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Form of Spatial Flexibility in Lanting House Dwellings in Palangka Raya City

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ABSTRACT

The geographical condition of Kalimantan Island, which has many rivers, indirectly influences the formation of the city's character. This condition led to the formation of river culture or defined as a civilization based around rivers. This led to the presence of lanting houses as an architectural product resulting from river culture. The issue that is currently developing is maintaining the architectural products of lanting houses, which are the identity of the City of Palangka Raya and must be preserved. The problem that occurs is that residents of lanting houses have challenges, namely limited space. Limited space makes residents of lanting houses use the space in lanting houses as efficiently as possible. Lanting house residents adapt to complex and varied activities by adjusting the space in the lanting house. This research examines the form of an individual's ability to adapt to limited space through spatial flexibility in a lanting house. This research uses a mixed method to review phenomena based on experiences with architecture. The phenomenon referred to in this research is the experience of the residents of the lanting house regarding limited space. It is hoped that this research can provide an overview of the forms of spatial flexibility that occur in limited spaces in buildings on water or lanting houses in Palangka Raya City. The research implications contribute to sustainable housing development strategies for riverine communities, inform cultural preservation policies for traditional architecture, and provide design guidelines for space-efficient dwelling solutions in water-based settlements.

KEYWORDS *Flexibility, Lanting Houses, Spaces*

INTRODUCTION

The city of Palangka Raya is one of the largest cities in Indonesia with a variety of abundant natural resources. The city of Palangka Raya, like most cities in Kalimantan, has the characteristics of settlements concentrated in watersheds, swamp areas, and wilderness (Hamidah et al., 2014, 2016; Hamidah, Rijanta, et al., 2017). Therefore, the characteristics of the settlements there mostly follow the direction of the river. This characteristic gave birth to *river culture*, meaning that most of life revolves around rivers. The characteristics of a place are very important because people often define themselves based on where they live. These characteristics are influenced by the surrounding environment (Casakin et al., 2015; Cockrell, 2021; Donald, 2022; Lomas et al., 2024; Weil, 2023; Zahid & Misirlisoy, 2021). The settlement pattern on the banks of the Kahayan River has a linear pattern following the river and walkway patterns (tatau wijaya garib et al., 2021).

River-based settlements are not unique to Indonesia but represent a global phenomenon observed across tropical regions. Similar patterns exist in Thailand's floating markets along the Chao Phraya River, Vietnam's traditional stilt houses in the Mekong Delta, and Cambodia's floating villages on Tonlé Sap Lake. These settlements demonstrate how communities adapt

their architectural solutions to aquatic environments, creating sustainable living patterns that have persisted for centuries. The phenomenon reflects broader themes of environmental adaptation and cultural resilience in Southeast Asian riverine communities (Hamidah, Garib, et al., 2017; Hamidah et al., 2018; tatau wijaya garib et al., 2021; Yasin et al., 2020).

Previous studies have established important foundations for understanding river-based settlements and spatial flexibility in traditional architecture. Research on river-based settlements in Kalimantan has been conducted by Hamidah et al. (2014), who examined settlement patterns along the Kahayan River and documented the linear development following waterway patterns. Studies of Indonesian archipelago settlements by Daryanto (2016) provided typological analyses of floating house structures, establishing classification systems for water-based dwellings. Vernacular architectural studies of stilt houses have been extensively documented by Tandal (2011), who analyzed behavioral approaches in traditional architecture and demonstrated how environmental conditions influence structural adaptations. Research on spatial flexibility in traditional architecture has been explored by Sutanto & Ariaji (2022), who examined behavior-based design approaches and demonstrated how users adapt spaces to meet changing needs. However, these studies have not specifically addressed the spatial flexibility strategies employed by *lanting* house residents from the perspective of user experience and adaptation patterns.

As development has progressed in Central Kalimantan, many new buildings have been constructed, including unplanned settlements on the banks of rivers (Hamidah et al., 2014). The settlements on the banks of the Kahayan River mainly consist of riverside houses. Riverside houses consist of three types, namely *lanting* houses that float above water, stilt houses built between land and water, and land houses, which are usual houses encountered on land. Unlike typical houses, the *lanting* houses on the banks of the Kahayan River have the unique characteristic of floating on the river water. This led to the presence of *lanting* houses as an architectural product resulting from *river culture*. The issue developing today is how to maintain the architectural products of *lanting* houses, which are the identity of the City of Palangka Raya and must be preserved.

