

# Application of Space Flexibility Concept in Vertical Housing (Case Study: *Rumah Renteng*, Surakarta, Indonesia)

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**Abstract**— The development of vertical housing is an alternative in overcoming the community's need for limited affordable land. Most vertical dwellings are designed and adapted to the provisions and standardization of space that have been set. However, sometimes this causes problems for residents about the comfort of staying because of the limited space provided. As time goes by, the need for space for residents is also increasing. The limitations of the unit dimensions make them adapt by making some changes to their units according to their own wishes. These changes are made so that they get a comfortable stay and their activities can be fulfilled in their respective units. Occupants do many ways to make arrangements or changes to their units starting from changing the function of the existing space. The previous occupant's living culture from horizontal to vertical, requires residents to be able to adapt in a new environment. The purpose of this research is to see the form of space flexibility that is carried out by residents in vertical housing. The method used in this study uses a qualitative method. The results of this study are used to identify how residents adapt in adaptively to residential units in vertical housing.

**Keywords**— Occupant Adaptation, Space Flexibility, *Rumah Renteng*.

## I. INTRODUCTION

Urbanization is a factor in the rapid population growth rate in developing countries such as Indonesia. The continuous increase in population cannot be matched in the provision of housing, which has an impact on the growth of informal settlements on vacant lands belonging to the city (Adianto, 2016). These informal settlements also grew because of the inability of the informal community to reach formal houses in the city (Turner, 1976; Boonyabancha, 2009). Thus, informal settlements that grow in big cities in Indonesia arise due to the continued increase in population urbanization which is not directly proportional to the provision of residential land in the city (Sinaga, 2015).

According to Kotaku in 2016, the difficulty in dealing with slum settlements is caused by several factors, such as (1) limited land and (2) insufficient funds for housing development. The problem of limited land is very influential on the economic condition of the community, especially for low-income people because the formal housing provided has a very expensive price which is not in accordance with the economic conditions of the community as well. This is what causes low-income people to find it difficult and limited in

getting affordable housing. Based on sustainable development goals, which will encourage the use of effective instruments to be able to control pollution or environmental damage and can change people's behavior and habits (Santosa, 2000). Because of this, the development of vertical housing is an alternative strategy or effort made by the government in overcoming the community's need for housing amid the limitations of land issues in the middle of urban areas, one of which is joint housing. *Rumah Renteng* is one of the shared residences built vertically in the city of Surakarta.

As time goes by, the need for space for residents is also increasing. The limitations of the unit dimensions make them adapt by making some changes to their units according to their own wishes. These changes are made so that they get comfortable living and their activities can be fulfilled in their respective units (Tonmitr & Ogura, 2014). Occupants do many ways to make arrangements or changes to their units, starting from changing the function of the existing space, adding space vertically, turning a room into a multi-function room, limiting space to expanding the space. The flexibility of space that occurs is based on how residents get the comfort of living in the vertical dwelling.

The purpose of this study was to determine the form of space changes made by residents in vertical dwellings. In addition, this research is also to provide an overview and knowledge about how residents adapt to the limited space in their residential units and what changes occur in these spaces in order to create a comfortable stay.

## II. LITERATURE REVIEW

### A. Behavioral Adaptation of Occupants

The shift in living culture from horizontal to vertical requires an adaptation process from the residents. This adaptation process is based on differences in behavior between cultures living in horizontal and vertical settlements (Ananto, 2015). Adaptability is defined as the design capacity of space that allows users to adapt to their spatial needs in the available space and change the design of the space in terms of volume or size and function (Kisnarini, 2015). So that space can be a place for carrying out activities, but activities cannot be limited by a space (Septanti, 2015).

B. Space Flexibility

Adaptability has a close relationship with space flexibility where space flexibility is the ability to adapt to a space by utilizing one or more space functions that allow it to be used for various properties and activities and the pattern or arrangement of space can be changed as needed without changing the arrangement. building (Fauzia, 2014). Space is formed according to the relationship between activities, concepts, and physical attributes (Canter, 1997; Edge & Unlu, 2003). In its application, space flexibility has 3 concepts according to Toekio (2000), including:

1. Expandability

A concept that allows space to accommodate growth through expansion and can continue to grow according to the needs of its occupants.

2. Convertibility

A concept that allows for changes in orientation and atmosphere according to the wishes of the perpetrator without making major changes to the existing space.

3. Versatility

The concept that allows space to accommodate several activities or functions at different times or accommodate activities according to their needs in the same space (multifunctional).

III. METHODOLOGY

This study uses a naturalistic paradigm by using a qualitative research strategy to be able to bring up aspects that are changes or adaptations to residential units carried out by residents. The data obtained from the field were obtained directly through field observations and interviews with residents.

