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Acculturation of Structure and Construction in the Houses of Balinese Migrants (Case Study: Basarang Jaya Village, Central Kalimantan)

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***Abstract*— Basarang Jaya village is one of transmigration areas in Kapuas Regency, Central Kalimantan Province. Its terrestrial feature was initially dominated by peatland. Following transmigration program in 1961, the peatland was then subject to change in land use. By 1963, transmigrants from Bali had begun to settle the village, creating an acculturation between the newcomers and the local people from Dayak Ngaju tribe. This study aims to find out structure and construction of the transmigrants' settlements because of the acculturation between the transmigrants and the local people. The study applied a qualitative methodology with the case study approach. The observation that took place at Nyoman Remuja house yielded the followings results: 1) the settlement structure and construction of the transmigrants had changed three times, starting from woods, then switching to a combination of woods and concretes, and finally transforming to fully concretes; 2) the change in the settlement structure and construction was due to the change in characteristic of the foundation, from peatland to solid soil due to landfill; 3) Changes in the forms, structures, construction, and materials caused changes in thermal occupation. However, in the Basarang Jaya, the community's residence is still north-south oriented. This orientation, furthermore, is based on the Tri Hita Kirana cultural norm which is suitable for tropical climate in Indonesia. The extended form of the houses, which is in accordance with Betang dwelling concept of Dayak Ngaju, causes air circulation to flow rapidly throughout the room creating a comfortable atmosphere for living even though the houses use concrete materials.**

***Keywords*— acculturation; structural and construction; the houses of Balinese migrants; Basarang Jaya.**

I. INTRODUCTION

Uneven population density and distribution between those living in Java and other islands in Indonesia have caused the government of Indonesia to organize a migration program. The program is namely transmigration. The population who are incorporated in the program are so-called transmigrants [1]. Transmigration program in Central Kalimantan Province began in the late 1960s with the conversion of peatland in Basarang, Kapuas Regency as the prospective transmigrant location. The area was officially opened in 1963 and was renamed Basarang Jaya Village. The village became the center for Balinese transmigrants those leaving from southern Bali [2].

A long-standing interaction between the transmigrants and local Dayak Ngaju people has created acculturation. The embodiment of cultural acculturation between the transmigrants and Ngaju Dayak local communities is implemented in non-physical and physical cultures. The non-physical are implemented in the language use, where Balinese transmigrants are able to speak Dayak Ngaju language, to adopt the way of life and to eat the type of food of Dayak Ngaju people [3].

The physical culture manifests objects of human works such as homes. In this context, the forms of structure and construction of housings of the Balinese transmigrants continues to evolve and adapt [4], [5] and the use of new materials and shape shows a new identity. This study aims to find out the form of structure and construction of housings of the Balinese transmigrants because of the acculturating process with the local people. The study considers it an important issue to have a more comprehensive understanding about the manifestation of acculturation between the Balinese and the Dayak Ngaju people in the form of housing structure and construction.

People migrating from one cultural environment to other cultural environments will experience dual process of socio-cultural and psychological changes due to their encounter with the local community [6]. Such intercultural interaction may create an acculturation when it endures.

Acculturation occurs when a cultural group meets with the other cultural group. This process continues and is a response to new social conditions [7], [8]. A house is a manifestation of human physical culture constructed by an ever-developing process related to the mobility of socio-economic aspect of the inhabitants in a particular life span [9]. Housing attributes can be different, based on their human behavior and temperaments [10]-[12].

Balinese people highly esteem the values of their religion and sacred life. They place belief, ritual, tradition, and taboo at the top priority in their daily life. One of the beliefs still enduring among the Balinese is the housing structure, and a house is believed as one of significant aspects of life. The principles of Balinese architecture are applied to traditional houses. The first concept is related to the form and the division of pavilions while the second concept was related to the physical forms of building structures.

The structure of housing construction is an arrangement of main construction (the part, which bears the weight), whereas construction is defined as a relationship among materials, that creates a unified endurance and strength [13], [14]. The structure can be divided into three broad categories, i.e. lower, middle, and upper structures. In Balinese traditional houses, the structure and construction follows Asta Kosala-Kosali and Asta Bumi principles; in which the structure and the construction follow the size the house's owner body parts, namely feet, arms, and fingers. These owner's parts of body become the basic measurement of Balinese architecture in building a house. The principle of human scale and proportion is incorporated in order to create balance. Therefore, measurements are based on *sikut* (parts of human body of the person responsible for the building) [15]. The building structure of traditional houses is always totally exposed, and it was called the honesty of the structure.