The problem arising from this issue is that residents of *lanting* houses face challenges, namely limited space. Limited space makes residents of *lanting* houses use the available space in their homes as efficiently as possible. Residents adapt to complex and diverse activities by adjusting the space within the *lanting* house. This adjustment allows the same room area to accommodate different needs.

According to data from the Central Kalimantan Provincial Housing Office (2023), there are approximately 1,247 traditional stilt and floating houses remaining in Palangka Raya City, representing a 35% decline from 1,918 units recorded in 2010. This downward trend reflects modernization pressures that threaten traditional housing forms. The Central Statistics Agency (BPS) data indicates that 68% of these traditional dwellings have areas between 36 and 54 square meters, significantly smaller than contemporary housing standards, necessitating innovative spatial solutions by residents.

The adjustments carried out by the residents of these *lanting* houses are based on the concept of space flexibility. Space flexibility is defined as the ability to adapt within a space or can be understood as the ability to organize space by using one or more functions of a space. Flexibility in the use of space is also characterized by a space's ability to accommodate various

purposes and activities, which can be achieved by changing the spatial layout if necessary without altering the building's overall layout.

The practical urgency of this research is heightened by several critical factors: the accelerating threat of modernization displacing traditional houses in favor of concrete structures, weak regulatory frameworks for preserving local architectural heritage, and the absence of systematic documentation of spatial adaptation strategies. Current urban development policies in Palangka Raya do not adequately address the preservation of traditional housing forms, while rising land values along riverbanks create pressure for redevelopment. Understanding spatial flexibility becomes crucial for developing sustainable housing solutions that maintain cultural authenticity while meeting contemporary living standards.

The novelty of this research lies in identifying the spatial flexibility of *lanting* houses from the residents' perspective, which has never before been systematically studied in the context of Kalimantan vernacular architecture. While previous studies have focused on typological classification and structural analysis of traditional houses, this research uniquely examines user-driven adaptation strategies and behavioral patterns that enable residents to maximize limited space. This resident-centered approach provides insights into indigenous spatial solutions that have evolved through generations of practical experience, offering valuable lessons for contemporary sustainable design.

This research aims to identify and analyze the forms of spatial flexibility employed by *lanting* house residents as strategies to maximize space efficiency and cultural sustainability. The specific objectives include: (1) documenting various spatial adaptation strategies used by residents to accommodate multiple functions within limited space, (2) analyzing the relationship between resident needs, activities, and spatial arrangements in *lanting* houses, (3) categorizing the types of flexibility (versatility, expandability, adaptability, movability, and universality) observed in *lanting* house spaces, and (4) understanding resident perceptions of spatial comfort and functionality in relation to their daily activities.

The benefits of this research are multifaceted and significant. Academically, it contributes to the growing body of knowledge on vernacular architecture and spatial adaptation in Southeast Asian riverine communities, providing empirical data on user-driven spatial solutions. Practically, the findings inform sustainable housing development strategies for similar communities facing space limitations and urbanization pressures. Culturally, the research supports preservation efforts by documenting traditional spatial practices and demonstrating their continued relevance. Policy-wise, the results provide evidence-based recommendations for developing housing regulations that support cultural preservation while meeting contemporary needs. The research outcomes can guide architects and planners in designing culturally appropriate and space-efficient housing solutions for riverine communities, not only in Indonesia but throughout Southeast Asia where similar challenges exist.

METHOD

This research employs a mixed-method research strategy conducted in Pahandut and Pahandut Seberang Villages, Palangka Raya City, Central Kalimantan. The research location

was selected based on the concentration of traditional *lanting* houses and accessibility for comprehensive data collection. A mixed-method research strategy combines quantitative and qualitative methods to produce more complete and in-depth data. (Creswell, 2007) Data collection utilized three primary techniques: literature study for theoretical framework development, systematic observation for documenting spatial arrangements and flexibility patterns, and in-depth interviews for capturing resident experiences and perceptions.

