

# Assessment of existing local houses condition as analysis tools for shore housing improvement program in Weriagar district, Bintuni Bay

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**Abstract.** The housing assessment is a part of the pre-feasibility study in The Shore Housing Improvement Program in Weriagar District, West Papua. The housing assessment was conducted to identify the physical condition of existing houses. The parameters of assessment formulated from local references, practices and also national building regulation that covers each building system components, such as building structure/frame, building floor, building cover, and building roof. This study aims to explain lessons from local practices and references, used as the formula to generate assessment parameter, elaborate with Indonesia building regulation. The result of housing assessment were used as a basis to develop the house improvement strategy, the design alternative for housing improvement and further planning recommendations. The local knowledges involved in housing improvement program expected that the local-based approach could respect to the local build culture, respect the local environment, and the most important can offer best suitable solutions for functional utility and livability.

**Keywords:** housing assessment, housing improvement, local knowledges, vernacular, weriagar district

## 1. Introduction

Weriagar district is a remote area away from Bintuni bay regency, only accessible by boat for 3-4 hours. It has a distinct character of change-sensitive estuary area and local culture owned by its Indigenous People. The living community has lived for centuries and inherited custom land law as well as livelihood in fisheries. Due to its location, it had been revealed that coastal and river erosion threats Weriagar District since fisheries and settlement activities interfere its natural function. There is also a problem in settlement area, that always submerged by sea tides, it affects the houses feasibility, as well as the health of the living community. Based on the issue, The Shore Housing Improvement Program was developed to improve settlement and environment condition in Weriagar, in order to increase life quality of the living community. The program was first initiated with pre-feasibility study, to identify the main alternative solution and recommends the most prospective solution.

Generally, the housing assessment was conducted to a building that used familiar structure system and assessed with common building regulation. The Weriagar district community still hold strong traditional values and very dependent on nature, so the parameters used to housing assessment should be adjust based on it. So that, the assessment results can be balance and fit with local wisdom.

In addition to the assessment parameter derived from local knowledge, it is needed to elaborate with other parameter that have detailed and specific basis of building. In this case is used Indonesian national



regulation on public housing, it contains the basis of feasibility standard for a health and safety in every building structure elements, covering the building foundation, building frame, roof structure, lighting, air circulation, sanitation, the space ratio per person, and the usability of materials and the maintenance which are based on local knowledge [1].

In order to strategy development of housing improvement, It should be done with a local-based approach, it has respect to the community and respect to the process and building culture [2] and also leave minimum harm impact to environment. The local knowledge of houses were developed by living community to adapt with their environment characteristic and culture, with basic construction techniques which people have learned from over centuries, local labour availability, and also environmentally friendly materials [3].

The objective of this paper, specifically explains the housing assessments analysis tools to identify existing local houses condition for development strategy, and basis of design alternatives for housing improvement program, also to explain lessons from local practices and references could be used to formulating assessment parameter.

## **2. Research and Method**

### *2.1. Scope*

Weriagar District settlement located in Bintuni Bay Regency, West Papua. 2°16'22.3"S 132°53'38.3"E. The housing assessment scope are 33 pre-identified random samples from total 131 houses, based on The Inhabitant Survey Report of Centre of Population and Policy Study in 2013.

### *2.2. Method*

There were 3 steps in physical house assessment, (1) data collecting; (2) data analyzing; and (3) providing recommendations.

### *2.3. Assessment Parameter*

The following housing assessment parameters adapted from Indonesia national regulation about house feasibility criteria which has adjusted with local wisdom. Buildings are divided into observation 3 elements. They are building structure/frame, building floor, and building cover.

