regarding the quality of the green space for your dream home						
	Very unimportant	0	1	2	3	4	Very important

The analysis will be using distribution analysis for respondents' data (demographic and housing profile), private outdoor space types, private outdoor space access, and activities in Private Outdoor Space. The results will be compared between the existing and preferred conditions. To see whether there's a shift in the preferences of the private open space.

The results from housing satisfaction and housing preferences of green space qualities will be analyzed quantitatively by examining the mean value and standard deviation (SD) of view-to-outside quality and green space quality. If the results of the mean value are closer to one (1) indicates that in general respondents are dissatisfied/ not prioritizing the green space qualities, but if the results are closer to four (4) then generally the respondents are satisfied/ prioritizing the green space qualities. SD values are also needed to be identified to confirm the accuracy of the mean values to represent the sample data. The mean values and SD for housing satisfaction and housing preferences of green space qualities then will be compared to see, if there are or there aren't, value gaps between the expectation and the reality. If the mean values for satisfaction are higher, then the existing condition is good enough, but if the results are the opposite, then respondents have different preferences for their future house.

3. Results and Discussions

Because this research wants to understand the preferences from the perspective of residents, as the users, it is necessary to map the background of the respondents, which is the demographic data and their housing profile. As for the shifting preferences of the private outdoor space, the housing satisfaction and preferences regarding the green space qualities i.e., view-to-outside and green space will be evaluated and compared, along with the private outdoor space activities, types, and access.

3.1. Respondents' Characteristics

All of the 231 respondents in this research originated from several cities in Indonesia. The characteristics of the respondents can be seen in Table 3. Most of the respondents are female in gender (61%). Respondents' age, mostly range between 20-50 years with a percentage of 31-40 years (28%) and 41-50 years (24%). Educationally, the respondents have bachelor's (33%) and master degrees (32%). Most of the respondents are workers, with 27% working in the government sector and 25% in the private sector. More than half, or 56% of the respondents already married and have children. These various characteristics of respondents may affect their examination and preferences for their outdoor spaces.

Table 3 Respondents' Characteristics

Variables		freq	%	Variables		freq	%
Gender	Female	140	0.61	Employment	Unemployed	3	0.01
	Male	90	0.39		Student	30	0.13
Age Range (y.o.)	<20	12	0.05		Teacher	18	0.08
	20-30	52	0.22		Housewife	23	0.10
	31-40	63	0.28		Private sector	57	0.25
	41-50	55	0.24		Government	62	0.27
	>50	48	0.21		Entrepreneur	21	0.09
Education	High school	28	0.12	Marital Status	Professional	2	0.01
	Diploma	8	0.03		Retired	14	0.06
	Bachelor	77	0.33		Single	70	0.30
	Master	73	0.32		Married	32	0.14
	Doctorate	44	0.20		Married w/ children	128	0.56

3.2. Housing Profile

The housing profile of the respondents can be seen in Table 4. From the table, it can be informed that all of the respondents lived in urban areas, either in clustered, urban housing, apartments, or public housing. Of all of the typologies, the dominant type was urban housing known as kampung (59%) followed by clustered or

gated housing (36%). Most of the respondents are homeowners (87%) and have lived in their existing house for mostly over 10 years (52%). The housing in this study is mostly 1-story (48%) to 2-story (44%) houses. As most of the respondents are married, the number of occupants is more than 4 family members, with the majority of 4 members in 31%. For the size of the house, most live in houses with a medium area between 61-90 m² (24%) followed by houses with an indoor area of 91-120 m² (20%). The size of the outdoor area varies, the most is only around 5-20 m² (34%) and then quite large around more than 40 m² (25%). These respondents' housing profile is expected to influence the results of evaluating their satisfaction with outdoor spaces in their existing house and also their preferences for their future house.

