# The process of adaptability and flexibility of floating house (*Rumah Lanting*) in West Kalimantan, Indonesia

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ARTICLE INFO

**Article history**
Received February, 10, 2022
Revised March 10, 2022
Accepted April 3, 2022
Available online April 23, 2022

**Keywords**
Adaptibility
Flexibility
Floating house
West Kalimantan

ABSTRACT

The culture of settlement of each person is different in accordance with internal and external factors. The culture of settling alongside the river such as in floating houses has becomes a local wisdom for the local community. The ability to adapt and make adjustments to the physical environment by floating house occupants makes this settlement exist until today. The concept of adaptation and adjustment to the physical environment becomes an important point for floating house occupants. Therefore, this study seeks to formulate the concept of adaptability and flexibility in floating houses. The research method used is the case study method with a multi-case approach. The selected cases are samples that indicate that there has been an adaptation process based on consideration of the duration of occupying the floating house. The analysis is carried out by looking at the patterns of occupants' behavior that affect the function and nature of space. The results of this study are formulated into the concept of adaptation through two types of modification namely environmental modification and User modification. Environmental modification occurs when the function of the existing space changes, following the addition of property. User modification occurs when changes in spatial functions force the occupants to change behavioral patterns.



## 1. Introduction

The culture of community life in Indonesia varies according to the characteristics of the region and the influence it receives from outside the region. This difference is influenced by the arrival of several ethnic groups such as Chinese, Indians and the South Pacific Islanders [1]. They brought their respective cultural life patterns, while spreading to various islands in Indonesia. The characteristics of the different regions have brought adaptive cultural influences in accordance with the conditions of each region. In the Kalimantan region, the characteristics of the area which consist of waters and land produce a varied culture of living in accordance with the context of the region. One of the settlement cultures that can be found is the culture of settling on the riverside. Life in the riverside settlements in which there are values, rules and norms as well as local wisdom of the local culture of the people who live alongside of the river so that it becomes part of the cultural identity of the riverside settlements [2].

The rivers in Kalimantan have a major role in people's lives, especially those who live on the riverside and inland communities [3]. River transportation served as the main routes connecting economic centers in cities and villages in the early development of several regions. The function of this river transportation was slowly shifting to land transportation due to several reasons such as easy access,low cost and time saving. The culture of settling on the riverside in Kalimantan can be

found in large rivers, one of which is the Kapuas River [4]. This settlement culture can be found in the floating houses along the river. The identification of these waterside settlements can be identified from various criteria. The identity of riverbank settlements is identified from the meso scale (river types, settlement patterns, regional networks, area and building functions, area accessibility, and building layers) and micro scale (occupancy patterns, building functions, materials and construction, building orientation, connectivity of roads and walkways.

The culture of living on the riverside is an example of life in harmony with the environment. Changes in a person's culture go hand in hand and are interrelated with the environment he/she builds [5] . In the environment of traditional societies, culture has a correlation with the artificial environment of groups of people who have shared interests (homogeneous). They have the ability to control the environment in accordance with their wishes. They build a place to live according to the needs of those who share similar perceptions and cultural backgrounds [6].

Floating house occupants are those who can put up with a different living environment from homes on land. The housing needs demand forces them to remain in the floating house. Changes in the built environment encourage inhabitants to try to adapt to these conditions by accommodating the needs [7]. The demands of environmental changes stimulate the ability to adapt to these conditions by considering cultural adjustments to achieve a better quality of life [8]. Consideration of building construction and development in response to the environmental changes is an ongoing effort to preserve the building for the next generation [9]. Floating houses have limited space so that the occupants are required to adapt to these conditions and make adjustments to get comfortable in activities in the physical environment. The ability to adapt to the existing environmental conditions encourages a person to empower and use existing potential to achieve a comfortable place to live [10]. The problem in this study is how the process of adaptation and adjustment to the physical environment of the occupants of the floating houses. The problem will also be supplemented by a search of the behavioral patterns of the occupants of the floating house. The aim of this study is to find out about the concepts of adaptability and flexibility in floating houses. The findings are expected to be a guideline for evaluating and planning a floating house with a similar concept.

