

Exploration Of Spatial Arrangement Changes As A Form Of Spatial Sustainability In Dwelling. Case Study : *Kilungan* House in Kudus Old City, Indonesia

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ABSTRACT

Space is an architectural form that is used to accommodate activities with certain functions. In a space contained activities carried out by humans and functions that represent these activities. Sometimes during this period the space undergoes changes in activity and function. Space can undergo physical and non-physical changes to respond to changes in these activities and functions. *Kilungan* is a local term used to refer to the tall massive fence in the Old City of Kudus. The massive fence, known as the *kilungan*, was built with one of the goals to provide a sense of security. Inside the *kilungan* house, there are at least 2 main building masses, namely the main house and the supporting buildings. The spaces in the *kilungan* house which have been inhabited for more than 100 years have also undergone changes in response to the spatial sustainability of the dwelling. The purpose of this study is : (1) to explore and describe the spatial change; (2) to find and explain the meaning of the spatial change in the *kilungan* house. This study uses an inductive qualitative method. The initial stage is to make observations to get the distribution of the *kilungan* house. The research area is limited to the Old City of Kudus, Indonesia. The core stage of the research is data collection and analysis carried out simultaneously inductively. Exploration is carried out on cases to obtain findings in accordance with research objectives. The results of this study were found changes in spatial arrangement in the *kilungan* house in the form of: (1) changes in function without changing the physical form of space, found in spaces that accommodate different activities but have the same activity pattern; (2) changing the function of changing the spatial arrangement without changing the mass of the building; (3) changes in spatial arrangement change the physical building; (4) shifting activity changes zoning (5) Determining the direction of change does not change the orientation of the building in the circle. ; (6) Spatial sustainability in residential areas is indicated by changes in activities, functions, spatial arrangement but does not change the core things which are the concept of the *kilungan* house. Spatial sustainability can be found in the adaptations made by building users to new functions in the spaces in the dwelling.

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Keywords: change, spatial arrangement, spatial sustainability, occupancy

1. Introduction

Space in architecture is related to a place that accommodates certain functions and activities. Space can be defined by its scope. Scope of space can be divided into 3, namely the bottom scope, side scope, and top scope. The spaces in the dwelling have a specific function to accommodate the activities of the occupants. Over time, residential spaces can experience changes in function and activity. Changes in function and activity in space can change the physical form of space. The phenomenon that

underlies this research is a change in spatial arrangement caused by changes in functions and activities in the dwelling. Changes in function and activity get a variety of physical responses.

Rapoport, divides space elements in architecture into three types, namely fixed, semifixed, and non-fixed elements. Fixed elements are elements of space that are static and not easy to move, such as walls, floors or roofs. Semi fixed elements are elements of space that are easy to move or move, such as

furniture, curtains or pots. While non-fixed elements are more related to humans as users of space, for example movements and gestures of the human body. The layout of fixed and semifixed elements can affect the quality of space and human behavior who use the space or environment (Sativa, 2017). Meanwhile, Hillier and Hanson (1984) stated that the existence of humans and all their activities is a phenomenon of the existence of space itself. This relates to the relationship between space in architecture and the process of social interaction. In general, space allows humans to socialize, exchange information, and form specific territories, including in the form of buildings, roads, zones, markers or space dividers.

The material studied is the change in spatial arrangement in housing as a form of spatial sustainability, taking the case of the *kilungan* house in the Old City of Kudus. Changes in spatial arrangement is one solution to the problem of changing functions and activities in space. This change is generally used to answer spatial sustainability so that space can still be used even though its functions and activities have changed. *Kilungan* house is a local term used to refer to a house that is within the scope of a high fence. This *Kilungan* is a fence for residential territory in a massive form. The shape of the *kilungan* is not always a separate fence from the building, but there are times when the *kilungan* is also part of the building. Anisa explained that *kilungan* is a local term used by the people of Kudus *Kulon* (Kulon Old City) to refer to the high massive fence that surrounds the house. This *Kilungan* is related to the building that was built when the Old City of Kudus became a prosperous area of trade. (Anisa, 2004). This *kilungan* house is located in the Old City of Kudus, more precisely the area around the Kudus Tower. The Old City of Kudus or more often referred to as Kudus *Kulon* is an area that became the forerunner to the founding of the Kudus City, Central Java. Kudus City is a historic city because there is one Walisongo, Sunan Kudus, who preaches in

this area. Sunan Kudus preaches and lives in settlements around Menara Kudus. This settlement is unique not only because there are towers, mosques, and the tomb of Sunan Kudus, but also because of the unique settlements. The settlements around Menara Kudus are dominated by houses that are inside high walls, creating a road that looks like a long alley. The houses that are within the scope of this high massive wall are called *kilungan* houses. Another phenomenon found is the existence of the *Kilungan* house which has physically undergone many changes. This is what underlies the researcher to make the *kilungan* house a case that is in accordance with the material to be studied.

