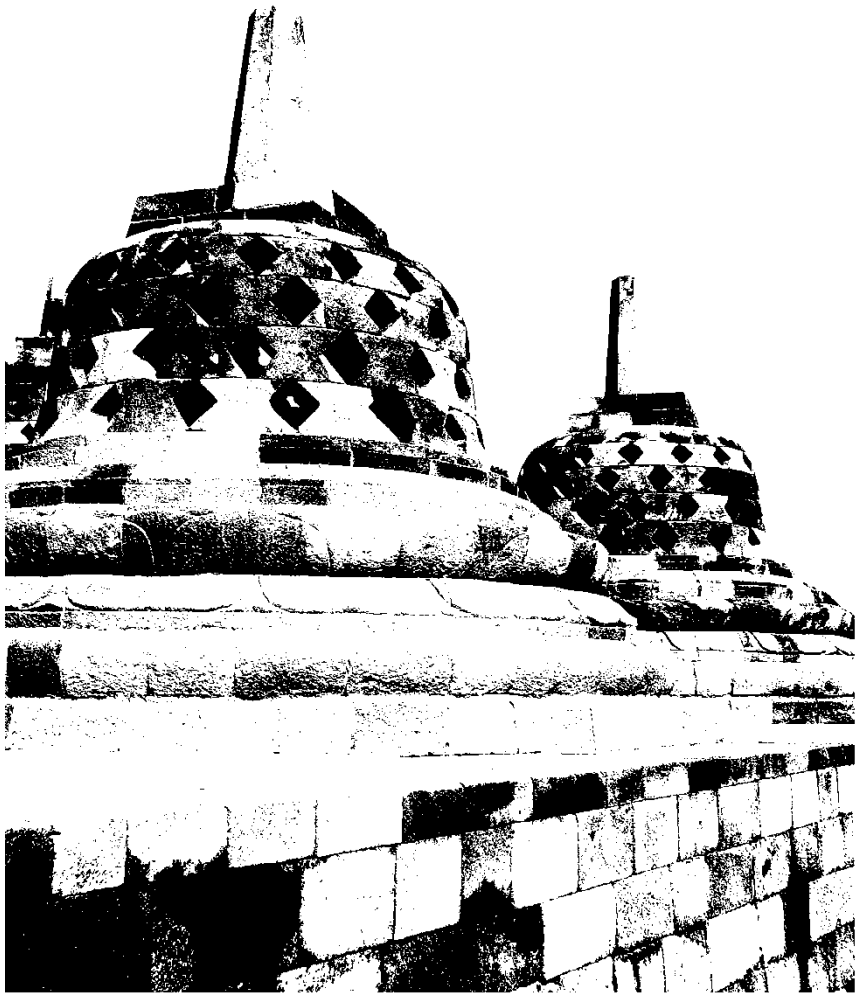
PROCEEDINGS

Local Wisdom in Global Era

Enhancing the locality in Architecture, Housing and Urban Environment

A. Indigeneous Architecture as
a Basic Architectural Design



3.1.1

A POTENCY OF A LOCAL MATERIAL TO ACHIEVE A CREATIVITY

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ABSTRACT

Local material used to be seen as a poor material. But nowadays, many architects try to explore the abilities of those material, so it can be used creativily in designing a sustainable building. It is one way to save the energy to deal with the global warming. One of the local material is bamboo. Bamboo is a sustainable material because it grows rapidly and it can be used in any building elements, from foundation to roof. Bamboo also have a capability in creating a thermal comfort inside a building. Many construction techniques are found, so bamboo can be used in a small buildings as well as big buildings, even in a long span buildings. Bamboo not only gives an aesthetic elements, but also a strong structure. Many great architectures now are made in bamboo. This paper shows some examples of buildings that use bamboo in creative ways.

Keyword: local material, bamboo, creative

I. INTRODUCTION

The use of local material is one way to save the earth due to the global warming issue. By using such materials, people use less energy because it does not need an added transportation, and it only needs a local treatment. Most common people used to think that local material is tend to be used by poor community. But that opinion is changed lately, because so many great architecture are built by local material nowadays. So many techniques are found now in the same old local material. That is why the same local material that is used by local people, can be changed to be sophisticated material in the hand of an architect.

There are many local materials available on earth, such as stone, wood, thatch, palm blare and bamboo. Those materials are available in every side of the world, only in a different kinds and characteristics. The most potential of local material is bamboo. It can be used in every part of a building, from foundation to roof.

Bamboo is the largest of the grass family of plants. It grows very quickly, providing renewable material for building, tools, and utensils as well as edible shoots. Bamboo is particularly suitable for creating beautiful roof structures and is extremely resistant to earthquakes. Bamboo can replace wood and steel in many other situations as well. It can replace rebar, act as pins in straw bale construction, create trusses and other structural members, provide decorative elements, and even function as plumbing. Bamboo is susceptibleto insect damage, however, and must be treated for longevity. Sustainable forestry practices must also protect against over-harvesting. Although bamboo is considered a “poor person’s material”in many countries where it has been used vernacularly, that associationis changing as new structural systems allow for more ambitious architecture that is patronized by the wealthy (Kennedy, 2004).

Bamboo is a local material in every place on earth. Worldwide there are about 1600 bamboo species distributed in about 121 genera (25 herbaceous and 96 woody). Geographically, these species are

found in the tropical, sub tropical and temperate areas of all the continents, except Europe where there are no indigenous species. The approximate continental distribution of bamboos is as follows: 67% in Asia and Oceania; 3% in Africa, and 30% in the Americas (Lopez, 2003). It shows that bamboo is easily to get and to be used in those places, and can be known as a local material.

II. THE POTENCY OF BAMBOO AS A LOCAL BUILDING MATERIAL

One of the ability of bamboo is as a building material. It can be used as a structure, a building surface, as well as an aesthetic element. So bamboo can be treated so many ways, depend on the need. Beside that, bamboo also has another potency in creating a thermal comfort inside a building.

2.1 Bamboo Preservation

Before bamboo is used as a building material, it needs to be preserved first. Bamboo without preservation can survive for 10 years, so bamboo with preservation must survive longer than that. There are many ways to preserve bamboo, i.e:

a. Bamboo preservation in general
   The best time for harvesting is the drier and cooler season when the insects are less active.

b. Passive methods
   Simple constructive measures like lifting up the pillars or an outjutting roof can help to extend the life time of the bamboo distinctly.

c. Active methods
   Smoking:
   Smoking it in its own resin. The smoke makes the rind unpalatable to insects which therefore decline the bamboo.

   Heating:
   The canes are heatted in kilns to ca. 150°C for a short time, so the structure of the outer zone changes and becomes more resistant against insects. The poles can crack up easily. When you cook bamboo, the starch and nutrient content will be reduced.

   Immersion:
   Freshly cut canes are immersed in water for 4-12 weeks. The nourishment for insects (starch and sugar) is removed. Streams are more suitable than stagnant ponds. Saltwater is not suitable, because the salt will stay in the bamboo and can bring moisture and fungi into the canes.

   Impregnating coatings:
   Coatings with borax are ecological and widely used. In addition, lime slurries, rangoo oil or slurries from lime or cow dung are also used. Using insectices is ecological not acceptable. These are kerosene, DDT, PCP and others.

d. Aim
   These methods prevent the invasion of pests during changing the surface of the bamboo or remove the nourishment of the insects. To protect the bamboo from fungi and mould, the moisture must be kept away. To preservate the bamboo inside of the pole, all diaphragmas have to be perforated or all segments drilled.

2.2. The Characteristic and Treatment of Bamboo

Bamboo has many characteristic that makes it better than the other materials. The characteristic of bamboo are:

a. Tensile strenght:
   The fibres of the bamboo run axial. In the outer zone are highly elastic vascular bundle, that have a high tensile strenght. The tensile strenght of these fibres is higher than that of steel, but its not possible to construct connections that can transfer these tensile strenghs.

b. Shrinking:
   Bamboo shrinks more than wood when it loses water. The canes can tear apart at the nodes. Bamboo shrinks in the cross section ca. 10-16 %, in the wall thickness ca. 15-17 %.

c. Fire resistance:
   The fire resistance is very good because of the high content of silicate acid. Filled up with water, it can stand a temperature of 400° C while the water cooks inside.

d. Elasticity:
   The enormous elasticity of bamboo makes it to a very good building material for earth-quakeendangered areas. Another advantage of bamboo is its low weight. It can be transported and worked easily, the use of cranes is mostly unnecessary.

Bamboo can be worked with the simplest tools wich must be especially sharp because of the highly silicified outer zone. Tool wear is considerably high. Recommendable methods are:

a. Splitting:
   Very easy as long as it is splitted along the cane axis. The cane is split in halves and quarters and the driven apart by a wedge. It can also be split with a knife frame into four or eight segments. By means of splitting we get halved canes, strips and battens. To get planks, all the nodes are smashed and the wall of the pole is split over its entire length and forced open until the wall of the pole lies flat. Up to the age of 18 months, the canes can be peeled. The strips can be used as ties or be woven to make strings and ropes. Bamboo being forced to grow in a box

b. Shaping:
   Bamboo which grows in a box gets a square shape. So it can be better used for connections.

c. Bending:
   Freshly cut, bamboo can be bent and will keep this shape after drying. When heated above 150° C, bamboo keeps its shape after it goes cold.

The surface area of bamboo also has to be treated in some ways. The informations about bleaching and dyeing are determined for small parts for kite-constructions. Bleeching and dyeing possibly can change the structure of the bamboo that far, it can´t support enough weigt. Nevertheless these methods should be introduced:

a. Bleaching:
   Bleaching in hydrogen peroxide removes traces of resin or wax. If it stays in it too long, the bamboo will get perished.

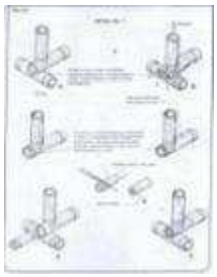
b. Dyeing:
   Every country has developed its own traditional method of dyeing. In principle:

   1. Remove the wax, otherwise the colour can´t penetrate into the bamboo.
   2. Bleach befor dyeing, so the colour will become more regular.
   3. After dyeing, fix the colour in a solution of vinegar.

2.3. Bamboo Construction

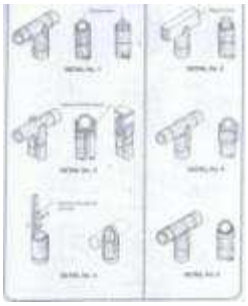
Bamboo can be used as a structure, building surface, as well as an aesthetic elements. It can be used as a foundation, coloumn, floor, wall, roof truss, etc. Some bamboo construction technologies are shown in Figure 1.

Some basic rules for using bamboo in construction



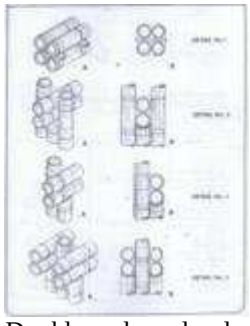
How to avoid the crushing of horizontal members

Types of joints used in bamboo construction

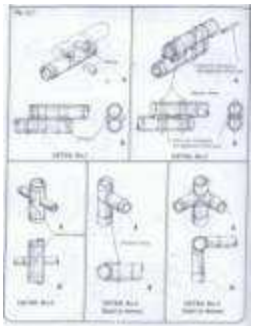


Joints horizontal and vertical members

Fixing horizontal and vertical members with pins and bolts



Double and quadruple beams-supports



Horizontal joints (not for structural members)

Horizontal splicing (not for structural members)

Figure 1. Bamboo construction technologies
Source: Lopez, 2003

According to those bamboo technologies, an architect can use it in designing an architecture, whether it is for a small building, or a big building. Even for a long span building, bamboo can handle it.

2.3 The Role of Bamboo in Creating Thermal Comfort

According to the research about the thermal performance before, bamboo has a capability to create a thermal comfort (Muchlis, 2010). The result of the research says that brick materials can decrease the outside air temperature more than the bamboo material. But the humidity generated by brick is much higher than bamboo. When it was analyzed using *psychrometric chart*, it can be concluded that

bamboo is more comfortable than brick. This conclusion was taken after considering two things, temperature and humidity.

The research also says that the difference of bamboo construction creates a different thermal performance. The research was done in two kinds of construction; vertical bamboo wall construction, and matted bamboo wall construction. The research shows that the construction of the matted bamboo construction has a better value of thermal comfort than vertical bamboo.

III. THE EXAMPLES OF ARCHITECTURE IN BAMBOO CONSTRUCTION

Bamboo is used in many great architectures lately. Many architects explore the potency of bamboo creatively. Some examples are Green School in Bali, and Kayu Manis Resto in Bali.

3.1. Green School, Bali

This object is located in Bali and created by master craftsmen, designers and builders, landscape architects and gardeners using a blend of cutting-edge technology and traditional materials and methods, so the result is a sustainable building. We can state there is no reason to say that bamboo is a difficult material to explore. From the pictures below, we can see how a structure can produce the form and aesthetics.

Figure 2. Green School, Bali
Source: Writers, 2009

Due to the width of the roof, the structure requires the support column. From the image above, bamboo as a column (take the weight of the roof) is set up with the same span distance. Bamboo is easily bent, so the roof shapes can be explored. Bamboo, can also be tilted in accordance with the needs. So the exploration of the form can also be supported by the structure.

Bridge in Green School, focus in bamboo construction: joints of horizontal and vertical members (beveled joint and scarf joint). Choices of the appropriate structure, forms a nice bridge with locally advanced materials. Bamboo has greater tensile strength than steel. It can produces curved shape on the bridge.

Figure 3. Green School, Bali
Source: Writers, 2009

Aspects of natural lighting are applied in this building. Bamboo styled crisscross to each other to strengthen the structures. From the left picture, circular aperture of light become a point of interest. From right image, the columns made a curve shape.

Figure 4. Green School, Bali
Source: Writers, 2009

The connection structure of the image above is using the method: fixing horizontal and vertical members with pin and bolts. The column is made oblique, not perpendicular to the section supported.

Fence has a distinctive pattern. These patterns are obtained from the split bamboo because it is easily to split, according to its usefulness.

Some bamboo (as a cantilever column) are united in this STONE FOOTING. This type is commonly used for slope and flat grounds. Rigid columns, such as the use of steel columns, are no longer visible,

This is a boarding house for students. All furniture are using beautiful bamboo. The windows have views of the Ayung valley. This boarding called Housing Bamboo. No less interesting with modern furniture, just live in it we feel in harmony with the natural beauty and comfort.

Figure 5. Green School, Bali
Source: Writers, 2009

3.2. Kayu Manis Resto in Bali

Figure 6. Bali Kayu Manis Restaurant

Bali Kayu Manis Restaurant expresses the building through a row of bamboo. Restaurants by Budi Pradono become a tourist destination in Bali. Many tourists visit this restaurant for its romantic atmosphere inside. At least two local materials used in this restaurant: bamboo and clay. Local ingredients are collaborating with glass, which is used in modern building.

Figure 7. Kayu Manis Restaurant, Bali
Source: Writers, 2009

Bamboo in small diameter is arranged regularly as ornamentation, and roof covering is fiberglass, which mounted right on the open space of the receptionist area.

The bamboo is set up with the same distance and stopped at the same point, thus forming a line. It is a simple concept, but make an interesting display.

Figure 8. Kayu Manis Restaurant, Bali
Source: Writers, 2009

The visitors have to walk through this tunnel to go to restaurants. To get a different impression, it is made of local clay materials. The main structure of the restaurant building using steel, which are rigid. While bamboo is a lightweight ornaments, so that each material shows its character at once, united in aesthetics.

Inside the tunnel, there is no window/ openings. The designer let the natural light through the upper tunnel, in bamboo. Incoming light gives the impression of dramatic and exotic. Once again, bamboo can be paired with other materials, resulting in an aesthetic architecture without leaving the local character.

Figure 9. Kayu Manis Restaurant, Bali
Source: Writers, 2009

Another function of bamboo is as a secondary skin to filter sunlight. To give an aesthetic impression, bamboo arranged differently between the top and bottom.

In ceiling, still using bamboo that is arranged almost the same with the ceiling in the receptionist area. But in this room, bamboo is arranged more tightly, so that it gains the formal and exclusive impression.

Figure 10. Kayu Manis Restaurant, Bali
Source: Writers, 2009

Other details, bamboo is arranged alternately between the vertical and horizontal. Bonding between them used “ijuk”, done very simply, so keep supporting the building appears minimal.

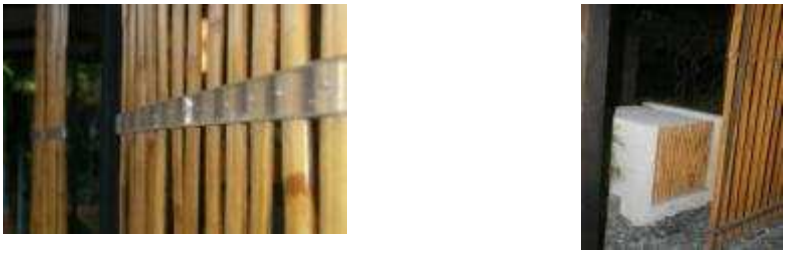


Figure 11. Kayu Manis Restaurant, Bali
Source: Writers, 2009

Bamboo is easy to split apart as needed. Bamboo can also be easily combined with other materials. Bonding between the bamboo is selected from materials that support the minimalist look, which is acrylic. A blend of contrast material, still produce harmony.

Other additional functions such as trash, is also completed with bamboo.

Another example of the bamboo that is used as building material for walls, has been performed in Babahoyo, Ecuador in 1989 (as seen the picture below). Training course for architects and engineers, it demonstrated methods of constructing roofs and walls from Bamboo.To reduce deterioration of the

bamboo from insects and climate, the bamboo pieces were cut in half. In the right picture, it's about the community building in Soritor during wall construction, in bamboo.

Figure 12. Walls in bamboo.
Source: (Kennedy, ___:p.201)

Figure 13. Wall sonstruction, soritor
Source: www.practicalaction.org

IV. CONCLUSION

This paper is expected to open the public mind about the benefit of bamboo. Bamboo has been proven to have high sustainability value. Bamboo does not require a long time to grow, so that the logging of bamboo will not make the forest bare. Bamboo also has proven to be a strong structure, can even be used in long span, able to curve and also having an aesthetic value. It can be said strong, elastic, and aesthetic. Bamboo is particularly suitable for creating beautiful roof, structures, walls and is extremely resistant to earthquakes. Bamboo can replace wood and steel in many other situations as well, and capable of creating thermal comfort . The last, bamboo is the most sustainable local material that can be used creatively.

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3.1.2

MALAY DECORATIVE IN MODERN BUILDING ARCHITECTURAL

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ABSTRACT

Traditional houses are almost always identifying through building raise on the pile, saddle roof and repeated gable-finials decorative that make them as a local distinct uniqueness. This uniqueness, which could be the strongest features, is bringing significant cultural value and influencies to the development of building architecture.

Gable horn, part of gable-finials, known as traditional roof decorative element has architectural similarities in the broad area coverage. Not only in traditional building of the archipelago, but also found strong evidence has similarities with decorative elements used on gable-finials in the region surrounding Astronesia such as; South East Asia, Malanesia, Micronesia, Polynesia and Madagascar. This has made identifying characteristic strong decorative elements. Gable horn become one hallmark of traditional architecture Astronesia region. Values contained not only from an architectural point of view, but can develop in accordance with their respective regional culture.

The study was based on literature review and field surveyed to observed the presence of gable horn of Malay architecture traditional building. How variant element that can be encountered and became the origin to architectural presedent. Research also see to what extent it used these elements as part of modern architecture is currently widely.

Keywords: gable-finials, traditional architecture

I. INTRODUCTION

Traditional compound, where Malay house spread on, was created respons to the actual housing need and community aspiration. It meet their socio-economic, cultural dan environments requirements (Yuan, 1987).

Malay house created nearly perfect solution to control of climate, multifunctional use of space, flexibility in design and shopisticated prefabricated system which can extend with the growing needs of family (Yuan, 1987). It is also identifying through riches cultural building components and decorative elements which have meanings that make uniqueness which could be the strongest features (Waterson, 2009).

This house, mostly spread in central Sumatra and Malaysian Peninsular, is not just a living house. It is a part origin of people spirit in community and conception of human soul (Waterson, 2009). It designed with deep understanding and respect to nature. It built closed to sea shore or river side in hinterland area which usually as compound formation that sprawl to each other.

II. RESEARCH APPROACH

The aim of research is discover Astronesia architecture style through empirical of Malay house at Central Sumatera, Indonesia. This research attempt to addressing and identifying indigenous shelter concept design through field studies and theoretical.

The approach in this research was using both qualitative and quantitative. Main research was collecting primary data through field study. It follows to conducted by literature study such as theories, previous research reports, empirical earlier studies include interview of some experts in this field.

2.1. Traditional Building of the Archipelago

At glace, the most obvious of Astronesia architectural style how building house is rise on pile. This is very general feature of built form in South-East Asia, Micronesia and Melanesia. But it seems to fade out in Polinesia where buildings are often set upon raised stone platforms (Watson, 2009).

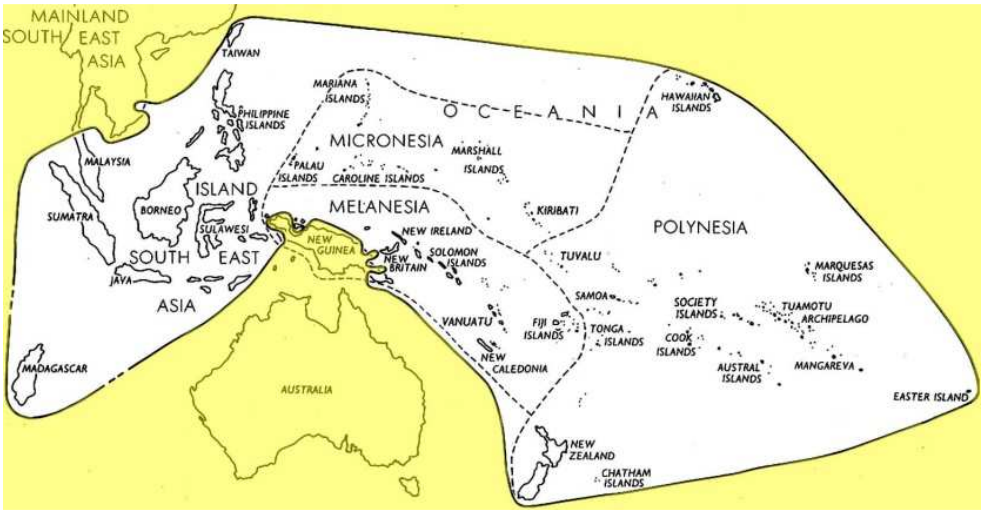

Figure 1. Astronesian boundary family
Source: Waterson (2009)

Another distinct element is saddle roof with an extended ridge-line often resulting in outward sloping gable-end, and sometimes highly exaggerated points to the eaves. In some places, saddle roof has developed a whole range of variations according to its surrounding condition

Figure 2. Some of Astronesia Traditional Houses
Source: Waterson (2009)

Similarities architectural elements in Astronesia region found in gable finial decorative as strong evidence how importan this feature. It can be formed simply from extensional of the rafters, or may be

elaborately carved. Gable horn, sometimes come from a likeness to animal such as buffalo, bird or dragon which are believed to serve a protective function for the inhabitants.

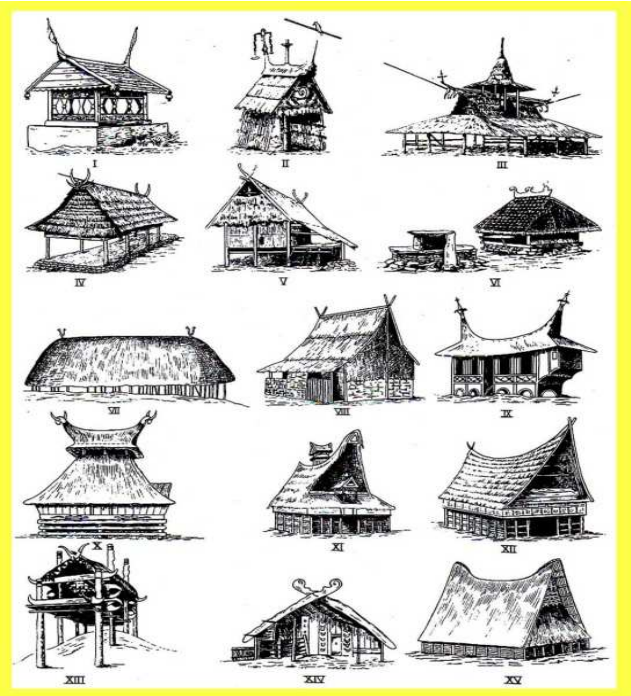

Figure 3. Gable roof and gable horn of Indonesian ancestral
Source: Waterson (2009)

The choice of horns as a motif doubtless reflects the great importance of societies where it is a major form of wealth and sacrifice, beside protective. In certain area, gable horn also point to the potential of these decorative elements to serve as a sign of rank or status in society.

2.2. Rise on Pile

Raise building on pile give distinct advantages. In fact, it is suited to tropical as a response to surrounding environments. It can describe a methods to adjust high distance floor above surface ground. There are some varieties to put or and rise building on pile. It seems this piling concept contradicted to modern technique that building should be tied up into ground. Malay pile building can be placed on the rock, or attach through simple platform without embed into ground

Figure 4. Building structure stand on simple platform
Source: Firzal (1994)

2.3. Saddle Roof

In generally, the Malay traditional saddle roofs are rectangular form and rarely square. It can be divide into three group which base on basic form such as: (1) *Belah Bubung Roof; or bubung melayu/rabung melayu/lipat kajang/lipat pandan/atap labu/ atap layar/ atap bersayap / atap bertinggam*, (2) *Limas Roof; or limas penuh/limas berabung melayu*, (3) *Lontik Roof ; or pencalang/lancang (traditional boat)/gorai* (Effendi, 1986).