Data collection involved literature study, observation, and interview methods. The research objects were selected from *lanting* houses in Pahandut and Pahandut Seberang Villages, Palangka Raya City. Data sources included 15 *lanting* houses chosen through purposive sampling based on representativeness of spatial configurations, resident demographics, and accessibility. Primary data were collected through house observations, resident interviews, and photographic documentation, while secondary data were obtained from government housing statistics, previous architectural studies, and urban planning documents. Literature studies were used to collect data from sources related to space, residents' perceptions, *lanting* houses, and spatial flexibility.

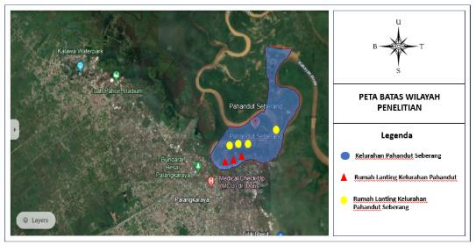

Figure 1. Map of the Boundaries of the Research Area

Observation techniques involved systematic documentation of spatial arrangements, furniture placement, space utilization patterns, and adaptation strategies in each *lanting* house. Structured observation protocols recorded spatial dimensions, functional zones, and flexibility mechanisms employed by residents. Observation was used to examine the solutions applied by residents to the challenges of limited area and remodeling of existing buildings, the flexibility of interior elements and facilities within the rooms, and the ways users take advantage of the spatial flexibility.

In-depth interviews were conducted with household heads or primary space users to understand their spatial adaptation strategies, comfort perceptions, and daily space utilization patterns.

Data analysis employed qualitative descriptive analysis and thematic analysis methods following Miles and Huberman's (1992) framework, involving data collection, data reduction through coding and labeling, and conclusion formation. The thematic analysis process included initial coding, cluster formation, and theme development to identify spatial flexibility patterns and resident adaptation strategies. According to Miles and Huberman (1992), the stages for analyzing thematic data consist of data collection, data reduction, and conclusion-making. In the data reduction stage, labeling (coding) is performed with the goal of organizing or processing data and assigning themes.

RESULT AND DISCUSSION

The presentation of the results and discussion of this research consists of two parts, namely the discussion of observation data and interview data. The presentation of the data obtained is divided based on aspects and indicators that have been prepared beforehand. In this research, the presentation of observation data and interviews of lanting houses is categorized into several codes to facilitate the data processing and analysis process. The code is in accordance with the data taken from the lanting houses, which are as many as 15 lanting houses. The division of lanting house codes is arranged in the following table.

Table 1. Object of Lanting Houses

No.	Lanting House	Code
01.	Mr. HS	A1
02.	Mr. SR	A2
03.	Mr. DS	A3
04.	Mr. YS	A4
05.	PR Mother	A5
06.	Mrs. MN	A6
07.	Mr. AR	A7
08.	Mr. NL	A8
09.	Mr. LI	A9
10.	Mr. JH	A10
11.	Mr. LK	A11
12.	Mr. IJ	A12
13.	Mr. SN	A13
14.	Mr. BN	A14
15.	Mr. PS	A15

After the lanting house code is prepared. Then it was discussed about all aspects found based on field data from each of the lanting houses that had been collected. After that, analyze the form of spatial flexibility based on the occupant's perception of the space.

Overview of Lanting House

Of the 15 lanting houses that have been observed, aspects such as spatial layout, space area, number of spaces, and background of residents are then arranged and seen. Here is an overview of the lanting houses that have been found.

Based on the aspect of layout, the lanting house has the following plan.

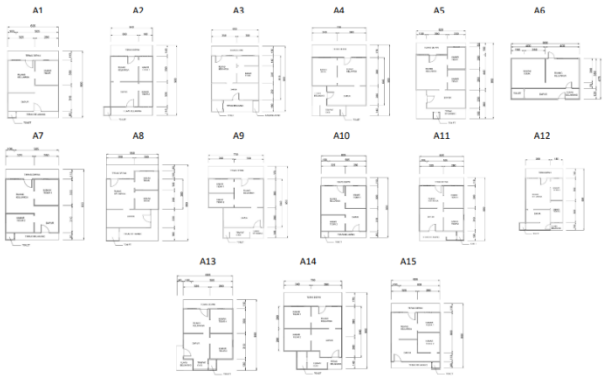

Figure 2. Lanting House Plans

Based on the aspect of space area, the lanting house has the following room area.