This research is a continuation of previous research, namely the House inside the *Kilungan* in the Old City of Kudus (Anisa, 2004), the Vernacularity Study of the *Kilungan* House in the Old City of Kudus (Anisa and Nuraini, 2020), and Identification of Building Arrangements in Vernacular Residential: The Case of Houses in Kudus Old City (Anisa and Lissimia, 2021). The purpose of this study is to explore, describe, and get the meaning of changes in space in the *kilungan* house.

2. Material and Methods

This research is a qualitative research, with the aim of exploring the spatial changes in the dwelling. The method used is an inductive qualitative method. Because the purpose of this research is to explore, this research uses an inductive qualitative method for the process of data collection and analysis. Setyowati (2013) revealed that qualitative research is a process of recognizing a problem based on efforts to build a complex and comprehensive picture. Qualitative research is formed with words/descriptions, reporting detailed views of informants conducted in natural settings.

The research material is a change in the spatial layout of the dwelling, namely the Kudus

traditional house. Data collection was done by direct observation and interviews with key informants. Observations were made on the existing conditions in 2022 to get an overview of the current spatial conditions, while interviews were conducted to obtain the original spatial data. The research location is the area around the Old Kudus City Center. The area boundaries used refer to the research of Wikantari and Narumi (1999). Based on initial observations of scanning the area, it can be found that several Kilungan houses are still preserved in their originality. Qualitative data retrieval is done by purposive sampling, namely selecting research cases using a specific purpose. The case studied is the case of the Kilungan house in complete condition and can be observed changes in its spatial layout.

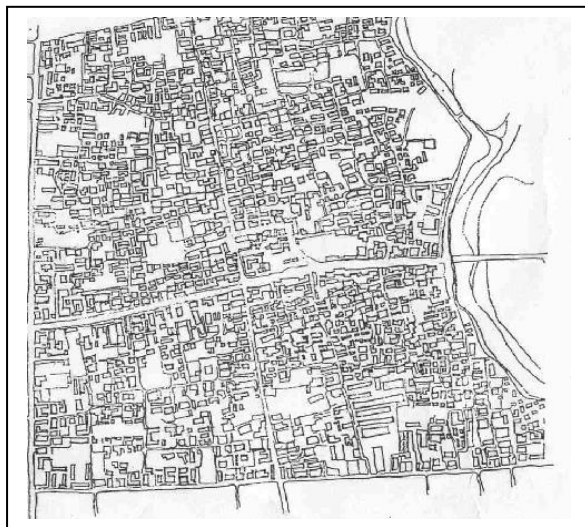


Figure 1. Scope of Research Area
(Source: Redrawn from Wikantari and Narumi, 1999)

In inductive qualitative research, the analysis process can be carried out simultaneously with data collection. Researchers become the main instrument so that the field observation process can be carried out simultaneously with interviews at one time. Bungin stated that data analysis in qualitative research is the central theme. Data is the only source of analysis that can only be used by researchers as a basis for analysis. Data will not be able to explain before

it becomes information. Meanwhile, information is a reality, namely a joint construction between researchers and informants. (Bungin, 2021)

Qualitative data analysis was carried out from the beginning down to the location during data collection by directly reducing, grouping, and so on until providing interpretation. The analysis was carried out continuously from the beginning to the end of the study. In the analysis activities, patterns, models, and research themes are sought. (Ashadi et al, 2018). The analysis of this study uses a manual analysis procedure or Manual Data Analysis Procedure (MDAP) with 5 steps, namely making transcripts-coding-categorization-theme-memos. These five steps are the steps taken when the analysis uses MDAP.

