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RESEARCH ARTICLE

Influence of inhabitant background on the physical changes of Banjarese houses: A case study in Kuin Utara settlement, Banjarmasin, Indonesia

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KEYWORDS
Banjarese house;
Vernacular house;
House physical change;
Inhabitant characteristics;
Socio-culture and economy

Abstract
The disappearance of vernacular buildings is a common phenomenon worldwide and in Indonesia. The Banjarese house, a type of Indonesian vernacular architecture, is a typical riverside dwelling that shows the strong relationship between the river and the inhabitants. In view of the number of Banjarese houses facing degradation as a riverside type of vernacular architecture, a study is necessary.
The characteristics of the inhabitants must be considered when observing the condition of the remaining houses. Therefore, this study aims to investigate the influence of inhabitant background on the physical changes of Banjarese houses for future revitalization.
A research was conducted in the embryo of Banjarmasin along the Kuin riverside settlement in Kuin Utara sub-district through a door-to-door survey with a questionnaire. The exploration indicates the following: (1) the original form of all remaining houses has been altered, (2) most of the inhabitants are classified as a low-income society, (3) the different characteristics of the present inhabitants change the physical condition of houses, (4) the relationship of the current house condition to the socio-culture and economy of the inhabitants plays a prominent role in revitalizing Banjarese houses as a valuable asset.

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1. Introduction

1.1. Background

The Banjarese house, which is a product of the culture of the Banjarese tribe in South Kalimantan, is a typical riverside vernacular dwelling that shows the strong relationship between the river and the inhabitants. As they are built on wetland, Banjarese houses stand on pillars. Even though many types of vernacular buildings can be seen throughout Indonesia, only a few are related to a river. This fact shows that the Banjarese house has a marked uniqueness.

The Banjarese house was originally built as a part of the Banjarese palace complex in 1526–1612 on the riverbank of Kuin Utara, which became the embryo of Banjarmasin (Table 1). However, in the 16th to 19th centuries, royalty and aristocrats were authorized by the king to build their houses in the same style as the palace (Zohrah and Fukukawa, 2010). Those houses mingled together with the ordinary commoner houses. The fall of the Banjarese Kingdom in 1860 caused a degradation of the ownership of Banjarese houses. As a result, commoners who had money started to build differently styled Banjarese houses and modified the original shape, layout, and ornament of the house (Anhar, 2010). Later on, Banjarese houses were classified into 10 types of vernacular house and one type of traditional house, which are defined by the shape, layout, ornament, structure, and residents.[1] As the riverside area became crowded, Banjarese houses later expanded into other areas such as on the flat lands and in the mountains.

As a precious part of culture and history, Banjarese houses should be preserved. However, people have stopped building Banjarese houses. According to Mentayani (2015), five factors are responsible for the ceased development of vernacular houses: (1) the limited supply of original house materials, (2) the lack of skilled carpenters, (3) the development of new building materials, (4) change in lifestyle, and (5) the need for more privacy. Moreover, the physical condition of most remaining Banjarese houses is worsening. This situation led us to investigate the degradation of Banjarese houses.

We presume that the current physical condition of Banjarese houses is affected by inhabitant background, such as socio-culture and economic. The study hypothesizes that changes in the needs and lifestyle of the residents greatly affect the current physical condition of Banjarese houses. To verify our hypothesis, we studied the relationship between inhabitant characteristics and house condition.

1.2. Objective of the study

This study aims to identify physical changes made to the remaining houses by the house owners. We also research the socio-cultural background and economic aspects of the residents, as well as the current needs and lifestyle of the inhabitants. The influence of inhabitant characteristics on the current Banjarese house condition must be observed. The result of this study is expected to contribute to house revitalization.

[1]According to Seman and Irhamna (2001), the eleven type of Banjarese House are *Bubungan Tinggi, Gajah Baliku, Gajah Manyusu, Balai Laki, Balai Bini, Palimasan, Palimbangan, Cacak Burung, Tadah Alas, Joglo,* and *Lanting.*

2. Research methodology

2.1. Target location

We chose the embryo of Banjarmasin City in the settlements along the Kuin Utara riverbank as the target location (Fig. 1). Banjarmasin is the capital of South Kalimantan Province with an area of approximately 98 square kilometers. Lying in the confluence of the Martapura and Barito Rivers, the city is located in an extensive swamp area.

Kuin Utara is a sub-district located in northern Banjarmasin, which is about 1.45 square kilometers wide. The downstream of this sub-district is the embryo of Banjarmasin City, where the Islamic Banjarese Kingdom was developed.

2.2. Methods

A general research was undertaken in August–September 2014, finding that only 13 Banjarese houses were still occupied. However, only 11 houses were made available for our investigation because two households refused to collaborate in this study.

The observation was conducted by interviewing households through a door-to-door survey. We used a questionnaire to obtain the required information. The respondents did not fill in the form by themselves and only answered some questions in an interview. The questionnaire consisted of questions about occupation and income, family, house profile, daily activities, and housing improvements. The physical condition of the buildings was also observed by measuring, sketching, and taking photographs.

2.3. Review of literature

The globalization pressures, the technological advancement, and the changing lifestyle in the recent decades have caused the degradation of vernacular houses. A number of previous studies in Indonesia and other countries discussed about vernacular houses. Case studies of this viewpoint were performed in various countries, such as Iran, Malaysia, Thailand, Pakistan, Indonesia, and China (Table 2). Hashimah (2012), Mirmoghtadaee (2009), Talib and Sulieman (2012), Hanan (2010), Kamalipour and Zaroudi (2014), and Sardjono et al. (2016) identified the relationship of culture, religion, lifestyle, and the environment to vernacular houses.