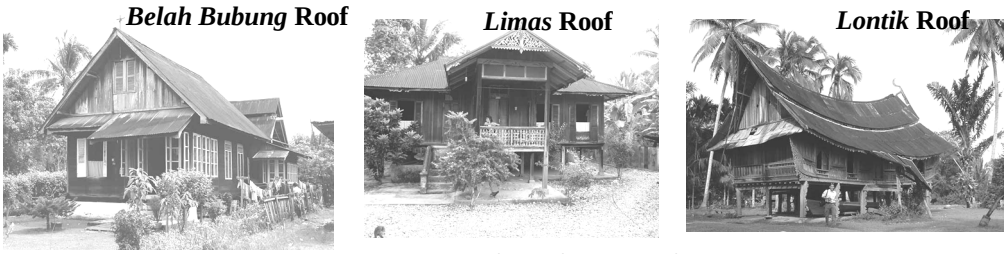

Figure 5. Basic form of saddle roof
Source: Firzal (1994)

Figure 6. Variant of saddle roof
Source: Firzal (1994)

2.4. Gable-Finials Decorative

The finial is an architectural device, typically carved and employed decoratively to emphasize the apex of a gable or any of various distinctive ornaments at the top, end, or corner of a building or structure. A gable finial can be describe as vertical surface situated at one or at both ends of the roof, adjoining a pitched roof. Its shape depends on the type of roof and parapet, mostly triangular, which is as on the facade rather than the back end (front gable).

Figure 7. Variant of Malay gable finial
Source: Firzal (1994)

Gable horn, part of gable-finials, known as traditional roof decorative element has architectural similarities in the broad area coverage. Not only in traditional building of the archipelago, but also found strong evidence has similarities with decorative elements used on gable-finials in the region surrounding Astronesia such as; South East Asia, Malanesia, Micronesia, Polynesia and Madagascar.

This has made identifying characteristic strong decorative elements. Gable horn become one hallmark of traditional architecture Astronesia region. Values contained not only from an architectural point of view, but can develop in accordance with their respective regional culture.

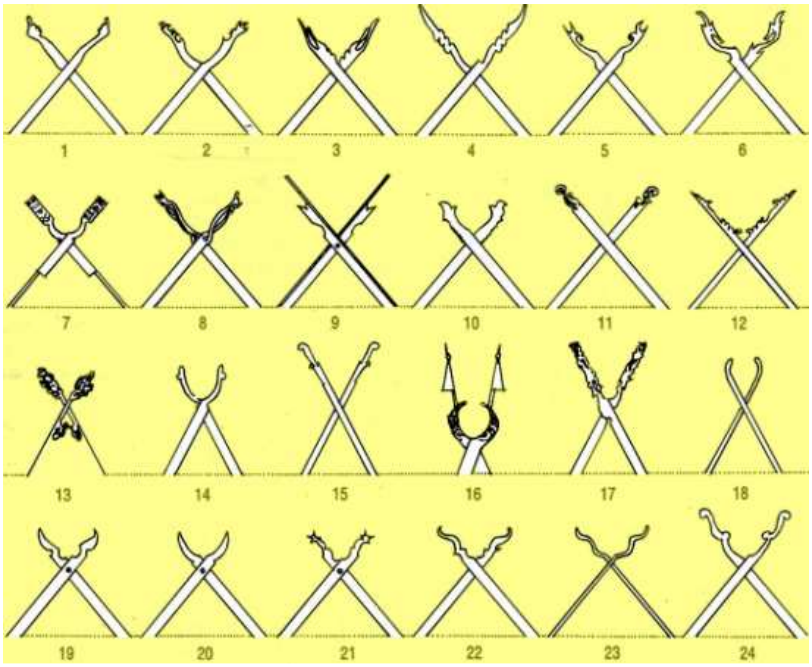

Figure 8. Typical of South-East Asian gabble horn
Source: Waterson (2009)

Figure 9. Varian of recent gabble finials decorative
Source: Firzal (1994)

III. CONCLUSION

Although there are so many varieties and forms of architectural elements in the region Astronesia, but raise on the pile, saddle roof and gable finial are become most important characteristic of traditional architecture Astronesia. This can be described that how these elements can be developed in many variants throughout the archipelago.

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3.1.3

TRADITIONAL ARCHITECTURE FORMERS AS CHARACTER CITY FACE JOGJAKARTA

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ABSTRACT

Initially known as character-forming aspects of the city are: the height of the building, boundary lines and building envelope ("building coverage"). After that, city planning in San Francisco (1970) adds solidity aspect of the building ("bulk"), and Design Guidelines Long Beach, California (1980) adds the appearance ("appearance") and the configuration of the building mass, as character-forming aspects of the new town . In addition, the study looks ("appearance") of buildings, elements: scale, color and texture of building materials should be considered also, as one character-forming aspects of the city.

Meanwhile, according to Hamid Shirvani (1984) character-forming aspects of the city faces, including: Land Use, Building Form and Massing, Circulation and Parking, Open Space, Pedestrian Ways, Support Activity, and Preservation Signage, so that through these studies, see that the appearance of the building into one aspect of the city forming a fairly dominant. What about the character of the city of Jogjakarta's face?. Through qualitative analysis, the results of the survey are "on the spot" in the city of Jogjakarta, it is known that the traditional architecture of Yogyakarta nuance, such as: building with gable, a pyramid roof and roof joglo, has dominated in several strategic places in the city of Jogjakarta, so architecture Jogjakarta traditional, can be considered as character-forming face of the city of Jogjakarta.

Keywords: traditional architecture, the city faces and Jogjakarta.

I. INTRODUCTION.

The growth of cities, a process that is closely related to human civilization, so the shape of the city is not just a human product, but also an accumulation of current political, economic, social and cultural norms are based on prevailing at the time of its formation. For urban design, Hamid Shirvani (1984) [1)] suggested that elements strongly associated with Urban Design, including: Land Use, Building Form and Massing, Circulation and Parking, Open Space, Pedestrian Ways, Activity Support, Signage and Preservation. While the formation of architecture (Building Forms and Massing) and elements of urban design which others (Circulation and Parking, Open Space, Pedestrian Ways, and Activity Support), can not escape the role of Architect as the main actors, and other actors, such as: climate , culture, social values that exist, economic aspects, resources, technology and society, which played a role in decision making.

Yogyakarta city is known as a cultural city, has a character and a different face than the other cities in Indonesia, because of Yogyakarta that was built in 1755 formed from a palace Ngayogyokarto Hadiningrat. So maintaining the identity and character of nuanced Jogjakarta traditional local government programs Municipality of Yogyakarta and became the ideals and desires most community residents. In accordance with the theory Hamid Shirvani (in 1984), in addition to architectural elements of the other city, the city faces is determined by the character forms a mass of existing buildings in it. Therefore, when most of the buildings sector in the city have Indise styles, characters must face the nuanced Indise city. To maintain the attractiveness of the city of Yogyakarta, known as a tourist destination number 2 (two) after Bali, is appropriate when the specific character of the city's

face remained dipertahakan traditional Javanese. So that the efforts towards it will greatly help local government and Yogyakarta will be welcomed enthusiastically by the people of Jogjakarta.

With the change of behavior from traditional to modern society, it is interesting to find out more about how the development of facial character of Yogyakarta, and what aspects that influence it. Traditional architecture as a character-forming face of the city of Jogjakarta to be very interesting to discuss, because at the time of globalization, there will be a tendency in which the public will appreciate more traditional works that have been adapted to the era, from the modern works that shaped the same. This is in line with the opinion of John Naisbitt and Patricia Aburdene in the book; "Megatrends 2000" (1988:108) [2)] which says that in the 21st century, will occur renaissance in the arts and the global lifestyle that is marked by the emergence of Cultural Nationalism, which more homogeneous our lifestyles, will strengthen our dependence on the values of the deeper, such as: religion, language, art and literature. While outside world will grow more uniform, then we will increasingly appreciate the tradition of distinctively and blossom from within ourselves.

II. ARCHITECTURE IN THE CITY JOGJAKARTA

2.1. Traditional architecture Jogjakarta.

Sugiarto Dakung in the book "Traditional Architecture Special Region of Yogyakarta (1987) [3)] defines the notion of traditional architecture, as a form of a building, structure, function, ornamentation and the way they are made, passed down by generations, and can be used to perform the life activity accordance with the values of life held occupants. Functionally, Sugiarto Dakung (1987) divides Javanese Traditional Architecture in four (four) types of functions, ie (a). houses, (b). houses of worship, (c). where deliberation and (d). warehouse. While according to the historical development of his house, Sugiarto Dakung (1987) divides house of Javanese form in 4 (four) different forms, namely: Panggangpe, Kampung, Limasan and Joglo. Panggangpe House Style represents the simplest form of the building, because it consists of only one room and is a basic form of house building Java. Then the form of Village (which owns more than one room) is more perfect than Panggangpe level, and subsequently Limasan represents further development of the village form, and finally complete Joglo forms with supporting facilities, like: Pringgitan, Sentong and page Next page Up, is seen is a form of The most perfect development.

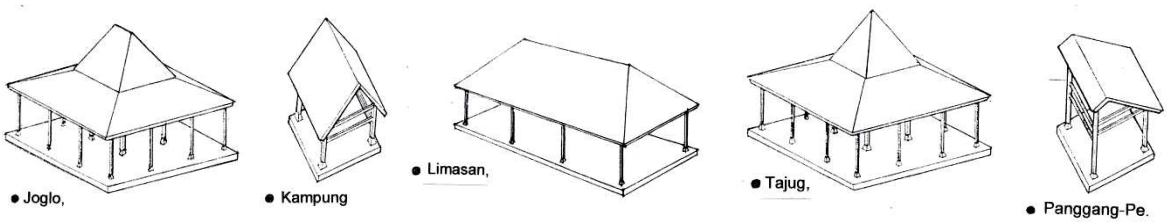

Figure 1. Traditional architecture Jogjakarta.
Source: Researcher (2008).

Franz Magnis Suseno in the book "Ethics of Java" (1988) 4) says that despite the influence from outside the Java community but has an incredible ability to maintain its cultural authenticity, by allowing even accept the foreign culture, as a means to enrich culture, Java, until finally it makes the influence of foreign culture as a culture of Java. While amost Rapoport in the book "Development, Culture Change and Supportive Design" (1983) 5) says that in designing buildings that dotted the decline of traditional buildings, must first be learned from the building environment, so it could get any matters most later amended (the "core elements") and what matters most quickly changes ("peripheral elements"), as well as what things are most readily accepted by the prospective wearer ("new elements").

While Arya Ronald in the book "Values of Traditional Houses Architecture Java (2005-142) 6) says that: (1). Type of house building is highly dependent on the social aspects, in this case means that closely related to the homeowner attempts to gain recognition from the community, (2). Building form, depending on geographical and social aspects, which form the structural aspects associated with geographic and functional forms associated with the social aspect, so in this building form closely related to efforts to obtain home owners love from the surrounding environment (natural environment, social and spatial) in such a way that will not cause conflicts of culture. (3). Determination of house locations will be determined by geographical aspect, in this case are closely related to efforts to get closer to home owners with the natural.

Thus, the possibilities of change in the form of house building architecture of Java, which can be practiced, but still retains the traditional norms that are still maintained by most of the Java community, are the possibilities of change form, provided that: (1). As part of the macro cosmos, closely related to efforts to building owners can obtain the affection of the environment (nature, social and spatial), so that it will not bring the culture and inner conflict. (2). In conjunction with the "concept of time", to be built in accordance with the progress of the age, but still maintain the existing norms and (3). As a "personality" of the owner, should be accepted and gain recognition from the community.

Inside the building the building, people want to always familiar with the Java nature, as well as to take refuge against the negative influence of nature, so the shape and placement of buildings, always endeavored to be able to adapt to the environment, including the ability to control or make up the negative factors of nature, and the ability to engineer and make the most positive factors of nature. Thus, form a sloping roof, like a saddle, a pyramid with a wide variety of shapes and overstek, will remain the choice of the people of Java. Although pemanfa'atan cooler space will affect the appearance of the buildings in big cities, but in line with the concept of energy efficient buildings that are a "trend" of the present use of the vent, roof insulation, design of openings, the spaces open and cross ventilation ("Cross Ventilation") will remain in use and are often found.

In addition to sheltering wanted to negative influences from nature, such as wind, excessive sun or rain storm, Javanese people basically want to be intimate with nature. In the book: "The Book almanac Betaljemur Adammakna" (1980) 7) R. Soemodidjojo essay, it is said that the Javanese people in choosing the location of the yard, determining the direction of orientation of the house, build a house, put up the house and determine the position of the door to know the existence of certain rules ("pitungan"), which is believed will bring good luck in his life. Based on norms for selecting a location, determine the orientation and determine the position of this door, then the attitudes and human behavior in the future of Java, is predicted to always choose a location that has high accessibility and tend to choose the orientation toward the sun and wind circulation is more profitable, and choosing the best view for the building. Because of the breeze in the city of Jogjakarta, mostly from south to north, the orientation of buildings to the south and the north remains a choice, because the buildings that use the concept of energy saving will be more profitable with this orientation.

2.2. Development of Traditional Architecture in the city of Jogjakarta.

Jogjakarta is located between Mount Merapi in the north, and Samodera Indonesia in the south, Kulon Progo Regency in the west, and Gunung Kidul district in the east, have a pivot Mount Merapi – Monument – Jl. Malioboro – City Center – Palace – Stage Krapyak – Indian Ocean that divides the city proper from the north to south, the axis Jl. KHA Dahlan – City Center – Jl. Senopati – Jl. Alamans nail and the axis Jl. Godean – Jl. Kranggan – Monument – Jl Sudirman – Jl. Solo that runs from west to east, into the main shaft of the city. Jogjakarta city, surrounded by the outer ring road that cuts the entrance to the city of Jogjakarta, ie from the direction of Jl. Magelang, Jl. Solo and Jl. Wates.

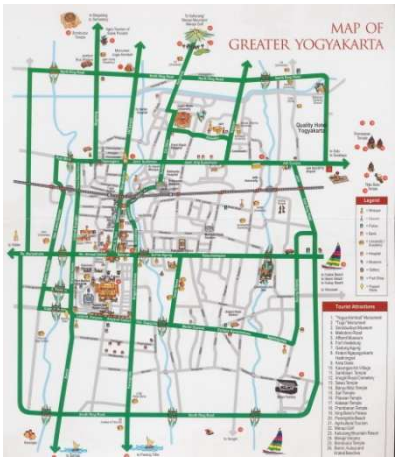

Figure 2. City map Jogjakarta.
Source: Google (2010).

Structure or composition of the city of Jogjakarta basically closely related to the existence of the Kraton Yogyakarta since the start of excess Gianti Agreement Date 13 February 1755. From then Sri Sultan Hamengkubuwono I started building Ngayogya Hadiningrat palace complete with various facilities and infrastructure to be able to accommodate all the needs of the kingdom. Then the development of the palace was succeeded by the sultans of his successor, until today. Jogjakarta in particular had an imaginary axis that runs from north of Mount Merapi – Tugu Yogyakarta – Kraton – Stage Krapyak – the South Sea. Imaginary axis represents the process of human life from birth to face the Prince of the Exalted. In Jogjakarta city spatial structure of the Kraton Yogyakarta Stage Krapayak connected by road Panjaitan IN – Plengkung Nggading (Plengkung Nirboyo) – Square South – Barbie Hinggil, while among the palace with the monument are linked by the North Square – Jl. A Yani – Jl. Malioboro – Jl. Mangkubumi.

Figure 3. Jogjakarta Palace and a Pillar Shaft
Source: Google (2010)

Among North Square and the monument which stretches from the north to the south of Yogyakarta, there is the point of intersection 0 (enol) km and became the center of Yogyakarta at a time intersection between the axis north – south (Jl. A Yani – Jl. Malioboro – Jl. Mangkubumi) with west axis – the eastern city of Yogyakarta (Jl. Wates – Jl. Wirobrajan – Jl. KHA Dahlan and Jl. P Senopati – Jl. Paku Alaman – Jl. Kusumanegara – Jl. Gembiro Loka) that runs from west to east. In addition to traditional-style Sonobudoyo Museum, in the downtown area there are buildings of colonial style Indise, such as: Bank of Indonesia, BNI, and Post Office, Court and Market House Bering Harjo, while Beteng Vredebrug like most Dutch forts still looks stylish the Portuguese.

Figure 4. Buildings in the centre of Jogjakarta.
Source: Google (2010)

According to the spatial structure of Jogja city, other than Street shafts. Wirobrajan – Jl. Kusumanegara the past PASAL Jogja city, there is the axis road which runs from west to east and is going through the city of Yogyakarta Tugu, ie the axis Jl. Godean – Jl. Tugu Jogja-Kranggan Market – Jl. Urip Somahardjo-Jl. Solo. Although through the center of Yogyakarta, when compared with the axis Jl. Godean – Jl. Market Kranggan – Monument – Jl. Sudirman – Jl. Solo, the development of the axis Jl. Wirobrajan – Jl. KHA Dahlan – the intersection of Center City – Jl. P Senopati – Jl. Kusumanegara still lost rapidly. In the northern city of Jogjakarta, especially along Jl. Solo and Jl. Sudirman relatively close to the campus of UGM, UNJ, Atmajaya, UPN, the new building grows higher than the existing buildings in downtown Yogyakarta as well as existing along Jl. Malioboro.

Figure 5. Meeting house, hotel and shops
Source: Researcher (2008)

Figure 6. Campus, flats and office buildings
Source: Researcher (2008)

Through the observation is “on the spot” in the field, it seems that most of the buildings constructed after 1980, although in modern design, and accommodate new functions, but most still retain the traditional architectural nuances of Jogja, both of proportions and detail of the building. It can be understood through the opinion delivered by Frans Magnis Suseno (1988), that humans and has typical Javanese culture, namely: the ability to maintain its cultural authenticity, by letting himself get influence from other cultures, to then make a foreign culture such as cultural Java, and the views amost Rapoport (1983) which says that in order to design a traditional building, environment must be studied in advance of the building, in order to obtain the things the slowest changes (“core elements”) and things that are most rapidly changing (“peripheral elements”), as well as what things are most

readily accepted by users (the “new elements”), from the observations are “on the spot” in various parts of the city of Jogjakarta, note that for the construction of the building is the slowest to change is norm or philosophy of life of people of Jogjakarta, while the most rapid change is the use of electronic tools and mechanics to development, such as: generators, air conditioners, solar photovoltaic cells, the use of materials or construction materials for the construction of buildings, such as concrete, ceramics, gibsum , steel, aluminum, bitumen, mild steel (galvanized), PVC, fiber cement and so forth, while the things that are more rational, effective and efficient, and economical (“new elements”), such as: design drawings, construction management, will more readily accepted by the people of Jogjakarta in building renovation.

III. CITY FACE CHARACTER JOGJAKARTA

Through literature study, so far known as the physical aspects of building a city, is related to the factors: height of the building, the building demarcation line (GSB), the closure of the building (“building coverage”), solidity (“bulk”) buildings, appearance (“appearance”) building and configuration of the building, including colors, materials, textures and shapes appear (“façade”) buildings. A good course of study not only focused on those factors, but also the analysis of “in-depth” of the urban physical patterns of a city. Given in the city context, the height of buildings will form the city skyline, the city skyline will always be associated with a building height factor, while the height of buildings could not be separated from other factors, like: KDB, GSB, KLB and solidity (“bulk “) buildings.

By observing the physical condition of the city of Jogjakarta is “on the spot”, can be seen that the construction of tall buildings, a large part appear in Jl. Solo is located quite far from the center of Yogyakarta. Although the axis Jl. Solo – Jl. Sudirman – Monument – Jl. Pasar Kranggan meet at the main axis Tugu. Tugu – Malioboro – City Centre – Alun-alun Utara – Keraton Jogjakarta, but between Tugu Yogyakarta in Yogyakarta city center still has a distance of 2 km, so it does not affect the downtown skyline Jogjakarta.

Since the outbreak KLB in downtown Jogjakarta can be controlled, the skyline in the downtown area Jogjakarta can be maintained, so that the authority of the central city, city orientation, symbol of the city of Yogyakarta as well as the ritual center of Jogja city still remain intact, and does not interfere with the emergence of high-rise buildings along Jl. Solo. By controlling KDB, which was quite intense, and the application of GSB that is greater than 0 (zero) as well as the use of specific building design, appearance of new buildings in the city of Jogjakarta has a bulky impression can be reduced. The most successful was the control GSB along Jl. Solo, even though it can build with the GSB = 0, but high-rise buildings along Jl. Solo, still built with the GSB more than 0 (setback).

With the understanding that style, style or ‘style’ buildings can be interprete as a collection of the characteristics of a building, where the structure, unity and expression of the building is combined in one building form that can ultimately remind us of a certain period, or a particular region, we can conclude that most large buildings in the city of Jogjakarta, either shopping or mall on Jl. Malioboro, as well as meeting buildings, hospitals, shops, flats, hotels, markets, offices and university campuses in various corners of the city of Jogjakarta, most still wearing the nuanced style of traditional architecture Jogjakarta, so the skyline is happening and style building is used, will affect the character’s face Yogyakarta.

Figure 7. Gas pump, door and gates in Jogjakarta.
Source: Researcher (2008)

Tugu Jogja as a pivot – Jl. Mangkubumi – Tugu Railway Station – Jl. Malioboro – Kepatihan – Large Market Bering Harjo – Ngejaman – Gedung Agung – Beteng Vredeburg – the intersection of the Fountain (Yogyakarta city center) – Alun-alun Utara – Palace Ngayogya Hadiningrat – Alun-Alun Kidul – Plengkung Nggading – Stage Kerapyak which stretches from the direction of north to south, in addition to an historic area also includes one road section which is located in the center of Yogyakarta, where a very strategic location to become tourist tujuah areas of economic activity centers for the citizens of the city of Jogjakarta. As a tourist destination as well as centers of economic activity, the appearance of the road axis Tugu – Keraton Jogjakarta is expected to act as "window dressing" of the city of Jogjakarta, so it can provide a snapshot of the ability of the city along its citizens.

But in fact the appearance ("performance") of existing buildings along Jl. Mangkubumi actually less developed, even the dull-faced impressed. The main area of the face conditions of Yogyakarta is somewhat helped by the appearance of Joglo Building near the railway gate between Jl. Mangkubumi and Jl. Malioboro.

The presence of outer ring road ("ring road") the city of Jogjakarta, a rectangular-shaped and circled the city of Yogyakarta, in addition useful for the smooth transportation in the city of Yogyakarta and its surroundings, as well as strengthening the transportation network as well as clarify the pattern that has begun to form when the Kraton of Jogjakarta standing. The presence of outer ring road which lies parallel to the axis of symmetry and Tugu Yogyakarta – Jl. Mangkubumi – Jl. Malioboro – City Centre – Keraton Jogjakarta from north to south, and parallel to the axis Jl. Wirobrajan – Jl. KHA Dahlan – Fountain crossroad – Jl. Panembahan Senopati – Jl. Pakualaman – Jl. Kusuma State, and the axis Jl. Godean – Jl. Market Kranggan – Monument – Jl. Sudirman – Jl. Solo from west to east, in addition to facilitate the entry of migrants from Magelang, Solo and Purworejo, is also able to strengthen the character of the city of Yogyakarta which is impressive face formal and oriented towards the Kraton of Jogjakarta. Appearance of "street furniture" (lights, bus stop, like a flower), which lies along the streets of the city of Jogjakarta and wearing protocol ornaments or ornaments with traditional classic patterns and colors typical of the Kraton Yogyakarta (dark green, yellow, gold, yellow of ivory and light green), able to strengthen the character and the face of the traditional city of Yogyakarta and melancholy.

Figure 8. Street lights along road in the city Jogjakarta.
Source: Google (2010)

IV. CONCLUSIONS AND SUGGESTIONS.

4.1. Conclusions

- Based on the above discussion, it can be concluded that as a reflection of changes in behavior, thought patterns and value systems adopted by most of the people of Jogjakarta, Jogjakarta Traditional Architecture of physical manifestation, such as building materials, layout, scale space, structure, construction and utility buildings will quickly changes, while the norms of life is still maintained, so the form of appearance ("appearance") mass of buildings in the city of Jogjakarta tend to be built in accordance with the progress of the age, but still wearing shades Traditional Architecture Jogjakarta.

- Because the city of Yogyakarta, was able to maintain the downtown skyline as well as the physical pattern of the city of Jogjakarta, the traditional architectural character-forming Jogjakarta became the face of the traditional city of Jogjakarta and melancholic.

- While using the system structures and new building materials such as concrete, ceramics, gibsum, steel, aluminum, bitumen, mild steel (galvanized), PVC, fiber cement and so forth, but the new buildings in Jogjakarta, still built with the nuances of Traditional Architecture Jogjakarta. This is in line with the Javanese way of life that would appreciate a change or technological progress, as long as these changes will not deviate from the norms, rules or guidelines that have been long on hold. In particular, the shape of the roof of the building does not have a traditional shape Jogja straightforwardly, but still maintains its essential harmony with the surrounding environment, so that the sloping roof forms, such as saddles, along with variations of a pyramid shape, a double roof, house ventilation and overstek width, will remain become the people's choice of Jogjakarta.

4.2. Suggestions.

- Feel the traditional city of Yogyakarta, known as a tourist destination number 2 (two) after Bali, it is a usual, if maintained. So that community efforts to maintain a permanent attraction of Yogyakarta needs to be preserved, because it will greatly assist local government programs Jogjakarta. It is recommended that the Government of the Special Region of Jogjakarta making the "Design Guidelines" city of Jogjakarta, which in addition to regulate the following aspects: Land Use, GSB, KDB and the outbreak also regulate aspects: Magnitude of Mass, Scale, Proportion and Langgam / style ("Style") Building, Closure of Buildings ("Building Coverage"), solidity ("bulk") Building, Appearance ("appearance") Building and Construction Period Configuration, including colors, materials, textures and shapes appear ("the façade") buildings.