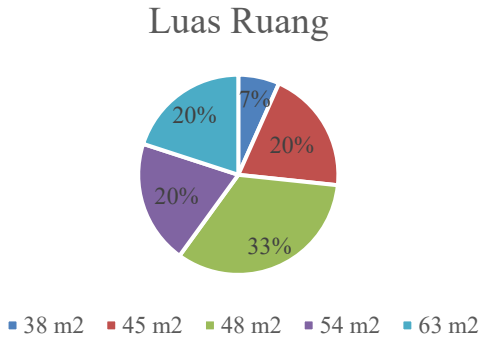

Figure 3. Percentage of Lanting House Space

Based on the aspect of the number of spaces, the lanting house has the following number of rooms.

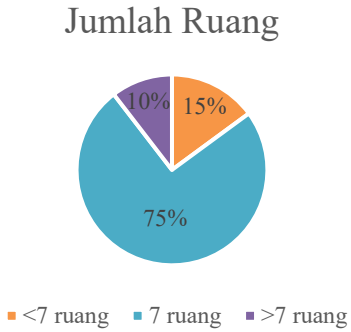

Figure 4. Percentage of Total Lanting House Space

Based on the background aspect of the residents, the number of jobs for residents of the lanting house has the following amounts.

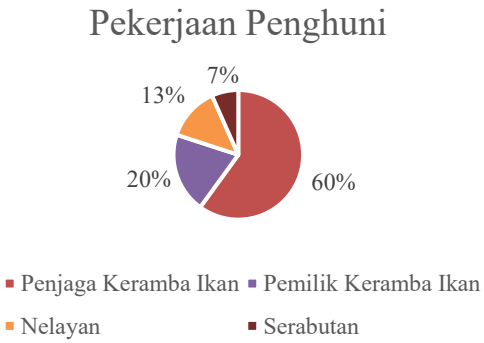

Figure 5. Percentage of Occupant Occupation

Based on the background aspect of the residents, the lanting house has the following number of residents.

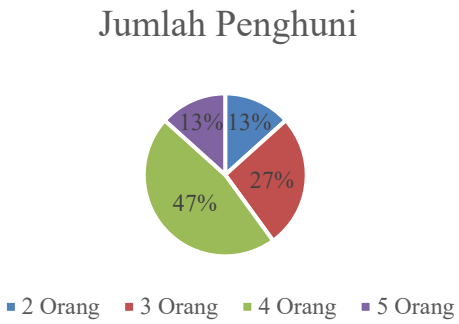

Figure 6. Percentage of Population

Form Flexibility

The lanting house has several rooms. In each of these rooms, there is a form of flexibility found when collecting data in the field. This form of flexibility is explained below.

a. Versatility

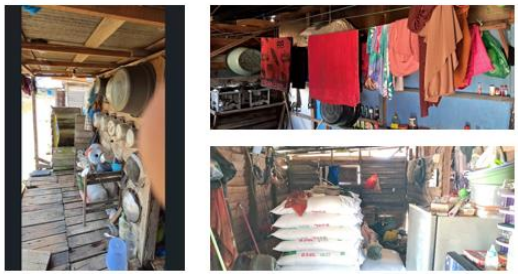

Figure 7. Forms of Versatility of Lanting Houses

From observations in the field, it was found that a number of forms of versatility flexibility are found to be a room used multifunctionally for various activities as shown in the following table.

Table 2. Forms of Versatility Flexibility

No.	Room	Form Flexibility
01.	Kitchen	As a place to cook, receive guests, eat, wash clothes, store clothes and store fish feed.
02.	Front Porch	As a place for cooking, storing fishing equipment, storing fish feed and drying clothes
03.	Rear Porch	As a place to wash kitchen utensils, store kitchen utensils, and dry fish.
04.	Living Room	As a place for prayer, eating, receiving guests and a massage place.

b. Expandability

From observations in the field, a number of forms of space flexibility are found to be expandable, namely a form of flexibility, namely space that can be developed according to the needs of residents and desires through increasing the area of space as shown in the following image.