In terms of the physical changes of traditional houses, Mahdavi and Yarmand (2013), Pinijvarasin (2003), Noviarti et al. (2013), Viquar (1996), Pang (2006), and Lestari (2013) stated that the changes in vernacular houses are mainly due to the introduction of new building materials and the community's effort to fulfill the residential needs and lifestyle. The lack of natural construction materials and the available construction materials in today's modern market also influence the changes in vernacular houses.

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Table 1 History of Banjarese house.

	Year	Description	Location
The Original Banjarese House	1526–1612	The complex of Banjarese palace as the origin[a]	Riverbank, specifically in Kuin Utara
The Development of Banjarese House	16th–19th	Royalty and aristocrat started to build Banjarese house[a]	Riverbanks, flat lands, mountains
		The houses developed together with ordinary houses for commoners[a]	
	1860	Fall of the Banjarese kingdom[b]	
		Degradation of owners[c]	
		Commoners who have money started to build Banjarese houses[c]	
		Modification of original shape, layout, and ornament of the house[c]	
	Now	People stopped building Banjarese houses[d]	
		The number of existing Banjarese houses is decreasing[d]	

[a] Zohrah and Fukukawa (2010).
[b] Artha (1970).
[c] Anhar (2010).
[d] Mentayani (2015).

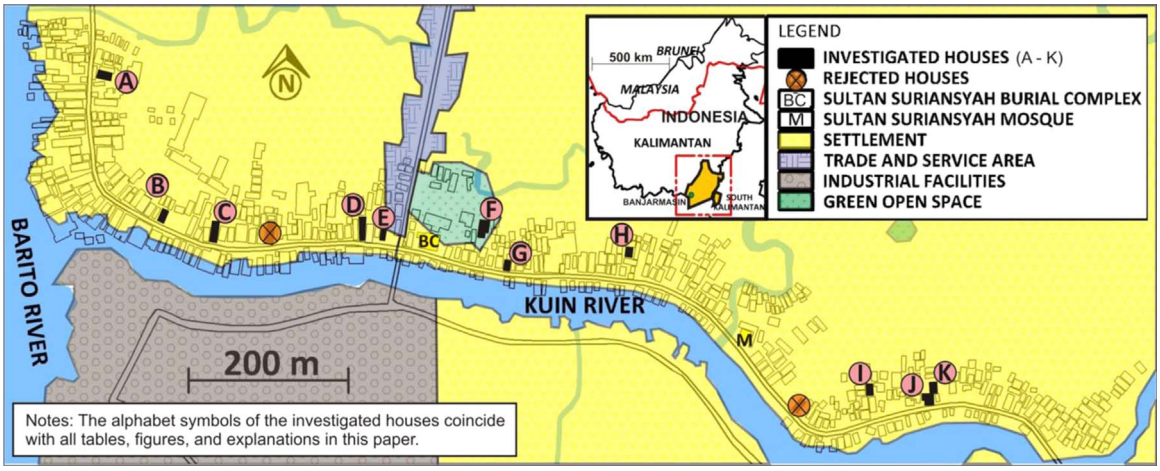

Fig. 1 Location map.

Most previous studies on Banjarese houses have been undertaken by local researchers and have been written in Indonesian. Zohrah (2012) studied the development and formation of settlements in Kuin Utara to provide a basis for the potential reconstruction of Banjarese settlements within a socio-cultural context. However, similar to other researchers, Zohrah only focused on the *Bubungan Tinggi* type, the most prestigious among other Banjarese houses because it is the type used for the former Banjarese palace.

Michiani and Asano (2015) investigated all types of Banjarese houses in Kuin Utara settlement. Nevertheless, they did not include aspects related to the inhabitants and only focused on the physical characteristics, the current situation, and the change process of the existing houses.

To the best of our knowledge, no study has reported about the influences of socio-cultural aspects and the economic background of the inhabitants on the existing Banjarese houses in Kuin Utara settlement.

3. Current physical condition of Banjarese houses

3.1. Room layout and use of space

Although Banjarese houses have 11 types, only two remaining houses are classified as *Bubungan Tinggi*, two houses as *Balai Laki*, and seven others as *Balai Bini* (Table 3). We classify the investigated houses based on the current building floor area into three groups: small, medium, and large (Table 4). The original function of a Banjarese house is residential space. However, some existing houses have a

Table 2 Literature review.