II. Materials and Method

A. The Study Area

Basarang Jaya Village is located in Basarang Sub-regency. Geographically, Basarang is located in 2°53' SL - 3°0l' SL and l14°14' EL - 111° 23' EL in the area of Kapuas Regency, Central Kalimantan (Fig. 1). The sufficient numbers of public facilities and infrastructures has made this village the centre of socio-cultural and religious activities of Balinese in Kapuas Regency.

B. Research Methodology

This study employed the qualitative methodology, in which a practical condition was disclosed and comprehended to reveal the unknowns. This research method is very suitable with the research objective, namely describing the acculturation process in the houses' form, structure, and construction as a result of the meetings of two different cultures (Dayak Ngaju and Bali); which are closely related to the physical changes in houses' materials and in socio-culture.

The study applied the case study method using the embedded single case study strategy. The case study was selected because it allowed the researchers to answer explorative research questions and focus on contemporary phenomenology in the real world.

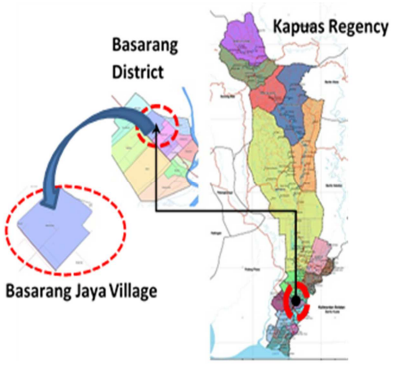


Fig. 1 The Research Location

C. The Technique of Data Collection

Field observation and in-depth interviews were applied to collect the research data for the analysis. In-depth interviews with key informants consisting of the homeowner, former head of Basarang Jaya village, the elder of Banjar Satya Dharma were conducted before, during and after the field survey to obtain more detailed information and to reconfirm the findings.

D. Case Selection Criteria

The observed unit was Nyoman Remuja's house. This house was selected based on the following criteria:

- Nyoman Remuja is the first generation of the Basarang Jaya Village transmigrants;
- Nyoman Remuja is the Balinese descendants of the local leader at Banjar Satia Dharma in Basarang Jaya Village;
- Nyoman Remuja is a *mantir* (those authorized to solve problems related to customs in Dayak Ngaju community. In addition, *Mantir* is appointed pursuant to the Letter of Decree of the Kapuas Regent).

III. Results and Discussion

The selected observation unit is divided into 4 units of observation. This division is based on the year of observation unit. The observation unit 1 was Nyoman Remuja's first house built in 1963 (Fig. 2). The observation unit 2 was Nyoman Remuja's second house built in the 1970s (Fig. 3). The observation unit 3 was Nyoman Remuja's third house built in the 1980s (Fig. 4). The observation unit 4 was Nyoman Remuja's fourth house built in the 2000s (Fig. 5).

The structure and construction analyses of the observation units are divided into three broad categories namely, lower, middle, and upper structures. The structure and construction analysis of the observation of units 1, 2, 3, and 4 are summarized in Tables 1, 2, 3, and 4 respectively.

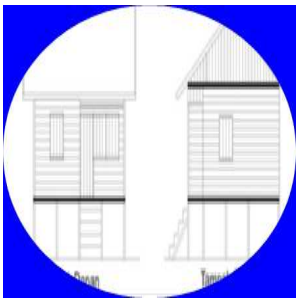
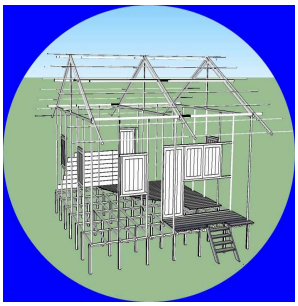



Fig.2 (Left) The Observation Unit 1; (Right) The Structure and Construction of the Observation Unit 1


Fig.3 (Left) The Observation Unit 2; (Right) The Structure and Construction of the Observation Unit 2

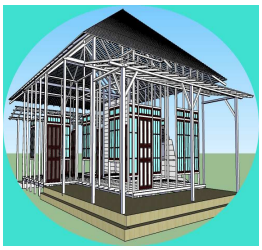



Fig.4 (Left) The Observation Unit 3; (Right) The Structure and Construction of the Observation Unit 3