- Viewing conditions Jl. Mangkubumi who impressed dull, it is proposed that the Local Government to revitalize the region of Jogjakarta and buildings along Jl. Mangubumi, improve the urban space as well as improvement of city facilities as well as structuring the city faces, including the revitalization of buildings along Jalan Mangkubumi, a business area as well as tourism that connect with Jl. Malioboro. Jogjakarta Local Government considers the revitalization of buildings along the street is one area that alternative arrangements can be implemented in a relatively short time, but it has a large manfa'at for the city of Jogjakarta.

- To maintain the authority of the central city of Jogjakarta, and maintaining the orientation of the city, maintains a symbol of Yogyakarta as well as maintaining the ritual center of the city of Jogjakarta, Skyline in Jogjakarta city center should be maintained as the current condition of the area. In the central region of Yogyakarta have made efforts to control the height of the region with the establishment of KDB, outbreak and need to be agreed upon style buildings that may be present in the region. The presence of a contextual building new BI with BI old buildings could be used as an example. Where it is considered disturbing the spatial region, the presence of Monument March 11 can be reviewed.

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3.1.4

THE INFLUENCE OF NORMS "*PASANG*" ON SETTLEMENT ENVIRONMENT AMMATOA KAJANG, SOUTH SULAWESI

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I. INTRODUCTION

Architecture of Ammatoa Kajang community is one of physical manifestation of culture produced by one of traditional communities exisiting in South Sulawesi in Bulukumba district, Kajang Subdistrict exactly in Tana Towa Village.

Tana Towa Village, located approximately 56 km from the capital of Bulukumba District, or approximately 234 km from Makassar, South Sulawesi provincial capital, situated in Bone gulf with the boundaries: north is bordered with Sinjai District, west is with Bulukumpa sub-district, south with Herlang District and north with Gulf of Bone, located at an altitude of 500-700 meters above sea level.

Custom community of Ammatowa according to *Pasang ri Kajang* is bounded by four river known as Butta Ilalang Embaya or Butta Tanah Kamase-masea, whereas those which are located outside the four stream boundaries is called *Ipantarang Embaya* or *Butta Kuasaya*. The four rivers which become borders or zoning of Ammatowa tradition community, is bordered by Tuli River in North, with Limba River in East, with Doro River in West and with Seppa River in South (Rashid, 2002: 59).

The division, in addition because difference of settlement location, is also backrounded historically by influence of the entry of Islamic teachings and consciousness that appears to divide itself due to demands of development needs of life. It can be explained in detail as follows:

1) Early period namely, from the beginning of the periods identified as the period in which the Kajang Community for the first time recognize human civilization. At this stage all the Kajang district was an area under the power of Amma Toa as tradition leader.

2) The colonial and pre-Islamic period was happened around the fifteenth century. In this period Kajang become one of the area fighted by surrounding kingdoms especially kingdom of Gowa and Bone. During this period, according to Mattulada 1977, the structure of the region had not changed physically, but society of Ammatoa was introduced by the kingdom system which include the appointment of a representative of kingdom to be a government in Kajang and then become a guideline in setting the government system in Kajang.

3) The inclusion of Islamic Period (beginning of XVI century) was a very historic period in terms of the conception of physical layout physically in Kajang. Kajang district across the region which was a customary area, divided into two areas namely: external Kajang called *Ipantarang Embaya* or *Butta / Land Kuasaya* and internal Kajang so-called *Ilalang Embaya* or *Butta tanah Kamasea-Kamase.* The division of these spaces were due to the development of two understanding of Islamic religion who were delivered by three-person delegations of Ammatoa in studying Islam. Two out of three messengers of Ammatoa learn Islam more on spiritual approach that leads to tawasuf / mystisism : self & spiritual purification in order to be closer to God, the Creator, Preserver of Universe. Whereas another delegate learned Islamic teaching relating to sharia in nature. AmmaToa as tradition leader was more amenable to the first thought because it was more in accordance with their belief system that has been adhered to over the years. Furthermore, Ammatoa took a policy to halve Kajang area. Territorial boundaries were not determined by Ammatoa on the basis of pre-existing gallarang limits. Therefore, the existing tradition areas were not comply with the administrative boundaries of villages. Even though it was divided into two regions, but in the period Ammatoa still controlled outside region
.

4) Pre-Independence Period. In the early nineteenth century, Kajang at that time under the control of the kingdom of Bone. King of Bone put his representative as government of Karaeng Deya. After Kajang was submitted to the Netherlands, Karaeng Deya was appointed as Retgen with territory covering Kajang and some areas. In 1921, Regentschap was abolished, Kajang later became a separate District which controlled 5 district orders (modification of previously existing 9 gallarang to be 5 district).

5) Post-Independence Period, the Five District orders were directly adjusted by the national government system into 5 villages in the Kajang sub-district which their boundaries did not pay attention to the boundaries of pra-existing Ammatoa tradition areas. During this period, Outside Kajang was escaped Ammatoa control.. And since 1982, tradition communities areas which was previeoulsy consisted of 9 villages, 2 villages were escaped into the transition area (*calabai*) namely dusun Balagana and Jannaya. Thus community areas of Ammatoa Kajang was divided into 3 areas, custom area , transition area and outside of tradition area. It can be seen in the following figures:

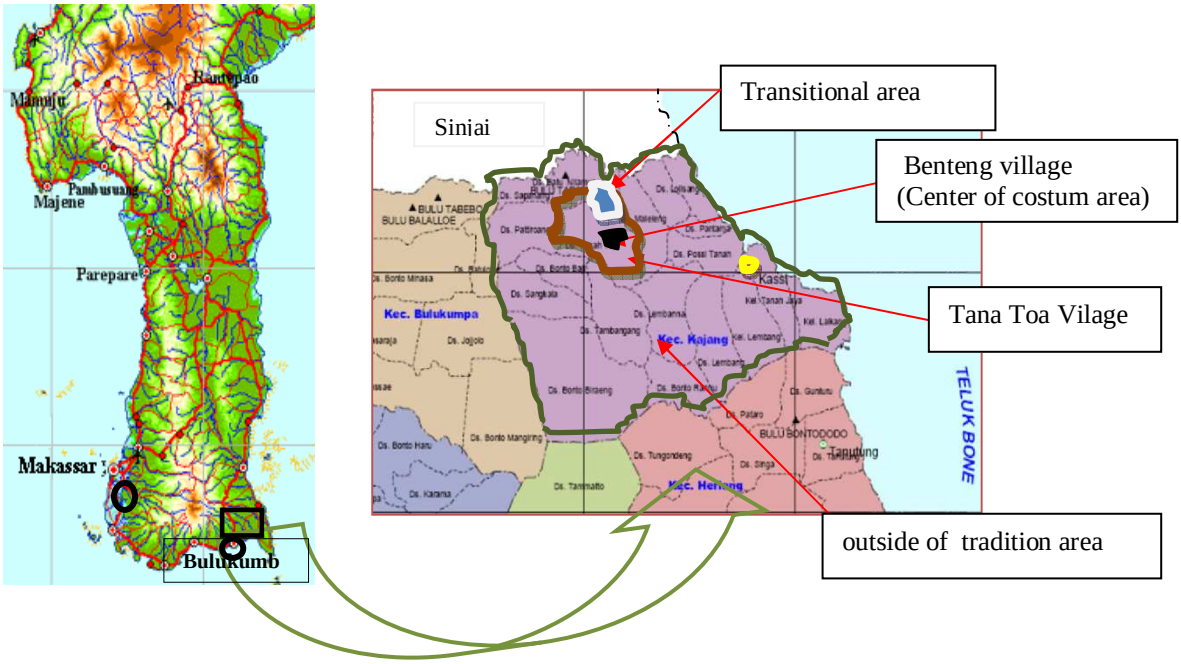

Figure 1. Kajang community Area, consisting of tradition Regions, transition Region and outisde of tradition region (outer part of Kajang)

Viewing the history of Kajang community can be said that settlement for tradition community of Ammatoa Kajang is a traditional settlement phenomenon that still survive in the modern age. Its endurance is greatly influenced by the strong traditional norms that they hold in common is known as "*Pasang*". Situation of the original settlement can be seen at Benteng village which is a centre of tradition area and residency of Ammatoa.

1.1. Pasang Ri Kajang

Knowledge systems of Kajang tradition community are basically sourced from the *Pasang ri Kajang*. Rashid (2000: 4) defines *Pasang* as a system of knowledge (*pa'ngissengang*) that comes from the One God as a sacred duty and obligation to the people of Kajang indigenous communities, that are passed from generation to generation heritably. While Akib (2003: 52) formulates *Pasang* is a collection of messages, clues, and the rules of how one put themselves on the macro- and micro-cosmos and ways to interwines harmonization of relationship of nature, man and God. *Pasang* is a value system that become the highest guideline for indigenous communities of Kajang concerning how conceptualize the most valued things in life, both mundane- and eternity-oriented.

In such a function, *Pasang* become a measure whether something is "good" or "bad", whether something is "allowed" or "no." Options over disagreements above will be determined by the indigenous communities of Kajang through value recommendations to be delivered (*pasang*).

The such high situation of *Pasanq* is due to content of *Pasanq* has been arranged in such a way and has been around since first humans (*mula tau*) that is at once the representative of the *Tu Rie 'A'ra'na* on earth, and then received additions from generation to generation who receive revelation of *Rie 'A'rana*. Thereby, the contents of *Pasanq* are ideas of divinity of *Tu Rie'A'rana* and delivered to humans through His choice. *Pasanq* in its function as a system of cultural values, he creates the role (attitude and behavior) of community in facing society and their environment, whereas in its function as a value system of beliefs, *Pasanq* lead to mental attitude of indigenous community toward supernatural powers that are beyond him, as well as procedures for treating and forming beliefs on all these things.

1.2. Faith System

Faith system principlly consists of concepts that lead to the belief and obedience for the believer. The faith is a sense of believe on unseen world, ideas about God and the Last Day, believe in the supra-natural power, and various kinds of things can cause a sense of believe on what is believed, afterward it cause obedience and fanatism on whole of what believed in.

Object in faith systems are abstract and outside of daily human life. Adherents manifest their feelings through worship. Through a series of acts, adherents can express a sense of love, sense of fear or a sense of amazement at the object of worship which are often for such purpose, symbols are used.

As to faith system of tradition community of Kajang, Akib (2003: 53) argues, that *Pasanq* that contains the values "*kunne*", ie, guidelines which deal with mundane life, but with the core or primary purpose to "*konjo mange*" namely a sufficient life in hereafter (*kalumannyanq kaluppepeanq ri allona ri bokona Tu Rie 'A'rana*). And to be able to achieve all-sufficient life in the hereafter, applied way of life *akkamase-mase.* Thus, the spiritual ideas for the purpose of mundane to form pattern of life *kamase-mase*, and for the purpose of matters concerning the time after death through faith *Patuntung* form sufficient eternal life (*kalumannyang kalupepeang*).

Thus the pattern of life *akkamase-mase* is a value manfestation of *Pasanq* through physical aspect, while the faith of *Patuntunq* is a value reflection of *Pasanq* through spiritual aspect. The concept of death, to the indigenous communities occupy a very important position. Because they believe that life emerged after the end of life on earth is the immortal life forms. Actions during life on earth will be rewarded by *Tu Rie'A'ra'na* accordance with the quality of these acts and deed. Preparing their self well before die and become the liabilities of *Ammatowa* community. Death for *Ammatowa* community become a beginning to enter eternal life.

According to village chief of Tana Towa (Amnah, 2009), Islam was accepted as official religion in Tana Kamase-masea by Bohe Sallang (the first Ammatowa who embraced Islam). Afterward belief of *Patuntunq* as a spritual culture of Ammatowa community underwent sincretisation process in various form in its appreciation and implementation. Formal recognition as a follower of faith *Patuntunq* is not found in the village of Tana Towa, the existing one is self-identification as "muslim", but in the quality of Islamic religiousty, they mix it with traditional spiritual elements of *patuntunq*. How syncretization of Patuntung-Islam can be seen in *Pasanq "guru sara' tanqattappa' ri patuntunqa kaguruanna, guru patuntunq tanqattappa ri ta kapatuntunqanna*," the meaning is Islamic scholars who do not believe in patuntung, his scholarship is invalid, and a patuntung teacher who do not believe in Islamic scholar, his *patuntung* is invalid.

Ammatowa indigenous belief systems are basically derived from the "*Pasang ri kajang*" which are considered as philosophy of their lives, because in it contain the values and procedures of livelihood,

and is a science. Procedures for livelihood, among others; human relationship with *Turie'A'rana* (The One God), relationships with fellow human beings and human relationships with their environment.

Spiritual ideas for the purpose of mundane will form life pattern of *akkamase-mase* and purpose of *keakhiratan* thoroug belief of *patuntung* form a belief about eternal life after the end of the world (*Inne linoa pammaria-marianji, ahera 'pammatanggang kara'kang*, its meaning: this world is only stopover, the hereafter is eternal life). These spritual ideas became the spiritual belief system, namely the belief of *patuntung* with its systems that govern the procedures or operation of the systems so that become a place of community, nature and *Turie'A'Ra'na* connecter.

The principles contained in *kamase-mase*, are (1) the existence of a causal link of human deed that will affect life in the Hereafter, (2) a person must exert himself elements (physical and spiritual) to things that are contained in *pasang* to obtain a good position in side of God and (3) the understanding of materialistic life in the world can have a negative impact on humans.

When someone does not use his/her aspects of humanity to good things, then after death his/her spirit is not acceptable by *Tu Rie'A'ra'na* and vacillates over the period. For those who can account for hisself/herself aspects of herself, it is available reward for his/her in the form of happiness in hereafter that is a real life. Manifestation exploits humanitarian aspects of a person to indigenous communities is through the way of life *akkamase-mase*.

Rashid (2002), describes the notion of "*patuntung*" which comes from the word "tuntung" which had meanings, as follows:

1) *Tuntung* means "to demand" or "learning", *patuntung* means "those who demand" or "learner". That is, one who is studying something "*pangissengang*" (science) that originated from *Pasang ri Kajang.*

2) *Tuntung* means "peak" or upper end (height), meant that someone who is trying to reach the peak or top of something.

3) *Tuntung* means "to search", patuntung means the searcher. That is, someone who is searching for something with willpower mempunyi with grim determination, because it is driven by something faith effort to get something sought.

From some sense of the word "*tuntung*" above, it can conclude that that a learner who seeks knowledge to the top (essence of science). In the context of indigenous communities of *Ammatoa* in question is the truth essence of "*Pasang ri Kajang*" containing messages, advice, guidance or direction of life that must be obeyed, followed and be carried out for the happiness of the world and the hereafter.

II. THE INFLUENCE OF NORMS "PASANG" TO THE SETTLEMENT ENVIRONMENTAL

2.1. Settlement Patterns

Orientation

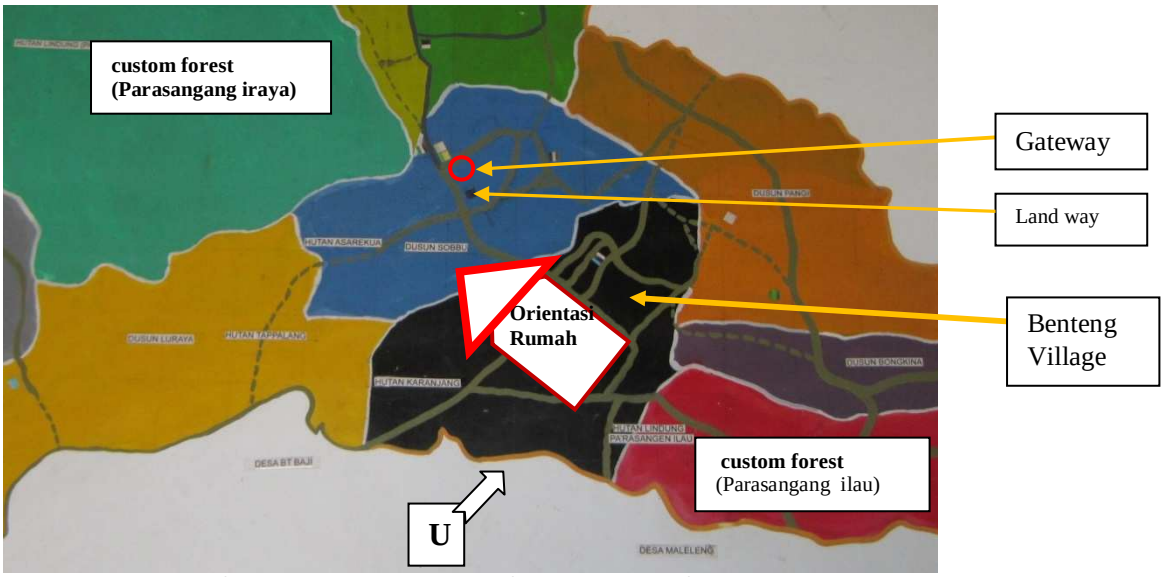

Figure 2. Orientation of settlement at tradition area of Benteng Village facing West.

In the region near housing area of Ammatowa in hamlet of Benteng, settlement patterns appear in groups and facing West (Mount Bawakaraeng and Mount Lompobattang), showed: (1) as a orientation characteristic of belief "*patuntung*" adopted by Kajang indigenous communities. Place of *Patuntung* residence is believed to be in between these two mountains, (2), in addition, front (*pandallekkang*) of the house had something to do with the existence of custom forest (*Parasangang iraya*), where the *Bohe Amma* (*Ammatowa I*) fell into this world,

2.2. Shapes and Elements of Houses

Figure 3. Houses shapes of Kajang communities governed by the provisions of the norm *Pasang*.

- **House Construction**

House construction of inner tradition areas, where residence of *Ammatowa* shows the simplicity and merges to environment. Because all of it use natural ingredients.

To build a house, it is required:

(1) Three long blocks as wooden nail or lower tendrils (*padongko*) lying accross from front to back,
(2) wooden block or block tendrils (*lilikang*) that cross from the left side to right side of the house,
(3) Block pillars whose numbers are 16 bars, two of which are core pillars (*poko bala*) which should have the selected quality, although others wood is not straight, can be used as pillar of the house. All pole of houses are buried in the ground as deep as one elbow (*sisingkulu*) or half depah (*sihalirapa*)
(4) Roof made of palm leaves on a blade of bamboo is tied by using a blade of rattan,

(5) Floor made of some blade of bamboo are woven by using parts of the rattan in form of a large frame. Each slot boundary of floor is restricted by using wooden blocks (*kokko*). In grafting the entire construction it is forbidden to use nails.

- **Form and elements of house**

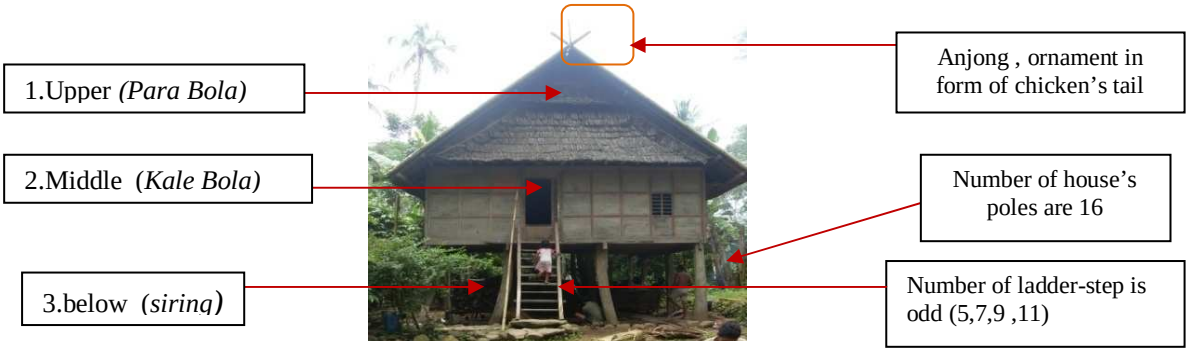

Figure 4. House Shape of Kajang community governed by norms which are originated from *Pasang*.

Vertically, the house is divided into three spaces, namely: the first part is the upper part (*parabolic*) is a symbol of the upper world (*boting langi*) that is considered sacred and very privilege. As with the upper world (*boting langi*), which according to them as a residence of the gods, goddesses and *Tu'Rie'A'ra'na*, upper attic is also considered a residence of god and a place for precious heirloom or main foodstuffs (their crops). The second part is the middle or body of house (*kale bola*) occupis a function as the life where social interaction happen. For that this part requires a certain division of functions and institutions that regulate the social interaction. The third part is the bottom or *siring* is occupied with pets and so forth.

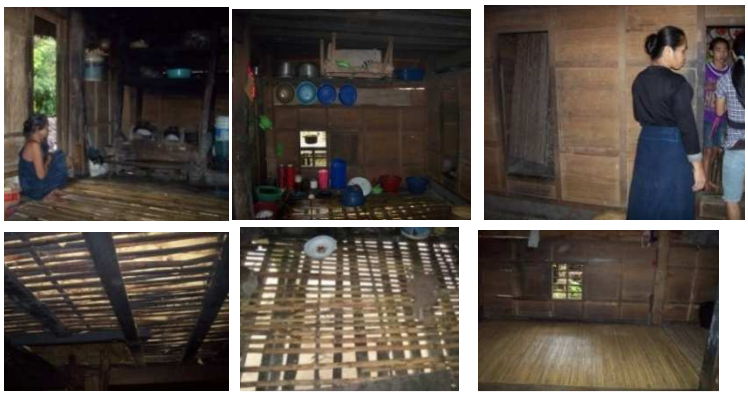

Figure 5. Elements of room in the house which is set in the customary norms sourced from the *Pasang*

Figure 6. *possi bala* as the central media (ritual place) that connects the upper world and underworld, all poles are planted / contact with soil directly.

Horizontally, every house in the area of inner customs, in general have 3 (three) compartments called "latta", which are limited by *pappamuntulan*, consisting of: front part (*latta riolo*) for cooking, the middle part (*latta 'ritangnga*) for sleeping room of guests, and back part (*latta riboko* or *tila tila*) for bed of womankind and host. The position of *latta riboko* is about 30 cm in height than *latta ritangnga*. In series of poles between the front room with living room there is a special pole taken as a navel of house (*posi bola*). This place is used as a place or media to make contact with the upper world (*boting langi*) where the gods and *Tu'rie 'A'ra'na* settles. The poles are considered capable of connecting between the upper world and underworld, so that whole ceremony is done within house, and the pole is used as the central media.

- **Symbolic meanings associated with house construction**:

(a) *Pappamuntulan* mean that everything has limits, including actions or deeds of human. It is an infringement act for a guest who passed *pappamuntulan* if he/she is being a guest, except with permission of the host.

(b) Placement of the kitchen at the front of the house had something to do with the conception of the simple life (*kamase-maseya*). Guests will immediately know the readiness of host to service his/her guest (*annjo tubattua parallui naumbui-umbui api*). They show everything they are and dish out his/her guests what the host eat.

(c) House poles consists of 16 bars which are arranged 4 to back and 4 to the side, show 4 elements that build the world and universe, namely: earth, fire, water and air.

(d) House poles planted in the ground are not equipped base as traditional houses of Bugis and Makassar in general by *Ammatowa* because man should not be separated from the soil, *anjo buttayya, iyamintu angronna tauwa*. Of soil human originate from, of soil human live, and to soil human will back.

(e) Core pole (*poko bola*) symbolizes the greatness of the *Ammatowa* leadership, so that the pole should meet requirements, namely; it may not has wood eyes and dead wood (*akkapancu*), because it is able to cause misfortune and reduce livelihood for its owner, because the wood eyes are considered may influence the behavior of its owner. It may not has dual shoot (*rua pucu'na*), because it is fearful the homeowner has double character or he has not a constancy of life. It may not bent form, because homeowners are expected to have an honest character (*lambusu*) in their life.

(f) Boards for wall mounted horizontally are a symbol of "do not turn something has been dead". Trees that have been made into a board is considered already dead, so the position may not be vertical, such as when it was still alive. This means prohibition of act which is not in accordance with reality.

(g) House Ridges (*timba lajara*) do not indicate social strata like most traditional houses of Bugis and Makassar. Principle of *anre ata anre karaeng* (there is no slave, there is no king) as a statement of *Amma Bohe* when he make a worship (*a'somba*) toward Karaeng Sombayya ri Gowa to ask *Kala'birang* (honorary), because he thought that there was no a king and he was not a king in his leadership area (Usop; 1978).

House for them are to meet protection of physical, psychological and social needs, reflecting the attitude that upholds the value of simplicity in the concept of life *kamase mase* matching with *Pasang* teachings.

Meaning contained in sort of bamboo on ridge of house is a symbol of traditional board structure that includes *Ammatowa*, *Karaeng Tallua*, *ada 'limayya ri tanah Loheya* and *ada limayya Kekeya*. All of them are symbolized in the form of bamboo sorts directing toward poach of house (*anjong*

bala) which symbolizes togetherness and of unity identity of Kajang indigenous community (*assikajangeng*).

Selection of single bamboo located in edge of isosceles triangle of ridge house show three main role and status of *Ammatowa*, namely, as a *Sanro* who masters magic spells, as a *guru* (teacher) who masters the contents of *Pasang*, and as a *pangadarrang* who conduct manners and customs council head. These symbols are in accordance with the principles of *Ammatoa* leadership; "*tallumintu nakkulle nialle pangule, iyamintu dipantarangi nanuntungi, ditangngai nasiraka'-raka ', ribokoangngi nangngampi* (meaning; only three that can be appointed as a leader, namely, in front he led his people, in the middle he together with his people (deliberation) and behind he guard and defend the rights and interests of all his people.