Author(s)	Location	Methodology	Key findings(s)
Viquar (1996)	Pakistan	Literature review and field observation	The major changes in housing are mainly due to the introduction of new building materials and systems. A relation to larger social, economic, and cultural issues is crucial to completely understand the nature of the most minute physical changes. Economic and practical concerns are a great factor in affecting choice of building material.
Pinijvarasin (2003)	Thailand	Literature review and field observation	Modern development has affected the characteristic of vernacular housing compound: 1. A loss of the relationship between the houses and the watercourse. 2. House size has increased. 3. Physical formation has changed from a collection of communal houses to housing compound.
Pang (2006)	China	Literature review and field observation	To sustain urban morphological features and qualities in today's cities, some forms of transformation that match with modern functionality are needed. These forms should be based on understanding of the urban fabrics and spatial quality as well as respect the socio-cultural and behavioral roots from the context.
Mirmoghtadaee (2009)	Iran	Literature review and field observation	Habits should be physically harmonious with traditions and lifestyle.
Hanan (2010)	Samosir, Indonesia	Literature review and field observation	The sustainability of the traditional architecture is governed by pragmatic motivations and functional considerations of the inhabitants.
Hashimah (2012)	Malaysia	Literature review and field observation	The Bugis people strongly adhered to culture in building their houses.
Talib and Sulieman (2012)	Malaysia	Literature review and field observation	The relationship among the culture, religion, and the environmental aspect of the Nusantara tropical climate plays an important role in expressing the unique characteristics of Melaka.
Lestari (2013)	Nias, Indonesia	Inductive qualitative with field observation	The under, rear, and/or upper parts of the houses have shown physical changes and modifications. The functions of the rooms of the traditional houses have not permanently changed. The physical and functional changes represent the community's effort to fulfill the residents' needs and lifestyle as well as to adapt with the lack of natural material in today's modern market.
Mahdavi and Yarmand (2013)	Hamidia City, Iran	Spatial policies of settlement approach	Understanding the relationship between rural and urban environments can help change the structure-function relationship and establish appropriate links. Lifestyle, religion, and family relationship have caused fundamental changes in urban village development.
Noviarti et al. (2013)	West Sumatera, Indonesia	Literature review and field observation	Urbanization has affected the sustainability of Minangkabau traditional building. Traditional building conservation requires immediate action for the preservation as a part of the habitat of the community sustainability.
Kamalipour and Zaroudi (2014)	Iran	Descriptive-analytical method	The complexity of relations between multilayered hierarchies of socio-cultural factors and urban housing form in terms of physical form and spatial configuration in the case study of vernacular housing.

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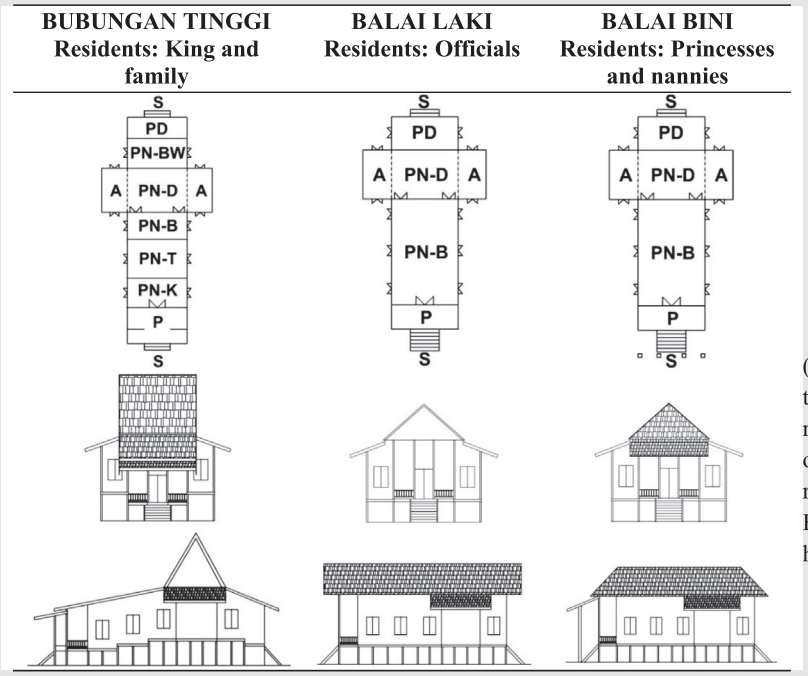
Table 2 (*continued*)

Author(s)	Location	Methodology	Key findings(s)
Sardjono et al. (2016)	Kudus, Indonesia	Literature review and field observation	The specificity of form and order in the house comprises the scope of the group and eventually forms settlements. Kudus house is the Javanese traditional house whose elements are adapted to the natural conditions, history, and local culture of the Kudus communities.

Table 3 Layout and facade of the original Banjarese house.
(Redrawn by the author. Source: Seman and Irhamna, 2001)



(The symbols in the pictures represent the original name of room layout of Banjarese house.)

Notes of symbol:
S: stairs
P: terrace
PN-K, PN-T, PN-B, PN-D, PN-BW: living room
A: bedroom
PD: kitchen

new function. Some houses serve as small stalls that sell daily needs (houses A and E), as a septic tank store (house B), as a cellular phone credit store (house C), and as traditional hat crafts (houses H and K). Thus, the houses serve not only as a residence but also as a venue for various economical activities.

As shown in Table 3, the original Banjarese house only had two bedrooms: one on the right side for parents and another on the left side for children. Nonetheless, the owners of some investigated houses added new bedrooms (Table 6). This condition reflects that modern society requires more privacy, i.e., each family member should be given enough personal space, which is accommodated by bedroom. A Banjarese house is characterized by having one front door and one back door located symmetrically in a single line for entering and leaving the house (Table 3). However, as shown in Table 6, the number of access ways present in the current houses is changing. Some houses have more than two doors, some still have two, and some others have only one door. The positions of the current doors are mostly not in their original positions.

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Table 4 Physical condition of investigated houses.
Source: Field surver (2014).