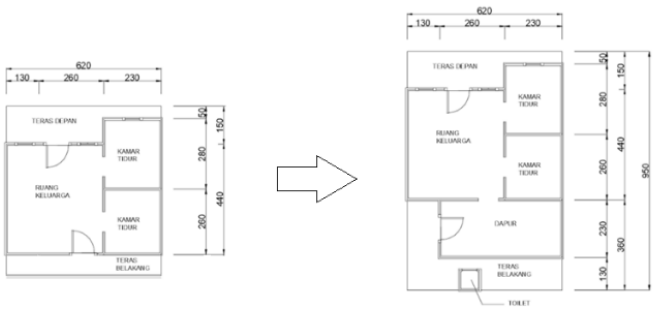

Figure 8. Form of Expansion of Lanting House

c. Adaptable

Figure 9. Adaptable Shape of Lanting House

From observations in the field, a number of forms of Adaptable flexibility were found, namely a form of flexibility in which a design is able to adapt to changing user and environmental needs over time as shown in the following table.

Table 3. Adaptable Flexibility Form

No.	Room	Form Flexibility
01.	Kitchen	There is a need to store bottles and kitchen utensils, making residents create innovations by making places like *kitchen sets* that are formed on the kitchen wall
02.	Front Porch	There is a need for cooking so that residents take advantage of the space by making stoves from firewood for cooking places.
03.	Rear Porch	There is a need to dry the fish caught so that the residents take advantage of the space on the back terrace to dry the fish.
04	Rear Porch	There is a need to raise chickens so that the residents take advantage of the space on the back porch to make chicken coops.
05.	Living Room	There is a need to carry children so that residents create innovations by making a carrying device that is tied to the ceiling as a children's swing.
06.	Living Room	There is a need to store fish feed so that residents use the space on the ceiling as a place to store fish feed by using long wooden blades to hold fish feed.

d. Movable

Figure 10. Moveable Flexibility Form

From observations in the field, a number of forms of Movable flexibility were found, namely a form of flexibility in which the design is able to be dismantled and reassembled in another location without compromising quality and material.

Table 4. Moveable Flexibility Form

No.	Room	Form Flexibility
01.	Bed	There is furniture in the form of modular cabinets to store clothes that can be moved easily
02.	Living Room	There is furniture in the form of modular cabinets to store shoes that can be moved easily

e. Universal

Figure 11. Universal Forms of Flexibility

From observations in the field, a number of forms of Universal flexibility are found, namely forms of flexibility in which designs have functions that can be adjusted to various different uses.

Table 5. Universal Shape of Lanting House

No.	Room	Form Flexibility
01.	Kitchen	The table in the kitchen room can have a variety of functions, namely being used as a place to store clothes, a place to drink water and as a place to store kitchen utensils.
02.	Rear Porch	The chicken coop on the back porch apart from being a chicken coop to store chickens, the residents also use it to store firewood for cooking
03.	Living Room	The ceiling in the living room is not only a place to store fish feed but also a place to store fishing equipment.

In the results of the discussion of the overview of the lanting house and the form of flexibility above, several data results were obtained and written in the form of the following description:

1. In one lanting house is inhabited by different occupants, but most of them are inhabited by 4 people in one lanting house. This is because most of the residents have 2 children. However, there are also residents who have 3 children and some who do not have children either. This causes a difference in space, namely for residents who have 2 or more children in their house, they usually have 2 bedrooms, while those who do not have children only have one bedroom.
2. Most of the residents of the lanting house work as fish cage guards. This is because most of the residents of the lanting house keep fish in cages owned by others. Apart from being a fish cage keeper, residents also have other professions to increase their coffers for daily needs. This is because the results from the fish cage revenue sharing are not enough for daily needs. This leads to many designs in the form of adaptable flexibility in the lanting

house that function to accommodate the needs of residents such as a place to store fish feed, a place to store massage cream and so on.