Fig.5 (Left) The Observation Unit 4; (Right) The Structure and Construction of the Observation Unit 4

TABLE I
OBSERVATION UNIT ANALYSIS 1

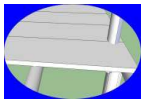
Preposition	Lower structure and construction	Middle structure and construction	Upper structure and construction
Connection Model	1. The joint between the sticks and the sloofs was open and pen-shaped, the girders were adjacent to the sloofs and locked with nails.  2. Floors were arranged lined up over girders and locked with nails. Wall posts were adjacent to sloofs with ½ *coak* (a mortise-and-tenon technique) connection model.  3. The stairs were propped up on sloofs and locked with nails.  4. The columns (sticks) were planted on the ground with a horizontal beam model.	1. Doors and windows were joined to the jamb sills using hinges.  2. The walls were joined to the posts (functioning to hold the walls) with a betel stack model (an installation process arranged like betel leaf sheets) and then locked with nails. 	1. The trusses were joined to the wall beams by a connecting method and then locked with nails. Purlins, battens and roofs were locked with nails.  2. Trusses and rafters, ceiling joints, and hanging beams were joined by a connection method and were locked with nails.  3.The ridgepoles, rafters, battens and roof were joined by using nails. 
Sizes	The round stick size was Ø 10 cm and 2 m long. The sloof size was Ø 7 cm and 4 m long. The girdle size was Ø 5 cm and 4 m long. The floor board was 4 m long, 2.5 cm thick and 18 cm wide.	The door size was 80x200 cm. The window size was 60x 120 cm. The house post was Ø7 cm and the sills used 5/7 cm beams, the wooden wall size was 4 m long, 2.5 cm thick and 20 cm wide.	The truss size was Ø 8 cm, the purlin size was Ø 7 cm, the rafter size was Ø 5 cm and the batten size was Ø 3cm.
Materials	The materials were local wood (gelam), which was frequently used and easy to find around the construction site.	Boards, door frames and window frames used local wood (meranti). Posts and sticks used local gelam wood.	The truss frame, purlins, rafters, battens used local wood *(gelam)*. The roof used *rumbia* tree leaves.
Conclusion	The 1963 house was made from round *gelam* wood harvested near from building site. The structure and construction used centimeter and meter.		

TABLE II
OBSERVATION UNIT ANALYSIS 2

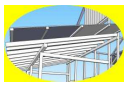
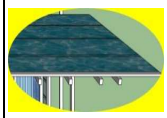
Preposition	Lower structure and construction	Middle structure and construction	Upper structure and construction
Connection Model	1. The joint between the sticks and the sloofs was single open and pen-shaped, the girders were placed on the top of the sloofs and locked with nails.  2. Floors were arranged at 1 cm intervals above the girders and are locked with nails.  3. The porch and the house had a difference of floor height approximately 10 cm. Wall posts were joined with sloofs with ½ model joints.  4. The columns (sticks) were planted on the ground with the horizontal beam model.	1. Doors and windows were adjacent to the jamb sills using hinges. Frames and wall posts were joined with mortise and tenon connection.  2. The door frames were adjacent to the wall posts. Above the door, vents were made and they attached to the wall post. 	1. The truss with the wall beams were connected using ½ joints. The truss ceiling joints and rafters were connected to the hole pens. Purlins, battens and roof were locked with nails.  2. The porch used a flat roof. Porch posts, rafters, wall beams, battens and roof were joined with nails and bolts.  3. The roof was connected to the battens and rafters by using nails. 
Sizes	The stick beam size was 5x10 cm and 40 cm long. The sloof size was 5x10 cm. The girder size was 5x7 cm. The board floor size was 4 m long, 2.5 cm thick, 18 cm wide.	The door size was 90x200 cm. The window size was 60x 20 cm. The house post size was 5x7cm. The sill was 5/7 cm. The wall was 4 m long with 2.5 cm thick and 20 cm wide.	The truss size was 5x10cm. The purlin size was 4x8 cm. The rafter size was 5x7 cm. The batten size was 2x3cm.
Materials	The materials used local woods (Bornean ironwood and meranti).	The board material from meranti wood was used for floor and wall, while Bornean ironwood and meranti wood beams were for doors, windows and sills.	Purlins, truss frames, battens used local woods (meranti and *benuas*). The floor of the house was from zinc.
Conclusion	The 1970 house was made from Bornean ironwood and meranti woods harvested from the nearby building site. The structure and construction still applied centimeter and meter.		