Building structure/frame consists of foundation, bottom column, upper column, floor, roof and wall. In the assessment of foundation, a maximum score is given if there is no differential settlement or settlement of the building and if the building is not tilting. In the assessment of bottom column (from foundation to floor), a maximum score is given if columns are made of processed wood (instead of logs) with sufficiently close spacing among each other and bound with bracings between the bottom poles to form a rigid system. In the assessment of upper column (from floor to roof structure), a maximum score is given if columns are made of processes wood (instead of logs) and have connections with roof frame and house's sheathing frame. In the assessment of Floor a maximum score is given if floors are made of processed wood (instead of logs) with tight spacing so that floorboards do not sag, shift, nor tilt, and have different elevations between room. In the assessment of roof, a maximum score is given if the roofs are made of processed wood (instead of logs), wood dimensions are sufficient to bear loads, and have correct wooden roof construction system (roof stands). In the assessment of wall, the maximum score is given if walls are made of processed wood (instead of logs), have correct wall support system and connected to the main frame/roof system.

Building floor consists of floor frame and floorboard. In the assessment of floor frame, a maximum score is given if floor frameworks are made of processed wood (instead of logs), have tight spacing so the floorboards do not sag, shift, and tilt, and have different elevations between rooms. In the assessment of floorboard, a maximum score is given if floors are made of processed wood (instead of logs), have tight floorboard spacing and not undulated.

Building cover consist of wall, door, and window. In the assessment for wall, a maximum score is given if wall covers are made of wood plank, processed neatly and uniform in size. If *gaba-gaba* is used, it should have a uniform shape and size, tightly closed and fixed on the wall framework solidly. In the assessment of door, a maximum score is given if doors are made of processed wood (instead of logs)

with finishing, and have regular shape and size and a minimum score is given if doors consist merely of frames/sills closed only by curtains and door leaves are absent. In the assessment of window, the maximum assessed if using wood materials that already processed (not from logs) with finishing, has a definite shape and size. Average assessed if window not only have frame/sills but also have shutters made from unprocessed wood and not finishes. Minimum assessed if window only have frame/sills, closed only by a curtain and don't have shutters.

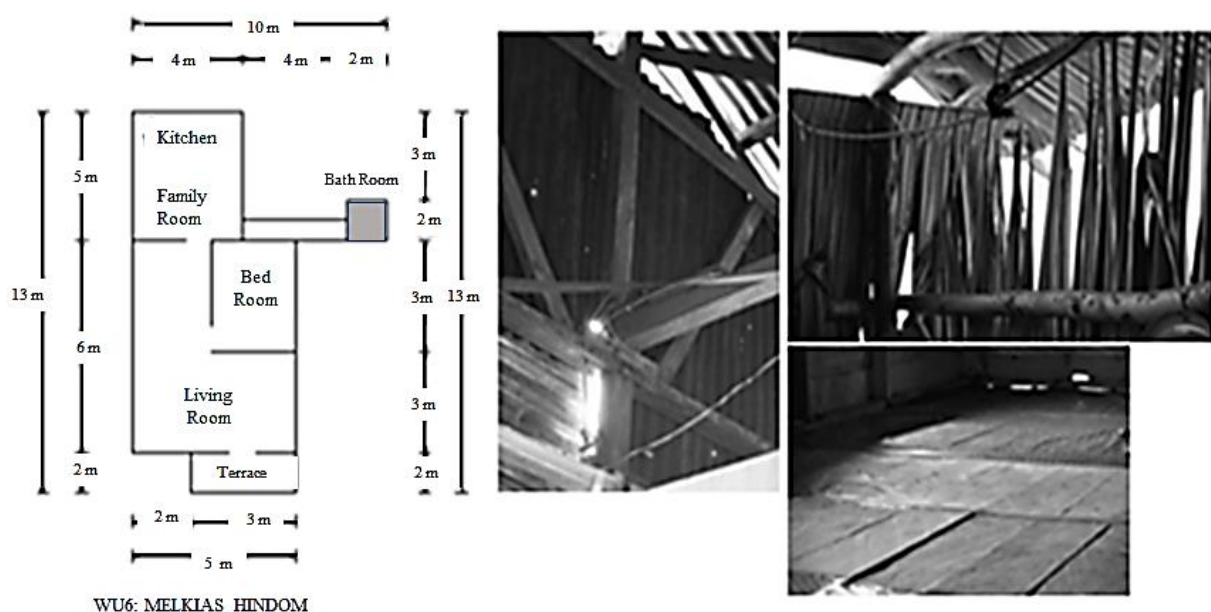
Building Roof consist of roof frame and roof cover. In the assessment for roof frame a maximum score is given if roofs are made of processed wood (instead of logs), with sufficient wood dimensions to bear loads, and have correct wooden roof construction system (roof stands). In the assessment of roof cover, a maximum score is given if roof coverings are made of zinc, which is used to cover all parts of the building, and already has ceilings made of plywood/gypsum and a minimum score is given if roof coverings are only made of unsealed *rumbia* (still leaking), if there are still parts of the roof that are not covered by roofing materials, and if there is no ceiling.