Description			House Code										Total	
			A	B	C	D	E	F	G	H	I	J	K		
Room Layout and Use of Space	Current Size	Small (≤100 sq m)				○	○					○	○	4	(36.4%)
		Medium (101–180 sq m)	○	○				○	○	○	○			6	(54.5%)
		Large (180 sq m)			○									1	(9.1%)
	House Function	Residence				○	○	○	○		○	○		6	(54.5%)
		Residence and business	○	○	○					○			○	5	(45.5%)
	Number of Bedrooms	1											○	1	(9.1%)
		2	○				○	○			○	○		5	(45.5%)
		3		○	○				○					3	(27.3%)
		5				○				○				2	(18.2%)
	Number of Access	1			○		○					○	○	4	(36.4%)
		2							○	○	○			3	(27.3%)
		3	○	○		○		○						4	(36 4%)
	Size Change of Total Floor Area	Total floor area enlarges more than 30%												0	(0.0%)
		Total floor area shrinks between 9%-0% or enlarges up to 30%		○	○		○		○	○				5	(45.5%)
		Total floor area shrinks more than 9%	○			○		○			○	○	○	6	(54.5%)
Material and Utility	House Material*	Floor (*Ulin* wood)	○	○	○	○	○	○	○	○	○	○	○		
		Wall (*Ulin* wood)	○	○	○	○	○	○	△	○	○	○	○		
		Roof (*Sirap*)	▲	▲	△	▲	▲		▲	▲	△	▲	▲		
		Foundation (*Ulin* Wood)	○	○	○	○	○	○	○	○	○	○	○		
	House Utility**	Electricity (No Electricity)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
		Drinking Water (River)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	△		
		Toilet (River)	▲	▲	▲	▲	▲	○	▲	▲	▲	○	▲		
	Quantity of Natural Lighting	Adequate							○					1	(9.1%)
		Minimal Sufficient		○						○	○		○	4	(36.4%)
		Insufficient	○		○	○	○	○				○		6	(54.5%)
Physical Quality※		Good												0	(0.0%)
		Medium		○	○		○		○	○				5	(45.5%)
		Bad	○			○		○			○	○	○	6	(54.5%)

Notes:
* House Material
○ulin
△ulin+kalsiboard (wall); sirap+zinc (roof)
▲zinc
□leaves/thatch
* House Utility
○river
△river and tap water
▲state electrical company (electricity), tap water (drinking water), water closet (toilet)
※Will be explained in Table 3 House Condition Criteria

We also found a difference in floor area between the original and renovated houses (Table 4). The size of most current houses is shrinking. Table 6 shows the original and renovated areas, the reduced and enlarged areas, and the disappearing or additional rooms. Table 6 shows the original shape of each house.

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3.2. Material and utility

The original floor and wall materials of Banjarese houses are made of *ulin* wood (Table 4). All remaining houses are also still using *ulin* (100%) for flooring. As a natural construction material, *ulin* is becoming rare and expensive in today's modern market, at more than IDR 150,000 per piece. Hence, *kalsiboard* is a cheaper alternative choice to *ulin* as an additional wall material. The original roof of a Banjarese house was covered by *sirap* (shingle), being one type of traditional Indonesian roofing. However, only a few of the remaining houses use *sirap*; most of them have converted to

Table 5 House condition criteria.
Source: Field survey (2014).

Condition	Criteria	House Code											Total	
		A	B	C	D	E	F	G	H	I	J	K		
Good	Total floor area enlarges by more than 30%												0	(0.00%)
	No or less damage in house elements												0	(0.00%)
	Adequate natural lighting							○					1	(9.1%)
Medium	Total floor area shrinks between 9%–0% or enlarges by up to 30%		○	○		○		○	○				5	(45.5%)
	Some damages in house elements		○	○		○		○	○				5	(45.5%)
	Minimal insufficient of natural lighting		○						○	○		○	4	(36.4%)
Bad	Total floor area shrinks by more than 9%	○			○		○			○	○	○	6	(54.5%)
	Major damages in house elements	○			○		○			○	○	○	6	(54.5%)
	Insufficient of natural lighting	○		○	○	○	○				○		6	(54.5%)
Overall Condition: ◎good ○medium ×bad		×	○	○	×	○	×	○	○	×	×	×		

Fig. 2. Investigated houses condition. Exterior and Interior of Investigated House B (Left). Exterior and Interior of Investigated House F (Bottom). (*source*: Field Survey (2014)).

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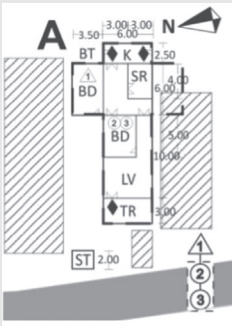
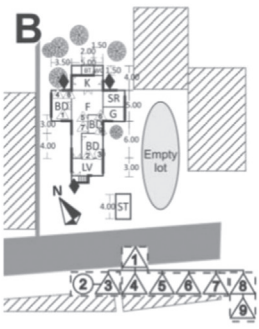
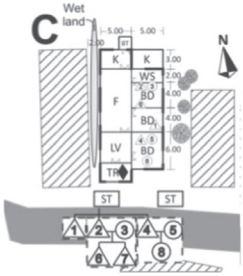
Table 6 Investigated houses profile.
Source: Field survey (2014).



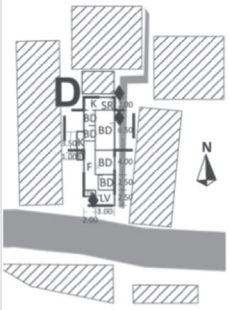
A
Building Type:
Balai Bini
House Function:
Residence & Business
Constr. Year:
1900
House condition:
Bad
Total Area:
Original: 171 sq m
Renovation: 150 sq m
(+) -
(-) 21 sq m (BD)
Income:
N/A



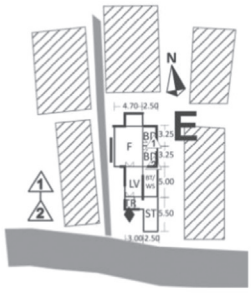
B
Building Type:
Balai Bini
House Function:
Residence & Business
Constr. Year:
1925
House condition:
Medium
Total Area:
Original: 117.5 sq m
Renovation: 125 sq m
(+) 7.5 sq m (BT/WC)
(-) -
Income:
N/A