TABLE III
OBSERVATION UNIT ANALYSIS 3

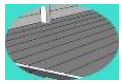
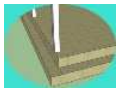
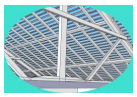
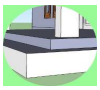
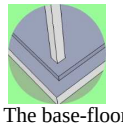
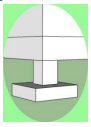
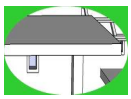
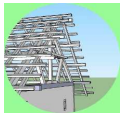
Preposition	Lower structure and construction	Middle structure and construction	Upper structure and construction
Connection Model	1. The sticks were joined to sloofs using a single open pen. Beams were placed on the top of sloofs and locked with nails.  2. Floors were arranged tightly above the beams and were locked with nails.  3. The porch and house had a height difference approximately 10cm. Porch posts were planted on cement castings.  4. Columns (sticks) were planted on the ground with a model of crossing gelam woods or *kapur naga* woods.	1. Doors and windows were joint using sills with hinges. The door and window frames were joined to the wall posts using the edging to form jambs. The sills (*malang*) were joined to wall posts using pen links and holes.  2. The doors were adjacent to posts that had been disponed with hinges as binders. The vents were joined in the jambs using hinges as binders.  	1. The joints of the truss and the beams of the wall used the ½ coat model while the truss rafters and ceiling joints used a hole pen model. Both sides of the truss were clamped to lock it while the purlins, battens and roofs were locked with nails.  2. The roof joined to porch used 15-degree plain roof, consisting of posts, rafters, concrete blocks, and roof. They were connected by nails and bolts. 3. Roof used shingle nails connecting to rafters. 
Sizes	The stick beam size was 5x10 cm and 1 m long, the sloof size was 5x10 cm. The beam size was 5x7 cm. The floor board was 4 m long 2.5 cm thick and 18 cm wide.	Main door 90x200 cm. Room door 80x200 cm. Window 80x 120 cm. Posts 5x7 cm. Sills 5/10 cm. 4-meter-long, 2.5 cm wide and 20 cm wide wall	The truss size was 5x10 cm, the purlin size was 4x8 cm, the rafter size 5x7 cm, the batten size was 2x 3cm.
Materials	Wooden blocks (Bornean ironwood), wooden planes (meranti)	Wooden-floors (Bornean ironwood); wooden walls (*meranti*); wooden blocks (Bornean ironwood and meranti) for windows.	The truss frame, purlins, rafters, battens used local wood (Bornean ironwood), the roof used shingle.
Conclusion	The house renovated in 1980s was made of Bornean ironwood and meranti and completed with concrete porch (front and backyard/rear). The structure applied centimeter and meter.		

TABLE IV
OBSERVATION UNIT ANALYSIS 4

Preposition	Lower structure and construction	Middle structure and construction	Upper structure and construction
Connection model	1. Practical sloof posts joint in concrete form; the floors were in ceramic-layered concrete.  2. Floors were in ceramic-layered concrete and concrete porch posts with diameter of 8-10 cm.  3. The base-floor applied Chicken Claw construction. Sloof dimension was magnified to 25/15 to replace river stones to hold the soils and to distribute the upper weight.  4. The foundation was planted in the ground with the Chicken Claw foundation model (the local foundation).	1. The windows were adjacent to jambs and were joined by hinges on the wall. The ventilation applied 20x25-cm holes. The canopy was built above the window to be the shelter from the rain.  2. The doors were adjacent to jambs and connected by hinges on the wall. The ventilation applied 20x25cm holes. 	1. The truss and the wall beams used ½ joint. The truss ceiling joints and rafters are connected using pen holes. Both sides of the trusses were clamped. Purlins, battens, and roof are connected using nails.  2. Roof connection to porch uses 15-degree plain roof, consisting of posts, rafters, concrete blocks, and roof. They are connected using nails and bolts.  3. The multi roof was connected to battens, rafters, and purlin with nails. 
Sizes	The Chicken Claw base dimension: 60x60 cm; The porch posts: 20x20 cm; the sloof: 25x15 cm; the practical post: 10x10 cm; the ceramic: 40x40 cm	The main door: 90x200 cm; the room door: 80x200 cm; the bathroom/lavatory doors: 70x200 cm; windows: 80x 120 cm; the sills: 5/10 cm.	The truss: 5x10 cm; the truss' ceiling joint: 5x7 cm; the purlin: 4x8 cm; the rafter: 5x7 cm; the batten: 3x 5cm.
Materials	Concrete (sand, stone, water, cement), landfills from other villages.	Ceramic floor size was 40x40 cm, brick plaster wall, sills, beams, doors and windows used local woods (Bornean ironwood and meranti).	Purlins, truss frames, rafters, battens used local materials (Bornean ironwood). The type of the roof was multi roof.
Conclusion	The 2000s house applied concrete as a result of the improvement of transportation facility. The structure and construction still applied centimeter and meter.		