Table 4 Respondents' Characteristics

Variables		freq	%	Variables		freq	%
Ownership	Owner	201	0.87	Duration of residence (years)	<1	16	0.07
	Tenant	29	0.13		1-5	57	0.25
Residential Type	Clustered	82	0.36		6-10	38	0.16
	Urban Housing	138	0.59		>10	119	0.52
	Apartment	6	0.03	Indoor Surface Area (m²)	<36	10	0.04
	Public Housing	4	0.02		36-60	38	0.17
Number of Floors	1	111	0.48		61-90	55	0.24
	2	100	0.44		91-120	46	0.20
	3	14	0.06		121-150	28	0.12
	4	2	0.01		151-180	24	0.10
	>4	3	0.01		>180	29	0.13
Number of Occupants	1	8	0.04	Outdoor Surface Area (m²)	<5	35	0.15
	2	26	0.11		5-20	78	0.34
	3	35	0.15		21-30	29	0.13
	4	71	0.31		31-40	29	0.13
	5	55	0.24		>40	59	0.25
	>5	35	0.15				

3.3. Satisfaction and Preferences of Outdoor Space Qualities During Pandemic

Before studying the shifted preference on the outdoor space as experienced by respondents, it is necessary to look at the results of the respondents' general evaluation related to satisfaction of the green space qualities during the pandemic, and their preferences for their future homes. The green space qualities assessed are view-to-outside and outdoor space qualities. The result can be seen in Table 5. Based on the results, the mean values for the existing conditions, either for the view-to-outside or green space qualities are lower than what they preferred. For the existing evaluation, all of the mean values are less than 3, while for the preferences values are all above 3, with gap values all resulting in negatives.

Table 5 Housing Satisfaction and Preferences of Outdoor Space qualities

Indicators	N	Housing Satisfaction	Housing Preference	Gap Value
		M ± SD	M ± SD	
View-to-outside	231	2,67 ± 1,11	3,28 ± 0,90	-0,62
Green Space	231	2,66 ± 1,20	3,33 ± 0,92	-0,67

The housing satisfaction on view-to-outside resulted in the mean value of 2,67 ± 1,11 and for outdoor space qualities resulted in 2,66 ± 1,20. On the contrary, the housing preferences mean values resulted in 3,28 ± 0,90 for view-to-outside and 3,33 ± 0,92 for outdoor space qualities. The gap values also resulted in negatives, with the outdoor space quality having a bigger gap of -0,67 and the view-to-outside quality at -0,62.

The results indicated that respondents were dissatisfied with the current quality of view-to-outside and outdoor space in their existing house and they expected an increase in quality in future healthy homes. The gap between expectation and reality can lead to complaints and disappointment with their homes [1]. Previous research, also stated that the green space aspect has the biggest gap value between satisfaction and reality [18]. With these results, it is increasingly emphasized that there is a need to improve healthy residential design in the future, especially for the quality of the open spaces. Incorporating greeneries into the built environment could also be one way to increase sustainability in buildings [12].

3.4. Activities in Outdoor Space during Pandemic

To have a better understanding of the use of private outdoor space during the pandemic, the respondents were asked to give information on what outdoor activities they have conducted during the quarantine period. Based on Figure 1 it can be seen, that residents in Indonesia do various activities in their outdoor space, from relaxing, socializing, gardening, hobbies, work, domestic work, and even sunbathing. According to the overall result, most of the Indonesian respondents did gardening (n=111; 25%), followed by relaxation (n=97; 22%) and exercise (n=79; 18%) in their outdoor spaces.