### 1.1. Floating House

Initially, a floating house was a home for riverside traders who used it as a place to support their activities as traders [11]. In addition to being a place for trading, a floating house was also used as a residence for traders. The basic concept of the floating house architecture is very simple, namely a lower-class community's house with a riverside cultural background. All the traditions and culture of the river including its natural environment are manifested in the physical form of traditional architecture, making a floating house a vernacular architecture [12].

Floating houses are houses that float on the water that are often found along the rivers in Kalimantan. These houses are typical floating houses in West Kalimantan made of local materials. The material used is mostly of wood [13]. In some areas of Kalimantan, houses on the water or on the riverside is the beginning of the growth of settlements, especially migrant settlers. They are migrants from outside the region who use the river as a trade transportation route and the riverside as a temporary residence [14]. Floating houses are part of the settlements on the water [15]. But their existence is threatened since the community prefer to have a home on the land.

### 1.2. Adaptability and Flexibility

Adaptation is an adjustment preference that has considered and projected future needs. The building and its environment that are built are modified according to normative aspects for the sustainability of residence to meet the long-term social needs and follow the pattern of modernization [16]. The relationship between the needs of residence often becomes a factor for occupants to make adjustments. The incompatibility between the needs and the building design requires occupants to adapt to various conditions [17]. Viewed from the environmental aspect, the adaptation process encourages sustainable patterns of life and avoids lagging behind environmental changes. Adaptation also maintains the essential aspects of the building as well as the continuity of the use of material [18].

Adaptation also considers aspects of the use of time. The ability to adapt to the environment and the changing needs can work well if the time and place selected correspond to needs. In subsequent development, adaptation has a correlation with flexibility related to physical changes in the

environment. A high level of flexibility in the use of space makes it easy for the inhabitants to adapt. The level of convenience is also affected by the characteristics and quality of space, dimensions, organization of space, and changes in the physical attributes of the environment [19].

The ability to adapt in making changes to the environment and buildings requires good management. This condition is obviously different compared to changes in the standard environment and buildings and does not require an adjustment process in its use. The management consists of consultation, supervision, implementation and also cost control. The application of good management can help the adaptation process [20]. The flexibility that occurs in the adaptation process must be able to accommodate changes due to user demand both qualitatively and quantitatively. The added value of flexibility is an indicator of the ability to adapt the building to the changing demands [21]. Adaptability and flexibility are also related to ability to modify. The concept of environmental and building modification is carried out by making changes. Changes that occur cause changes in dimensions within a certain time both regarding the addition and reduction of buildings or parts of the building and can also occur in the smallest part of the building units [22].

## 2. Method

This research used the case study research method. Case study research is a series of scientific activities carried out intensively, in detail and in-depth about a program, event, and activity at the level of individuals, groups of people, institutions, or organizations to gain in-depth knowledge about the event. Typically the events selected, hereafter referred to as cases, are actual (real-life) events, which are taking place, not something that has passed [23]. The case study in this research consisted of 6 cases so the approach used was a multi-case study or a collective case study. Although there are more than one (multi-case) cases studied, the procedure is the same as a single case study, because both Multi-Case and Multi-Site Studies are the development of the Case Study method [24]. More details can be seen in the following Fig. 1.