3. All the houses are oriented towards the river and have their backs to the land. This is because in the past there was no road to reach the lanting house which could only be reached through water / boat transportation. However, now when there is a road there is a road, the kitchen room behind the house is usually used as a residence to receive guests.
4. The area of lanting houses in Palangka Raya City is quite wide and even exceeds the government-subsidized house, which is around 38 m2 – 63 m2. This is because at first most lanting houses did not have the space of the room as they do now. At first, the room area in the lanting house was only around 20-30 m2. Over time, residents increase the area of the room due to their needs and activities. This increase in space is included in the form of expansion.
5. For the rooms in the lanting house on the banks of the kahayan river, most of them have a pattern, which consists of a front terrace room, living room, bedroom, back terrace, toilet and kitchen. This is because the room in the lanting house has almost the same space pattern, namely not having a bathroom but having a toilet for defecating on the back terrace. This is because the residents of the lanting house mostly use river water to bathe and wash on the back terrace of the house.
6. Lanting houses in Palangka Raya City have a form of flexibility by means of versatility and expandability. This is because most of the functions of a room in a house have many functions according to their needs. This corresponds to the form of flexibility i.e. versatility. The residents of the lanting house also increase the area of the room due to their needs and activities. This corresponds to a form of flexibility that is, expandability.
7. Lanting houses in Palangka Raya City have the development of flexibility in an adaptable, moveable and universal way.

After the results of the observation data have been explained, the next step is to find out the form of spatial flexibility from the occupants' perception of the space itself, namely by the thematic analysis method. Thematic analysis takes the A10 lanting house because this lanting house is representative and can represent other lanting houses from predetermined aspects such as spatial planning aspects, space area, number of spaces, and the background of the occupants. Thematic analysis was taken from in-depth interviews (in dept interviews) from residents of lanting houses.

The results of the interviews with the residents of the lanting houses that have been transcribed are then labeled. From the results of labeling the interview transcript of the participants, the next process is to do the first cycle coding. The goal is to identify and sort out the statements of the interview results so that statements that can represent expressions that have a meaning that are close to (initial code). In the first cycle coding process, 27 initial codes were identified which were divided into 13 initial codes from the lanting house space and 14 initial codes from the perception of flexibility. Of the 27 existing initial codes, data condensation was carried out using the term cluster. Based on the labeling of the interview transcript, words that have similar meanings were identified.

These words are grouped and generalized into a word that can represent them. There are 12 clusters that have been successfully compiled. Based on space design, it consists of six clusters, namely Spatial Planning, Space Dimensions, Furniture Arrangement, Space Function,

Type of Space and Accessibility. Based on user privacy perception, it consists of six clusters, namely Occupant Needs, Occupant Activities, Audio Comfort, Visual Comfort, Thermal Comfort, and Social Interaction. The following is an explanation of the 12 clusters.

a. Definition of a Space Cluster

1. Spatial Arrangement: Formed from the expressions of residents who express the different spatial arrangements in the Lanting House.
   "…. If there are 7 rooms here, mas, the front bedroom, there is the back bedroom, this is the family room, then there is the kitchen, the front terrace, the back terrace and that's the toilet." - JH
2. Dimension of Space: Formed from the expression of the occupants regarding the freedom of activity felt while in the room.
   "In my opinion, in the middle room, it's more because it's spacious...." – JH
3. Furniture Arrangement: Formed from the expression of the occupants regarding the selection and arrangement of furniture that will be adjusted to the area of the room.
   "... I try to find furniture that is simple and not too much gold so there can be a spacious place here...." – JH
4. Function of Space: Formed from the expression of the occupant that expresses the function of the room in the house in daily life.
   "... In this living room, yes, it's because sometimes it's made as a place to eat, a place to pray too....." – JH
5. Type of Space: Formed from the expression of the occupants regarding the type of room in the house that is included in a certain type of room.
   "... This is my bedroom with my husband, it's my son's bedroom" – JH
6. Accessibility: Formed from the expression of the occupants that express the accessibility between rooms with each other.
   "I think it's quite good, ma'am, this is access from the entrance one to the back door and the terrace to dry the clothes" – JH

b. Definition of Perception Clusters

1. Residents' Needs: Formed from the expression of residents who express their needs in the diverse Lanting House.
   "…. Because I am usually asked by neighbors to help me get a massage. Usually this living room is made for a place where I massage my neighbors...." – JH
2. Resident Activities: Formed from the expression of residents who express their activities while in various lanting houses.
   "…. I'm the owner of a carp cage, so I need a lot of places to store this fish feed stuff." - JH
3. Audio Comfort: Formed from the expression of the occupant expressing his comfort in terms of hearing in the room.
   ". I think in my bedroom it's because it's not noisy and quiet" – JH
4. Visual Comfort: Formed from the expression of the occupant expressing his comfort in terms of visuals in the room.
   "In this family room, it's because it's spacious, but at night it's nice to sleep in the house because it's cold here at night....."– JH