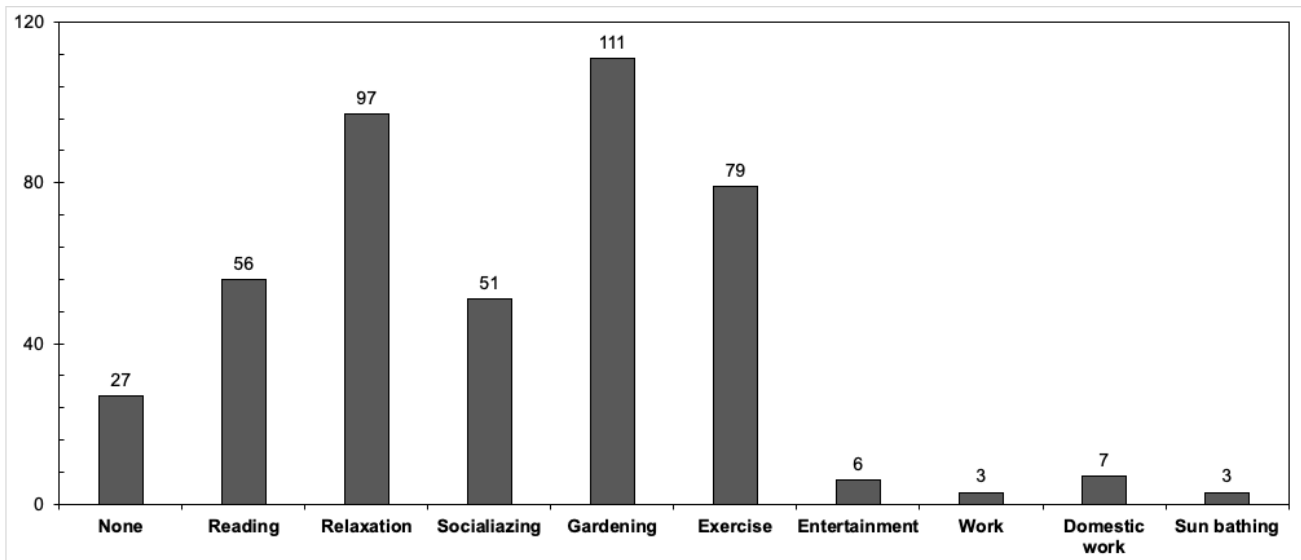


Figure 1 Activity in outdoor space during the pandemic

Gardening was the most common activity done by Indonesian respondents during the pandemic. Gardening is not a new activity, but several previous studies have shown an increase in this activity during the pandemic, some people have even made this activity their new hobby [11][25][26]. The popularity of gardening during the pandemic because people longing for nature in a time of ecological loss [27]. They went back to engaging with nature and natural elements by planting flowers, herbs, and other plantings in their yards. Growing activity is proven satisfactory to residents and can increase not only their physical and psychological health but also their social health [28].

The second dominant activity that the respondents did was relaxation. As mental health issues such as loneliness, anxiety, and stress were on the rise during the lockdown period, natural environments such as green open spaces are proven to reduce negative mental health problems. Just viewing greeneries, helps residents to relax thus reducing their stress and other emotional states [1][13][14]. For workers, taking a 20-25-minute break in green areas can positively affect energy and performance [5]. As most of the respondents are workers, having green space can support their productivity while working from home.

The last outdoor activity that most residents did during the pandemic was exercising. The prohibition on going outside, such as to local parks or gyms, forced them to adjust their activities inside their homes. During the pandemic, people realized that maintaining health with a healthy lifestyle such as exercise is very important

and can enhance immunity [17], which made them not easily infected by viruses or other infectious diseases. And now having a private green space has become a privilege to still maintain their healthy lifestyles without having to go to public areas.

3.5. Shifting Preferences of Private Outdoor Space Types

The pandemic has resulted in shifting preferences in terms of preferred private outdoor space types. As can be seen in Figure 2, the results for the existing and the preferred private outdoor types had some differences. The existing private outdoor types that most respondents have are the front terrace (n=169; 33%), followed by garden (n=108; 21%) and indoor terrace (n=98; 19%), while their preferred private outdoor space was firstly indoor terrace (n=167; 24%), followed by garden (n=151; 22%) and then front terrace (n=106; 16%).