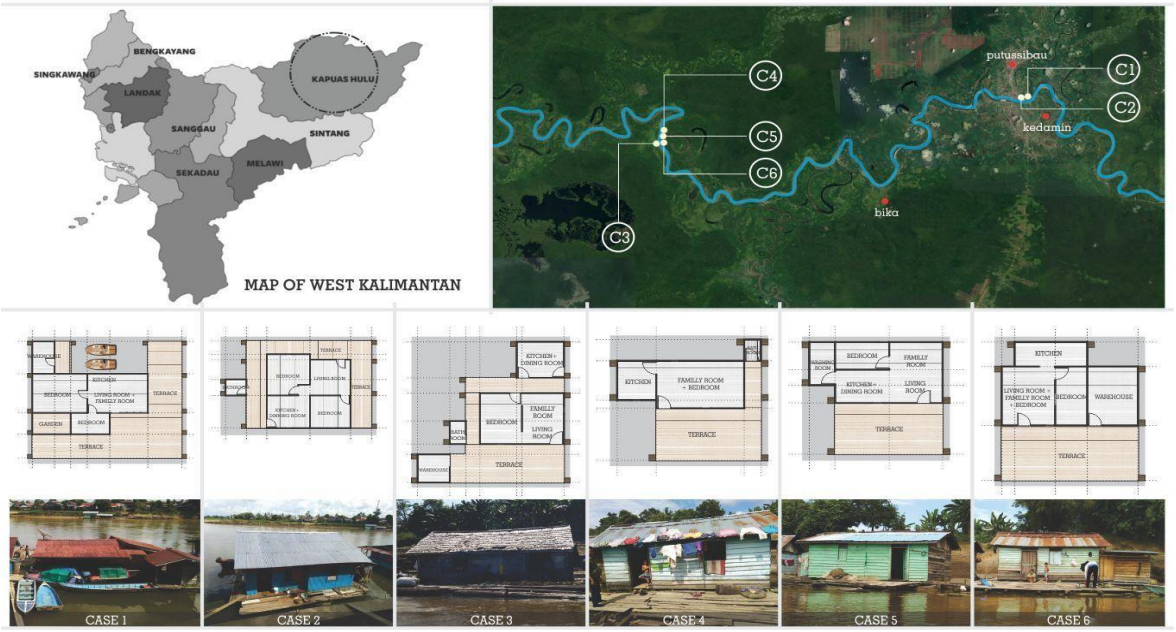


**Fig. 1.** Research Location Map

The aim of this study is to find out about the concept of adaptation by the occupants, so the object of observation in this study is the behavior of the occupants. The consideration for the cases selected isthe floating houses which have been occupied for more than 5 years. This selection is based on the comfort of the occupants living during this time span and some adjustments made to the floating house to achieve the convenience of doing activities. This research was carried out in Kapuas Hulu Regency of West Kalimantan. The cases selected were floating houses located on the Kapuas River. Two cases were located in North Putussibau Sub-District and 4 cases in Bika Sub-District.

## 3. Results and Discussion

### 3.1. Activity Pattern

Each person's activity patterns differ and are influenced by a number of factors and backgrounds. The pattern of human activity is affected by several aspects such as individual values, social and cultural values one observes in his daily lives [25]. For occupants of the floating house, the role of the physicalenvironment strongly influences the pattern of activities and dependence on the environment is also very strong. In the study of environmental behavior, the relationship between the physical environment and behavior is reciprocal. Space in the physical environment will have meaning and information that interpret the culture and lifestyle of its inhabitants in their social structure [26]. More details can be seen in the following Fig. 2.