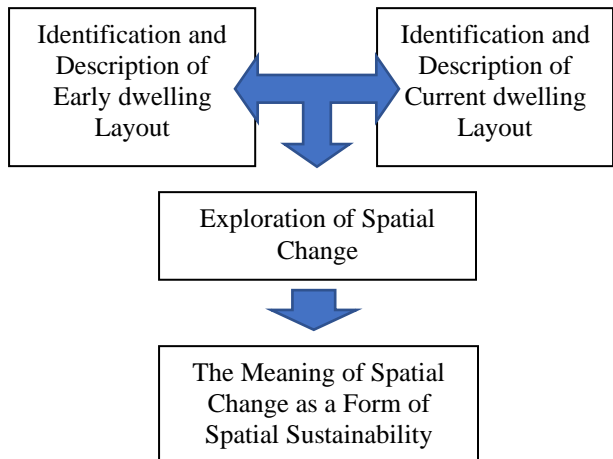


Figure 2. Stages of Analysis

While the detailed analysis stages can be divided into 3 steps, namely: (1) Identification and description of the initial layout of the dwelling; (2) Identification and description of the current dwelling layout; (3) Exploration of Spatial Changes; (4) The meaning of spatial changes as a form of dwelling spatial sustainability.

3. Results and Discussions

Exploration to get the meaning qualitatively is done through four stages. The following is an explanation of each stage of research that has been carried out to explore changes in spatial arrangement in dwelling areas.

3.1. Identification and Description of Early Occupancy Layout

The housing that became the research case was the *kilungan* house in the Old City of Kudus. *Kilungan* is a local term used to refer to a high fence that separates the house from the surrounding environment. This *Kilungan* is not only a physically high massive wall, but also non-physically has a special meaning. The *kilungan* house from the outside looks like a mass of buildings but when viewed from the inside, the *kilungan* house consists of several masses of buildings and the courtyard in between. The *kilungan* houses in the Old City of Kudus were built in the 1800s. This house is a work of vernacular architecture that accommodates the needs of its users. At that time, the people of the Old City of Kudus were a society with two main activities that stood out, namely trading activities and recitation activities. These two activities are reflected in the spatial arrangement. Trading activities are carried out in the *sisir* building. Recitation activities are carried out in *jogosatru*, *gedongan*, and *pawon*.

Spatial arrangement in housing is related to the relationship between spaces and the activities contained in them. The arrangement of residential space accommodates the daily activities carried out by its users. The initial spatial exploration of the dwelling was obtained through field observations and interviews, starting with the exploration of activities in the dwelling. In the research case, the initial activities that can be described are divided into two, namely routine residential activities and business activities. The initial themes found in all cases were two main activities that were accommodated in one house. The definition of

the house in the housing studied includes several building masses.

The layout of the initial mass of housing has the same pattern, namely there are several building masses in the *kilungan*. In the case studied, the main building is a house with the original form of a traditional Kudus house with a 2-dimensional carved wooden *gebyok*. In the main building or residence there are three main rooms, namely *jogosatru*, *gedongan* and *pawon*. In the case studied, there are two *pawon* rooms, namely in the *west* and *east* of the *gedongan*. At the front of the main building, adjacent to the yard there is a *sisir* building. This *sisir* building is built with bricks. The shape of the *sisir* building mass extends following the main building in front of it. The *sisir* building was used as a secondary food warehouse and a trading place.

In the main building, there are the following spaces: (1) *jogosatru*, is a public space in the house; (2) *gedongan*, is a private room in the house which also contains rooms; (3) *pawon*, used as a place for family activities. In this case, the two *pawons* have different functions. West *Pawon*, which is inside is used as a place for family activities. Only people closest to home users can enter it. This house borders the road on the east side. The *east pawon* is used as a place to receive guests, the same function as *jogosatru*. Because the owner of the house is a trader, often intermediaries (brokers) gather in this house. In its development, on the east side an elongated room was added and opened to the street. This space is used as a place for trading activities including displaying merchandise. At the rear, there is an additional warehouse because the *sisir* building is not sufficient to store merchandise.