5. Thermal Comfort: Formed from the expression of the occupant expressing his comfort in terms of thermal in the room.
   "…. On the front porch, it's more spacious and cold and not hot during the day." – JH
6. Social Interaction: Formed from the expression of residents who express their social interaction with residents or relatives. "…. Then in this living room, sometimes if there are relatives come here it becomes a living room….." – JH

c. Relationships between Clusters/ Themes

After categorizing and defining each initial code that has similar meanings in the same cluster, the next stage is to associate or review the relationships between each of the clusters. Here is a depiction of it shown in the diagram.

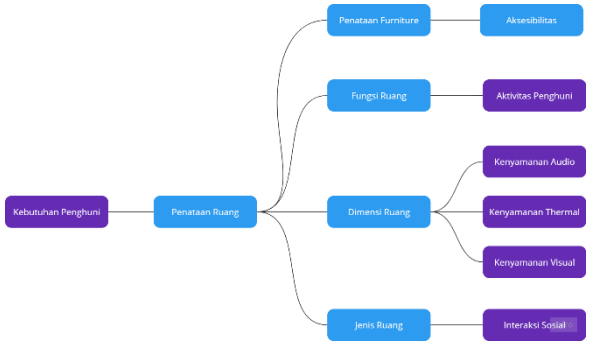

Figure 12. Relationships Between Clusters

Based on the results of the linkage between existing clusters, it can be concluded that the flexibility of space in architecture is greatly influenced by the needs of residents and the spatial arrangement of a building. The spatial arrangement includes the dimensions of the space, the type of room, the function of the space and the arrangement of furniture.

The function of the space is greatly influenced by the activities of the occupants because it can be seen from the dual function of a room, namely the family room which is also commonly used as a space for eating, sleeping, and receiving guests, etc. Then the participants saw that the dimensions of the space were related to the level of comfort of the occupants such as thermal comfort where the occupants preferred the bedroom because it was quieter and less noisy. Furthermore, the type of space in the house is influenced by the social interaction that arises between the residents of the house and with the surrounding community. Then the last is that the arrangement of furniture can affect the accessibility of residents in the house.

CONCLUSION

This research successfully achieved its objectives of identifying and analyzing spatial flexibility forms in *lanting* houses, revealing how residents maximize limited space through innovative adaptation strategies. Based on the analysis of the data that has been carried out, it can be concluded that the form of flexibility in the *lanting* house is as follows. The findings demonstrate that spatial flexibility in *lanting* houses is fundamentally driven by resident needs and spatial arrangements, encompassing space dimensions, room types, space functions, and furniture arrangements. In the context of *lanting* houses in Palangka Raya City, the flexibility of space in architecture is greatly influenced by the needs of residents and the spatial arrangement of a building. The spatial arrangement includes the dimensions of the space, the

type of room, the function of the space, and the arrangement of furniture. In the context of spatial function, *lanting* houses in Palangka Raya City are characterized by versatility and expandability. Versatility refers to how residents make a room multifunctional, accommodating various kinds of activities in one space at different times. Meanwhile, expandability is shown when residents increase the area of space from the original room. In the context of furniture arrangement, residents of *lanting* houses use the concepts of adaptability, movability, and universality. The furniture is adaptable because it can adjust to changing user needs. It is movable because the furniture is easy to move. It is universal because the furniture can be adjusted to various different uses. In the context of space dimensions, this relates to the level of comfort perceived by occupants, namely thermal, audio, and visual space. Thermal space is formed from the perception of ambient temperature; residents prefer a cool rather than hot room inside the *lanting* house. Visual space comes from the perception of sight, where occupants prefer a spacious room. Audio space relates to the perception of hearing, where occupants prefer a quiet and peaceful environment. In the context of the type of space, it is related to social interaction activities that occur in the *lanting* house, such as interactions with relatives in the family room. Future research should explore the application of these spatial flexibility principles in contemporary riverine housing design, investigate the potential for integrating traditional spatial solutions with modern building technologies, and examine the transferability of these findings to other Southeast Asian river-based communities facing similar spatial constraints and cultural preservation challenges.

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