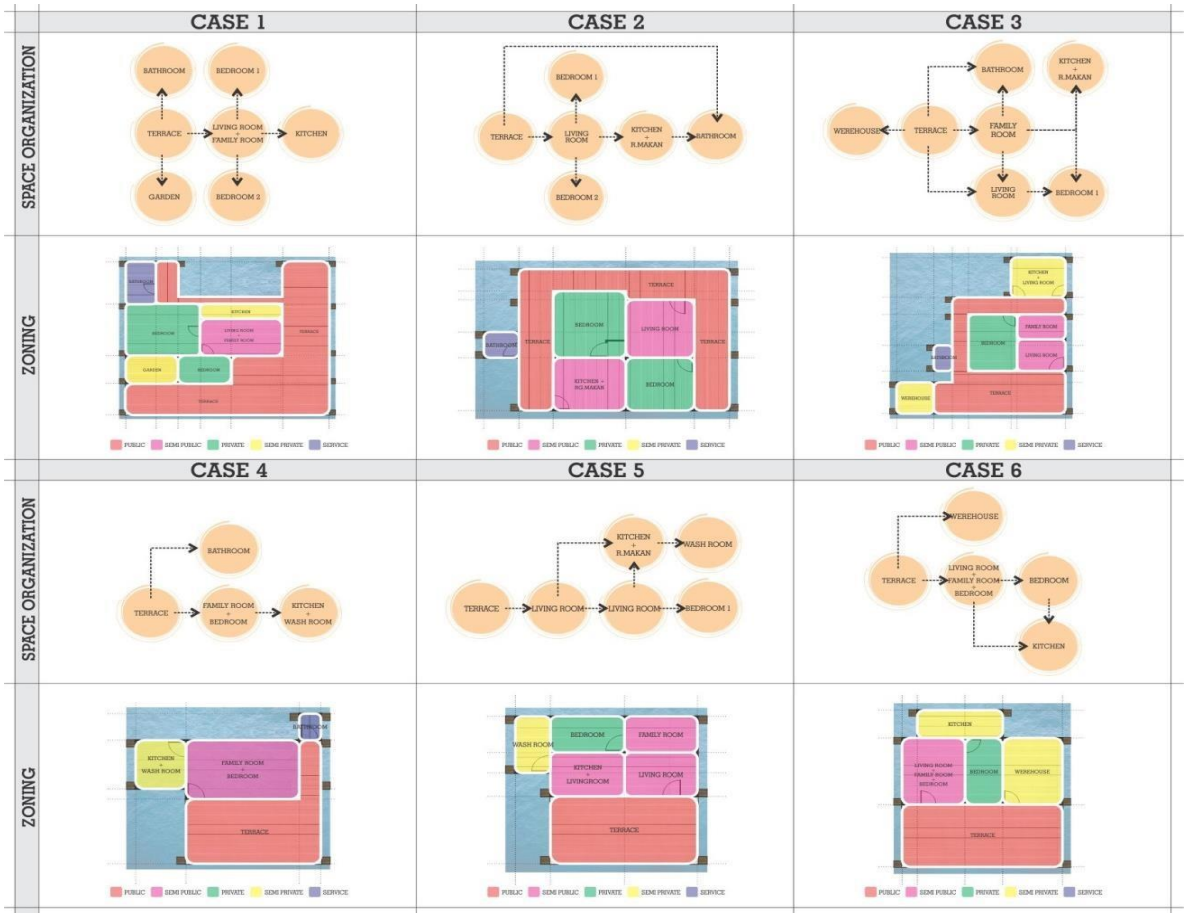


**Fig. 2.** Space Organization and Zoning *Rumah Lanting*

The activity patterns of floating house occupants tend to be centered with the center of orientation on space which has a relatively long utilization intensity. This orientation is formed because of the limited space available and the number of activities that cannot be carried out due to limited space. As a result, occupants use a space for communal activities to organize various activities. Communal space that is commonly used is a room that initially functioned as a sitting room. Because of necessity, the space can be multifunctional, serving as a dining room, kitchen, bedroom and also a living room. The implications of flexible activity patterns affect the need for more flexible furniture as well as the demands of dynamic movements [27].

Adjustment of space zoning in floating houses occurs due to demands. The existing zoning gradually changes the nature of space. This zoning change is in response to changing behavioral patterns. This zoning change occurs in a space that functions as a new communal space. This communal space initially functioned as a semi-public sitting room that was transformed into a public space due to changes in the function of space, while other spaces tend to have no change of function and nature of space.

### 3.2. Relationship between Behavior and Physical Environment

The environment in the domain of this study is the physical environment as a place or space for the behavior or activities of occupants of floating houses. Specifically this environment is the spaces or forming parts of the space for activity. The relationship between behavior and the environment will affect the adaptation process of floating house occupants. The main problems in spatial planning and aesthetics in the physical environment are the selection of furniture and proper finishing as well as safety and conducive aspects to create comfort for its occupants [28].