### 3. Results and Discussion

#### 3.1. Data Collecting

The results of data collecting from 33 pre-defined house sample consist of size, room type, and interior facilities; Existing interior visual data and exterior condition of houses; Number of householders and inhabitants; Daily and periodically of routine activity pattern in each room; Space requirements references and activity type. The data collected through interview and observation.

The following sample of data result are collecting to explain the condition of sample house (see Figure 1).



Villages	Householder	Householder number	Inhabitants	Status	Area
North Weriagar	Melkias Hindom	1	4	Indigeneous	72

**Figure 1.** Sample of result of data collecting.

### 3.2. Data Analyzing

Based on collected data of houses in every village in Weriagar District, the analysis process is conducted which consist assessment of physical condition percentage using predefined parameter. The following sample of the housing assessment of physical condition percentage.

**Table 1.** Sample of House Assessment form.

Building Component System	Building Component	Building Condition Percentage			
		0-25 %	26-50%	51-75 %	76-100 %
<b>Frame/Structure</b>	Foundation		v		
	Bottom Column	v			
	Upper Column		v		
	Floor		v		
	Ceiling		v		
	Wall		v		
<b>Floor</b>	Floor Frame		v		
	Floor Board		v		
<b>Building Cover</b>	Wall		v		
	Door	v			
	Window	v			
<b>Roof</b>	Roof Frame			v	
	Roof Tile			v	

### 3.3. Recommendation

Based on observation and assessment results, the following recommendations could be made:

- **Elevated Building**  
All of the buildings in Weriagar District need to be elevated in order to adapt to local conditions (tidal area). The minimum building floor height is higher than the maximum height of the tide that occurs periodically every year.
- **Frame Construction System**  
Frame construction system needs to use in the elevated building. In this system, the foundation structure does not rely on soil type or bearing capacity but on the bond between the foundation and the upper framework which ensures the overall stability of the structural system. This frame construction system is also applied in the overall structure of the system including structural floors, pillars, and roof of the building.
- **Local Materials**  
The usability of local materials becomes dominant because of limited availability of materials from the outside and lack of supporting system to transport goods. The local materials have been processed beforehand to ensure their strength, durability and to facilitate their maintenance. Local materials are used both for building structure and building envelope.
- **New Materials**  
The use of new materials needs to be introduced mainly for roofing to increase durability against rain and to facilitate maintenance. Moreover, additional materials such as glass for windows and openings of the buildings are also needed.

Based on the analysis result of space usage preferences, inhabitant activities, and existing house layout, the following recommendations on house layout are made:

- House layout should follow daily activity pattern.
- House layout should follow room usage and function pattern which may be different to common building standards.
- Room and house layout should consider the growing building type to anticipate additional room needs which have not been fulfilled in the initial house construction stage, so that the house shape and character can still be maintained. Furthermore, the original and additional parts would be integrated.

#### 4. Conclusion

Each location has different natural challenges, the manifestation of human resistance to living in natural landscape reflected into the type of the settlement and the manner the houses are built. Local knowledge can be used as a strategy in the strategy development of housing improvement in Weriagar District due its offer best suitable solutions for functional utility and liveability. [3] Lesson from local knowledge elaborated with building regulation, generating the balanced assessment parameter for achieving contextually appropriate and sustainable development [4].

Visual physical assessment is effective and easy to conduct, due the houses has a very simple structure, but visual assessment can only detect major damage of structural or building physic. Assessment should be done by people who are competent in their fields, since visual assessment has no clear basis, and rely on the experience and knowledge of observer.

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