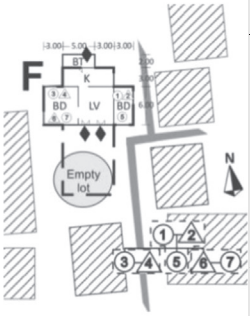
C
Building Type:
Balai Bini
House Function:
Residence & Business
Constr. Year:
1900
House condition:
Medium
Total Area:
Original: 205 sq m
Renovation: 209 sq m
(+) 54 sq m
(BT, K, BD, TR)
(-) 50 sq m (BD)
Income:
N/A



D
Building Type:
Balai Laki
House Function:
Residence
Constr. Year:
1900
House condition:
Bad
Total Area:
Original: 113.5 sq m
Renovation: 89 sq m
(+) 4.5 sq m (K, BT)
(-) 29 sq m (BD, TR)
Income:
IDR 450,000



E
Building Type:
Balai Bini
House Function:
Residence
Constr. Year:
1900
House condition:
Medium
Total Area:
Original: 79 sq m
Renovation: 94.05 sq m
(+) 26.25 sq m
(BT/WS, ST)
(-) 6 sq m (K)
Income:
N/A

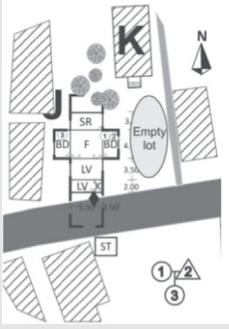


F
Building Type:
Bubungan Tinggi
House Function:
Residence
Constr. Year:
1800
House condition:
Bad
Total Area:
Original: 212 sq m
Renovation: 118 sq m
(+) 10 sq m (BT)
(-) 104 sq m (K, L, TR)
Income:
N/A

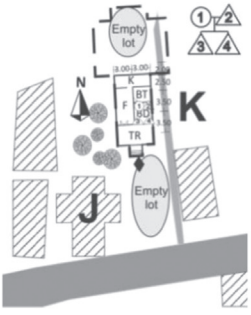
G
Building Type:
Balai Bini
House Function:
Residence
Constr. Year:
1900
House condition:
Medium
Total Area:
Original: 130 sq m
Renovation: 122 sq m
(+) 12 sq m (WC/BT)
(-) 20 sq m (K)
Income:
IDR 2,000,000

H
Building Type:
Balai Laki
House Function:
Residence & Business
Constr. Year:
1900
House condition:
Medium
Total Area:
Original: 120.5 sq m
Renovation: 151.75 sq m
(+) 35.25 sq m
(BD, SR, TR, WC)
(-) -
Income:
IDR 600,000

I
Building Type:
Balai Bini
House Function:
Residence
Constr. Year:
1930
House condition:
Bad
Total Area:
Original: 183 sq m
Renovation: 165 sq m
(+) 16.5 sq m (BT/WC, K)
(-) 34.5 sq m (K, BD)
Income:
N/A



J
Building Type:
Bubungan Tinggi
House Function:
Residence
Constr. Year:
1900
House condition:
Bad
Total Area:
Original: 140.75 sq m
Renovation: 94 sq m
(+) -
(-) 46.75 sq m (K, L, TR)
Income:
IDR 1,000,000



K
Building Type:
Balai Bini
House Function:
Residence & Business
Constr. Year:
1900
House condition:
Bad
Total Area:
Original: 180 sq m
Renovation: 69 sq m
(+) -
(-) 111 sq m (F, BD, K)
Income:
IDR 1,000,000

Notes of symbol:
TR: terrace
LV: living room
F: family room
BD: bedroom
K: kitchen
BT: bathroom
WC: water closet
SR: storage
G: garage
ST: stall
- - - - original house shape
♦access door

Family structure symbol:
○male
△female
one nuclear family

The investigated houses are symbolized with alphabets from A to K. The alphabet symbols coincide with all the table, figure, and explanation in this paper.

zinc, which is easier to obtain. All remaining houses are still using the original foundation made of timber. The foundation of a Banjarese house has two parts: the bottom is *tongkat* made of *galam* wood, whereas the upper part, *tiang*, is made of *ulin* wood. These data indicate that house material selection is greatly related to the economic status of the inhabitants; cheap materials are preferred for housing renovation or improvement.

Aside from the change of construction material, today's Banjarese houses have also undergone changes in utility, such as electrical installations that were not provided in the original houses. This situation discloses that the current inhabitants need electricity not only for lighting but also for operating electronic appliances, such as refrigerator, television, and radio. Basically, the present electricity needs are supplied by the state electrical company (Table 4). Plumbing installation

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Table 7 Exterior and interior conditions of houses.
Source: Field survey (2014).

Exterior view (facade)	×	○	×	×	×	×	○	Δ	×	×	○
Interior (original room layout)	×	×	×	×	×	×	×	×	×	×	×
Overall condition	×	○	×	×	×	×	○	Δ	×	Δ	Δ

Note-a:
◎: High (Exterior view and room layout are nearly the same as the original style)
○: Medium (Exterior view is close to the original style; room layout is changed)
Δ: Medium low (Some exterior parts are changed, e.g., only one wing left; room layout is changed)
× : Low (Exterior view and room layout are drastically changed)

Note-b:
[1] Refer to the outer shape of the floor plan.
[2] Point out building facade, including roof, door, ornament, etc.
[3] Specifies the room layout.

has also changed. In the past, people went to the river for washing and for metabolism activities; by contrast, most present inhabitants have converted to tap water and built a bathroom/WC for practical reasons and privacy needs.