The observation units 1, 2, 3, and 4 have revealed that the structure and construction of Nyoman Remuja's house has changed from wooden-based to wood-and-concrete-based to concrete-based structures. The wooden construction of the observation unit 1 was used to anticipate wild animals and adapt the peatland condition. The two-meter wooden construction was used in the observation unit 1 to anticipate wild animals and to adapt the conditions of the site and the peatland. For the structure and the construction of the housings, mixed jungle woods found around the transmigration area like the weeping paperbark were used. The observation unit 1 was the housing provided by the government for transmigrants, so its structure and construction used the international standard and the universal form.

The drying peatland that started to dry and condense caused the structure and construction of in the observation unit 2 to experience decrease in its braces. These braces were cut until the size of 40 centimeters long. Along with the improvement of the economic condition, the transmigrants combined mixed jungle woods and the first quality woods like ulin (Eusideroxylon Zwageri) as the building materials, and the international standards were still used for the structures and constructions.

The more improved access to the transmigration location (due to the road building), the dried and condensed peatland, and the better economic condition had caused the structures and constructions in the observation unit 3 to change its materials. The materials were the mixture of wood and concrete, and the kind of wood used for this mixture was the first quality one, ulin.

The improved accessibility to the transmigration location and the difficulty in obtaining wooden materials drastically changed the structures and constructions in the observation unit 4 particularly in its materials and dimensions. In this unit, only the upper structures use woods while the middle and the lower structures and constructions use concrete; and furthermore, the concrete merging with the ground is used for the lower constructions.

The form of structure and construction of housings of the Balinese transmigrants is undergoing a continuous evolution and adaptation as a manifestation of acculturation between the Balinese and the Dayak Ngaju peoples. The elements of structures and constructions of housings are hidden. It is not called the honesty of structure anymore. They have used a new shape to show a new identity.

IV. CONCLUSION

The process of acculturation between Balinese and Dayak people in Basarang Jaya can be seen in the observation unit, Nyoman Remuja's residence. This house, from 1963 until the 2000s, had experienced changes three times in its shapes, structures, construction, and types of building materials. The houses' form had changed from the stilt houses to houses built on the surface of soil. The height of the stilt houses in the 1970s and 1980s also had changed due to environmental conditions of peat swamp starting to dry up and solidify.

The materials used change to adjust to the increase in the residents' economic condition and the accessibility and availability of raw materials like concrete and iron around the location of transmigrants.

The structures and construction of the observation unit experienced three changes, namely wood construction, wood-concrete mixed construction, and concrete construction. Changes in structures and construction of the house adjust to changes in environmental conditions, economic improvement of transmigrants, lifestyle and improved accessibility. For the structures and construction of the houses, people no longer use the size of the body of the house's owners, the common way used by traditional Balinese communities. Instead, they use international sizes like centimeter and meter. These international measures are applied because of limited materials and the necessity to follow the sizes commonly used in transmigration locations.

Changes in the forms, structures, construction, and materials (from wood to concrete) have caused changes in thermal occupation. However, in the Basarang Jaya Village, especially at Mr. Nyoman Remuja's residence, the community is still north-south oriented. This orientation, furthermore, is based on the Tri Hita Kirana cultural norm which is suitable for tropical climate in Indonesia. The extended form of the houses, in accordance with Betang dwelling concept of Dayak Ngaju, causes air circulation to flow rapidly throughout the room, and the existence of many windows also creates fine room lighting. Moreover, the space between distant building masses and 40x60 meter residential plots is supported by the presence of barriers in the form of fruit trees around residential areas and rubber plantations behind the areas, and these vegetation barriers create comfortable atmosphere for living even though the houses use concrete.

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