This study uses a naturalistic paradigm with a qualitative research approach. This is so that there is no distance between the researcher and the object under study (Groat & Wang, 2013). Qualitative research basically wants to find meaning and find in-depth understanding based on the object to be studied (Moleong, 1997; Cresswell, 2010). The use of qualitative methods is used so that researchers can interact and observe the object of research directly, so as to obtain data that is in accordance with field conditions.

The location in this study is located in *Rumah Renteng* which is one of the vertical residences in Surakarta City. The occupants of this *Rumah Renteng* were the original occupants of the residential site before it was rearranged by the Surakarta City Government.

IV. RESULT AND DISCUSSION

The human need for space to be able to move cannot be separated from the role of architecture itself. Residential units at *Rumah Renteng* are activities that are often carried out by residents in their daily lives, which can indirectly respond to the needs and desires of residents that can change over time. The use of flexible space can certainly give residents flexibility in managing their residential units (Warouw, 2010). So that the previously planned space will change its function or use depending on how the occupants can maximize the


existing space.

Space adaptability has a close relationship with space flexibility where space flexibility is the ability to adapt in a space by utilizing one or more space functions that allow it to be used for various properties and activities and the pattern or arrangement of space can be changed as needed without changing building arrangement (Fauzia, 2014).

The limited space in the units of the observed object allows the flexibility of space in which a room can become a multifunctional space. Based on the concept of applying flexibility proposed by Toekio (2000), it can be seen that most residents apply the concepts of convertability and versatility to their residential units.

TABLE I. Space Flexibility Matrix by Occupants

	Space Flexibility					
	Living Room - Bedroom	Living Room - Business Room	Living Room - Storage	Corridor - Living Room	Corridor - Storage	Corridor - Sunbathing Area
1	•	•	•	•	•	
2	•			•	•	
3	•				•	
4	•			•	•	
5			•	•		
6			•	•		
7			•			
8	•		•			
9	•			•	•	•
10	•				•	
11	•			•	•	
12	•	•	•	•	•	
13	•			•	•	
14	•		•	•	•	
15						
16						
17	•			•	•	•
18	•			•		
19	•		•	•		
20	•			•		
21	•			•	•	
22	•	•	•	•	•	•
23			•	•	•	
24	•					
25	•				•	
26	•				•	
27	•			•	•	•
28	•		•	•	•	
29	•			•	•	
30						
31						
32		•	•	•		•
33	•				•	
34	•					
35	•				•	
36		•	•	•		•
37						
38						
39			•	•		•
40	•				•	
41	•			•		
42	•			•		
43			•			
44			•		•	•

Note :  
 : A occupant who doesn't make any changes at all

Source : Author, 2022

Based on the results of the matrix in table 1, it can be explained that the spaces in the majority observation units have multiple functions (multifunction). These flexible spaces apply the concept of versatility, namely that space can accommodate several functions or functions at a certain time (Toekio, 2000; Fauzia, 2014).

TABLE II. Analysis based on the Concept of Space Flexibility

Space Flexibility	Analysis
<ul style="list-style-type: none"> <li>Areas in residential units with high flexibility are in the corridor and living room areas. Many functional changes exist in these two areas.</li> <li>The occupancy of the corridor area is due to the limited space available and the resident culture of the residents who are still on the site.</li> </ul>	<ul style="list-style-type: none"> <li>High flexibility in the corridor and living room areas makes both areas a multifunctional area, where the existing functions can change at any time according to the needs of the occupants.</li> <li>Even though there are some residents who have not made any changes at all, which means that the shape of the floor plan is still the same as at the beginning.</li> <li>Limitations on the area of the existing residential units due to the various activities, activities and needs of the occupants which are adjusted by each occupant.</li> </ul>

Source : Author, 2022

It is known that the living room and corridor are areas with a high degree of flexibility where many residents place multiple functions in the area. The living room in some of the observed units can be a bedroom at certain times. In addition, for units that have stalls in them, the living room is used as an area for selling. The corridor area in the observed units is used as a multifunctional room by residents. The majority of the corridor area is used as an area for drying clothes, storing things and can also be used as an area to receive guests (Figure 1).



Fig. 1. Some Functional Changes in Occupants

(a) bedroom become a storage (b) living room become a bedroom (c) corridor become a sunbathing area or storage

Source : Personal Documentation, 2022

The limitation of space is a common thing to do with different aspects of the size of the land area or space inversely proportional to the need for occupant space in a dwelling.

The uniqueness of this joint venture is that the residents who occupy it are the original residents of the Keprabon village. Where this indicates that the bond between citizens with each other is very strong. The types of work that the majority of *Rumah Renteng* residents do are temporary work, laborers, the private sector, traders, selling basic necessities and so on.

The reason for changing or adding to the function of the existing space is due to several factors such as:

- Increasing the number of family members in one house
- Changes in the needs of each occupant

The majority of residents in joint and joint houses are 3-4 people (Figure 2), while there are also many who live in one residential unit only 1-2 people. In one residential unit, only a few are occupied by more than 4 people.