We also observe the quantity of natural lighting for each house (Table 4). This point comprises the effectiveness of window and other openings to allow enough daylight into the house. Most of the houses lack natural lighting, whereas others show minimal insufficiency. Only one house receives adequate natural lighting.

3.3. Physical quality of house

Considering the size of the change in total floor area, the quantity of damage in house elements, and the quality of natural lighting, we have categorized the houses' physical quality into good, medium, and bad conditions as illustrated in Tables 4 and 5. Approximately 45.5% of houses are classified to be in a medium condition while 54.5% are in a bad condition. None of the houses are in a good condition. The samples of the physical condition of the current houses are presented in Fig. 2 (Table 6).

We also evaluate in this study the similarities of current Banjarese houses to original ones in terms of building interior and exterior. Table 7 reveals that the closer the existing floor plan, façade, and original room layout to the original style, the higher the house value is. Two houses at the highest value are in a medium condition; the exterior view is close to the original style, even though the room layout has been changed. Three houses are classified as medium low, whereas the remaining houses are classified as low quality. Table 7 shows that most of the exterior parts of the houses have been changed while the interior parts have been drastically altered.

This section indicates that the current house function has been changed from exclusively for dwelling to supporting economical activities. In addition, the original house materials have mostly been substituted with cheaper materials during house renovation or improvement. Consequently, none of the remaining Banjarese houses in the study area are in a good condition. The closer the existing floor plan, façade, and original room layout to the original style, the higher the house value is. Thus, in the view of future revitalization, the results of the discussion in this section can be considered to maintain the existence of Banjarese house.

4. Inhabitant background

All of the inhabitants are Banjarese and Moslem, originally from the Islamic Banjarese Kingdom. According to Leirissa (1996), in the 17th century, the Banjarese Kingdom became the largest Islamic kingdom in Indonesia. This Islamic background has affected the socio, economic, and cultural aspects of Banjarese people.

To understand the background of the inhabitants, several aspects of socio-culture and economy were observed as illustrated in Table 8. On the basis of the number of members, a household can be classified into three types: small family (1–4 persons), middle-sized family (5–7 persons), and big family (more than 7 persons). Most of the residents of a Banjarese house live in a small-sized family. Indeed, most of the families have many children, but the children eventually move out from the house after growing up and having their own family.

In Indonesian culture, children generally still live with their parents even after marriage. They only move out after gaining enough money to build their own house or getting a job that is located far from their parents' house. Our investigation shows that some households live as a nuclear family (54.5%) while some others live with extended family (45.5%), which may include grandparents, siblings, cousins, etc. Details of the family tree for each house are listed in Table 6.

Most of the respondents are original inhabitants; they have been living in the house since birth, and their houses have existed for more than 50 years, having passed from generation to generation. As a result, the ownership of most

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Table 8 Socio-cultural and economic background of inhabitants.

	Description			House Code										Total	
				A	B	C	D	E	F	G	H	I	J	K		
Socio-culture	Family Type	Nuclear				○			○	○		○	○	○	6	(54.5%)
		Extended		○	○		○	○			○				5	(45.5%)
	Family Size	Small (1–4 persons)		○				○				○	○	○	5	(45.5%)
		Middle (5–7 persons)							○	○	○				3	(27.3%)
		Big (7 persons <)			○	○	○								3	(27.3%)
	Length of Stay	< 5 years												○	1	(9.1%)
		6–20 years													0	(0.0%)
		21–50 years							○	○					2	(18.2%)
		Since born		○	○	○	○	○			○	○	○		8	(72.7%)
	Previous House Location	Original inhabitants		○	○	○	○	○			○	○	○		7	(63.6%)
		Same village, different areas							○						1	(9.1%)
		Different villages, same city								○				○	2	(18.2%)
	Staying Reason	Parents house		○	○	○	○	○	○	○	○	○	○		10	(90.9%)
		Near workplace												○	1	(9.1%)
	Year of Construction	Around 1800							○						1	(9.1%)
		Around 1900		○		○	○	○		○	○		○	○	8	(72.7%)
		After 1925			○							○			2	(18.2%)
	House and Land Ownership	Parents		○	○		○	○		○		○			6	(54.5%)
		Head of household							○		○		○		3	(27.3%)
		Family				○									1	(9.1%)
		Rent												○	1	(9.1%)
	House's Getting	From parents		○	○	○	○	○	○	○	○	○	○		10	(90.9%)
		Rent												○	1	(9.1%)
	Aspiration to Move	Yes/no	Yes	○	○							○		○	4	(36.4%)
			No			○	○	○	○	○	○		○		7	(63.6%)
		If yes, why?	Economic	○	○										2	(50.0%)
			Better dwelling									○		○	2	(28.6%)
	Desire to Preserve	Standard		○						○			○	○	4	(36.4%)
		No idea			○	○	○	○	○		○	○			7	(63.6%)
Economy	Occupation	Labor group							○						1	(9.1%)
		Informal sector		○	○		○	○		○	○	○	○	○	9	(81.8%)
		Teacher				○									1	(9.1%)
	Workplace	In the same village where they live		○	○	○	○	○	○	○	○	○			9	(81.8%)
		Different village, in the same city												○	1	(9.1%)
		Out of the city											○		1	(9.1%)
	Income	< IDR 900,000					○				○				2	(18.2%)
		IDR 900,000–1,870,000											○	○	2	18.2%
		※IDR 1,870,000 <								○					1	(9.1%)
		N/A		○	○	○		○	○			○			6	(54.5%)

Notes: ※The regional minimum wage of South Kalimantan in 2015 is IDR 1,870,000

houses is still assigned to the parents, which later will be passed down to the next generation.