2.3. Circulation

If you want to enter the customs area, you must pass through the gateway which is also a physical mark/boundary. Psychological mark perceived is the difference of atmosphere when entering the area. In conformity with statement of Schulz (1980) that limit is not only marked by physical boundaries or as a halt but the space limits could be a different space atmosphere.

Figure 7: The main path to enter the customs area of river stones arranged naturally

Any land in the Benteng village has a very clear boundaries such as fences or rocks arranged, because by rule of *pasang*, use of cement is prohibited. Whereas the boundaries that are so clearly made are manifestation of custom community attitudes that prevent the occurrence of conflict. (It can be seen in the picture below):

Figure 8: Circulation is clear as a consequence of ownership boundaries clarified by using natural ingredients to avoid conflicts.

Some roads are easily recognizable from both plant species, material creation of fence or existence of some objects that could be a marker such as a certain trees that grow in the middle road are not cut. (In accordance with the teachings of *pasang*) or a stone that is naturally respected its existence so it can function as a marker.

Several intersections and fork in the road which made the field of children's playground. Although children since their small communities has helped to feed livestock is responsible, bathing but still need time to play with their peers.

Figure 9. Circulation model created as a consequence of attitude of the people of the community who are obedient on norm of *pasang*

At each intersection and fork is often apparent a lodge/house which serves as a place to socialize more often utilized by men, or to negotiate, to take a rest, It also can be a sign in a certain neighborhood setting. It can be seen in the figure below.

2.4. General Facility

Public facilities such as markets, public health centers, schools and mosques beyond Benteng village. Whereas, the existing places in Benteng village as an area centre are such as tombs, wells and Baruga.

Baruga

Baruga is a building that serves as a meeting hall. It is located on main routes of front side when we once entering custom area. Orientation of hall meetings like houses in Benteng village overlooking the West. The form is similar to dwelling houses. Only the number of poles are 25 bars. In its spatial distribution, *latta riolo* and *latta tanqnqa* are unified their function as a room ordinary people, with walls that are closed as high as about 30 - 40 cm. At *latta riboko* its floor remain higher than *lattu riolo* and *ritangnga* and walls are covered like dwelling house and given 2 small windows. The existing ornaments on the building are similar to ornaments on dwelling house such as anjong ornaments on front and rear ridges. (it can be seen on the figure)

Figure 10. Baruga that looked sloping not parallel to the road due to western orientation.

Cemetery

Cemetery founded in dusun Benteng is the public cemetery and the grave of the *Galla, Puto,* (traditional leaders). Where position of graves are slightly higher than road and graves of *Galla* are bordered to indigenous forests (forest *Tunakeke*). It can be seen in the figure.

Figure 11. General cemetery without the limiting fences and graves of *Galla Puto* are given boundaries

Public Well

All the villagers of Benteng village take water for daily needs in the wells located on the main entry course of the custom area. It is bordered to the creek. The well also function as a place to bathe and wash. Its water source called Tunakeke, and for bathing place it is divided into : for men bathroom and women bathroom (the mothers). But the bathing place for men can be used by women (average for old woman) as a place to bathe and wash if the men don not use it and if the many women use women's bathroom.

Figure 12. Place of the Women's bathroom. Source water from Tanakeke flowing continuously channelized by using hollowed bamboos.

Working place

In general, Kajang community of custom areas residing in dusun Benteng has rice fields or fields in others village such as in Tombolo, Sobbu and Pangi. Although some of them remain have fields in the Benteng village. Some soil conditions in Benteng village are rocky so that it is not enable to grow rice. Plants are often planted like corn and vegetables and secondary crop that can grow in rocky soil.

Figure 13. Fields planted to corn in dusun Benteng rice fields located in dusun Tombolo

According to the rule of *Pasang* they should not use technologies such as tractors for plowing. Until now rice area plowed by using buffalos. So buffalos are still preserved in many communities around Kajang community settlement of custom areas. These are seen in some houses equipped with small buildings, thereon are occupied by forage whereas beneath are animal stable (see figure 14). Beside buffalos, horses are also considered important because the horse as a means of transport carrying the harvest from the fields to house or to market.

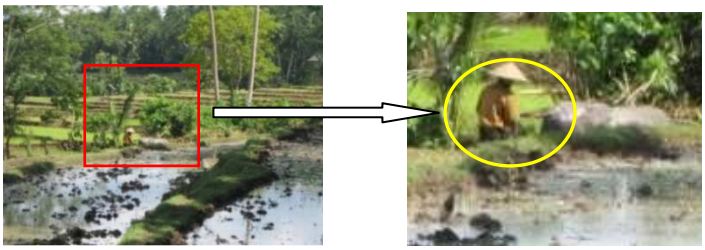

Figure 14. Teaching of *Pasang* has cultivate a respectful and friendly attitudes with nature and environment

All cattle area maintained (fed and bathed) by children who have not reacehed mature age. In Benteng village areas availability of a place specialized for bathing buffalos or these buffalos can do their pleasure by wollowing in mud.

Figure 15. Spaces in residential environment that serves as a place to accommodate rearing of livestock.

For the women can work to help the family economy while delivering their pleasure in weaving sarongs, headbands and so on which are used according to rule of *Pasang* by the custom communities. They also can plant tarum's tree to be black dye (according to the rules of *pasang*) for thread that will be spinned to be ready clothes.

Activity of planting arum tree are usually around house yard area or in respective fields. For process of weaving (dying, drying, rolling and spinning) like thread to be sarongs, women use space underneath the house exactly around under *latta riboko*. (it can be seen at the following figure:)

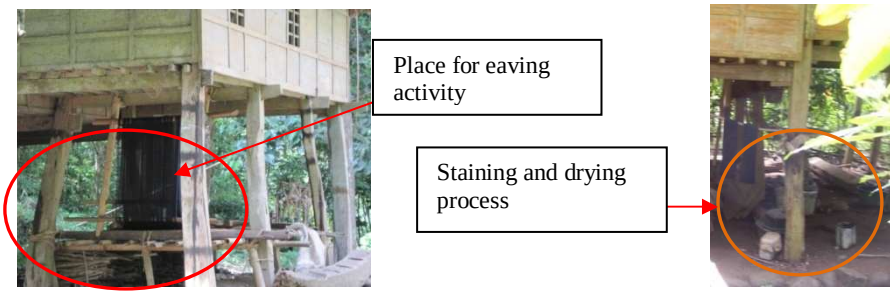

Figure 16. The room or place used by the mothers / women for additional work beside taking care of household

III. CONCLUSION

Effect of norm "*Pasang*" is very strong on manifestation of house and residential environment of Ammatoa Kajang community. Shapes of house in Dusun Benteng tend to be uniform, in both form and size and not rich in ornaments.

House orientation, shapes, elements of house and the spaces inside and outside of house (environment) in term of circulation systems, public facilities and workplaces, all formation process are strongly influenced by norm *Pasang*.

At Amma Toa Kajang community, norms derived from the teachings of *Pasang* have influenced formation of behavioral patterns, whereas behavioral pattern is one of the elements forming the spaces including the spaces on the settlements.

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3.1.5

ANECDOTE OF BENGAL VERNACULAR SPACES

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ABSTRACT

The idea of this text is to renarrativize and re-evaluate the institutionalized architectural narration of Bangladeshi vernacular architecture through 'alternate discourses' which can be termed as history from the below.

Innumerable number and vastness of rivers are the basic of all structural formation in Bangladesh. These rivers and river-based agriculture helped to develop ethnic native identity which stresses to develop a unique indigenous vernacular spaces and architecture. This Vernacular architecture examines the dwellings, village formations and settlement patterns of the same societies.

The most pervasive architectural presence in this delta is the 'pavilion structure'. The most elemental pavilion is the rustic 'Bengal Hut' where the vernacular architecture starts. Again 'Bungalow' is such a dwelling unit which was regenerated from the basic living unit of Bengal hut of the indigenous subordinate people and became popular and patronized by the colonial ruler and later established as a kind of architectural style in Western continent.

The study tried to investigate and enunciate the development of vernacular spaces of Bangladesh through postcolonial discourses, from 'Bengal Hut' to famous 'Bungalow' which is a new kind of voyager that open up class of 'instrumental' or 'native informants', which function as an anecdote of alternate history and was not so branded to western as well as in indigenous, such a way indigenous knowledge can be turned into intellectual property.

Keywords: Bengal Hut, Bungalow, Post Colonialism, British colonial period

I. FRAME WORK

If we look back to understand our historical and cultural matrix in the perspective of world narration, we would always found a space of difference-fragmented and episodic history. The forces of history and tradition of settlements in Bangladesh is holding diverse ethnic, imperialistic cultural and religious beliefs.

Certain physical and cultural factors not only act as constrains but also as the source of ideas for the formation of settlement, family structure, art and architecture in Bengal. Topology, climate politics and economy are the foremost factors behind it. The main stream of civilization and pattern of life in this distant land seems to have remained virtually unaffected over thousand of years where numerous clusters of villages formed the bed-rock of the society, the bulk of which is depended on agriculture. The art and architecture of the land is essentially an expression of an agricultural society who eked out their living from the soil, which profoundly influenced their creation. The rural values, knowledge

which constituted a large section of masons, craftsmen, live a simple life and dwelt in unpretentious mud, bamboo or thatched huts, which in course of time and for the colonization got disregarded.

In rural area, architecture is understood as a socio-cultural phenomenon rather than as a static and inert 'object' that can be studied only in terms of its formalistic characteristics. Vernacular architecture examines the dwellings, religious and agricultural structures, fortifications, village formations and settlement patterns of the same subaltern societies, and difference is defined through criteria of function, environmental and climatic concerns, and formal, three dimensional qualities of space. Our land, which is segmented by rivers, causes regionality. But regionality created by rivers has a unified multiregional cultural Condon.

History of Bangladesh is a history of Imperialism. Invaders like Aryans, Greeks, Mongols, Turks, Afghan invaded India through west and their influence in Bengal was felt much later in modified form. All of them except the British wanted to stay and blend with the indigenous but merely the British wanted to rule like a colony.

Colonial influence has been explained by different authors in different ways, to some it was a transition between the traditional and the modern, to some colonial architecture is a product of Cultural contact while other believe it is a function of dependent peripheral capitalism. There is no need of such segmental explanations because all the interpretations hold true in different degrees for all colonial countries. There was never a homogenous colonial style, but there were of course, similarity of attitudes among colonizers that gave rise to certain patterns of development. The concept, such as stability and change in terms of architectural expression are quite complex, especially when applied to cultures with and already rich and strong building tradition that were suddenly brought into contact with imported ideas and tastes.

II. PRESAGE

The delta, comprising now of Bangladesh and most of West Bengal, is located between two geo-political matrices. On the one hand, it has always been considered as a part of Western orbit, formed mostly by the large Indian culture extending towards Persia, Arabia and ultimately Europe. This aspect is apparent in most explicit levels of culture, language, liturgies, institutions and laws. On the other hand, at a more foundational level, an irreducible stratum links it with an eastern matrix formed of the South-East Asian culture.

The western matrix gives the culture a visible superstructure; it is the eastern matrix which reveals the true nature of delta. The Eastern matrix comprises predominantly a water based civilization- a world of moistness fecundity and lushness- where cosmological and valorized concepts are generated from river dynamics and agricultural rituals. The eastern matrix possesses a more terrestrial cosmology rather than a celestial one, where order in the universe, is manifested by the annual flooding, the monsoon etc. The popular venerated spirit is the serpent, being specially honored all along the matrix, as in Bengal, rice cultivation has generated specific rituals and honorific practices.

It is also a matrix of 'rice culture' where rice is not something merely consumed but is the basis of value- construction of a collective ethos and mythos, and of the articulation of self identity. 'In the Bengal delta rice-cultivation is an extensional occupation; the production of rice is the production of world view.'[1] Clay is the basic material found in the delta, although bamboo and timber have also been used commonly as building like hut and bungalow material, which is directly produced from river and agricultural vastness.

The 15th and 16th century saw the truly upsurge of a Loukik [vernacular and folk] Bengali culture. Two streams characterized the region. The domain of the pandits who authority came from the Vedik Sastra , and the vernacular stream, the domain of the plebeians, the dweller of the villages and rivers, whose

[1] Richard Eaton- The rise of Islam and Bengal frontier 1204-1760, University of California Press 1993. pp.15

practices relied mostly localized belief and rituals.[2] Subaltern practice their own way to build dwelling unit as well as bungalow[regenerated from hut] through emerging vernacular sense on the other hand civilized elite group established and patronized the bungalow as a style for pleasure home. Indigenous architecture has a clear relationship with collective consciousness, relation with the soil, cultural behaviour and values and norms. The subaltern, for historical period made their dwelling respect with material articulation and other lattice of intensity and contextuality.

The integral relationship between pavilion and environment is also the key to complex organization, from simple clustering to complex patterns, and finally form a deltaic city. Deltaic morphology implies the disposition of isolated building in a fabric of paddy fields, gardens, orchards, lakes and ponds. Clusters are formed by grouping pavilion 'unit' in a series, or around an amorphously interiorized space [the courtyard]. An understanding of deltaic development lies, not in the dense labyrinthine fabric of cities, but city- forms east of the Bengal delta in the ' rice culture' matrix, where the distinction between urban and rural morphology has not been so oppositional, and building took their place in the natural milieu with minimal turmoil.

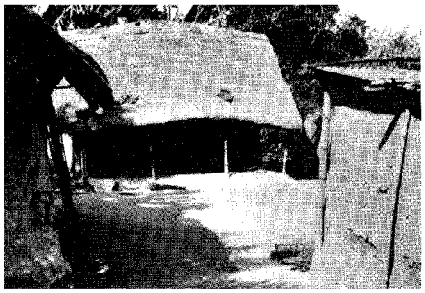

Figure 1. Bengali Hut with Uthan[3]

Figure 2. The activities of Uthan[4]

III. VERNACULAR ARCHITECTURE AND BANGLADESH

The Latin word '*vernaculus*' means native. In native context, Architecture is vernacular when it exhibits distinct characteristics in construction techniques, material use, performance of space, social system within a particular community to sustain. Vernacular is also referred to as "the mode of expression of a group or class". The Theoretical elaboration of vernacular idea primarily focused on the features of vernacular architecture:

> "Vernacular architecture comprises the dwellings and all other buildings of the people. Related to their environmental contexts and available resources, they are owner or community-built, utilizing traditional technologies. All forms of vernacular architecture are built to meet specific needs, accommodating values, economies and ways of living of the cultures that produces them."[5]

> "Vernacular architecture generally embodies community values, and less evidently, may symbolize concepts of cosmos, or acts as an analogue for the abstraction of belief. Thus even a simple dwelling may reflect both the material and spiritual worlds of it builders and occupiers."[6]

[2] Pundranagar to Sher-e Bangla nager-'Chatana' publication 1998,Dhaka, pp.9
[3] Mohammed A. Muktadir & Dewan M. Hassan, Traditional house Form in rural Bangladesh: A case study for Regionalism in Architecture.
[4] Quazi Azizul Mowla, Settlement Texture: Study of a Mohalla at Dhaka, Journal of Urban Design, Vol. 2, Issue 03, October 1997, UK. pp. 259-275.
[5] Oliver Paul- Encyclopedia of Vernacular Architecture of The World, Cambridge University Press, Vol. 1,UK.
[6] Oliver Paul- Encyclopedia of Vernacular Architecture of The World, Cambridge University Press, Vol. 1,UK

Vernacular architecture, therefore, is an essentially social and region specific built forms made of local materials using local technology in time and place by a particular community.

In rural Bangladesh, the patterns of pastoral heritage evolved through countless generations and affected the evolution of the traditional house form.[7] The traditional Bengali house form, 'Bengal Hut', in its basic form is a cluster of single-storied dwelling units around a courtyard, which is 'Uthan' in local language. The space organization of hut is based on broad categories of function it is to perform. Two distinct functional domains inner house and outer house are found in Bengali Hut which respectively performs family functions like sleeping, cooking and eating and formal functions such as socializing with the community. Adding to spatial order, Bengali Hut is also culturally defined by social codes, customs and norms which are often defined as 'the female domain' and 'the male domain' which correspond with the 'inner house' and the 'outer house' respectively. In addition to public/private realms, religious beliefs also influence the layout of hut. Muslim huts are laid out following the cardinal directions of the *Qibla* for prayer and also to determine sleeping and toilet orientation.[8] On the other hand, a spatial dimension of Hindu Hut emphasizes ritual purity within the house or the homestead.

Although the climate factors in shaping the rural house form of Bangladesh apparently less deterministic, the introvert layout of the hut around the courtyard, the low-height hut with projected roof overhangs and vegetation around to circumscribe the landscape, the insulating capacity of thatch roof, mud wall or bamboo panel all contribute significantly to the excellent thermal performance of the Bengali Hut.

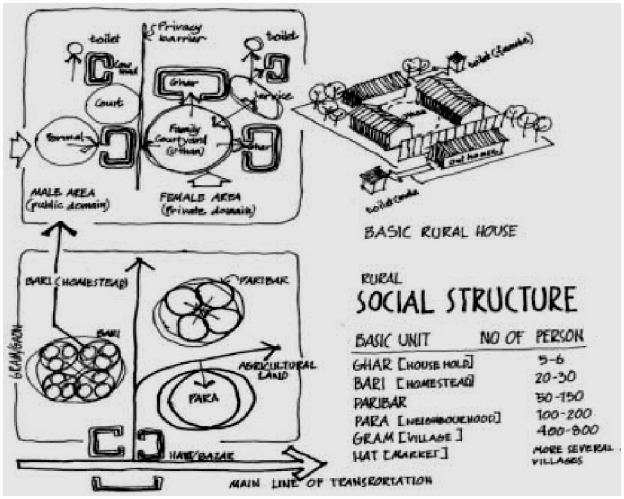

Figure 3. The basic space arrangement of Bengali Hut[7]

Figure 4. Variations of Bengali Hut

[7] Mohammed A. Muktadir & Dewan M. Hassan, Traditional house Form in rural Bangladesh: A case study for Regionalism in Architecture.

[8] Mohammed A. Muktadir & Dewan M. Hassan, Traditional house Form in rural Bangladesh: A case study for Regionalism in Architecture.

The most pervasive architectural presence in the delta is the 'pavilion' structure. Its singular persistence as the idea of dwelling further clarifies the culture of Bengal Delta. The most elemental pavilion is the rustic Bengali hut which is essential a roof [known as the Bangla roof] a canopy defined by the uniquely bent roof meant to thwart the intense sun and torrential rain and directional wind and secondarily the walls, permeable to the movement of the air and placed well within the perimeter of the roof. The hut is a free standing form whose pavilion like quality, manifested by the parasol roof and the permeable wall is emphasized by the verandahs, terrace and semi enclosures, creating an ambiguity from inside and outside. And cluster of hut created the social bonding and here the middle space or the courtyard work as a space of performance. Sometimes it is a breathing space; sometimes it is a meeting space.

If we go further and investigate Bengal hut we can see other architectural form is also influenced from this hut. Bungalow of or belonging to Bengal. Bungalow is the relations of dependence and re-inscription between architecture and anthropology. Bungalow is a reconfiguration of the deltaic hut. True Bungalows (say the purists) represent structural simplicity, efficient use of space, and understated style.

Figure 5. Bengali Hut and its pavilion structure[9]

Figure 6. First Bungalow in British India 1790 [residential house][10]

IV. POST COLONIALISM AND BANGLADESH

> "Post-colonialism' loosely designates a set of theoretical approaches which focus on the direct effects and aftermaths of colonization. It also represents an attempt at transcending the historical definition of its primary object of study toward an extension of the historic and political notion of "colonizing" to other forms of human exploitation, normalization, repression and dependency. Post-colonialism forms a composite but powerful intellectual and critical movement which renews the perception and understanding of modern history, cultural studies, literary criticism, and political economy."[11]

As suggested by its name, post colonialism is about dealing with the legacy of colonialism. Perhaps somewhat surprisingly the most prominent form this has taken to date has been in the cultural realm, especially with respect to identity politics and literary studies. Thus, the most common way the term has been used is in reference to a genre of writing and cultural politics, usually by the authors from the countries which were previously colonized. All post colonialist theorists admit that colonialism continues to affect the former colonies after political independence.

What post colonialism does in Bangladeshi cultural history is to enable us to question the totalizing tendencies of European reading practices and interpret the texts on their own terms and read them

[9] Huts of Bengal, Archaeological Studies and Training, Eastern India.
[10] Anthony D. King '*The Bungalow':* The Production of a Global Culture,p-11

[11] "Global Justice and Cultural Diversity" and "Post colonialism in Science, Medicine, Economics and Culture", Conference about Postcolonial study and criticism in literature-introduction paper- Toronto in 1999

from our specific locations. Interestingly, much of the "us" and the "our" doing this reading is projected in nation-state terms.

> "Postcolonialism may give the impression that the sole preoccupation of the colonized after territorial independence is colonialism. There are grave ramifications to such a postulation. Excessive interest in colonialism can cause us to ignore our histories before colonialism, and also conveniently to overlook indigenous annexations and annihilations of our own people and their history." [12]

Founder of the 'Subaltern study group Ranajit Guha argued;

> "What clearly is left out of this un-historical historiography is the politics of the people. For parallel to the domain of elite politics there existed throughout the colonial period another domain of Indian politics in which the principal actors were not the dominant groups of the indigenous society or the colonial authorities but the subaltern classes and groups constituting the mass of the laboring population and the intermediate strata in town and country-that is the people".[13]

As a regional entity Bangladesh had been a unique modifier. All the external rulers excepting the British could be tempered and later on could be identified with the local people and culture. May be it is because all of them belonged to oriental cultures having similar values and also that they settled in the region. For the first time during the British rule the ruling class remained as alien usurpers and failed to identify themselves with the local people. At a later the western educated Bangladeshi middle class assumed a similar role. However, indigenous values could not be eradicated.

Traditional histories are often influenced by Marxism when they are explaining or discovering the Bengal history. Thus, they tend to begin with India in a kind of semi-feudal state, then go on to tell how it was colonized by the British, how it was politicized, and how it eventually earned its independence. The heroes of these narratives are the Indian elites: the elites, usually presented as the first Indians to gain any sort of political consciousness, are said to provide the inspiration, the ideas and the values, for resistance and rebellion against the British.

During the study of the works on the postcolonial discourse, two prominent aspects emerge: a descriptive concept of post colonialism and a programmatic concept.[14]

In Indian Subcontinent, this term 'Subaltern' has been brought to the center of critical scholarship by the Subaltern Studies Collective writing since 1982 on South Asian history and society from a "subaltern perspective." In the Preface to Subaltern Studies,[15] Volume I, Ranajit Guha proposes the following definition:

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[12] R.S. Sugirtharajah, "A Postcolonial Exploration of Collusion and Construction in Biblical Interpretation," in Sugirtharajah (ed.), The Postcolonial Bible, pp.112.

[13] Ranajit Guha was the founding father of Subaltern studies. Subaltern Studies vol.2 1985 p-04 Oxford University press, New Delhi, India

[14] From Postmodernism to Post Colonialism- On the Interrelation of the Discourses -Paul Michael Lützeler (St. Louis) pp.12. NewYork

[15] The Subaltern Studies Group (SSG) or Subaltern Studies Collective are a group of South Asian scholars interested in the postcolonial and post-imperial societies of South Asia in particular and the developing world in general. The term Subaltern Studies is sometimes also applied more broadly to others who share many of their views. Their approach is one of history from below, focused more on what happens among the masses at the base levels of society than among the elite.

> "The word 'subaltern' . . . stands for the meaning as given in the Concise Oxford Dictionary, that is, 'of inferior rank.' It will be used . . . as a name for the general attitude of subordination in South Asian society whether this is expressed in terms of class, caste, age, gender and office or in any other way." [16]

Without access to the line of social mobility, rather then name of a differential space can be termed as subaltern. They are outside the established structures of political representation and power and denied access to both mimetic and political forms of representation. Gayatri Spivak termed subaltern-

> "The space of difference inhabited by those who have no access to the lines of mobility within a society." [17]

This definition gives us the true portrait of subaltern voicelessness. The Subaltern Studies Group adopted Gramsci's idea to encourage rewriting action of Indian subcontinent history. The dominant history on Indian subcontinent nationalism doesn't involve the role of subaltern groups, workers, and middle class people living in the cities or villages. To speak it briefly, what meant by subaltern is "the non-elite people". And what meant by "the elite people" is "the dominant groups, either come from indigenous people or foreigners". The foreigners are the British state authorities, the corporate owners, traders, plantation owners, land masters, and missionaries. While the indigenous people can be divided into those who work at the national level (feudalist entrepreneurs, indigenous employee in higher bureaucracy) and those who work at the local and regional level (members of dominant groups).[18]

By speaking out and reclaiming a collective cultural identity, subalterns will in fact

Re-inscribe their subordinate position in society. Postcolonial literature and cultural theories locate the culture and historical subject matter from pre colonial period to the present.

The term "subaltern" in this context is an implied reference to an essay by Italian Marxist Antonio Gramsci (1881–1937). Literally, it refers to any person or group of inferior rank and station, whether because of race, class, gender, sexual orientation, ethnicity, or religion.

The SSG arose in the 1980s, to attempt to formulate a new narrative of the history of India and South Asia. Although they are, in a sense, on the left, they are very critical of the traditional Marxist narrative of Indian history, in which semi-feudal India was colonized by the British, became politicized, and earned its independence. In particular, they are critical of the focus of this narrative on the political consciousness of elites, who in turn inspire the masses to resistance and rebellion against the British.

Instead, they focus on non-elites — subalterns — as agents of political and social change. They have had a particular interest in the discourses and rhetoric of emerging political and social movements, as against only highly visible actions like demonstrations and uprisings.