Number of Family Members in One House

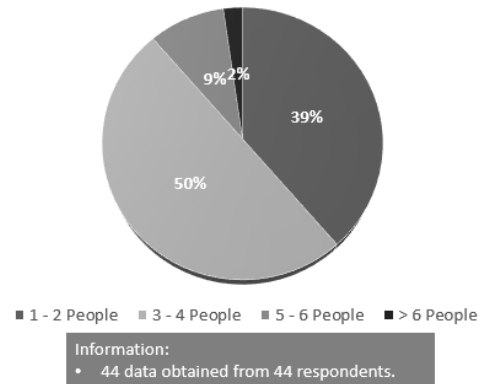


Fig. 2. Average Number of Occupants in One Unit  
Source : Personal Documentation, 2022

In addition, the majority of residents are nuclear families consisting of husband, wife and children (Figure 3). It can be seen that residents need to be able to adapt to the existing space compared to before. This indicates that the occupants must have adapted to the current occupancy by making additions in the form of partitions whose shape also cannot be permanent in accordance with the provisions or rules of the *UPT Rumah Susun* in Surakarta City.

Family Member Details

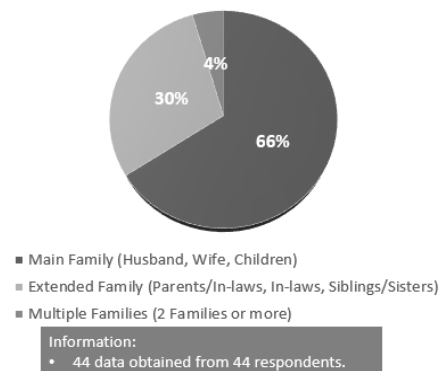


Fig. 3. Details of Family Members in One Unit  
Source : Personal Documentation, 2022

The limitations of the existing space do not prevent residents from adapting. The way residents adapt by making changes or additions made to the residential unit of each occupant according to their needs, whether it is seen from the number of residents or the needs of each existing occupant.

Changes or additions made by residents are based on physical or technical aspects (Figure 4), functional aspects or the two underlying aspects. So based on the data obtained, that the majority of residents make changes or additions based on aspects of function.

Changes or Additions made in the Residential unit

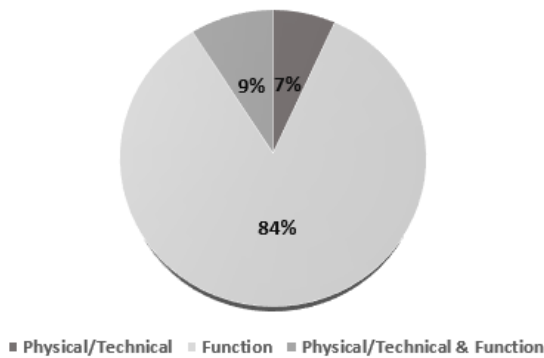


Fig. 4. Forms of Additions or Changes Made by Occupants  
Source : Personal Documentation, 2022

Space customization is seen in the corridors of each residential unit. It is seen that some units use the corridor as a place to put things due to the limited space in the units they have (Figure 5). Most of the items placed in the corridor are cupboards, shoe racks and chairs for guests.



Fig. 5. Some Changes to the Current Use of Corridor Functions  
(a) storage (b) living room (c) storage of unused items (d) sunbathing area  
Source : Personal Documentation, 2022

Based on the data obtained, the majority of residents changed the function of the floor plan before it was occupied in the balcony area and living room area, where the changes were:

1. Change the function of the living room into a bedroom
2. Change the function of the living room into a business area
3. Change the function of the corridor into a storage area
4. Change the function of the corridor as an area for drying clothes
5. Change the function of the corridor as a reception room

The limitations of the unit dimensions make them make some changes to their units according to their own wishes. These changes are made so that they get comfortable living and their activities can be fulfilled in their respective units. Where residents do many ways to make arrangements or changes to their units starting from changing the function of the existing space, by turning a room into a multi-function room or limiting the existing space.

## V. CONCLUSION

Based on the findings of the data, it was found that the application of the concept of space flexibility in vertical

occupancy occurred, namely that residents were more likely to make changes or additions to function rather than technically. The organization of space carried out by residents is more about how the activities and needs of residents, whether physically, functionally or economically, can be met at that time.

This is because changes and additions that occur are due to the culture of living in which residents are still horizontal. But after several years of residents living in vertical dwellings, residents can adjust each year by adapting according to the behavior of each occupant. So that each occupant will have their own characteristics and ways of meeting the limitations of the existing space and maximizing it well, although until now the impression is still not well organized.

Based on the findings of field data and associated with the theory used in space flexibility (Toekio, 2000), that the researcher supports the existing theory. That the application of the concept of space flexibility for low-income people is very necessary in adjusting to the level of community needs and economy. So that flexible and adaptive space areas are needed to be able to create a multifunctional space (Septanti, 2015).

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