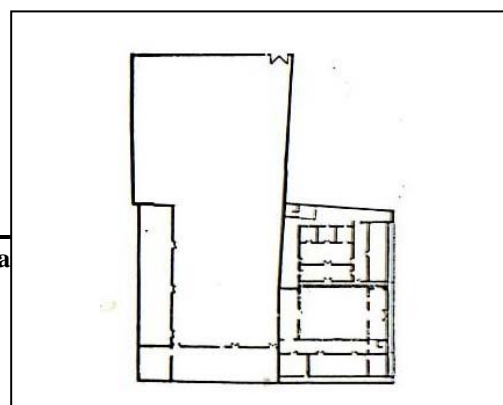


Figure 3. Early condition site plan the kilungan houses
(Source: Analysis based on observations and interviews)

There are 2 types of building arrangements in the *kilungan* found in previous studies (Anisa and Lissimia, 2021). Both types are related to the main building form. In the *kilungan* house with the main building in the form of a traditional Kudus house or a traditional Kudus house pattern, the orientation of the building is on the courtyard that is between the main building and the supporting buildings. While in the *kilungan* house with the main building form, the *gedong* house, the orientation of the mass of the building is on the 2 pages in it. The majority of the types found are type 1, with a centered orientation on the page in front of them. This is also related to the arrangement of the central area of the Kudus Old City, as a place where *kilungan* houses are found.

3.2. Identification and Description of Current Residential Layout

The *kilungan* houses in the Old City of Kudus are quite old buildings. Starting in the 2000s this building has entered the age of 200 years. Based on a survey conducted in 2022, some of the *Kilungan* houses can still be traced. However, most have undergone changes, especially in the wall material and the pattern of the space. This change cannot be avoided because the building users and the space requirements in the *kilungan* house have changed. The case studied is a *kilungan* house that has undergone changes but physically can still be seen the original pattern.

The arrangement of the masses has not changed, but the spaces have changed. Changes

in space include changes in function, changes in spatial patterns, changes in zoning, and changes in room names. The four changes were obtained based on the results of field observations and in-depth interviews with the owners and users of the *kilungan* house.

Jogosatru, as a public space in the main building, had an initial function as a reception room. The pattern of the *jogosatru* space still exists, but has changed. Changes in the function of this space is from a living room to a room. When it is used as a living room, in this room there are doors to the outside and inside. But when it is used as a room, this room only has a door to the inside. While the outer direction is maximized for windows with a wide size. The change in the spatial pattern that occurs is that the space initially extends 3.5x10 m and then is divided into two spaces, each measuring 3.5x5 m. Zoning changes occur from public to private zoning.

East *Pawon*, the initial function of this space as a living room and a place of trade. When this *kilungan* house was built, the merchandise in this house was palawija. Now this room is used as a living room. Ten years ago this room was still used as a reception room and a plastic shop, but since 2 years ago the plastic shop was closed. This space has not changed the pattern or zoning. The changes that occur are the reduction of activity and space names. West *Pawon*, in general, still has the same function, namely as a place of daily activities. This western *Pawon* is quite wide. The size is 10 meters wide which is divided into a room, yard and kitchen. The kitchen is a very spacious room because it was originally cooked using firewood. The kitchen was originally also used as a dining room. Cooking and eating activities are in one space without a partition. The current condition of the West *Pawon* Room has undergone several changes. These changes do not change the function and zoning. The changes that occur are the addition of activities and space names. This large space is now used

as a kitchen, bathroom, dining room, lounge, and reading room.

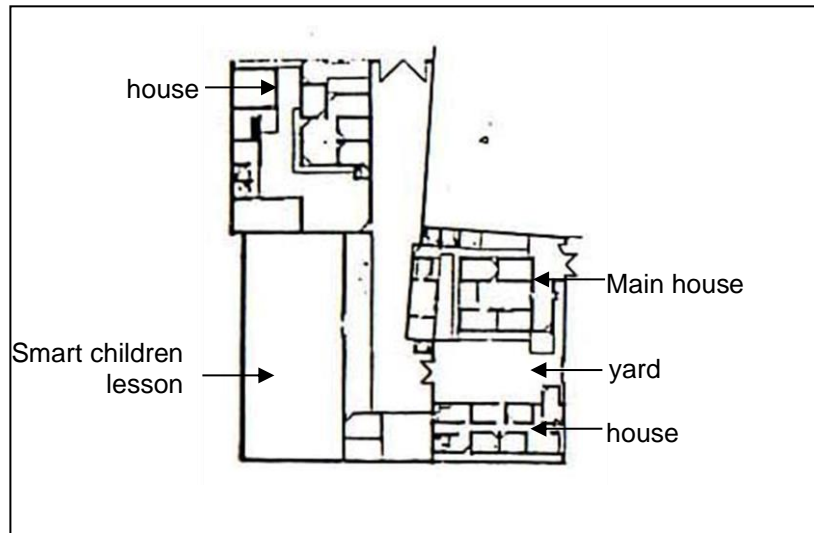


Figure 4. One of the Plans of the Kilungan House Now
(Source: Field Observation, 2022)

The *sisir* building in front of the main building is currently being used as a house. The shape of the building mass has not changed. The building that was originally used as a warehouse is long without a partition. Now it is used for houses with spaces: living room, 3 bedrooms, prayer room, kitchen, grocery store and bathroom. Changes that occur are changes in function, changes in spatial patterns, changes in zoning and space names. The warehouse on the back side is no longer used as a warehouse. This large room is used as a place for Smart Children's lessons. Functionally, it has changed from a warehouse to a non-formal education facility. However, these two functions represent business and trade in the *kilungan* house.