Adaptation can be interpreted as an individual's adjustment to the environment by changing himself to fit the environment or adjusting the state of the environment by manipulating the environment. In the floating house, the occupants' adaptation process produces two actions, namely environmental modification and User modification. Its occupants and behavior are a unified system that cannot be separated. The unity of this system includes the place and the environment. An evaluation of occupants' behavior can be performed if environmental aspects are considered [29]. The relationship between behavior and environment in the floating house results in two relationships, namely the environment that affects human behavior and human behavior that affects the environment. More details can be seen in the following Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8.

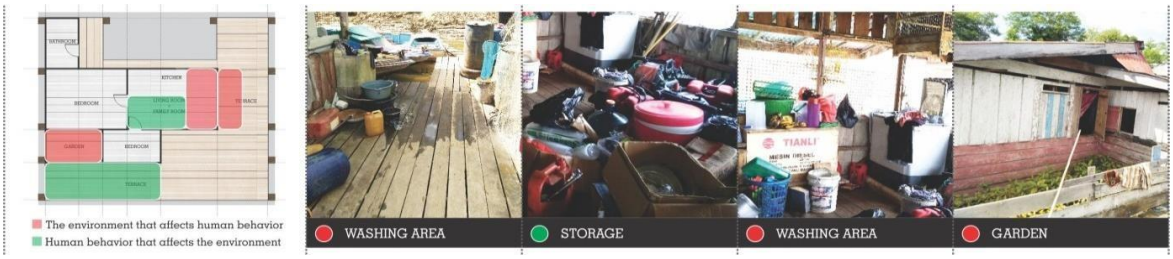


**Fig. 3.** Relationship between Behavior and Physical Environment Case 1

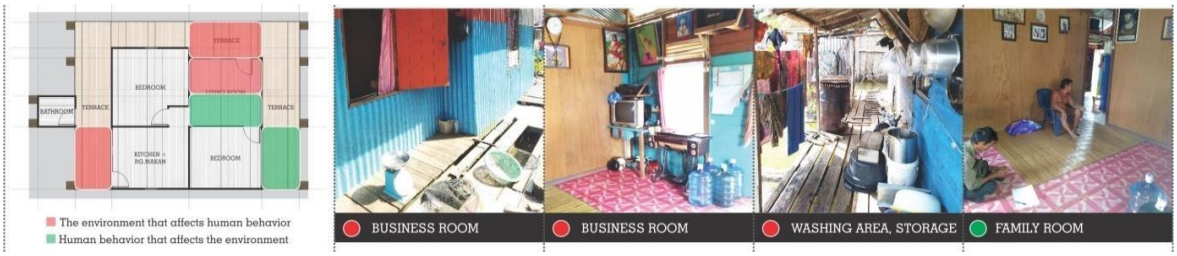


**Fig. 4.** Relationship between Behavior and Physical Environment Case 2


**Fig. 5.** Relationship between Behavior and Physical Environment Case 3

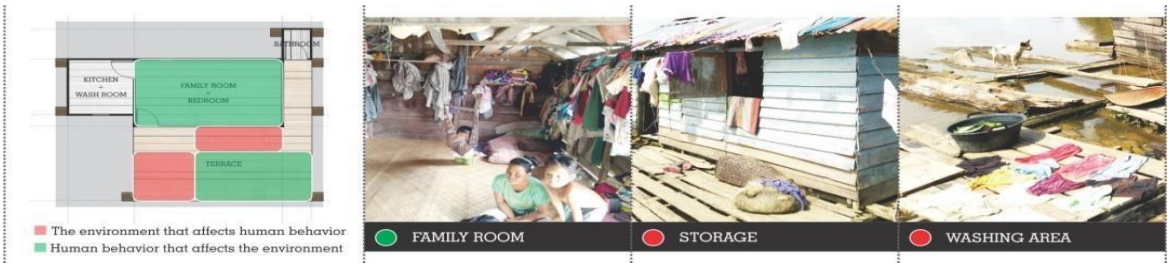


**Fig. 6.** Relationship between Behavior and Physical Environment Case 4


**Fig. 7.** Relationship between Behavior and Physical Environment Case 5


**Fig. 8.** Relationship between Behavior and Physical Environment Case 6

### 3.3. Physical Environmental Modification

Environmental modification in floating houses is carried out by changing part or all of the space for new functions. These changes are complemented by the addition of new properties in the room according to the needs.