The Subaltern Studies group was founded by Ranajit Guha. Other scholars associated with Subaltern Studies include prominently: Gyan Prakash, Gayatri Chakravorty Spivak, Partha Chatterjee, Shahid Amin, David Arnold, David Hardiman, Sumit Sarkar, Gyanendra Pandey, Dipesh Chakrabarty

Sources from www.wikipedia

[16] Ranajit Guha, "Preface," in Ranajit Guha (ed.), Subaltern Studies I: Writings on South Asian History and Society (New Delhi: Oxford University Press, 1982), p. vii.

[17] Gayatri Chakravorty Spivak, "From Haverstock Hill Flat to U.S. Classroom, What's Left of Theory?" in What's Left of Theory? : New Work on the Politics of Literary Theory, ed. Judith Butler, John Guillory, and Kendall Thomas (New York: Routledge, 2000). 26.

[18] Ranjit Guha and Collective (eds), Subaltern Studies 1982 Volume one. Delhi, Oxford University Press. In "On Some Aspects of the Historiography of Colonial India" essay.

Homi Bhabha argued,

> "Any group or society that has been oppressed wants an acknowledgment of its own history, a history which has been hidden or denied. I'm not pretending it's an easy matter. But to the extent to which it can have a positive transforming influence, I'm attempting with my work to shift notions of what it means to belong to a culture, to have an identity -- to show how limited it is to cling onto rigidly defined imperialist or nationalist ideas,"[19]

V. THE ANECDOTE

Following the recent developments in theorizing architectural historiography, postcolonial theory informs the understanding of history by a heightened awareness of the inherent politics within architecture. Architecture is understood here as a socio-cultural phenomenon rather than as a static and inert "object" that can be studied only in terms of its formalistic characteristics.

Until recently architectural historians have been reluctant to examine issues of politics, race and gender in the production of the built environment. New approaches to architectural history induced by studies in vernacular architecture, cultural geography and social history have created fresh insights into the history of the built environment. This effort would be better served if we took another look at some of the nineteenth-century defining ideas that have shaped architectural history, and the intellectual assumptions that have emerged unquestioned in twentieth-century discussions of modernism.

Vernacular architecture examines the dwellings, religious and agricultural structures, fortifications, village formations and settlement patterns of the same subaltern societies, and difference is defined through criteria of function, environmental and climatic concerns, and formal, three dimensional qualities of space. The theoretical developments in subaltern studies of 'hegemony', to explain the power and the resolve of cultural systems, provide the potential for questioning the space occupied in architecture by the classification 'vernacular'. Our land, which is segmented by rivers, causes regionality. But regionality created by rivers has a unified multiregional cultural Condon. How regional characters here become an instance of unison?

Subaltern agencies build their dwelling, space from their previous knowledge and the material availability. For timeless and changeable landscape temporary and moveable architecture was evolved. For this shifting architecture and for the joint family structural and cultural system forced them to be together. So concept of living in togetherness is manifested. This collective consciousness creates a certain type of vernacular form and space.

The hut is also the basic unit of the universe of the Bengali peasant, as the household is the unit of production, both tied intimately to the milieu formed by the hut and a court and the wider paddy fields. In this sense, the deltaic pavilion is not merely a visual object but a synthetic production of a local ecology, sociology and mythology.

The hut type and deltaic geography have also spawned characteristics settlement patterns. Along rivers and cannels, homesteads clustered on earthen mounds amongst rice field and groves have created a timeless landscape. Through historical changes, social upheavals or religious revolutions, the milieu of the subaltern village has remained more or less unchanged. It is still formed by the same kind of relation with nature and the river, same locational quality of the homesteads, paddy fields and groves.

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[19] 'Rethinking experience of countries with colonial past' interview with Homi Bhabha from Artforum [W.J.T. Mitchell] from The University of Chicago Chronicle 2002.

The idea of the pavilion is manifested by many concrete forms. The bamboo woven hut on stilts and thatch on an earth platform are straightforward example. And the bungalow also developed from this deltaic pavilion structure.

"The solid centralized mass, constructed in brick out of social need and monumental urges, the Bungalow are the elaboration of pavilion idea."[20]

Bungalow of or belonging to Bengal. Bungalow is the relations of dependence and re-inscription between architecture and anthropology. Through the insights from subaltern studies, we are forced to respond to the question of biases within the discourses on vernacular; and the question of subaltern agency as it is tied to the nature of evidence emanating from non-literate, indigenous societies. They build Bungalow which had imported to Europe as a very successful summer house.

VI. WRAPPING UP

History is capable of playing a definite role in social mobilization. In almost every country, attempts have been made by some sections or groups to control history. This is done by influencing the collective consciousness of people through protagonist actions favoring some ideas or interpretation and misrepresentation of historical events. Bungalow epitomized the idea of dwelling in nature under the assured shelter of a big roof from where one could look out into the distant horizon. Various type of tectonics were employed for the Bungalow but always derived from lessons learnt from the climate and local idioms. But in colonial ideology of racial segregation, it came to encourage spatial distancing and separation. It soon transplanted into an architectural style all across the subcontinent and all over the world.

Everything in the world is the product of a respective historical process. History scholars explain the real history from their philosophical point of view, which makes history itself seem to be a "blackbox" that is unknown to the people. In the other way, this interaction of history and philosophy sometimes has a positive impact by gathering the factual historical evidence, which can be proved to be realistic to the people.

Architectural development of our deltaic subaltern region has the strength to serve the physical and spiritual needs of people, from a single family to entire family. At the physical level, the build form of bungalow, it embodied centuries of learning with regard to orientation,[21] climate, building material and construction techniques. At the spiritual level, the build form conveyed total harmony with the life

[20] Pundranagar to Sher-e Bangla nager-'Chatana' publication 1998,Dhaka-p-10

[21]Proper knowledge for the orientation in architecture in this region developed for social innovation and people's real need and experience For example the proverbs of "Khana" that have been used widely throughout the South Asian region were developed by a woman named "Khona"—a famous personality in the mythical stories of this region [Khona was a wise woman in the court of king Bikramadditya-1st century B.C.].. Many of these proverbs include nature and environmental protection. Such phrases through interpersonal communication channels were active in creating awareness for environmental protection in rural Bangladesh. Having such a rich tradition, subaltern are not only the silent managers of their natural resources but are active in protecting biodiversity through their age-old traditional knowledge and practices. They possess intense ecological insights drawn from their culture and their productive and maintenance roles. They are able to offer ecological insights that are deeper and richer than the technocratic recipes of international experts or the responses their own societies. some proverb are given below which are practiced for hundreds of years for building subaltern hut and the bungalow-

"South facing is the best; East facing is the next to rest; West facing unwanted they say; North facing has little to pay". Or "light wall and roof is slope; all the family will stay in hope"

Source: Inter Pares- cultural magazine, 'Indigenous people and Cultural action' vol 19 March 1997 Ottawa, Ontario, Canada.

style in all its daily as well as seasonal rituals, unifying the socio cultural and religious aspirations of the individuals and community. Life style and activity followed in consonance with nature and architecture [bungalow] with nature.

Application of such realistic and yet value oriented attitudes, gave the society a sense of confidence and much needed feeling of self sufficiency. The external considerations were accepted under force and were gradually absorbed to facilitate the continuance to the envisaged life style. In this process, the role played by the people was that of shareholders in an enterprise. While the roles of each discipline may be demarcated, the final outcome expressed the multiple considerations that went into making it. That is how all different forms of architecture in Bangladesh have, over the centuries, given birth to a vernacular idiom, sustained the culture and in the process, sustained itself.

As a response to the culture, grew our human settlements along fertile stretches of land that we have been blessed with it on plenty. Built with genius sensitivity to the local climate, taking the best advantage of local material and craft the Bungalow form was emerged and it is a reflection of cultural excellence of the people it sheltered. It seems to be custom made by the life style, an example of how material influence build form and how it can create environ that can nurture a life tradition and vice versa. And all in all the house the basic unit where the human race comes to life and is nurtured, and the patterns such dwelling places create in the form of spaces, open and shut, is a true reflection of the values a culture stand for. But this legacy does not touch most of our modern environ. We may need to nurture again our ability to deal with variation as a creative force, and to think of structures that incorporate heterogeneous elements as a challenge to be met by innovative design. We may now be in a position to think about the origin of form and structure, not as something imposed from the outside on an inert matter, not as a hierarchical command from above as in an assembly line, but as something that may come from within the materials, a form that we tease out of those materials as we allow them to have their say in the structures we create."[22]

If the history of the world has been a colonialist process of the dissemination of Western civilization, and if the non-Western world is still ruled by the Western world morally and intellectually, then postcolonial discourse has to assume the form of a neo-Gramscian Long March in the realm of culture. This is not merely because culture has always been a field of anti-colonial struggle, but more importantly, in the age of hegemonic imperialism, culture has become the privileged and even the only field of counter hegemonic struggle. This very local culture, not only challenge the continuity of neo imperialism and colonization but also challenge the intelligentsia who have refused to hear or acknowledge the subaltern voice. The challenge and the significance is 'subaltern does speak'.

[22] Manuel De Landa, ' Material Complexity ',

3.1.6

CLIMATIC RESPONSIVE SPACE IN MELAYU PONTIANAK HOUSE: A PRELIMINARY STUDY

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ABSTRACT

As a building well adapted with climate, traditional houses in Indonesia usually are very suitable to tropical hot humid climate. Almost all parts of the house are constructed in order to respond to the climatic problem of high temperature and air humidity. Layout is one attempt to do so.

Such distinctive layout also appears in melayu Pontianak houses. The living room is located at the front of a large open terrace. Space inside of the house consists of one family room surrounded by bedrooms on each longitudinal side.

The problem of dead space in the middle of the house due to the lack of air flow is solved by row of large doors which behave as openings on the outside wall and inside wall facing each other to provide cross ventilation. Thin elongated shape of building maximizes the performance of cross ventilation. The presence of veranda at the front and at the back of the house helps cooling the air flow through the house.

The air flow of the house increases with the presence of opened back veranda which separates main building and the kitchen. With current airflow, the hot air inside caused by the occupant's activities can be immediately replaced by fresh lower-temperature air.

Keywords : Melayu Pontianak house, climate adaptation, layout

I. INTRODUCTION

The capital of West Kalimantan province, Pontianak, also known as the "Equator City". Pontianak lies on the equator, at 0° 02' 24" north latitude – 0° 01' 37" south latitude and 109° 16' 25" – 109° 23' 04" east longitude.

The daily mean temperature for Pontianak is 29.5°C, the mean minimum temperature is 22.9°C and the mean maximum temperature is 31.05°C. But occasionally the temperature can reach 33.7°C. High rainfall (3,000 mm – 4,000 mm) causes high air humidity as well. Air humidity can reach 99.5% with an average of 80%. This conditions indicate that Pontianak has a hot and humid climate.

Hot and humid condition of Pontianak often leads to uncomfortable condition felt physically by the city residents. Because the air temperature is continually very near to skin temperature, bodily heat loss to the air by convection or conduction is negligible. The main way to improve the thermal environment is by reducing the temperature with air flow (Koenigsberger et al., 1973; Szokolay, 2008). Sufficient air flow will reduce the saturated air envelope which can occur easily in hot humid condition. It will allow the dissipation of heat from the body. The air flow will also allow the body to experience the physiological cooling effect, the cold breeze we feel on our skin.

Mediastika (2002) showed that it is possible to have cooling ventilation in a house in a hot humid tropical environment. Without moving air (wind speed equals 0 m/sec which means the indoor temperature is equal with outdoor temperature, $\Delta t = 0$), cooling ventilation can be achieved when the area of the openings is at least 40% the area of the floor. But to experience the physiological comfort, the occupants must feel the air breeze pass across the body surface of the occupants, resulting in cooling effect.

Traditional and vernacular architecture is known to be well adapted with the environment where it was developed. The adaptation was done with using only natural sources of energy and observed physical phenomena (Hassan, 1986). Similar case can be found at the melayu Pontianak house, particularly from the building shape, the using of lightweight construction (wood) and the interior layout.

The solutions shown by the traditional and vernacular architecture is the passive or non-mechanic strategy which is a sustainable solution. These solutions need to be observed and studied and then to be adapted for new buildings.

Particular study on thermal condition of the built environment in Pontianak has never been done. This study is a preliminary study on how the vernacular melayu Pontianak house adapted with the climate, particularly in how the building's layout optimize the air flow inside the building.

II. METHODOLOGY

This study is a preliminary study to observe how the interior layout of melayu Pontianak house was adapted to optimize the ventilation and the indoor thermal environment.

This study is limited at the melayu Pontianak house which can be considered as the vernacular buildings in Pontianak. The thermal environment factor that will be studied are the indoor layout of the house compared with its possibility of supporting the air flow inside the building as part of natural ventilation.

Methodology used for this study is descriptive explorative by comparing existing field situation with theories. Primary data were collected from field measurement and observation. These data then compiled, redrawn and classified for the purpose of analysis.

Analysis conducted by comparison, reviewing the excellence and the weakness of primary data compared with theories of relevant guidance. The interpretation from the analysis results as the conclusion.

III. AIR MOVEMENT AND VENTILATION

Air flows either because of natural convection currents, caused by differences in temperature, or because of differences in pressure. As air hits the windward side of a building, it compresses and creates a positive pressure (+). At the same time, air is sucked away from the leeward side, thus creating a negative pressure (-) (Lechner, 2001).

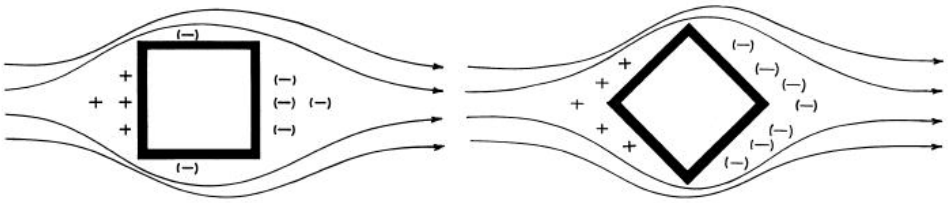

Figure 1. Air flowing around a building will cause uneven positive and negative pressure areas to develop
Source: Lechner, 2001

The Bernoulli effect can also be applied for studying air flow. The Bernoulli effect states that an increase in the velocity of a fluid decreases its static pressure. Because of this phenomenon, there is a negative pressure at the constriction of a venturi tube as seen in Fig. 2 (Lechner, 2001).

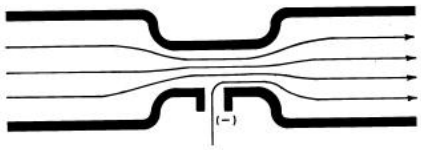

Figure 2. The venturi tube illustrates the Bernoulli effect: As the velocity of air increases, its static pressure decreases.
Source: Lechner, 2001

Air movement and natural ventilation are main tools to sustainably provide the comfortable thermal environment in hot humid climate (Koenigsberger *et al.*, 1973). Adequate ventilation brings in fresh outdoor air then the air is passed over people to increase evaporative cooling on the skin (Lechner, 2001).

Cross ventilation also must be provided to achieve comfort thermal environment. Cross ventilation assures the constant flow or movement of the air inside a building (Koenigsberger *et al*., 1973).

Designers must consider their designs to provide buildings with comfort thermal environment. Different types of climate requires different types of design strategies. Koenigsberger *et al* (1973), Lechner (2001) and Szokolay (2008) have proposed strategies for design, especially related to layout, dealing with hot humid tropical climate. The strategies are:

1. Long thin elongated plan shapes, with a single row of rooms to allow cross ventilation.

2. Elevate main building on stilts to avoid the stagnant or slowly moving air at the ground surface, thus capturing air movements of a higher velocity.

3. With low rise building, orientation for wind is more advisable.

4. Wide big area of openings for natural ventilation, especially for the living aren (up to 2 m above the floor). This condition is suitable for air change as well for air flow which will pass the air over the people to increase evaporative cooling.

5. Spacious veranda covered with roof or shading to lower the outdoor air temperature before entering the building.

IV. MELAYU PONTIANAK HOUSE

Melayu Pontianak house is the dwellings for Pontianak residents which were built and passed down by predecessor. As the history of Pontianak city can be seen from the rising of malay sultanate, Kesultanan Kadriah Pontianak, the architectural style of malay also affected the dwellings, hence the term “melayu Pontianak house”.

Currently, many houses of this style can be found at the region near to The Kadriah Palace Pontianak, especially on Kampung Arab Street or Kampung Beting, Sub-district of North Pontianak. Several other houses can be found scattered around the city area.

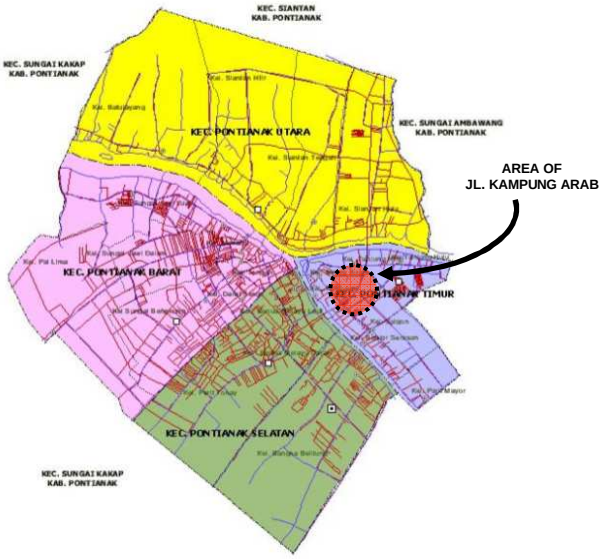

Figure 3. Administrative map for Kota Pontianak
Source: RTRW Kota Pontianak, 2001 – 2011

Main structure of melayu Pontianak house is from wood with elevated floor on stilts. Main frame of the building uses iron wood, a very strong waterproof kind of wood found in Kalimantan. The foundation uses wood pile foundation called "*alas-laci*" foundation. The wall constructed from wooden board. The original material for the roof was thin sliced wooden bar (called "*sirap*") or pile of leaves (called "*rumbia*"). Due to the age of the materials, many of the original roofs were replaced by zinc sheet roof.

Opening in the form of windows and doors can be found almost at every interior rooms. Each window and door also have ventilation opening above it. The window's shape is casement windows, but it was found that at several houses the original windows have been replaced by louvered glass windows.

Interior layout of melayu Pontianak house can be divided into two main part, the main house and the kitchen. The two parts are separated by slight lower level of open space called "*pelataran*" or in this article will be revered as *back veranda*. The back veranda is open, means it is not covered with roof or shading.

Front area of the main house always has front veranda covered with roof which acts as sun shading. After the veranda, the interior room begins with a spacious living room. Behind this living room are two rows of bedrooms, facing each other at the left side and right side of the house. These rows surround an alley at the center of the house, occasionally functioned as the family room.

After the main house is an open space or back veranda which connects the main house with the kitchen and toilet. This veranda is at the same level or sometimes at one step lower level as the main house, therefore the occupant does not have to go down to the ground to move from main house to the kitchen. This back veranda also used for kitchen activity when the family holds social or community events which require more cooking space.

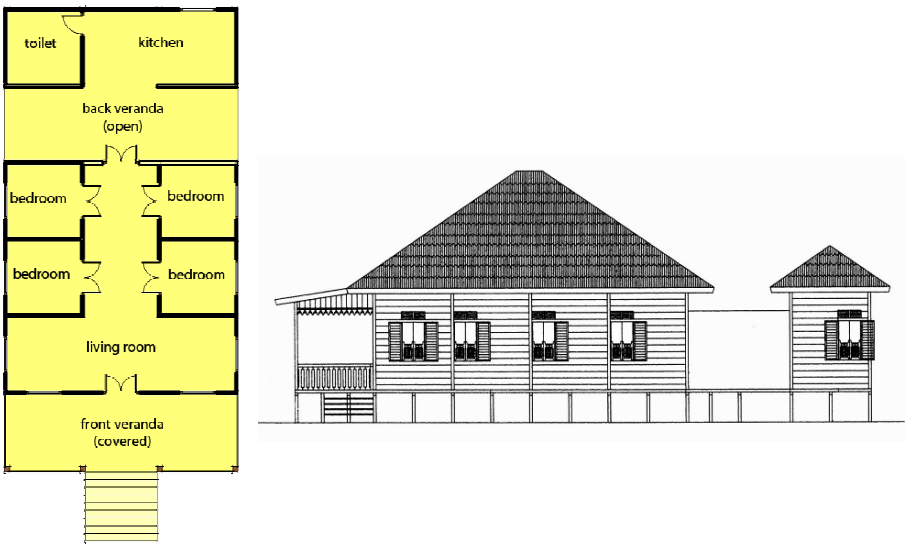

Figure 4. Typical plan and side elevation view of melayu Pontianak house
Source: field observation

Figure 5. Front view of one of the melayu Pontianak house
Source: field observation

Figure 6. View of back veranda (“pelataran”)
Source: field observation

V. ANALYSIS

Melayu Pontianak house is well adapted with hot humid climate. Comparing the guidance and the internal layout, the house adapts with climate in ways of:

1. Thin elongated plan with row of bedrooms allows a good condition for cross ventilation.

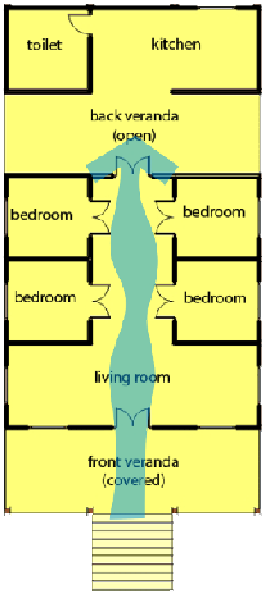

Figure 7. Thin elongated plan allows an adequate cross ventilation.
Source: analysis

2. Almost all rooms has big wide openings at human level (up to 2.1 m), windows and doors, therefore the air flow can move pass over the occupants and generate the physiological cooling (Fig. 8).
3. Main building is elevated on stilts, this will avoid the stagnant or slowly moving air at the ground surface, thus capturing air movements of a higher velocity. High humidity near the ground will also can be eliminated by the air movement below the building. It will take the water vapor as it flow (Fig. 8).

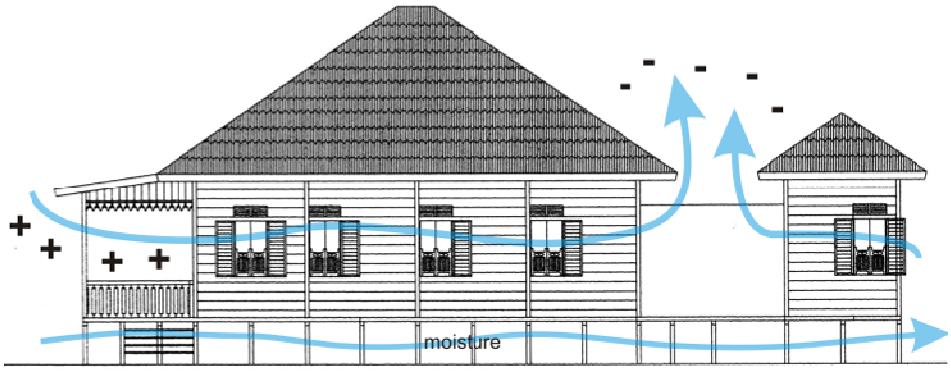

Figure 8. Higher level was made for capturing air movements of a higher velocity and humidity on the ground can be eliminated by air movement below the building.
Source: analysis

4. Cooking activities in the kitchen produce heat. The separation between main building and the kitchen can avoid the heat from entering the main building. Excessive heat can be easily eliminated by the air movement and wind collected by the open back veranda.

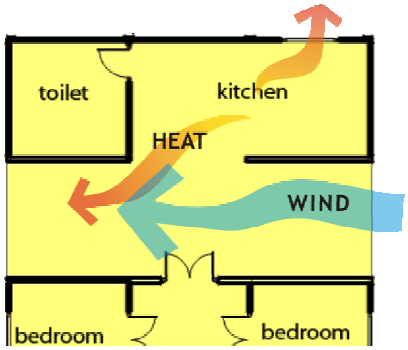

Figure 9. Heat produced by kitchen's activities can be eliminated by natural ventilation with large openings and open (outdoor-connected) back veranda.
Source: analysis

5. Front veranda covered with overhang and shading helps reducing the hot outdoor air before entering the building thus raising the air pressure at this area which can help air to flow into the building.
6. Rows of rooms facing each other at the center of the house may give the effect of wind funnel. Wind funnel can help increasing the speed of the air flow thus help the effectiveness of ventilation for each room.

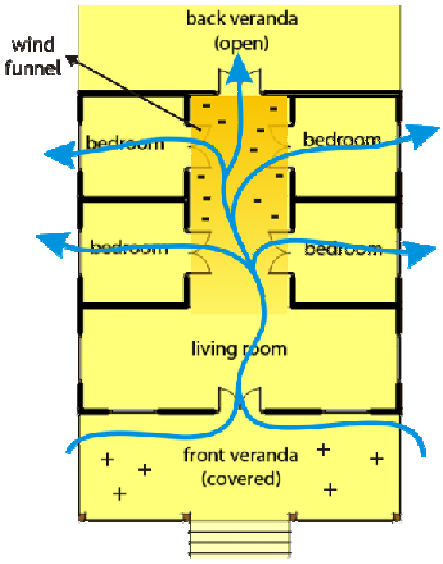

Figure 10. The "wind funnel" increases the effectiveness of cross ventilation for the rooms.
Source: analysis

7. Back veranda offers a good sample of the Bernoulli effect for the air flow. The open back veranda allow outdoor wind, which most likely has higher speed, to flow along the back veranda. In this case, the back veranda acts as the venturi tube. The main building door opened to the back veranda acts as the constriction. The air pressure around the door will be reduced and the indoor air will be sucked out the back veranda. The main building has constant air flow thus natural and cross ventilation of the house is improved.