3.3. Exploration of Spatial Change

Based on the identification and description that has been done, seven themes were found related to changes in the spatial arrangement of the *kilungan* house. The themes of the findings are the main building form and initial function, changes in function, changes in spatial

arrangement, direction and pattern of changes, changes in space zoning, building orientation, and the determining elements of change. The following will be explored between themes and dialogue between themes will be carried out to build memos.

The shape of the main building in the *kilungan* house will affect the arrangement of the mass of the building in it. In general, there are 2 main building forms at the beginning of the establishment of the *kilungan* house, namely the main building of the Kudus traditional house and the main building of the *gedong* house or European-style house. While the main building forms found at this time are divided into 3, namely the Kudus traditional house, the *gedong* house, and the Kudus traditional house which has undergone changes. This third type is commonly found in the field. The wall of the *kilungan* has not changed physically, but the building inside has changed.

Table 1. Spatial Changes

No	Early condition		Current condition		transformation
	Room name	Function	Room name	Function	
1	<i>Jogosatru</i>	Receive guests	Room	Rest	Room name, activity, function, zoning
2	<i>Gedongan</i>	rest and save valuables	Room	rest	Room name
			Family room	Gather together	
3	<i>Pawon 1 (east)</i>	Living room and trading area	Sitting room	Receive guests	Room name
4	<i>Pawon 2 (west)</i>	Accommodate daily activities	Dining room	Eating together	Room name, activity and function
			Kitchen	Cook	
			Ironing Room	Ironing	
			Library	Read a book	
			The lounge	Relaxing activities	
			Bathroom		
5	<i>Sisir building</i>	Warehouse and place of business	Sitting room	Receive guests	Room name, activity, function, zoning
			Room	Rest	
			Dining room	Eat	
			Kitchen	Cooking	
			Bathroom		
			Islamic Prayer room	<i>Sholat</i>	
			Shop	trade	
6	Back warehouse	warehouse	Course Place	Place of business - Non-formal education facilities	Room name, activity and function

(Source: Field observations and interviews, 2022)

The initial function in the house in general did not change. The house is used as a residence and a place of business. The change that occurs is the type of business that is in the house. At the beginning of its establishment, the majority of the business was in the tobacco trade. Current conditions, businesses in the home are more diverse.

The spaces in the *kilungan* house have changed. These changes are divided into 3, namely: (1) changes in the function of space without changing the physical form of space; (2) changes in the function of space change the spatial arrangement without changing the mass of the building; (3) Changes in spatial arrangement change the physical building. Changes in space essentially occur because of changes in the activity and function of space. Changes in function without changing the physical form of space, are found in spaces that accommodate different activities but have the same activity pattern. Findings in the field, public space (*jogosatru*) is used as a room

because the pattern of activities is the same even though the zoning is different. *Jogosatru* is a public space to receive guests. While the room is a private room that is used for rest. The zoning is different, so the solution to maintaining privacy in private spaces is done by closing the front door. The room can only be accessed through the family room. Although the rooms are located at the front of the building, access is still from inside the building. Another finding of changes in function is that the *pawon* room used for daily activities has changed in the form of additional functions. *Pawon* is not only used for cooking and eating but also for leisure activities and reading rooms. This happens because of the large dimensions of the space that allow for additional functions with the comfort of the same space. The warehouse or place to store merchandise is a building that is always present in the *kilungan* house. This warehouse also includes buildings that are maintained with function adjustments. In the research case, the warehouse has undergone several changes, namely as a

secondary food storage, tobacco storage, as a school building, and its current function is as a non-formal education facility.