Given a choice to move, most of the respondents prefer to stay (63.3%). Only a small number wanted to move for a better dwelling and for economic reasons. As the original inhabitants were born and grew up there, they feel quite satisfied with current conditions and have no desire for a better quality of life with a better environment and

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occupation. The original inhabitants are a type of community who still keep with local wisdom in staying put in the place they were born and grew up in.

The working place also became a characteristic of the inhabitants in the target area. Primarily, the ancestors of riverside society worked as fishermen. However, as time passed by and more job varieties have become available, people started to change their work field. Most of the inhabitants work in the informal sector (81.8%) as a motorcycle taxi driver, tomb guardian, vendor, mosque committee member, craftsman, broker, boat guard, and boat driver.

According to the South Kalimantan Statistical Data, the regional minimum wage of South Kalimantan is IDR 1.62 million in 2014 and increased by 15.40% to IDR 1.87 million in 2015. As shown in Table 8, the monthly income of almost all inhabitants is lower than the regional minimum wage. Therefore, the inhabitants can be classified under low-income class; only one of eleven respondents is classified under middle-income class.

At this point, we have gained basic understanding of the inhabitant background in the area. In summary, the inhabitants' lifestyle has changed. Education, information, urbanization, and globalization influence the inhabitants' lifestyle. These aspects should become a serious concern to revitalize Banjarese houses.

5. Correlation of inhabitant background with physical change

Aside from the physical condition of current houses and the lifestyle of inhabitants, the influence of inhabitant background on physical house change should be considered for the future preservation of a Banjarese house. To investigate the relationship of inhabitant background to the physical condition of the current house, some criteria have been considered in this study. For the physical aspect, we are focusing on the house layout and physical quality, which include the current total floor area, size change of total floor area, number of bedrooms, and building condition (Table 9). The socio-culture and economy of the inhabitants are represented by family size and income. We hypothesize that the number of family members influences decision on the size of the house, the number of rooms needed, and overall house quality. The more the family members and the higher the income is, the larger the size and the better the house quality is.

Table 9 reveals that most small families live in a small house while middle-sized families live in a medium-sized one. This outcome confirms that the number of family members affects the size of the current house. Similarly, the current total floor area for most small families shrank by more than 9% while that for middle-sized and big families shrank from 9% to 0% or enlarged by up to 30%. This finding indicates that a small family needs less space than a middle-sized family.

As specified in the previous section, the current inhabitants require more personal space. Thus, we investigate the change in the number of bedrooms in the present houses. Most of the small families have two bedrooms, which is the same as that in an original Banjarese house. Nevertheless, the result for middle-sized and big families is not significant. These results show that family size influences the number of bedrooms but not at a significant level.

Table 9 illustrates the present condition of the observed Banjarese house. In general, most small households are in a bad condition, whereas most middle-sized and big households are in a medium condition. As already mentioned, most children live with their parents even though they are married and have a job. Hence, the building condition in middle-sized and big households is in a medium state because of the share of house utility and maintenance cost.

Another aspect that influences the physical condition is household income. We hypothesize that higher income corresponds to better house quality and quantity. Basing on this assumption, we check whether the income of residents influences the current building size, size change of total floor area, bedroom number, and house quality.

As shown in Table 9, no positive relationship exists between income and the factors influencing housing condition. Further analysis reveals that the result is not significant because of the few respondents for income level. As mentioned before, most respondents are below the regional minimum wage of South Kalimantan (below IDR 1.87 million in 2015). Therefore, no specific result is found.

The conclusions obtained in this section indicate that the number of family members affects the current physical condition of the house. By contrast, the income of the inhabitants does not influence the physical condition of the current Banjarese houses. Nonetheless, we cannot find any significant result, especially for data regarding monthly income, because of the small number of respondents.

Comprehensively, the investigation of this study points out that support from many parties, including the local government and the house owners, is needed for revitalizing Banjarese houses. In addition, differences in the needs, privacy, and lifestyle of the present inhabitants change the physical condition of houses, such as house utilities and additional spaces. Moreover, the relationship of the current house condition to the socio-culture and economy of the inhabitants plays a prominent role in conveying the uniqueness of Banjarese houses as a valuable asset. Hence, aspects that influence in deciding additional rooms and spaces for the needs of the current and future residents should be prioritized for future revitalization.

6. Conclusions and suggestions

6.1. Conclusions

The research indicates the following results:

(1) The original form of all remaining Banjarese houses has been altered and modified by the owner.
(2) Most inhabitants are classified as a low-income society.
(3) Differences in the needs, privacy, and lifestyle of the present inhabitants change the physical condition of houses, such as house utilities and additional spaces.
(4) The relationship of the current house condition to the socio-culture and economy of the inhabitants plays a prominent role in conveying the uniqueness of Banjarese houses as a valuable asset. Hence, this aspect should be prioritized for future revitalization.

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Table 9 Relationship between building condition and socio-culture and economy.
Source: Field survey, 2014.