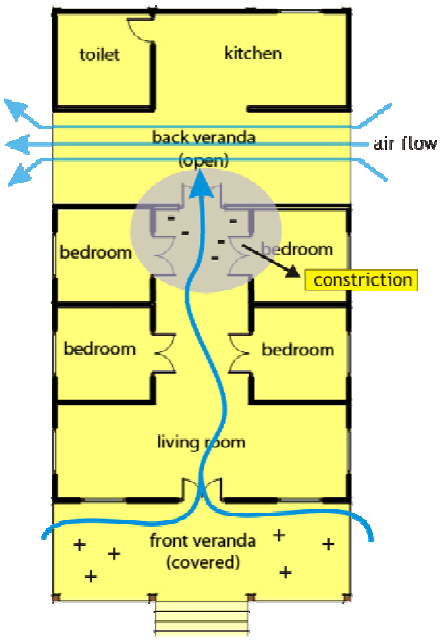

Figure 11. The back veranda acts as venturi tube and main building opening acts as the constriction, which will allow indoor air flows and give accepted natural ventilation for the house.
Source: analysis

VI. CONCLUSION

Vernacular buildings, as a result of hereditary tradition, has excellent design strategies in adapting to the local climate. These strategies is often overlooked by designers of new buildings in order to pursue more attractive building's shape and appearance.

The space layout at the melayu Pontianak house has been composed carefully to adapt with the climate of Pontianak. Spacious and covered front veranda will reduce the temperature of outdoor air before entering the building and it will also increase the air pressure. The open back veranda is also a distinctive feature found. When the outdoor air flows in the open back veranda, it will act as venturi tube and suck the indoor air from the main house. This combination will provide the house with well and adequate cross ventilation.

Other thing to consider is that air movement and wind speed very much depends on site climate condition. The melayu Pontianak houses studied here still have green vegetative surrounding and sufficient space between houses, a good environment condition to gain desired temperature of outdoor air and air movement. This condition should be provided prior to implementing the design strategies in new buildings.

This study is only a preliminary study to learn about the climatic response by local genius. Further empirical studies are required to invest more about dimensions of space and openings and which is the best layout configuration to achieve comfort thermal environment. Other elements of buildings, such as building form, building materials, etc. also need to be investigated to support comfort thermal environment on the climate of Pontianak.

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3.1.7

ARCHITECTURAL AND PHYSICAL CHARACTERISTICS OF INDIGENOUS LIMAS' HOUSES IN SOUTH SUMATRA

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ABSTRACT

The architecture of Limas traditional house in South Sumatra is influenced by culture and environment. Limas house, differing heights of the floors, divided into 3 parts which are functioning as follows front, middle and rear. Veranda is in the front for the guests and the sons. The middle part as a centre of the house which has highest levels is for the parents and the brides or for important guests, while the rear part is for the daughters and kitchen. The way of life and the way they use their houses influence the layout, ornament and size. Culture has a huge effect on the interior and exterior of Limas house, often beautify buildings in relation to local traditions and way of life.

Limas house in tropical climates is constructed by wooden materials. It allows not only significant cross-ventilation through openings of the windows and but also useful up lift swing doors and pagar tenggalung. The houses on stilts mostly built along the riverbanks and they facing the water.

Traditional Limas house is perfect example of sustainability; it demonstrates good environmental adaptation and will not threaten its environmental. Indigenous Limas' houses meet the cultural aspects and environmental comfort in local setting.

Keywords: Limas, traditional architecture, indigenous and sustainable.

I. INTRODUCTION

Palembang lies on the island of Sumatra and is separated in two parts by the Musi River, the longest river in South Sumatra. This stream shapes the heart of the city and it gives strong influences to the daily livings of inhabitants. Along the Musi River banks stand house on stilts which types are Limas and *Gudang* houses. Most of those traditional houses are located in the tidal marsh areas. The houses by the side of the banks are facing the water; the orientation of the houses forms an elongated profile of Palembang.

Based on the topography, Palembang is located in lowlands. Water is sourced either from rivers or swamps, as well as rain water. Even today the city of Palembang, is still covered by 52.24% of the by tidal swampy areas. Musi River is a meeting point for small rivers or creeks from the entire city. The creeks are only navigable at high tide. Water transportation mostly carried out by boat. In the recent years, there are plenty of wooden old house such as Limas house still exist in Palembang.

Limas House can be found throughout the region of South Sumatra province and even in the neighbouring provinces such as Jambi, Lampung, Bengkulu and Bangka and Belitung archipelago. It isn't surprisingly if Limas house is famous as a representative of Palembang traditional house even South Sumatra traditional house. Based on the concept of Ulu – Ilir (upstream – downstream), Kathirithamby-Wells, 1993, stated that Palembang is Ilir region (central administration, city and center of power) and the rest is Ulu region (hinterland, rural and agriculture). Because of this concept, all the

house types outside Palembang are called Ulu house and in Palembang itself the house type is called Limas house. In fact, there are many house types outside Palembang with different architectural style including Limas house but people called it *Ulu Berundak* House(in Musi Rawas Regency). On contrary, in Palembang there is three types of house i.e. Limas house, Gudang house and Raft House and has no *Ulu* house type. It isn't surprisingly if Limas house is famous as a representative of Palembang traditional house even South Sumatra traditional house.

Wooden structures in South Sumatra have been used in all kinds of building types for long time. Timber construction has a long history and very familiar to local people, knock-down is the most common house construction type. As sustainable resources from forest, timber has the potential to provide a renewable building material.

During a decade, housing development by mass activities or by individuals continues to grow very fast. Locations for housing development actually take dry land but in some areas in South Sumatra the housing development takes swampy areas, tidal areas, and riverbanks. In general, nowadays housing which are developed in swampy areas, tidal areas, and in the riverbanks by reclamation facing natural disaster. Reclamation activities might change the topographic and landscape becomes monotonous and bored while it threatens areas surrounding of flooding and landslides.

II. LITERATURE REVIEW

The existence of Limas traditional house is related to the Palembang. Taal, 2003, stated that Palembang sultanate was founded by noble refugee from the then powerful Javanese sultanate Demak. Since that time, Palembang was control southern part of Sumatera which consists of now known as provinces Jambi, Lampung, Bengkulu, South Sumatra and the archipelago of Bangka and Belitung respectively. Palembang is a central administration and the rest is a hinterland of Palembang.

Oo. et.al, 2003, stated that the majority of traditional houses of Barmar, Mon, Shan and Inn-thar races are built with indigenous building materials. The reason of using these materials is great durability and resistance due to shear and split conditions. In South Sumatra, traditional architecture uses local indigenous material such as wood, bamboo, rattan and palm leaf. These materials those are familiar easily to find in the surrounding areas. In general, local societies have good experience of using local material with proper techniques that they learn from their ancestors. In addition, in the process of rehabilitation of their dwellings because of damage or wrecked, they will find easily the local building material as substitution.

Mushtaha and Noguchi, 2005, explained about court-concept which is provides people's satisfaction both culturally and environmentally. The court is good concept for encourage family's activities, share internal spaces, gain both benefit sun and wind during the year. The local people have good experience in their environment for years and they can manipulate thermal comfort for daily life that corresponding with their culture. In South Sumatra, people recognize their geographical aspects such as river, tidal swampy areas and earthquake. They build traditional architecture which the construction is appropriate to the environment. The people of South Sumatra have much specific traditional architecture based on the characteristic of those areas. It creates traditional architecture more dynamic, aesthetic and attractive in the sense of building structure, building materials and the details

Similar to the traditional buildings in most parts of Indonesia, the Limas house of South Sumatra shows characteristics of timber buildings on stilts which are beautiful and fixed according to different culture and geographical environments. South Sumatra traditional house is a knock-down house, the traditional houses could be dismantled and rebuild in another location with mostly reusing of origin housing materials. The typical construction of traditional house is with flexible nail-less joints, and non-load bearing walls.

The shape roofs of the traditional houses in South Sumatra are classified into saddle type with modification, shield and the *limasan* (pyramidal), those types are suitable with their environments. Several types of South Sumatra traditional house are ornamentally, wood carving, interior decoration

and blend with specific traditional motives. Most wood decoration has the form of non human and animal but plants, wood carving decoration uses see-through transparent carving technique bearing plant motives such as sunflower, pineapples, bamboo shoot, and jasmine.

Limas traditional house has been demonstrates the extraordinary indigenous knowledge of our ancestors in shaping their quality life in the past. This indigenous knowledge will regain its meaning and value in the society, we should aware of the glory of the inherited tradition. The bearers of indigenous knowledge might be developed in recent and future for sustainable housing development of South Sumatra.

Maidiawati and Sanada, 2008, explained if traditional residence with wooden structure seems to behave well because of its lightweight materials compared to other building types. Light structure like wooden construction has good flexibility when the earthquake happens. The resilience of the structure will reduce shaking influences during earthquake. Traditional buildings in the western part of South Sumatra province showed the outstanding flexibility during the earthquake. The adaptation to the specific environment conditions of traditional house provides excellence shelters for the community including anticipation of humidity and solar radiation in humid tropical climate.

Vellinga, 2006, stated that many unique vernacular building traditions have disappeared in recent history a vast number is currently in the process of being lost. Contrast to Vellinga's claims, in recent year housing development is using many new materials building that should be provides from distance region. Because of that, many traditional carpenters cannot be able to handle building construction properly, In addition, many housing construction is using steel construction for roof framing. Steel structure for housing is overused and need more energy to make it. It is very wise if we use low energy consumption and environmental friendly to make housing structure.

Kim. 2006. states that because of modern architecture nowadays need huge energy consumption, it generates many environmental problems. It seems that that architecture becoming inharmonious with nature. Architecture will give impact to nature and vice versa, meaning that it isn't wise if architecture wants to conquer nature. In addition, it is realized architecture, nature and human beings as integrated concepts for centuries. Some studies mentioned indigenous knowledge has relationship between architecture and nature in term of selection and arrangement of site, manipulating wind direction by using natural connection, using variable doors and windows, designing eaves to control the amount of sunshine and managing natural light and ventilation system.

Singh, et.al, 2009, state that the concept of vernacular architecture based on bioclimatic was established and practiced by many civilizations for centuries. Different societies have developed their own architectural styles based on the specific environments. In general, the buildings use local materials which are performed harmoniously with the existing environment such as climate and humidity Vernacular architecture shows a good example of the unity between settlements, people and the physical environment. In contrary, the situation is ignored in nowadays society.

III. ARCHITECTURAL STYLE

As a traditional house Limas was known as the home for *Tetuo*. This type of house was often used for ceremonial activities. In accordance with the name, the house has a roof shaped Limas. This unique roof type is different from *Gudang* house and *Ulu* house. Limas house has a multi levelled floor according to the function room or for a particular purpose. Limas house has rectangular and stood on top of poles.

Figure 1. Limas house in Jend. Sudirman Street, Palembang

In the middle part of Limas, which is the highest is known as Gegajah space. This space is regarded as a sacred space in the context of the macro cosmos. This space for a family or person privileged position. Limas architectural style can be described has Limas roof type, fencing (*pagar*) *tenggaloong*, stairs, *simbar* and goat horns (*tanduk kambing*). the roof of Limas is decorated with *tandook kambing* (goat horns), *simbar* which are placed on the ridge or roof edge.

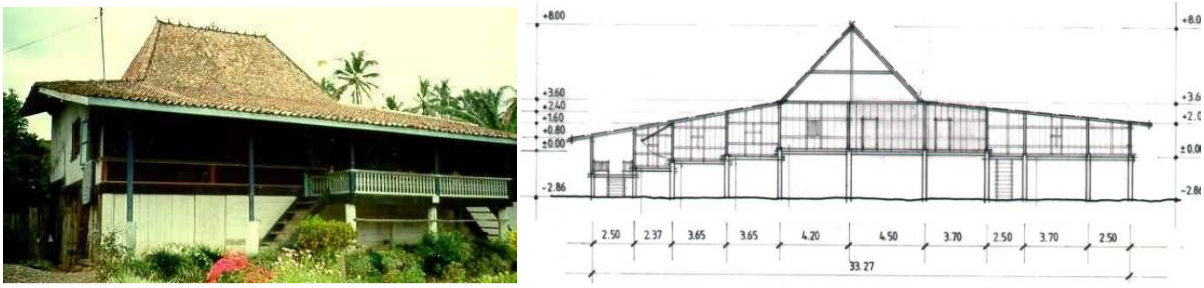

Figure 2. Limas House in Semendo Highland, Muara Enim Regency.

Limas has specific form of the roof angle. Roof angle above kekijing, front part of the house, has angle about 11^0 to 15^0, while in Gegajah space the angle of the roof between 45^0 to 60^0. There are still many Limas house, mostly in Palembang and very few in regencies and cities within South Sumatra province. Different roof angles provide a very good proportion of the building.

Figure 3. Ulu Berundak House similar to Limas House, in Musi Rawas Regency.

IV. PHYSICAL CHARACTERISTICS

Limas house foundation other than buried in the soft soil is also given the wooden pedestal in the base of pile. This system is similar to tie beams function and locally called *botekan* or *tapa'an* which provides excellent carrying capacity for construction. In general, this type of wooden construction for

Limas house is a pen and hole pattern. Construction with the traditional concept is in accordance with the concept of pivot, press, hook, pinch and pull. To strengthen the connection used a pen or a wedge of wood. Detail construction of Limas house is solved exactly in accordance with the function and its location.

Wood that lies horizontally such as beam and planks usually use the timber intact with no connection. While wood which lies vertically may be connected or placed on wooden construction underneath. In local, typical structures of Limas house were known as *lanang* (man) and *betino* (woman), *jalu*, *speeng*, *kip* and *poteeng*. Furthermore the ceiling is called *kajang angkap* with fitted *gulmat* and *rambatan tikus* or propagation of mice

In general, the structure of columns (bottom part) is not continuous with *sako* (upper part) of Limas house. *Sakos* are in rectangular shapes which sizes are different depends on the function. Basically, the position of the beam connecting the columns at the top is not proper based on the principal of structure, less robust than when lying upright but in terms of practicality it is much easier and simpler.

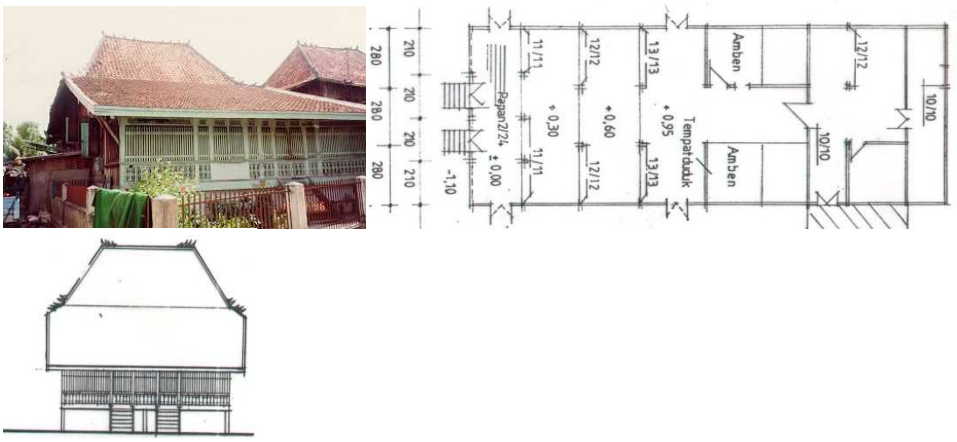

Figure 4. Small size of Limas House in Palembang

The layout of Limas house plans have a specific character, a rectangular, elongated from front to rear. The front of the house called *luan*, the rear called *buri*. While inside the house called *jeroo ruma* and outside the house called *jabo ruma*.

The composition and distribution of rooms in the house Limas in general are as follows:

1. *Pagar* (fence) *Tenggalung,* at the front of the house, in the front of *Lawang* (door) *Kipas*
2. *Jogan*, in the right and left side within kekijing.
3. *Gegajah,* in the middle part as core space under the roof of a steep pyramid
4. *Pangkeng*, bed rooms in right and left within *gegajah* space
5. Family Room
6. *Pawon* (kitchen)
7. *Garang*, a place to dry or is a transition area.

Basically, Limas house has several floors height in difference levels which is known as *kekijing*. *Kekijing* has the specific meaning and function that represents a philosophy of its location. The highest level of floor is for those that have high rank or caste and it has a private character. While the lowest floor is for common people and it has a public character. In recent decades, the situation is little bit change in Limas house, multi levelled floor express to respect older people by placing them on a higher *kekijing* while younger people settle in *lower kekijing*.

Limas multileveled floors divided into 3 parts which are front, middle and rear based on its function. Veranda is in the front for the guests and the sons. The middle part as a centre of the house which has highest levels is for the parents and the brides or for important guests, while the rear part is for the daughters and kitchen. Veranda is front *garangs*, space between *pagar tenggaloong* and *lawang kipas*, *kekijing* and *jogan*. Few limas houses have jogan as a room in the right and left sides.

Figure 5. Pagar Tenggalung, Kekijing, Lawang Kipas and Jogan of Limas House

In general, Limas houses have ornaments with fine carvings and paintings on the wooden walls, ceiling and doors. Doors called *lawang kipas* can be operated up lift and stick in the ceiling. *Lawang kipas* are located between columns behind *pagar tenggalung* in the entire side of *kekijing.*

V. INDIGENOUS KNOWLEDGE OF LIMAS HOUSE

Limas house in Palembang are generally built on a swamp area that is affected by the tidal of Musi River whereas Limas house in the hinterland are built in highland. In the lowlands pile foundation of Limas use pedestal log inside the soft soil whereas in highlands, pile foundation of limas use stone pedestals lays on the grounds. In highlands, the using of stone pedestals is to prevent from soil humidity and to reduce shaking from earthquake.

Use the pole on Limas house other than to adjust to water level fluctuations during tidal, wind circulation is also intended to be used naturally. Wind circulation on all four sides of Limas house and on the floor board can maximize air circulation.

The use of *pagar tenggalung* and *lawang kipas* that can be opened by twisting above and stick them to ceiling is to provide a continuous open space between the inside of the house and the outside. Opening *pagar tenggalung* and *lawang kipas* on the entire side of the front are to maximize the function of *kekijing* for activities that involving many people. In addition, air circulation and natural lighting are also getting better. Limas houses in lowlands and highlands have adapted with the environment by placing windows, doors and transparent fencing for perfect thermal comfort.

Gegajah that has a relation with cosmology has a high ceiling space also gives the temperature inside the house to get colder. Roof form of limas house provides natural thermal comfort and adequate natural lighting inside the house. Some of the side of practicality in daily life as well as incidental events that occur can also be solved by both the detail and layout of Limas house

Knock-down timber house is the perfect solution for traditional wooden structure because the house can be dismantled and set up again in different placed with almost all the material of original house. If

the house can be disassembled and moved in a practical way, so homeowners can rebuild it elsewhere so that you no longer need a new home material. This causes no waste from demolished houses, so that it can reduce the amount of waste.

VI. CONCLUSION

Limas traditional house is strongly influenced by geography, environment, and culture aspects which are formed for centuries and in accordance with the needs of local communities.

The way of life and the way they use their traditional houses influence the layout, detail, ornament and size. Culture has a huge effect on the interior and exterior of Limas house, often beautify buildings in relation to local traditions and way of life.

Traditional Limas house is perfect example of sustainability; it demonstrates good environmental adaptation and will not threaten its environmental. Indigenous Limas' houses meet the cultural aspects and environmental comfort in local setting.

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3.1.8

VERNACULAR ARCHITECTURE IN JAKARTA AND SURROUNDINGS

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ABSTRACT

The city of Batavia as a native of Jakarta, is believed by many experts is a fusion of several ethnic groups who lived together for several centuries, such as the Sundanese, Javanese, Arabic, Balinese, Bugis, Sumbawa, Ambon, Chinese and Malays. Therefore, some cultural products including architecture also reflects the combination of these.

Since becoming the capital, the pace of development in the city of Jakarta has made the Betawi people uprooted from their group so that complicates communication between them. Betawi people become increasingly crowded and displaced. As a result, thousands of people moved out and divorced Betawi dispersed into the suburbs. According to Saidi (1996), the Betawi people have been trying to maintain its cultural existence. However, supporters of Betawi culture in Jakarta were increasingly depleted.

In the 1970s, the government took the initiative to create a conservation culture in the village of Batavia Condet. However, speculative development is precisely the Betawi people have been marginalized in Condet with the opening edge of this region. In the 1990s the number of people in Condet Betawi expected to live 30% is an optimistic number. Learning from this experience, the decade of 2000s the government to develop more cultural conservation at the Setu Babakan. In this effort, a new vernacular architecture was built to replace the old building, coupled with the conservation of agriculture, art and food to attract tourists.

In coastal areas, Coastal Betawi people "meet" with the Chinese and Bugis. This meeting has resulted in the Chinese style of rural vernacular architecture in the Gulf region Naga, Tangerang and Bugis fishermen in the area of Kamal Muara, North Jakarta. Meanwhile in the southern region, the Betawi hicks "meet" with people who produce vernacular architecture Sundanese house on stilts in the region Kranggan, Bekasi.

This paper is a study of vernacular architecture in five regions covering Jakarta and surrounding Bay Dragons, Kamal Muara, Condet, Setu Babakan, and Kranggan. Some aspects of the study include spatial, accessibility, looking buildings, and building ornaments.

Keywords: Architecture, Vernacular, Jakarta

I. BETAWI PEOPLE AND JAKARTA

Some experts believe that people are actually starting a newcomer Betawi in Jakarta. This ethnic group was born from a combination of other ethnic groups who were already living in Jakarta, such as people of Ambon, Arabic, Balinese, Banda, Bugis, Bima, Bali, Buton, Flores, Java, Malays, Sundanese, and Sumbawa. University of Indonesia anthropologist, Dr Yasmine Zaki Shahab MA gauge, the newly formed ethnic Betawi about a century ago, between the years 1815 to 1893.

This estimate is based on a study of demographic history of city dwellers, who pioneered the Australian historian, Lance Castles. In the Dutch colonial era, governments always do the census, which is categorized by ethnic group. In census data Jakarta in 1615 and 1815, there were people from various ethnic groups, but there is no record of the Betawi ethnic group

Tabel 1.
Jakarta Population Situation In 1615 and 1815
Source: Castle (in Siswantari, 2000)

	1615	**1815**
Europeans and part-Europeans	2.750	2.028
Chinese	2.747	11.854
Mardjikers	5.362	-
Arabs	-	318
Moors	6.339	119
Javanese (including Sundanese)	-	4.139
South Sulawesi groups	-	4.139
Balinese	981	7.720
Ambonese and Bandanese	-	82
Malays	611	3.155
Slaves	13.278	14.249
	32.068	47.227

In addition, the results of the census of 1893 showed a loss of some ethnic groups that previously existed. For example, Arabs and Moors, the Javanese and Sundanese people of South Sulawesi, Sumbawa people, people of Ambon and Banda, and the Malays. Recognition of the existence of the Betawi people as an ethnic group and as a social and political unit within a wider scope, namely the Dutch East Indies, newly emerged in 1923, when Moh. Husni Thamrin, community leaders established Perkoempoelan Kaoem Betawi Betawi. Also new at that time all the Betawi people realize they are a faction, that faction Betawi people.

Some analysts and researchers are unsure of the Betawi ethnic Castles above hypothesis, as Koentjaraningrat (1975), Amri Marzali (1983), Probonegoro (1987), Supardi Suparlan (1990), Shahab (1994), and Mona Lohanda (1996) (Siswantari , 2000). But there who disagree with the Castles of Ridwan Saidi, a prominent Batavia.

According to Saidi (in Siswantari, 2000) the origin of the Betawi people more emphasis on theories about language Nothofer Melayu Bern dialect of Jakarta. Bahasa Melayu originated from the Polynesian family persebarannya point comes from West Kalimantan.

Nothofer (in Siswantari, 2000) argues that around the X century at the former power of population migration Melayu Tarumanegara West Kalimantan to Jakarta, via Bangka and Palembang. These migrant Malays berakulturasi with natives who came from Java, and produce generations of Malays called Java. In the XV century, they have memluk Islamic religion and have called the Chinese diving difficult to say Islam. The Malays of Java this is the forerunner of the Betawi.

Clarified by Saidi (1994) estimated that the Hindu kingdom Tarumanegara located in the Citarum river (now Jakarta with the Donegal border) that extends up to the power wing of the Bogor region (stele Ciaruteun) and Marunda (Monument inscriptions at Kampung Batu Growing up, now Kramat Tunggak). They are then referred to as the Betawi people come from Tarumanegara kingdom.

Shahab (2000) classifies the Betawi people based on place of residence consists of: Central Batavia, Betawi edge, hicks Batavia, and Batavia Coast.

1. Betawi Tengah, inhabit areas near Gambir, Menteng, Senen, Kemayoran, Sawah Besar, and the Taman Sari.

2. Betawi Pinggir, inhabit the area around Market Rebo, Pasar Minggu, Pulo Gadung, Jatinegara, Kebayoran, and Mampang Prapatan.

3. Betawi Udik, inhabit the area around Cengkareng, Tangerang, Batu Ceper, Cileduk, Ciputat, Sawangan, Cimanggis, Pondok Gede, Bekasi, Kebon Jeruk, Kebayoran Lama, Cilandak, Kramat Jati, and Cakung

4. Betawi Pesisir, inhabit the region around the Bay of Dragons, Mauk, Japad, Tanjung Priok, Marunda, Kalapa, and the Thousand Islands.

Furthermore, the Betawi hicks has two types:

1. they are influenced by Chinese culture, living in the north and west of Jakarta, and Tangerang

2. they are strongly influenced by the Sundanese culture, living in the east and south of Jakarta, Bekasi and Bogor. In terms of dialect, they are known as Betawi Ora, which has the characteristics of the end of the lettered word "a" becomes "ah", eg "saya" becomes "sayah"

This study took five regions including the Gulf of Naga, Kamal Muara, Condet, Setu Babakan, and Kranggan. Thus, in addition to belonging to the Dragon Bay Coastal Betawi Betawi hicks there are also influenced by Chinese culture, namely the Chinese Beteng west of the village. Chinese Architecture Beteng this is the major target of the study. Kamal Muara is a mixture between Betawi settlement with the Bugis Coastal North Jakarta. Condet and Setu Babakan is Betawi hicks. While Kranggan is a region where there is the Sundanese and Betawi Ora.