The next finding, the change in function changes the spatial arrangement without changing the mass of the building. In this finding, the building physically did not change. But changes can be observed when entering the spaces in it. Changes, especially in the activities and functions in the building. An example of a *sisir* building is a building opposite the main building. The main function of the *sisir* building is a place of business, but in its development the *sisir* building has changed. The *sisir* building is used as a dwelling because of the housing needs of the descendants of the owner of the house. Whereas initially the *sisir* building was used as a place for trade in secondary crops and tobacco. The changes that occur are that on the inside of the building a permanent partition is made for spaces but does not change the external shape of the building. Another finding is that the spatial arrangement changes the physical building, in this case the original form of the sacred traditional house was found in the *jogosatru* section which was initially open (because of a public function) then turned into a wall because it was used as a room.

Changes can be observed through historical interpretation (diachronic analysis) and network analysis/present conditions (synchronic analysis) (Loeckx and Vermeulen in Sesotyaningtyas, 2021). Meanwhile, according to Habraken, transformation can be observed based on the order of form, territorial order, and cultural order. Spatial transformation in an area can also be caused by several internal (local residents) and external factors. (Sesotyaningtyas, 2021)

The zoning of the space changes according to the needs of the activities in the space. In the main building in the form of a traditional Kudus house, *jogosatru* is the most accessible public space for everyone. This ease of access can be seen from the wide door at *jogosatru* which borders the courtyard and is visible from the main door of *kilungan*. In the research case, after the *jogosatru* turned into a room, the access also changed. This happened because the public zoning changed to private. The zoning of residential space in the main building extends, on the other hand, the zoning of business spaces outside the main building expands. This finding relates to changes in business activities that occur in the *kilungan* house. Current business activities are located in other buildings outside the main building.

Although there have been some changes in the layout and mass of the building, the orientation of the *kilungan* house has not changed. The element that determines the orientation of the building is the main yard between the main building and the supporting buildings. This main yard is an element that is seen directly from the direction of the door. The final finding from the exploration of this change is that the changes in the activities in the *kilungan* house are the determinants of change. So that this *kilungan* house is an example of vernacular architecture that adapts as a form of spatial sustainability.

Exploration findings relate to Rapoport (Snyder and Catanese, 1989) which reveals that in fact the main nature of space is a place between humans to meet each other, share food, and also to mark places in order to show personal or group territories. In essence, there is a close relationship between space and human social activities.



Figure 5. example of zoning changes: (left) initial zoning; (right) zoning now

3.4. The Meaning of Spatial Change as a Form of Occupancy Spatial Sustainability

Based on the themes of the findings described in the previous section, a memo framework or theorizing of findings on the meaning of spatial change as a form of residential spatial sustainability can be made. Occupancy is an embodiment or container of the needs of its inhabitants. The building and space in the dwelling represent the activities carried out by its users. So that in housing that is used for generations there will be changes that are tailored to the needs of its users. The housing that is the case of the research is the *kilungan* house, which consists of several building masses and has been occupied for more than 100 years. In that time span, spatial changes occurred as a form of sustainability. It can be concluded as a theorization that the form of spatial sustainability of housing in the *kilungan*

house occurs through a process of space adaptation as a solution to changes in functions and activities that occur in it. This adaptation occurs on a micro scale, namely the spatial arrangement that is tailored to the needs. Adaptation is done by minimizing the physical changes of the building. So that in the *Kilungan* house in terms of mass there is no significant pattern of change, because changes occur in the spaces. In line with the findings of the theorization, Wulung (2021) states that sustainable development has a high level of adaptation in the face of change. Meanwhile, Kusumastuti (2019) stated that in planning, the spatial aspect is the main aspect that is planned.

Adaptation as a solution to spatial change, is carried out by adjusting the space with new functions without changing the physical pattern of the building. So there is a zoning shift. Zoning of space undergoes changes in location

and size. Zoning space for economic activities is narrowing, but zoning for private activities is expanding. Another finding that builds the theory is the direction and pattern of spatial changes. The direction of spatial change is from general to specific functions. Many spatial changes occur in spaces with general functions rather than private residential spaces. Determining the direction of change does not change the orientation of the building in the circle. The buildings inside the circle are oriented to the courtyard. Although the function and arrangement in the building has changed, the orientation of the courtyard in front of it is

still there. Spatial sustainability in housing is shown by changing activities, functions, spatial planning but does not change the core things which are the concept of the *kilungan* house. Spatial sustainability can be found in the adaptations made by building users to new functions in the spaces in the dwelling. Based on the analysis, it was found that adaptation as a form of spatial sustainability that occurs in the *kilungan* house is a tiered or stratified adaptation. The main level is the adaptation of the residential zone. So the occupied function becomes the priority function.