Indoor terraces have become the most popular choice for Indonesian residents for their future homes. The indoor terraces, which can be in the form of courtyards or even backyards, serve as private green spaces that can be accessed from inside of the house for outdoor activities and can bring natural light and air into the building [2][13]. A study by Sabtalistia [29] showed that a tropical house with an inner court can provide abundant natural lighting so there is no need to use artificial lighting. As lifestyle changes due to the pandemic have increased mental health issues for residents, private indoor terraces have become valuable spaces that offer direct contact with the outside while helping us to take our minds to relax [30]. Indoor terraces can become spaces where the residents can feel a sense of retreat and security within their homes [13].

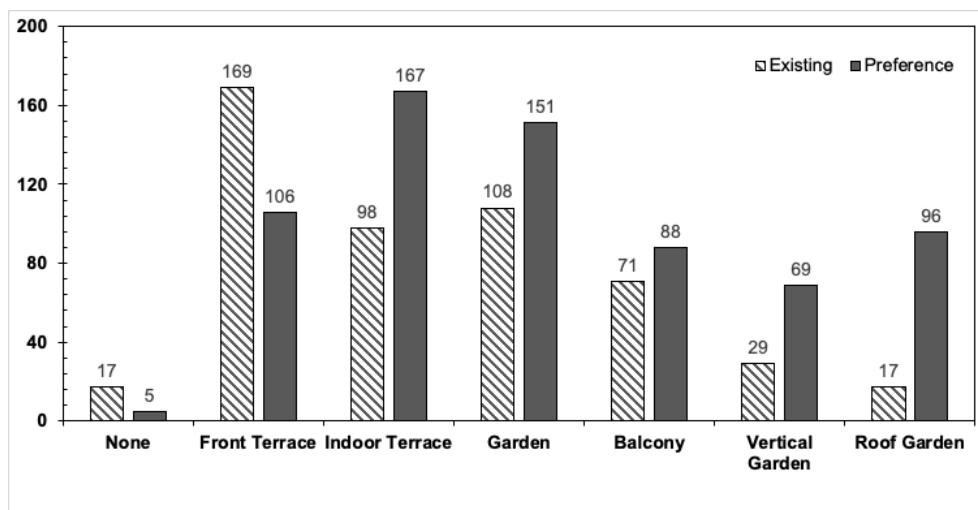


Figure 2 Comparison of the existing and preferences of private outdoor space types

Gardens were also popular among Indonesian residents. Gardens can be classified as green spaces that provide space for gardening activities, either for decorative plants or even food supplies [25]. Gardening had become a new popular hobby of residents during the lockdown period [11][25][26]. Gardens are accessible spaces for all ages and are relatively easy and quick to implement in urban areas [28]. Apart from gardening, gardens can also be a place for other activities including relaxing, exercising, socializing, and other activities with positive mental and spiritual effects [25].

The front terraces or front yards are also still favored by the Indonesians, even though it's no longer their first dominant choice. The front terraces, are one form of green open spaces in front of the house and usually also become the front access to enter into the house [30]. The front yards provide exposure to sunlight, fresh air, and nature. It also serves as a semi-public space for residents' social needs by providing visual access and interaction with the neighborhood. During the pandemic, even though there are rules for social distancing, the front yard can still provide social interaction while at the same time giving residents a feeling of security by having a distance between them and people outside their home area.

The results of the result gap for existing and preferences are also interesting to discuss where the biggest gap was the results for roof gardens (n= 79 gap value) and indoor terraces (n= 69 gap value). The gap shows there's a mismatch between what the Indonesians expected and what they have in reality. The illustration of the resulting gap can be seen in Figure 3. From the figure, there is a decrease in the number of respondents who do not want a private outdoor in their homes. This further shows how important the presence of green elements in the living environment is [5]. In addition, there can also be a significant decrease in interest in the front terrace, where in the respondents' existing homes this type of private outdoor space is the most common. What is also interesting is that apart from the indoor terrace, there is a significant increase in popularity for roof gardens.