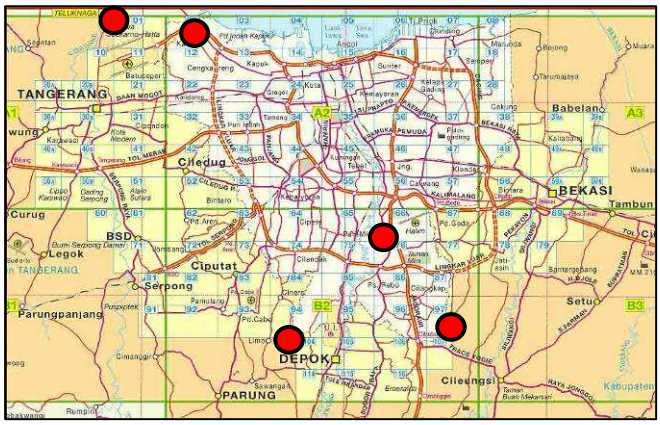

Figure 1. Distribution Research Areas

II. TELUK NAGA

Fortress Chinese people in general are farmers and living together with the Sundanese and Betawi in the Gulf coastal region Dragons. This community is located in between two villages namely "Lemo Village" and "Village Estuary." Lemo village majority of the population is rural Sundanese and Betawi Estuary is a majority.

A. Indigenous Architecture as Basic Architectural Design

Figure 2. Houses Cina Beteng

Houses *Cina Beteng* in general is one single dwelling unit and located in front of the field / fields. Orientation of main buildings on the street and other buildings facing each other. This pattern is similar to a village in Indonesia in general.

Spatial pattern of the Chinese house Beteng this unique is that there is a wide yard, either in front or behind the house. On the front is generally used for drying agricultural products and activities on the terrace used occupant activities. While at the rear, there is the back porch, barn, and a bathroom / WC outside.

Building materials used in general is a local materials such as bricks, wood and bamboo. Bricks used as a terrace floor, wood used for walls and roof construction. While bamboo is used as a wall for storage.

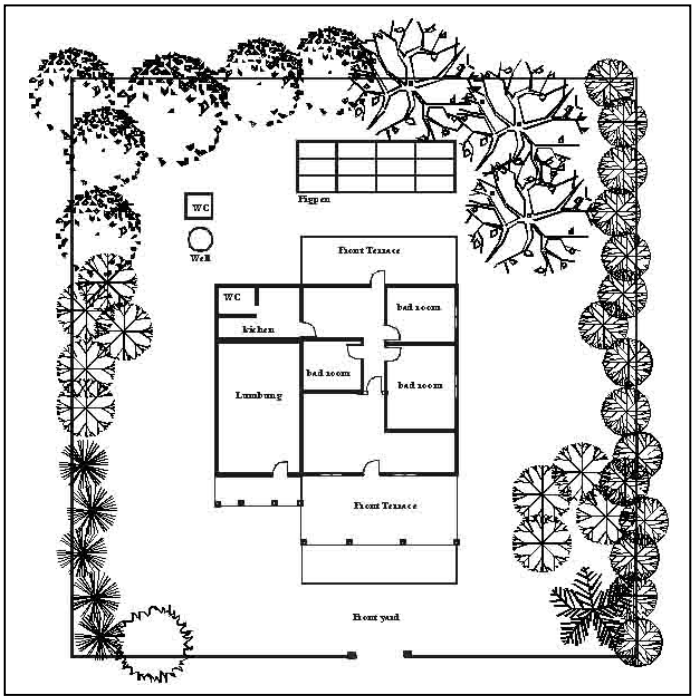

Figure 3.Plan House *Cina Beteng*

In the facade of the building, a typical Chinese ornaments are also presented, but the colors generally follow the colors used in building materials.

III. KAMAL MUARA

Kamal Muara is a fishing village. Formerly a village of Batavia with ponds which has now become the property of people outside the village. The arrival of the Bugis people since the 1960s, making this village is inhabited by the Bugis and Betawi, each of which is estimated to reach 40%. Both these groups live side by side, select a different location to reside. Betawi people prefer to live in the "land", while the Bugis people preferred to stay at the water's edge, either edge of the sea or rivers. This closeness is very linked to the Bugis livelihoods as fishermen and farmers green mussel.

Bugis village orientation was also followed rivers. Two features of the mosque to the instructions from the village of Bugis. However, the traditional home architecture Bugis has become increasingly rare. This is caused by several things. First, practical reasons such as activities in the field of fisheries. Bugis house berbentung stage became lower because of the green mussel waste backfill activities. Second, the preferred construction material not easily found on the market, such as wood Nibung be imported from Lampung. Third, the second generation prefer to stay at home made from the wall.

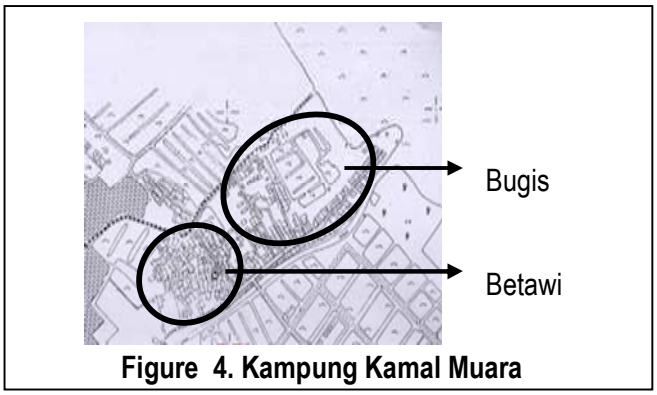

Figure 4. Kampung Kamal Muara

Dividing the space (zoning) horizontally at Bugis house generally consists of Private, Semi Private, and Semi-Public. Because it is a stage house, the entrance through the staircase and into the space that is named tamping. From here there are tamping into the living room door. A guest who are not relatives are only allowed to be here. While in the private, all the walls are separated by a curtain.

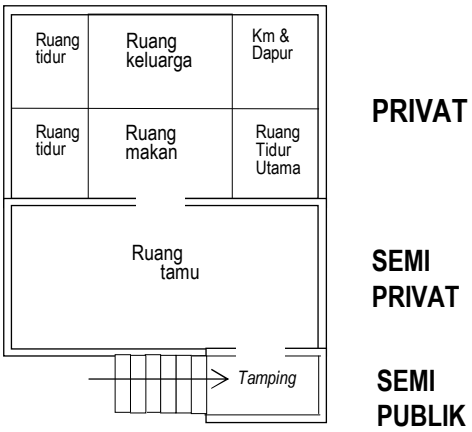

Figure 5. Zoning Bugis House

On the division of space vertically, Bugis people in Kamal's house is generally still divided into three parts, namely *Rakkeang*, *Ale bola* and *Awa bola*

In architecture Bugis, Rakkeang generally used for storage and Ale ball for occupancy. However, the Bugis houses in Kamal Muara Awa storage space is at a ball, because Rakkeang generally does not

work. Several openings in the side of the building and the building looks better air circulation functions as well as some of them have a distinctive ornament.

Figure 6. Vertical Pattern Bugis House

IV. CONDET AND SETU BABAKAN

Condet and Setu Babakan are two areas that have similarity in terms of conservation of Betawi culture. Condet developed since the 1960s, while the Setu Babakan developed since the 1990s. Condet failure suspected to be an important step in the development of Babakan Setu.

Condet is an area located in District Kramat Jati, East Jakarta Municipality. Region used to be the area of fruits, especially salak lanseum Condet and then used as well as preserve the Betawi culture preservation of fruits by decree (SK) Jakarta Governor Ali Sadikin numbered D.IV-115/e/3/1974 issued for strengthen an area of 18 228 hectares as the area of cultural heritage which includes Village batuampar, Balekambang, and Kampungtengah. Reason Bang Ali 30 years ago is because 90 percent of people who lived in Batavia Condet is genuine. With maketh Condet as a cultural reserve, the government and build roads Condet Kingdom, which connects the region with Cijantung Cililitan. Ease of access is coupled with the vagueness and lack of supervision resulted in the concept of cultural heritage of this region as it grows like a normal residential area. Administration time to a status-quo of the region in 1986 because of rapid housing development.

Consequences of failure in Condet, Batavia township in Setu Babakan, Srengseng Sawah, Sub Jagakarsa, South Jakarta and was initiated as a new area of cultural heritage. Setu Babakan initial momentum developed as a cultural heritage area was pioneered on September 13, 1997 at the event "A day at Setu Babakan". When it held various competitions, such as decorating contest getek, canoe races, competitions of fruit, vegetables and cooking competitions tamarind.Once this momentum, several Betawi cultural activists trying to involve the various institutions to develop this area. Department of Agriculture to plant tree seedlings, while the Department of Fisheries and sowing the seeds of hundreds of fish. The road to this area was also improved. In the end, the Governor issued Decree No. 9 years old in 2000 by the Provincial Government of DKI Jakarta, which makes the Setu Babakan as Betawi culture of conservation.

Here are some things that distinguish the two regions

4.1. Accessibility and Conservation

Condet accessibility in the region had been the enclave of closed and in the development and cultural preservation became an open area. With the construction of access roads through the region consisting of three villages (Balekambang, Central and Kampung Batu Ampar) This resulted in the influx of immigrants in recent decades even more dominant in number. Balekambang villages situated along the river Ciliwung is the most populated area of the Betawi people in Condet. But in the 1990s, their number reaching 25% is considered as the numbers are too optimistic. Betawi people in the region

comprising Kambang Bale Village, Batu Ampar, and Middle Village are in the minority. According to the 2000 census, the number of residents in the area Betawi Condet only 1.5% of the total population in the region. As a result, the Betawi people rarely found homes with pristine architecture. From visual observation, researchers found only three houses whose condition is still original.

Figure 7. Architecture Betawi *Asli* in Condet

Learning from Condet, Setu Babakan is the government's initiative to preserve Betawi culture in general. Houses inhabited by residents in the area restored to original Betawi house. In addition to homes, agriculture, processing of traditional foods (culinary), dance art, textiles, and etc. all of which developed into cultural tourism and education.

Accessibility to these areas is more difficult than Condet region. There is only one connecting road and no public transportation to enter this area. Setu (lake) to the end of the route to this region, and pledged an open space for tourism purposes.

4.2. Zone

There are several zones in the original house Betawi, which is the main zone (for a family residence), the zone of support (for relatives), gardens and ponds (Syafwandi et al., 1996). Both in Setu Babakan and there Condet main zone and zone support. However, gardens and ponds are still more prevalent in the Setu Babakan compared Condet.

4.3. Building Type

There are three types of Betawi style buildings: joglo, warehouses, and bapang (Syafwandi et al., 1996). In Setu Babakan, the type most often found Joglo.

4.4. Ornament

Some ornaments comparison of the two regions which are presented on ventilation, windows, doors and fences are presented in the following tables.

V. KRANGGAN

Kranggan is a township in the city of Bekasi, Bogor regency bordering areas. In this village can still be found traditional houses shaped house on stilts. Called the house on stilts because the building houses a number of pillars propped up, with the distance between the ground floor and averaging about 50 centimeters.

Traditional houses in Kampung Kranggan have varied roof forms and functions of each room in the house. At least there are three forms of roof houses on stilts which now remains in Kampung Kranggan, ie roof pyramid model, the model jure, and the model ngapak looming. Roof of the pyramid model and a cursory jure similar, but the roof has no ampig pyramid model, or cover the front and rear

are made of woven bamboo. Ngapak roof shaped like a towering model of a house roof joglo, with the top of taper.

At this stage the house generally has three core room, which is shaped los den, a bedroom, and used the back room or storage area heirloom rice called pangkeng or pandaringan. Besides these three rooms, equipped hall stage house addition, or Paseban, which serves as a place to relax or receive visitors.

Figure, 8 Houses Stage House Kranggan

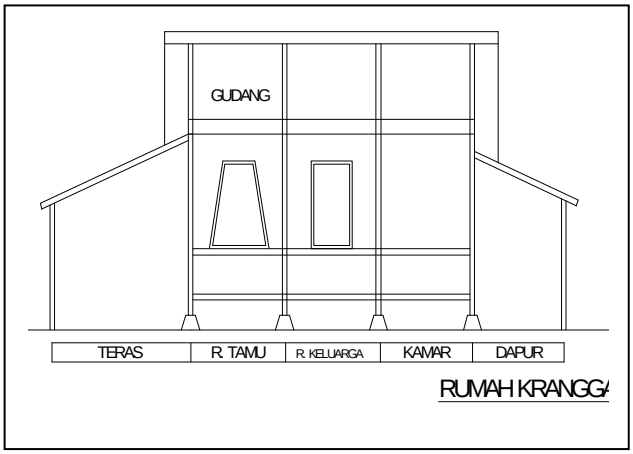

Figure 9. Section House Kranggan

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3.1.9

THE AESTHETICS INTERPRETATION THROUGH EXPERIENCE IN PLACE AT UMAH BALINESE ARCHITECTURE
Case Study: *Pamlaspasan* Ceremony Sacred Ritual Event

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ABSTRACT

Bernard Tschumi explained that there is no architecture without an event. It could be observed in Balinese traditional architecture. Balinese people never left their ritual event, daily and holydays for the sacred ritual. The Pamlaspasan sacred ritual events in their umah could illustrate the experience in place. The experience in place can be experienced through the senses and the wisdom of community.

Through three cultural phenomena; ideas, activities and artifacts (Honingmann's terms in the field of anthropology to distinguish cultural form), the experience in place can be described through the events of pamlaspas. From the process in perception through the experience in place at this pamlaspas ceremony could be identified the aesthetics interpretation of the umah Balinese architecture.

***Keywords**: sacred ritual event, experience in place, aesthetic interpretation*

I. INTRODUCTION

Tschumi (Vallee, 2007: 36) reveals that one of the starting points for the architecture is on top of all the events and not a form. In addition "an event is a different variety." He also said, that the definition of architecture is the dynamic and static definition of the senses in the sense of not dealing with a homogeneous space but the space that is always questioned by the movement or the use of (the experience of space-use) (Vallee, 2007: 38).

Furthermore, Grainger (Perez, 2006: 126) says that there are important differences between the two types of actions, actions taken by humans and the actions taken by humans in the belief that his success is not to reduce the human sense, but results from other places. Only the second kind of action can be called a ritual. Furthermore, Quantrill (1974: 19) says the myth and ritual is a causal concept (the cause). Rituals associated with the form or style of buildings and a group of buildings. Also in Quantrill Alexander (1974: 14) recognized the ritual as a generator of the floor plan which produces the architectural form. But on the other hand, Vitruvius in Quantrill (1974: 23), on his writing the most rooted in the tradition of classical education; predicting divorce between ritual and form. While this prediction has not happened in Bali, the research for this is very necessary. In addition, Ruskin in Kostof (1995: 19) writes that all the architecture suggests an effect on human mind, not only serves the needs of human body. Rituals can be said as poetry of functions: as far as a building that is shaped by ritual, a house which is not only function, but a description of it.

Ritual event is part of human cultural life as a complex pattern of human activities and actions both for individual or social life. Similarly, the ritual activity is the life of Balinese people that are believed to pass through hereditary legacy, when people perform daily activities will be always preceded, accompanied or based on patterns of thinking and act according to religious beliefs (Sabha, 1985: 34). Ritual events can be in the form of *rahinan* (ceremonial activities performed daily) and *rahinan ala ayuning dewasa* (ceremonial activities held on holy days). While the ceremony / *upakara* is one of three basics of Balinese traditional architecture which is interrelated with each other. Two other basics are *tattwa* (philosophy), and *susila* (ethics) (Sabha, 1985: 118). One of the examples of the sacred ritual event case, *rahinan ala ayuning dewasa* is in the form of offering *yadnya pamlaspas ceremony*.

Table 1. Rahinan sacred rituals events

Sacred Ritual Events	daily Performed	*Rahinan* : daily performed ceremony	Examples: • *Yadnya saiban* dedication • *Yadnya segehan* dedication
	Performed at certain times	*Rahinan ala ayuning dewasa*: ceremony held on the holiday	Examples: • dedication of *Yadnya mekiis* ceremony, • dedication *of Yadnya pamlaspas* ceremony • etc.

Pamlaspas is a series inauguration event of a work; could be mask, barong, temple or *umah*. In this case the event presented is *pamlaspas* of Balinese architecture work in the form of *umah/*house (case: newly constructed house). The series of events consist of *memakuh / memangguh* (discovery / determination of land), *ngeruak karang* and *nyengker* (opening and land boundary), *memirak* (change of land status), *mecaru / offering tawur* (permission for natural harmony), *mlaspas* (purification and reviving house according to its functions), and *mempen / mendem pedagingan* in *pemerajan* / temple / place of worship (to enshrine God and His manifestations and the ancestors to pray wholeness *Tri Hita Karana* toward *mokshartam jagaditha*).

Furthermore, with the living experience through senses and social wisdom, aesthetic interpretation revealed three kinds of culture, namely, idea, activity and artifact in *pamlaspas umah* event of Balinese community. Referring to the results of the research of Gelebet et al (1986), it is seen that all districts and towns in Bali have a similar architectural characteristics although it is noted that there are specialties for certain regions. Thus, the location of study samples may be conducted all over Bali Island (Figure 1). Therefore, this study accumulates space experience in several *umah* (houses) in Bali. One of the houses taken as a sample for the *mlaspas* event is the house (*umah*) on Waribang Street, Denpasar - Bali. The emphasis discussion is more on the aesthetic interpretation of a house on *paplaspas* ceremony of which event exposed on its *pamesuan* (gate).

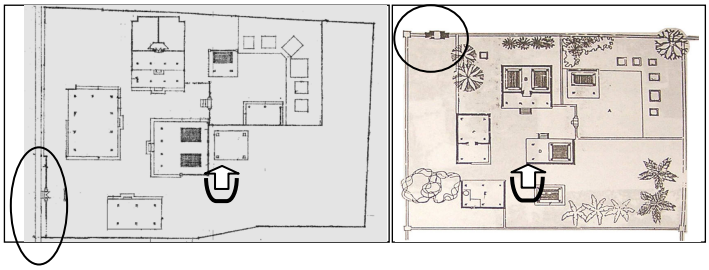


Figure 1. Form and position of *pamesuan* to *bale* and *pamerajan* in the *umah* at jalan Wanara Wana-Ubud and Celuk-Gianyar-Bali
Sketch: Oka Saraswati & Gelebet

II. *PAMLASPAS* EVENT IN *UMAH* BALI

Figure 2. Ornaments and decoration on the *Pemesuan*
Foto: Oka Saraswati

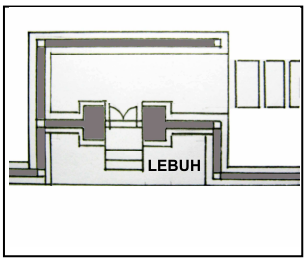
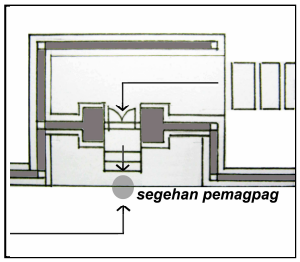


Figure 3. The map of *Pemesuan* in the form of *cangkem kodok*
Sketch: Oka Saraswati



Gambar 4. *Segehan Pamagpag* on every arrival of *tirtha*
Sketch: Oka Saraswati

Pamlaspas is the event cleaning and purification of a newly constructed building. *Mlaspas* according Arwati (2008: 4) is a Balinese word deriving from the word *mlas* and *pas*. *Mlas* means “to separate” and *pas* means “suitable”. In this case, it is an event where building materials consisting of various materials such as inanimate objects named stones, bricks, cement, timber and other building materials, collected and built or stacked and then into a unitary building up and live well hereinafter referred to as *umah*/house. Furthermore, the newly completed building is purified from the bad effects that may occur during preparation, construction to completion. In a series of ceremonies *melaspas*, also pray to Hyang Widhi Wasa to be pleased to bless His *kasunarin* (bless His holy rays) as well as strength and in order to make the building having *mlaspas* ceremony to "live /urip" adjusted with its function and is disassociated from "*ngeletehin*" (bad effect) and give expected welfare.

In this *pamlaspas* event, *manggala prawartaka karya* (the chairman of this event/the house owner), invites friends, relatives, families and public figures. The invitated expected to be present act as *manusia saksi* (human witness), in addition to *dewa saksi* (God and His manifestation and ancestors as witnesses) and *kala saksi* (nature as a witness). In addition, this event is started by conducting some preparations. The preparation begins with putting on *kuaca* /ornaments/clothes for buildings/bale, in the form of decorations *ider-ider*, *pedapa*, *langse*, *ulon*, *saput*, and *kuaca*/decoration for *saka lanang-wadon* as if bride groom and bride. Similar decorations for *sanggah* (shrines) and *pamesuan* (gate), these buildings are also decorated with *kuaca* (clothes). Besides being decorated with *kuaca*, pamesuan (gate) has decorative ornaments and decorations of its own. Ornaments on *pamesuan* of this *umah* (house) only show a personification *pengawak* (body), *sipah* (armpit), *gidat* (forehead), and *lelengen* (arm), and are not equipped with decorations in the form of statues as seen at the outer part of *pemesuan* (gate). In addition, the plan *pamesuan* (gate) forms *cangkem kodok* (frog mouth) (set back). Since this *pamesuan* (gate) is decorated with *kuaca* or ornaments among others *lamak*, as well as *Penjor*, it has given a signal that there will an event occurring at the Umah (house). During this *mlaspas* event, the invited person are only those close family, limited to the children of mother’s and father’s brothers and sisters of the house owner.

Furthermore, prior *pamlaspas* event is held, the *undagi* offer *tebasan* to *Ida Bathara Wiswakarma* who is believed as a guide like a teacher during the umah (house) development. Then, *tirtha* from Ida Bathara is sprinkled to all parts of the *umah* (house). In this event, *Upasaksi* is offered to *Ida Bathara Surya* and *Pertiwi* for all events to be held. Besides, *matur piuning* (notification) and *mendak toya tirtha pekuluh* (taking

holy water) is conducted to a number of temples. The *prajuru* (officers) *pesu/medal* (go out) of the *pamesuan* (gate) to family temples and *pamerajan Ageng* (temples/*pamerajan* at original house) and *kahyangan tiga* temples (*Puseh temples, Desa temples, Dalem temples*). On the arrival of this *toya tirtha*, pemagpag / *pemendak* ceremony is held in the form of *segehan* at *lebuh* (the outer part of the compound) in front *pemedalan/pamesuan*/gate from the house having *plaspas* ceremony. After that, Tirtha is placed in *Sanggar Surya*.

Then, on a good day/*rahinan ala ayuning dewasa* taken, the entire parts of the building is attached or tied with *sasap* on the walls or *saka bale* (pillars). *Sasap* which is made from coconut leaves and *dapdap* leaf tied with weeds and sprinkled with *toya segara*/sea water. Further, *bagia orti* and *ulap – ulap* are put on. *Bagia orti* is hookup on top of building (on the ridge or on top of row) and *ulap-ulap* at plank frame board or on the upper part door threshold. *Bagia orti* shapes in *reringgitan* and is made from palm leaves and *ulap-ulap* shapes in a piece of white cloth with *rerajahan* drawing. After that, *matatorek* (finger rubbing) is done with red, white, and black color.

Subsequently, *pengelukatan*/cleaning is performed to all types of ceremonial devices including *umah* which will have *plaspas* ceremony of which procession begins by sprinkling *toya anyar*/clean water, *ngayap penyeneng*, *ngayap beakaonan*, *ngayab durmenggala* and sprinkling *tirtha pangelukatan* and *ngayab prayascita* and followed by fragrant incense and flower blown by *saab* danced by hand in prayer rhythm. *Tirtha panglukatan* (in the form of fragrant water/*toya maukup* placed in *pangedangan*/soil pot) is an aromatic incense *tirtha*, flowers and fragrant sticky wet soil. Besides being sprinkled, this *tirtha* is also drunk by the occupants and their families. As this *tirtha* underwent fumigation process of burning incense, fragrant dry flowers, sugar, incense, sandalwood and *majagau* wood/*gaharu* wood, then the *tirtha* besides fragrant is also sticky. After the procession is completed, it is followed by sputtering *tirtha Pasupati* and knocking buildings; one of them is by hitting/strengthening the connection pins. This event is led by priest/*sulinggih* (as *wiku yajamana karya*/leader of a religious ceremony) praying by chanting mantra. And during this *pamlaspas* ceremony is held, *kidung* (spiritual hymn) is sung in groups like choirs and gongs *bleganjur* is unrelenting be rhythmical. In *pamlaspas* ceremony for bigger house, this ceremony is completed with *sasolahan wali* (dances accompanying the ceremony), like a puppet and *sidakarya* mask.

Fifure 5. Gong Bleganjur saat pamlaspas
Foto: Rudy

Moreover, to what extent of the invitees who are invited to be present, is also a matter of concern. For a simple house with simple gate, the invitation is only for close family until a representative from the big family where *tirtha* from *pamerajan Ageng* is taken. Whereas for *pemangku*/leaders at *Kahyangan Tiga* Temples, only an announcement is submitted to them without being invited to be present.

III. AESTHETIC INTERPRETATION AT *UMAH* BALI

Aesthetic work is the result of man-made, not born from nature, intended for human and his life and have a relationship with life and human existence. In addition, the expression of a work is its properties, which include shape, color, decoration and ornament. Furthermore, the expression is represented the subject that expresses a particular character. Intrinsic expression can trigger a particular emotional state, so it is considered as a system of signs. Further, the intrinsic expression is accepted as the perception with its meaning in five senses.