This environmental modification is carried out in a relatively narrow space to accommodate new properties. Therefore, the existing property must be flexible and can be moved easily. In spatial planning, it is necessary to consider the flexibility aspects of the use of materials and form processing as well as consideration of the use of structures and other components. This consideration helps in managing a flexible space through approaches of repetition, balance and similarity. Flexibility can alsobe created in the arrangement of various functions in one place by combining geometric properties [30]. More details can be seen in the following Fig. 9.

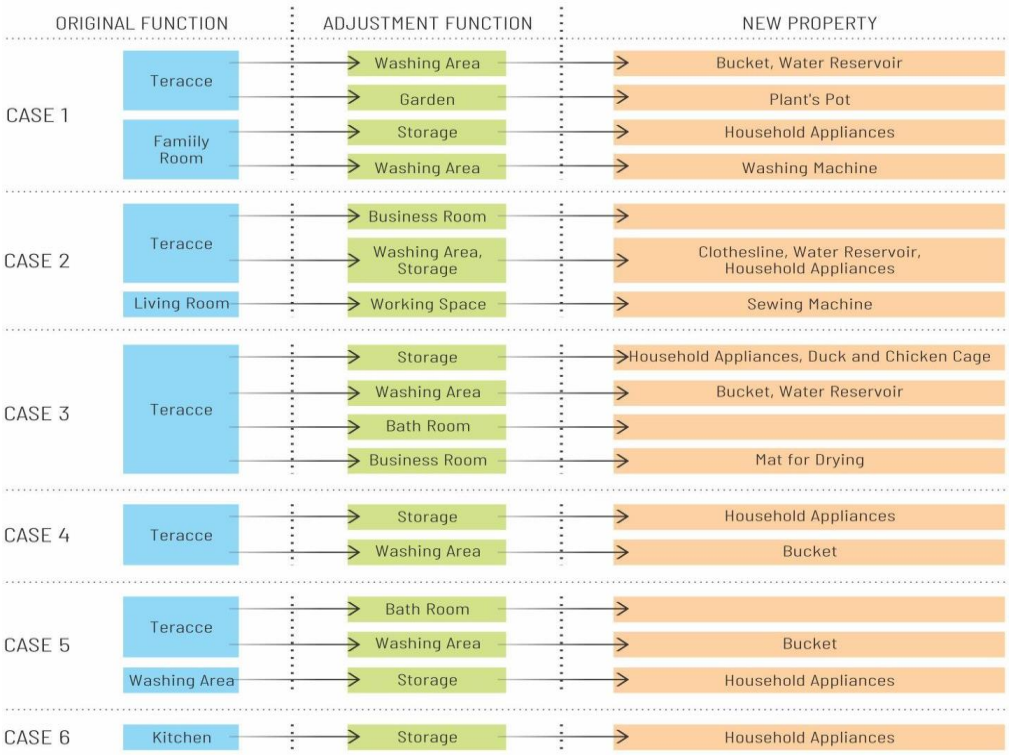


**Fig. 9.** Environmental Modification in The Floating Houses

### 3.4. User modification

User modification in the floating house refers to changes in the behavior of the occupants to adjust to the function of the new space without changing the room settings and adding new properties. User modification will continue until all activities of the occupants are fulfilled. If the activities of the occupants have been encapsulated, the modification has reached its saturation point and the occupants will move in the room even with different comfort levels. The arrangement of physical environment in the adaptation process is dynamically regulated to create a balance between occupants and the environment [31]. For more details can be seen in the following Fig. 10.