The decreasing interest of respondents in front terraces further proves the change in the behavior of residents due to the pandemic. Although the number of respondents who still desire front terraces is still quite large, the value and demand for front terraces, which were previously used to socialize and interact with neighbors and friends, have also faded. Most of the houses inhabited by respondents have been occupied for more than 10 years, at that time, people still frequently used the front terrace, especially to interact with the surrounding environment. However, modern urban society today, especially due to the experience of the pandemic, prefers to carry out social interaction activities as well as recreation in the third space, outside their homes [31]. This third space tends to be an open public space, such as cafes, restaurants in malls, or multi-purpose rooms.

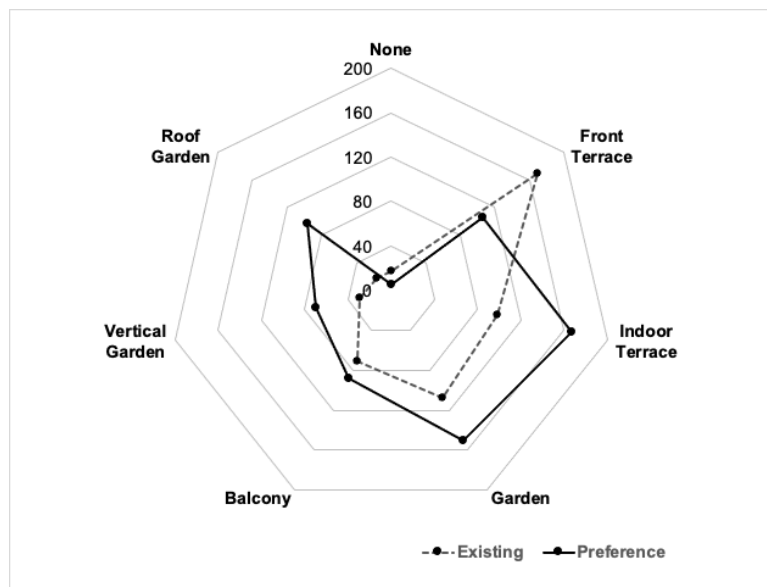


Figure 3 The gap between the existing and preferences of private outdoor space types

The increasing demand for indoor terraces also highlighted how respondents preferred a more private and individual outdoor space in their living environment. The COVID-19 pandemic has transformed the behavior of people where they "fear meeting people" so they want to be indoors more [2]. In addition, there was physical and social distancing during the lockdown period which changed the relationship between the individual and the family, and the family with the neighborhood [13]. Indoor terraces become an excellent option for enjoying the benefits of greeneries while still having privacy and a sense of security.

From the figure, it can also be identified that the growing popularity of having a roof garden. According to previous research [5][12] as there's a limited plot of land, having a roof garden is an alternative to increase the green area in urban environments. Utilizing rooftops can be a solution to have gathering areas, shared social zones, and landscaped environments for residential in densely populated areas [32]. In addition, green roofs have many benefits for the improvement of ecology, energy, and water conservation and can add to the aesthetic value of a building [33].

3.6. Shifting Preferences of Private Outdoor Space Access

This research also found shifts in Indonesian residents' preferences for access to their private outdoor spaces, either physically and/ or visually. From Figure 4 it can be seen that the existing private outdoor access that most respondents have in their home is from the parlor (n=151; 31%), then from the living room (n=81; 16%), and followed by the kitchen (n=70; 14%). As for the preferred access, respondents wanted to access their private outdoor access more through their living room (n=157; 19%), then their parlor (n=129; 16%), and then their dining room (n=114; 14%). Based on the overall results, for future house design, Indonesian residents prefer to be able to enjoy greeneries from common zones inside the house.