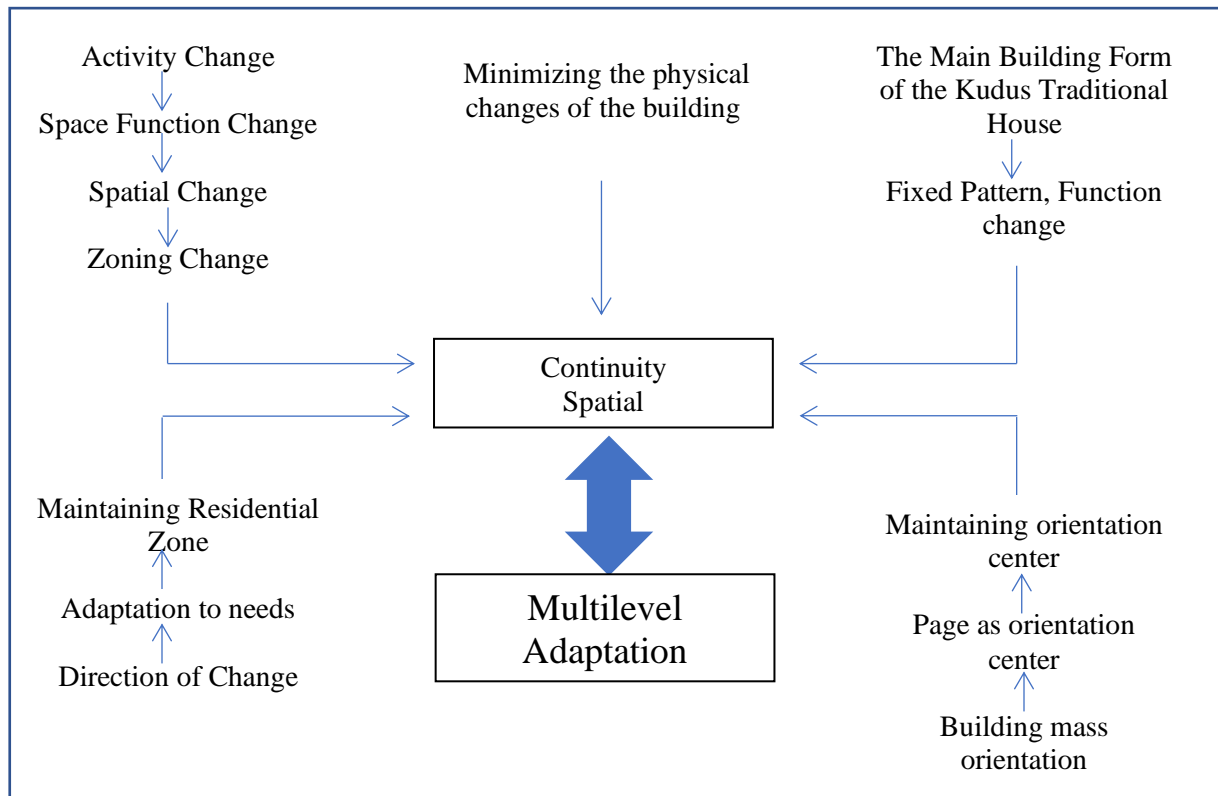


Figure 6. Dialog scheme between Finding themes
 (Source: Theorization of Analysis, 2022)

4. Conclusion

Based on a qualitative analysis of the exploration of spatial planning changes as a form of spatial sustainability in the *kilungan* house, the following conclusions are obtained:

(1) There are several types of physical and non-physical changes. Physical changes are related to the spatial arrangement and the mass of the building. Non-physical changes are related to changes in functions and activities observed during the research process;

(2) Changes in function without changing the physical form of space, are found in spaces that accommodate different activities but have the same activity pattern;

(3) changing the function of changing the spatial arrangement without changing the mass of the building;

(4) changes in spatial planning change the physical building;

(5) shifting activity changes zoning

(6) Determining the direction of change does not change the orientation of the building in the circle;

(7) Spatial sustainability in housing through a gradual adaptation or adjustment process. The main adaptation to the residential function, as the main function of the current *kilungan* house. This is different from the conditions when the *Kilungan* house was built. The initial condition of the *kilungan* house was built to accommodate the same large residential and business functions. The business function is still found at this time only experiencing changes in types and shifts in zoning.

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