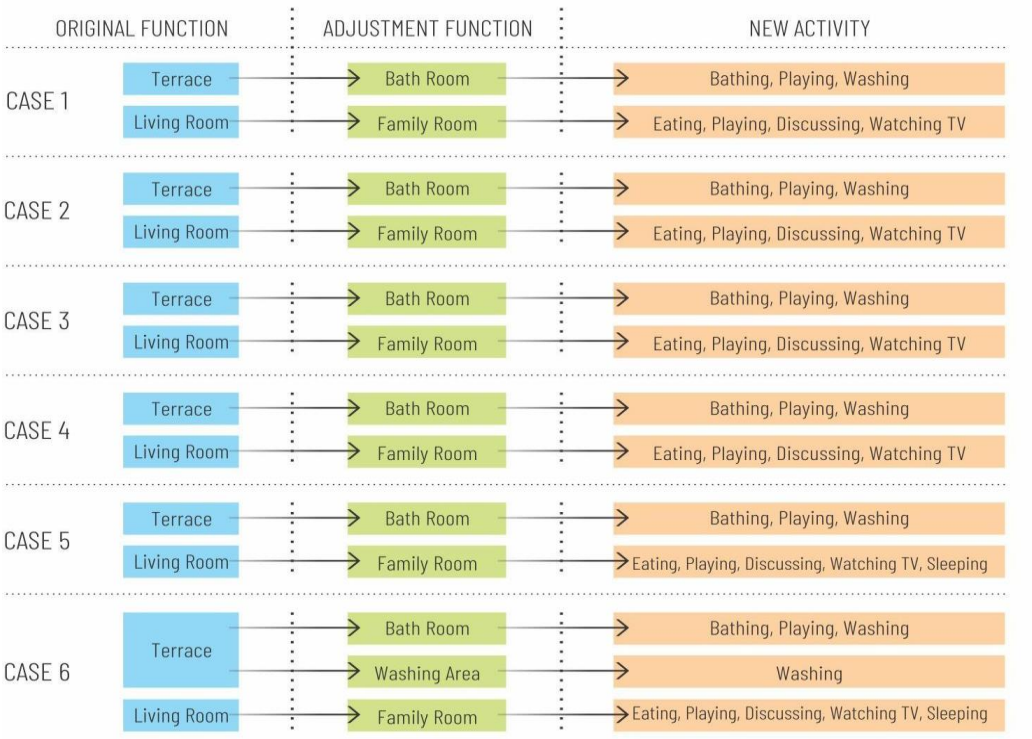


**Fig. 10.** User Modification in The Floating House

## 4. Conclusion

The activity patterns of the floating house are oriented towards communal space. The space is formed because of the need to accommodate the occupants' unfulfilled activities. This communal space also transforms functions according to the needs of each occupant. The result of these transformations affects the nature of space. The nature of space is adjusted according to the function of space. In general, the transition of functions in the floating house occurs from semi-public to public.

The process of adaptation and adjustment that occurs in the floating house produces two concepts, namely environmental modification and User modification. Environmental modification occurs when the function of the existing space changes, following the addition of property. Meanwhile, User modification occurs when changes in spatial functions force the occupants to change behavioral patterns to adjust to new spatial functions without changing spatial settings and adding new properties.

### Acknowledgment

The authors would like to express much gratitude to the Universitas Tanjungpura for the encouragement through the fund granted for this research in 2019 through the Independent Research scheme.

### Declarations

**Author contribution.** All authors contributed equally to the main contributor to this paper. All authors read and approved the final paper.

**Funding statement.** None of the authors have received any funding or grants from any institution or funding body for the research.
**Conflict of interest.** The authors declare no conflict of interest.
**Additional information.** No additional information is available for this paper.

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