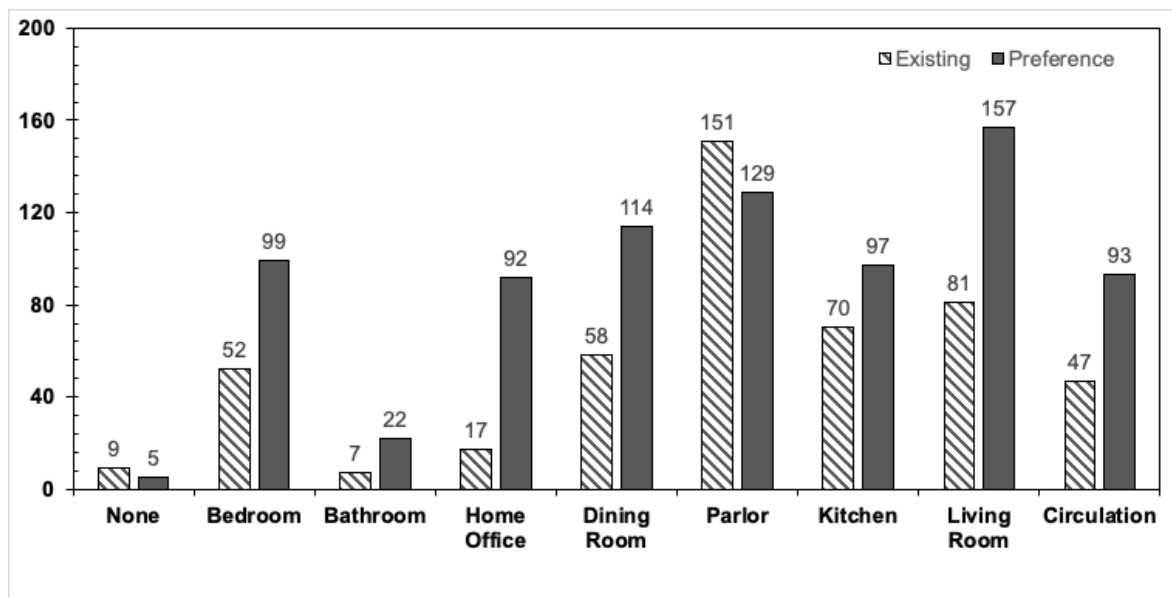


Figure 4 Comparison of the existing and preferences of private outdoor space access

In Indonesia, houses that are more than 10 years old usually place more green areas at the front near the living room as a semi-public area that is useful for socializing. This spatial organization was born from traditional houses in Indonesia such as Javanese, Betawi, and Sundanese customs, which place public areas at the front of the house [34]. In addition to the front area, earlier designs of houses in urban areas by developers generally also provide open space located near the service area, such as the kitchen, for air circulation. Most respondents have lived in their homes for more than 10 years so it can be predicted that the respondents' homes still have designs that adapt to Indonesian regional culture. As people's lifestyles change to a more modern way and also as the result of the pandemic, now they tend to want to have a more open area that is oriented towards the inside of the house, rather than outside the house and can be accessed from the common area like the living room or dining room.

The living room as the main room for gathering with family and friends, is considered by respondents to be the preferred room to be able to access private open space. Research by Zarrabi et al. [3] stated how open spaces can increase social interaction and can also be used as a living room for residents. Several studies in Indonesia, have found that the living room has become a very important room after covid-19 [33,31,35]. Houses built in the last 10 years by developers have also begun to eliminate parlors and make the living room as the room of the house as a place to do various activities together, ranging from relaxing, entertainment, and socializing [35]. The current modern society rarely receives guests at home and chooses to meet in a third place outside the house.

Parlors as a place to receive guests are also considered to still require access to greeneries. As a space for main access to enter the house, this area is a place to gather and socialize with others while enjoying the sunlight and natural air [30]. Parlors can also serve as a transitional space between the outdoors and indoors, therefore it is important to have openings for airflow that can prevent future cross-infection [17].

The last room that is considered necessary to have access to a private open space is the dining room. Enjoying food while being able to see greeneries and enjoying the cool air is considered comfortable for future healthy housing. Private open space located near the dining room can also be a space to eat outside and entertain with family members outdoors [36]. Research by Waisnawa and Pramana [37] also found the same thing, that in several modern homes views of greeneries can be enjoyed from the main areas of the house, one of which is the dining room.