			Socio-culture and Economy						
			Family Size			Income			
			Small (1–4 persons)	Middle (5–7 persons)	Big (7 persons<)	<IDR 900,000	IDR 900,000-1,870,000	※IDR 1,870,000<	N/A
Building condition	Current Total Size	Small (≤100 sq meter)	3		1	1	2		1
		Medium (101–180 sq meter)	2	3	1	1		1	4
		Large (180 sq meter <)			1				1
	Size Change of Total Floor Area	Total floor area enlarges by more than 30%							
		Total floor area shrinks between 9% and 0% or enlarges by up to 30%	1	2	2	1		1	3
		Total floor area shrinks by more than 9%	4	1	1	1	2		3
	Number of Bedroom	1	1				1		
		2	4	1			1		4
		3		1	2			1	2
		5		1	1	2			
	Quality	Good							
		Medium	1	2	2	1		1	3
		Bad	4	1	1	1	2		3

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6.2. Suggestions

Basing from the observation, we can still retain some Banjarese houses. Nonetheless, considering that the revitalization possibility of the houses is medium, we need to think about the revitalization process. To make future preservation possible, the following processes must be considered.

6.2.1. Physical revitalization

We will restore the exterior and interior of the sample houses in accordance with the principle of Banjarese houses and with some rules: restoring the original material, resetting the room layout, and creating clear boundaries as protection.

6.2.2. Non-physical revitalization

Aside from physical revitalization, non-physical acts should be considered, such as economic, social, and legal. Considering its background and characteristics, we propose the area as a historical tourism spot, which can upgrade the quality and value of the location. More job opportunities will be provided for the local inhabitants.

Much effort and support are needed from the house owner, society, and the government. Support from the local government is very important, especially financial support for providing materials and for ongoing maintenance. However, the self-initiative of the house owner is absolutely needed. For future work, the local government must improve the infrastructure of the surrounding area.

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References

Anhar, P., 2010. Inventarisasi Arsitektur Banjar [Inventory of Banjarese Architecture]. Universitas Lambung Mangkurat Press, Banjarmasin (in Indonesian).

Artha, A., 1970. Sejarah Kota Banjarmasin [History of Banjarmasin City]. Museum Lambung Mangkurat: Banjarmasin (in Indonesian).

Hashimah, W.I., 2012. Cultural determinants in the design of Bugis houses. Procedia Soc. Behav. Sci. 50, 771–780.

Hanan, H., 2010. Sustainability of the Traditional Form of Batak House in Samosir Island. Indigenous Architecture as Basic Architecture Design.

Kamalipour, H., Zaroudi, M., 2014. Sociocultural context and vernacular housing morphology: a case study. Curr. Urban Stud. 2, 220–232.

Leirissa, R.Z., 1996. The bugis diaspora. In: Reid, A. (Ed.), Indonesian Heritage: Early Modern History. Editions Didier Millet, Singapore, pp. 90–91.

Lestari, D.E., 2013. Perubahan Ruang dalam Rumah Tradisional di Kawasan Desa Adat Hiliamaetaniha, Nias Selatan [Room Change of Traditional House in the Indigenous Village of Hiliamaetaniha, South Nias] (Thesis). Universitas Gadjah Mada (in Indonesian).

Mentayani, I., 2015. Transformasi Adaptif Permukiman Tepi Sungai di Kota Banjarmasin Kasus: Barito-Muara Kuin, Martapura, dan Alalak [Adaptive Transformation of Riverside Settlement in Banjarmasin City, Case Study in Barito-Muara Kuin, Martapura, and Alalak] (Thesis). Universitas Gadjah Mada (in Indonesian).

Michiani, M.V., Asano, J., 2015. A study on the characteristics and current situation of Banjarese house, case study in Kuin Utara settlement, Banjarmasin, Indonesia. Summaries of Technical Papers of Annual Meeting Architectural Institute of Japan. F-1, pp. 109–110.

Mirmoghtadaee, M., 2009. Process of housing transformation in Iran. J. Constr. Dev. Ctries. 14 (1), 69–80.

Mahdavi, M., Yarmand, M., 2013. Rural-urban housing influencing changes in the physical-spaces of urban environment: a case of Hamidia City. J. Geogr. Reg. Plan. 6 (5), 200–208. http://dx.doi.org/10.5897/GRP11.111.

Noviarti, Irsa, Irsa, R., Putra, A., Masdar, A., 2013. Preserving minangkabau traditional building in West Sumatera, Indonesia: toward sustainable community. Mediterr. J. Soc. Sci. 4, 465–469.

Pinijvarasin, W., 2002&;2003. Changes in thai vernacular housing compounds. J. Fac. Archit. Silpakorn Univ. 19.

Pang, W.K., 2006. Urban morphology of traditional Chinese cities in the context of modernization – a case study of Suzhou. In: Proceeding of the 42th ISoCaRP Congress.

Seman, S., Irhamna, 2001. Arsitektur Tradisional Banjar Kalimantan Selatan [Traditional Banjarese Architecture of South Kalimantan]. Ikatan Arsitek Indonesia Daerah Kalimantan [Indonesian Institute of Architects Kalimantan Area], Banjarmasin (in Indonesian).

Sardjono, A.B., Hardiman, G., Prianto, E., 2016. Characteristics of traditional houses in the old town of Kudus City, Indonesia. Int. J. Sci. Res. Publ. 6 (2), 109–118.

Talib, R., Sulieman, M., 2012. Surveying on the cultural approaches for the melaka malay houses. Procedia Soc. Behav. Sci. 65, 511–516.

Viquar, S., 1996. Modernization and Cultural Transformation: change in Building Materials and House Forms Karimabad, Pakistan (Thesis). School of Architecture of McGill University, Montreal.

Zohrah, L., Fukukawa, Y., 2010. Characteristics of traditional high ridge houses in Banjarese Kampungs, South Kalimantan, Indonesia. J. Archit. Plan. AIJ 75 (647), 149–156.

Zohrah, L., 2012. Traditional high ridge house groups of Banjarese Kampung to clarify the organizing principles in the meaning of urban fabric. LANTING J. Archit. 1 (1), 57–67.

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