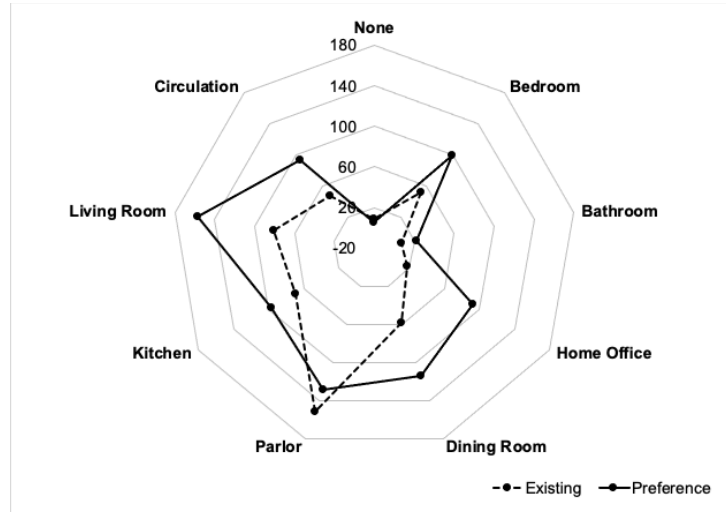


Figure 5 The gap between the existing and preferences of private outdoor space access

When examined from the gap between the existing and preferences of private outdoor access in Figure 5, it can be seen that the biggest gap between the existing access and the preferred access is for the living room ($n=76$ gap value) and home office ($n=75$ gap value). The access from the parlor seems to have decreased and is not preferred anymore. This result is interesting and shows the lifestyle of today's urban society.

The increasing interest in access to green space from the living room further emphasizes how in Indonesia the family room has become a very important space after COVID-19 [33][31][35]. The family room has become the main room in the house as a place for family members to gather and do various activities together [35]. With access to greeneries from this space, the quality of the space can be improved so that it can support the activities of family members.

Interesting results are also shown from the soaring preference for access to greeneries through the home office. Most respondents work, and for workers, the work-from-home (WFH) culture has become common. Therefore, the presence of home office space facilities in housing has become essential now [17]. The results show how working respondents are aware of how access to the greeneries will have a positive impact on their work during WFH. Viewing greeneries is known to be able to reduce stress and increase workers' productivity [1][13][14][17][18].

4. Conclusion

This paper aims to examine Indonesian residents' shifting preferences for private outdoor space as a result of the COVID-19 pandemic. The shifting preferences were examined by respondents' activities in their outdoor spaces during lockdown, and comparison of their existing and preferred types of outdoor spaces and how to access those outdoor spaces. Overall, Indonesian residents were dissatisfied with the existing quality of private outdoor space in accommodating their activities during the pandemic and this dissatisfaction made them expect an increase in quality for their future house.

Throughout this research, it was found that most Indonesian residents did gardening, followed by relaxation and exercise in their outdoor spaces during the lockdown period. This new lifestyle resulted in the shifting

preferences of private outdoor space types for their houses such as indoor terraces, gardens, and front terraces. This study also found the growing popularity of having a roof garden. Indonesian residents also have shifted preferences in how they access the outdoor spaces. Now, they prefer to have access to their private outdoor space through common zones of the house, not just from the parlor, but also from the living room and dining room. The result also shows growing demand of worker residents to have access to greeneries through their home office.

From the overall results, what is also interesting is how Indonesian residents currently have different views on outdoor spaces. This change is a result of the lifestyle of modern society and also changes in behavior after the COVID-19 pandemic. The results of this study emphasized the need to improve healthy residential design in the future, especially for the quality of the open space which can be one way to increase sustainability in residential buildings.

Research that focuses on the point of view of residents as the end users will be useful, especially for stakeholders for residential buildings, such as architects, interior designers, developers, and even the policymakers in shaping healthier housing environments. This research can be developed by examining the private outdoor space of specific house typology or specific regions in Indonesia for more contextual results.

5. Acknowledgements

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6. Conflict of interests

The authors declare that they have no competing interests.

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