Furthermore, Tuan (1974: 14) says that perception based on the principle of human cognition (including the experiences and feelings). That factors determine the human perspective, then proceed by identifying the rules on the elements and provide examples to support the interpretation. To support the above, on another occasion he says (1974: 14) that only a small part of most people's lives is

rational. It also conveys that the ways in which people perceive and evaluate that surface are far more varied. No two persons see the same reality. With good will one person can enter into the world of another despite differences in age, temperament, and culture (1974: 5).

In addition, human being has more ways to respond to the world than the five senses of seeing, hearing, smelling, tasting, and touching known to us since the time of Aristotle. According to Tuan (1974: 6), the traditional five senses man is more consciously dependent on sight to make its way in the world than on the other senses, but apart from that a human being perceives the world through all his senses simultaneously. It also says (1974: 8) that music is for most people a stronger emotional experience than looking at pictures or scenery. Furthermore Tuan (1974: 10) says the person who just "sees" is an onlooker, a sightseer, someone not otherwise involved with the scene of that experience. In modern society, man comes to rely more and more on sight. Space for him is bounded and static, a frame or matrix for objects (Tuan, 1974: 11).

In addition, to explore the close relationship between buildings and places, in which all aspects related to social, economic, cultural, world view and its historical, that is a researcher's "spatial experience" (empirical). In this condition, to understand the meaning of the architecture, necessary activities of interpretation that can provide and enrich the real answer about what is researched. Also submitted that it is a cultural unit, where the readings can result in different interpretations in accordance to the background of the observer.

Umah which has been manifested is not completed there. This work should bring happiness. How does this work bring happiness? It is mentioned that (Sabha, 1984), happiness will exist if the embodiment of traditional Balinese architecture is based on three things, namely, *tattwa*, *susila*, and *upacara*. In a conducted *upacara* (ceremony), it can be identified aesthetic interpretation of Balinese society which is fully filled of signs to read. Sometimes wishes will cover and block the senses and the human sensory from what should be read. As mentioned earlier, this aesthetic interpretation emphasizes more on the affected event on *pamesuan* and revealed through the ideas, activities and artifacts.

When *mendak* (taking) *toya tirtha*, where the occupants or prajuru (officers) *pesu/medal* (go out) of *pamesuan* to pamerajan ageng or to the temple, then it can be seen that a territorial is formed from *umah* until their destination. During the trip, the aestetic comes in form, decoration, ornaments, and colorful offerings, as well as fragrant incense, and the strain of chanted hymn. In addition, territory indirectly also reflected in people's daily life when they exit from the *pemesuan* (gate) will be asked by other people meeting them. The form of the question is as follows, "*Bli ka kija* (meaning: older brother, where are you going)?" It is not reasonable if asking, "*Bli uling dija* (meaning: older brother, where do you come from)?" That is a concept of leaving the house which has a territorial distant dimension. Then, does this mean that the outside was a wonderful pleasure. Will this contradict to the opinion of Suryani (Balinese, 1996: 60) who said *lek* (shy) is a normal behavior of the Balinese?

Further, on the arrival of *tirtha* (placed on the shoulder) the *pemagpag/pemendak* (the welcoming ceremony) is conducted at *lebuh* (outside) in front *pamesuan*. This shows the existence of meetings; there is no handshake, but there is welcome regard communication. The occupants staying inside go out *medal/pesu* to greet the comers; what and whoever they are. The physical space formed at that time is in accordance with the territory of the *pamesuan*. When the requested is in a small territorial level (village level: *tirtha* from of Kahyangan Tiga temple), the dimensions of space formed is in an intimate scale. It will be different if the tirtha being welcome is in the level of *Sad Kahyangan* Temple distributed all over Bali. Moreover on the front of pemedalan also wafted fragrant incense and strain of chanted hymn is heard. This strain is heard up to a radius of 50 meters. This spatial experience shows the existence of idea of welcoming with etiquette, namely, the activity of people staying inside go outside to welcome and then together come inside and the existence of artifacts supporting such welcome. Does this also mean that going outside is beautiful. If there is no going out then there is no incoming. Therefore, it was beautiful to going out so that the entry is also expected to beautiful.

Hereinafter, to what extent invitees to be invited is also reflected on the *pamesuan*. If the *pamesuan* form tends to be simple, namely in the form of angkul-angkul and plan is only in the form of *cangkem codok* (frog mouth), the invitation is just around the house (close relatives), The more invitees coming will also be reflected from the *pemesuan* (gate). If the invitation involving various parties and also cross kingdom, the *pamesuan* will be more mainstream. The *Pamesuan* in a more mainstream level (Saraswati, 2002: 84, 108) will have *ancal saji* as well as in the shape of *kori agung* completed with its *betelan*. Likewise, the decoration and ornaments of personification where will be more complete. Ornament on the *pamesuan* shows a personification (Saraswati, 2002: 60th) among others demonstrating the emergence of *pengawak* (body), *sipah* (armpit), *gidat* (forehead), ears, *subeng* (earring) or *lelengen* (arm), while decoration in the form of statues is found at the outer part of *Pemesuan*. *Pamesuan* and sculpture decorated with yellow, red, pink, purple, and green, kuaca; a contrasting colors that give splendor atmosphere of space. Meanwhile, gold and black and white *poleng* color gives the impression of the sacred. As Rockow said (MCMLIV: 56) that color cause the expression. The differences of both value and intensity have been deepened by the contrast. It will be more complete it if *pamesuan* is equipped with umbrella tends to red or yellow color and *penjor*. *Penjor* that stood in front of *pamesuan* describes the prosperity of the occupants. Geck (1971: 11) says that color has a sensation. Colors have psychological effects, physical and also a symbol. Moreover, despite the *penyengker* high wall *umah* impressed covered, but the condition of the occupants shown on *pemesuan*. Will it signify something happiness should be displayed in the aestetic extend to the outside of his *umah*.

The above conditions, one of the meanings can be seen from this sacred ritual event. The experiences in place at the event of the *pamlaspasan ceremony* give an aestetic interpretation that shown going out from umah and exposed on *pamesuan*.

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3.1.10
AN INQUIRY INTO THE USAGE OF RECYCLED WASTE MATERIALS BY URBAN POOR TO PROVIDE AFFORDABLE HOUSING

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ABSTRACT

It's the 'Tragedy of Commons' theory that works in our settlements, where self interest of multiple individuals harms the ultimate shared interest. We still live in a 'Pyramid Society' where the lower level consists of urban poor. There starts the complex situation and still unsolved question of urban housing. Studying the way urban poor builds the shacks with minimal resources to survive in the 'Machine City', some lessons can be learnt. To understand the implication three slums have been studied in Ahmedabad, India. The aim of the study is to understand the implication of recycled waste materials in construction of shacks in squatter settlements by an urban poor. Three slums, geographically at a distance, with people of different caste and religion, with different source of income and materials, provides a base for not only the physical or construction aspects but also the cultural, social and economical aspects. Understanding this complex web of aspects can help transforming these lessons in affordable housing to urban poor.

Keywords: *Recycling, Squatters, Low-cost housing, Waste.*

I. SECTION TITLE

An inquiry into the usage of recycled waste materials by urban poor to provide affordable housing: Case studies of squatter settlements of Ahmedabad, India.

II. PARTS OF THE PAPER

2.1. INTRODUCTION

The population problem has no technical solution;
It requires a fundamental extension in morality.
- Garrett Hardin

Hardin (1968) found that Tragedy of Commons starts like this. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.

As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility to me of adding one more animal to my herd?" This utility has one negative and one positive component. 1) The positive component is a function of the

increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly +1. 2) The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of -1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd and another; and another. . . . But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit, in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.

Understanding the city in the same manner, one can see the same process in which city is becoming like a machine, to run this machine it requires enormous amount of energy. The individuals are the part of the machine, who seeks to maximize own gain. And the machine goes out of control, polished from outside in the name of development but growing like a cancer in the body, requires more and more energy. The city sucks the energy from the surrounding villages and all the manpower and the 'wealth' and poverty pours into the machine and it grows bigger and bigger, in the same manner in which the first world nation exploited the third world nations for centuries and made people slaves. But they have to feed the slave for them to work; here they have to work to feed themselves. They have become the 'Economic Slaves', migrated by the situations like agricultural loss, losing lands to industries, debt, rural depression, etc. And they become the 'Children of Migration'. Even people in the city can't keep up the pace in its monetary system and joins the migrated people in making of temporary shelters to live, which slowly become permanent for them. Thus starts the inevitable, extra node of the system – Slums.

In India, there are about 1098 million people or herdsmen live in the field of 3,287,240 km^2. According to the estimation, population in 2025 would be 1331 million. According to the World Bank, 1/3 of the world's poor lives in India, in which 42% of them falls below the poverty line with daily income of 21.6 Rs. in urban areas and 14.3 Rs. in rural areas. As per 2001 Census, the total housing shortage in India is about 24.71 million dwelling units. According to the author Robert Neuwirth, there are one billion squatters globally, that is, about one in every seven people on the planet. This figure is likely to rise from 1 billion to 2 billion in 2030. It is observed (Nandy, 1987) that it would not be justifiable to blame government or building/ engineering industries because shelter for masses is not a simple technological issue or a mere problem of finances. It is a complex amalgam of a host of factors, which need to be tackled at all levels and in a holistic manner.

Most of the shacks in India are built from thin materials at very low cost because of the hot climate. Traditional building materials are costly and an urban poor cannot afford to build a shelter from them. When a slum dweller decides to build a house, he starts with a budget and he has a limited choice of materials and construction techniques. Surrounded by all the limitations, one looks into the neighbourhood and availability of the secondary or used materials. Wherever there are squatter settlements there are always networks of recycled waste materials, where one could buy the materials at very low cost. This bilateral business is helpful for both.

This leads to the point that rather spending billions of money to clear the slums, making the high-rise, low-cost buildings and rehabilitate the dwellers, one should try giving them tools to learn the techniques, creating job opportunities and making the squatter neighbourhood more 'healthy'. One should not see these squatters as cancer of the city and remove or relocate them but regenerate themselves as user friendly housing. How? The answer may lie within the squatters itself.

2.2. Simulation

Just like any other machine, city also needs the 'fuel' to run and in the end it generates a lot of amount of waste, some of which no one has solution yet and some of it are also harmful for environment. There are two types of waste is generated – organic waste and inorganic waste, which further can be divided in three types - organic, recyclable and inorganic/non-recyclable. Informal sector of collecting the waste consist of waste pickers or rag pickers, who come from vulnerable social background. Rag pickers not just clean the city but help saving a lot of amount of energy by redirecting or recycling the waste materials into the mainstream. Awareness plays a major role in using the waste materials. If people are pointed in this direction, the thrown waste would be added in the pile of resources. Though most of the urban poor are not literate enough and do not reuse the waste materials for any environmental control but for the purpose of survival in 'Urban Jungle'. But that does not make the cause less important. Many people other than the urban poor, makes living out of the 'secondary material network'. This network consists of rag pickers, vendors, sellers, recyclers, manufacturers, etc.

Figure 01
Source: Author

As the migration goes higher, the jobs are becoming lesser. When an urban poor can't find a job to fill the necessity of food for his/her family, most likely one turns out to daily wages like rag picking. This makes an urban poor act like a scavenger to keep up in the race of survival and by all means it does help a lot as there is pile of 2300 metric tonnes waste generated every day in Ahmedabad, the 7th biggest city of India in terms of population.

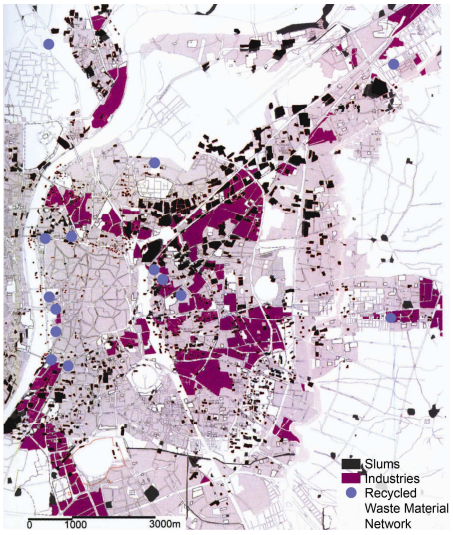

Figure 02

Source: KUMAR, K. Sree (2006), *Redevelopment of Chandola Lake Area Ahmedabad: Urbanistic View of Slum Networking as a Part of Wholistic Urban Renewal Process*, Ahmedabad: Unpublished Thesis, School of Urban Design, CEPT.

It is obvious that an urban poor will use the materials to build the shack which are available most nearby. But it is observed that with the change of geographical location of squatters, even within the city, the choice of materials is slightly different than the others.

Baradi Manvita (1995) found that when a slum dweller decides to build a house, he starts with a budget which is a function of his stage in the life cycle. Given his financial constraints, he has a limited choice of materials and construction techniques. Willingness to use recycled or secondary materials somewhat enhances the range of materials which he can use for the same cost. The principle source of used conventional materials is the demolition of the buildings, mainly bungalows. The processing and selling of the non-conventional and recycled materials is a fairly organized activity and exists as a network at the city level. This network of supply of unconventional material has emerged in order to fulfil the needs of slum dwellers within their paying capacity. Most of the processing and selling points of this network are on the eastern side of the river in the commercial and industrial areas, as this supply network largely depends on the other commercial and manufacturing activities of the city. In case of most materials, there is a savings of 40 to 60%. This means that material cost is halved. Normally the material cost constitutes about 60% of the cost of the house in the income category under consideration. Therefore, the use of the recycled material brings a reduction of about 30% in total cost of the house. The cost would vary when the transportation costs are added for moving materials within the city. Since transporting recycled materials from a large distance would increase the cost, slum dwellers prefer to get the materials from near vicinity. Therefore, in areas where recycled materials are not easily available they settle for new materials.

Three settlements in Ahmedabad are studied to understand the choice of materials by urban poor. All three are geographically placed at a fair distance within the city and represents different parts of the city. The aim of the study is to understand the implication of recycled waste materials in construction of shacks in squatter settlements by an urban poor. In all three settlements 15 houses were approached, also most of the houses were approached and asked a list of questions. This questionnaire generates important data of cost, places of procurement, materials used, etc. Total of 51 houses were approached to generate the data.

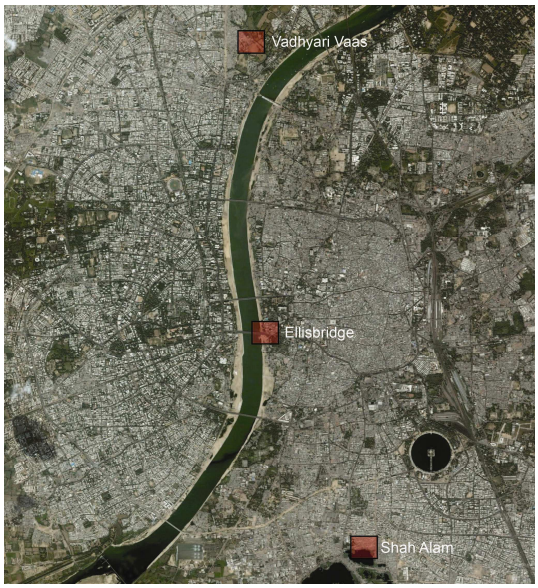

Figure 03
Source: Google Earth.

Figure 04
Source: Author

Figure 05
Source: Author

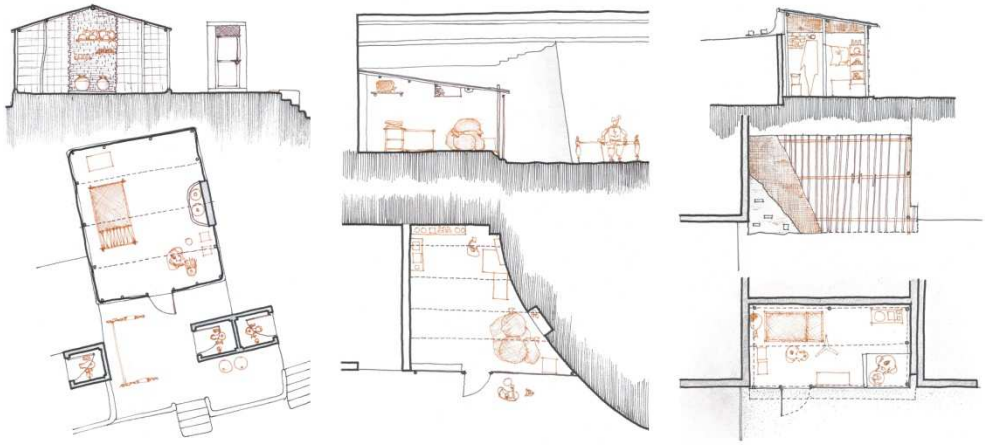

Figure 06
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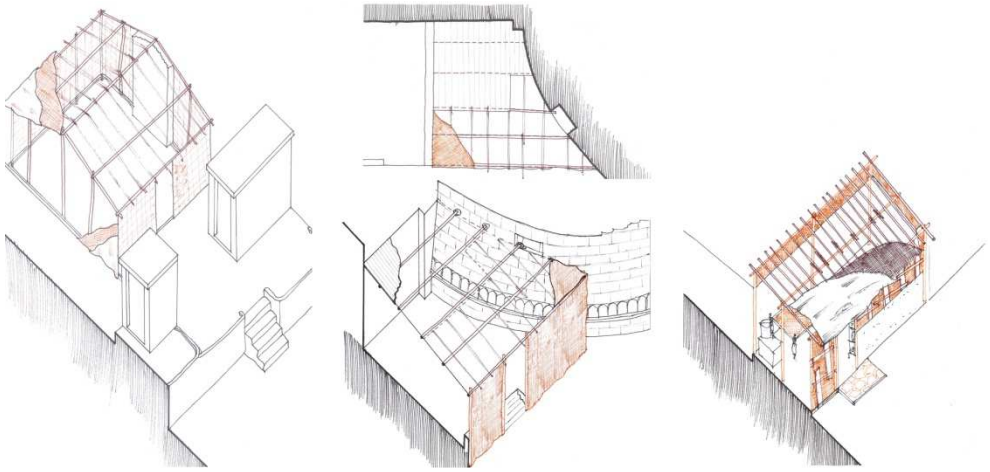

Figure 07
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2.3. Discussion and result analysis

With the help of data, generated from the questionnaire, some of the very basic and some interesting information has been generated and presented in the form of comparative charts. Some of the examples are below.

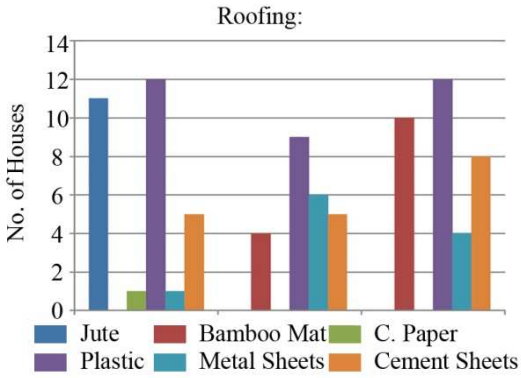

Chart 01
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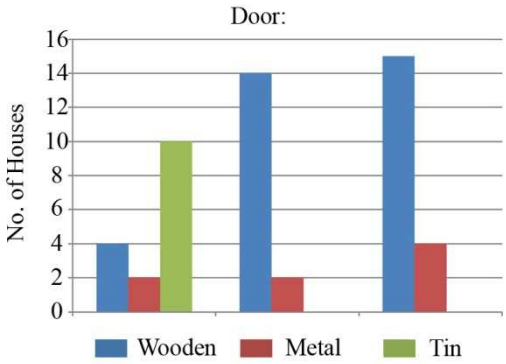

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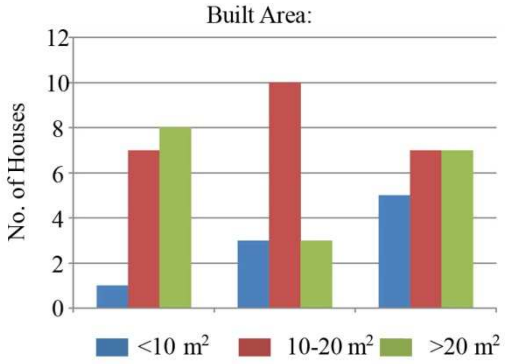

Chart 03
Source: Author

III. CONCLUSION

When a city grows larger and larger, it addresses many issues and has to take many decisions for 'development'. We still live in society where pyramid structure still exists in social and economical system and urban poor is on lowest layer. So when the time comes to make the decisions, lower layer suffers the most. There are many factor that works here, social, economical, political, etc. Even though the authorities want to make the better way to improve the way of life for these people, they always have the backdrop of economical situations. Even when they do not have any backdrop, decisions taken without the consideration of socio-economical conditions creates drastic repercussions and ultimately makes the cause fruitless. As far as economical situations matter, there are many ways to deal with it and provide an affordable house to urban poor without wasting money on high-rise concrete apartment, such as houses from recycled or secondary materials.

There are people living in the settlements that collect these materials and sell it to the secondary material markets or local *pithus*. They not only collect the material but some of them, according to their profession they have developed techniques for particular materials by experience. Such as in Vadhyari Vaas, people doing work of straightening the oil tins, have developed the techniques to make wall out of oil tins.

Pandya (2006) found that considering the demonstration value to the majority poor population with limited investment capacity, technology and material used should be of reduced costs and developed from waste materials. Also, appropriate technologies should be developed which can bridge the traditional techniques with the modern process and can be easily replicated in micro-production facilities situated in slums.

One of his projects is a good example for what's been said here and to prove that this issue does not necessarily have to remain in the books and thoughts only but it can be implemented into reality. The project - Manav Sadhna Centre is situated in Ahmedabad, near the Vadhyari Vaas slum. It was observed (Pandya, 2006) that Housing for the people belonging to the lower economic strata is an important issue of urban areas that requires action oriented initiatives for its proper *addresssal*. This project presents an opportunity to demonstrate effective use of low cost or affordable housing material and technology.

Figure 08
Source: PANDYA, Yatin (2006), *Recycling Solid Waste Into Affordable Building Components: Recycling for a Sustainable Environment and Poverty Alleviation in Indian Towns and Cities*, Germany, Vaastu Shilpa Foundation.

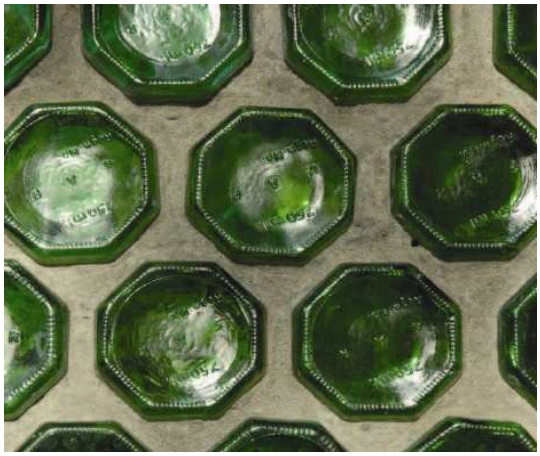

Figure 09
Source: PANDYA, Yatin (2006), *Recycling Solid Waste Into Affordable Building Components: Recycling for a Sustainable Environment and Poverty Alleviation in Indian Towns and Cities*, Germany, Vaastu Shilpa Foundation.

Figure 10
Source: PANDYA, Yatin (2006), *Recycling Solid Waste Into Affordable Building Components: Recycling for a Sustainable Environment and Poverty Alleviation in Indian Towns and Cities*, Germany, Vaastu Shilpa Foundation.

Figure 11
Source: Author

This study is also about the correlations which are generated by the social ecology. By this correlation study we can summarize a better solution for housing the urban poor or resettling the squatters that rather than building apartments on the outskirts, one need to look at whether the place will create better jobs or daily wage, whether it is not far from the work and transportation and the place to get the material then there is a whole new chapter of participatory housing as some of the people's skills can be useful in building houses from secondary materials which are not only cheaper than the concrete apartment but well organized and healthful and well structured than in the squatters. If only these factors are taken into account than only there won't be any demolition but resettlement in true terms.

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3.1.11

ACCOMODATING TEMPORALITY

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ABSTRACT

Issues on street hawkers are varied. Sometimes, it is seen not as a good thing and mostly rather disturbing for some people. This paper suggests that street hawkers have unique characteristics that can be seen as an advantage.
This paper will discuss several things: the temporary characteristic of street hawkers, how they used public spaces and the structures that accommodate this temporality. Some references of flexible spaces whether in Indonesia or outside Indonesia will also be analyzed to get an overall perception of how globalization can be viewed not as threat but as a potential reference to enhancement of local culture. In the end, the paper will show two design samples of students' final studio. Hopefully, this paper can contribute to understanding locality and indigenous architecture and its application to design.

Keywords*: street hawkers, temporary, flexible spaces.*

I. INTRODUCTION

"Indonesia is interesting, it doesn't seem to be effected by the world crisis… you see economic activities everywhere in every corner of Jakarta", one of my Japanese friend says to me few months ago. These economic activities are contained in the forms of street hawkers which trade many products and services, ranging from food, drinks, books, accessories, stationeries, daily products to shoes reparation services. Unlike retail shops that have permanent spaces, street hawkers' uniqueness lies in their temporary characteristic. They come and go in pedestrians and public squares. Some exists in the morning till noon, and others in the afternoon till nighttime, or in weekdays or weekends. Their temporary characteris-tics caused interesting temporary spaces in many cities in Indonesia.

Gasibu field, for example, is a public space in Bandung which is designed for outdoor sports and for formal ceremony on special occasions since the location of the field is in front of the government office in Bandung. However, only few people went there for morning exercises whether on weekdays or weekends. We can still see a few street hawkers. But, if we see it on the weekends, from morning till noon, we can see a very different atmosphere. The field was turned into a bazaar, street hawkers filled the Gasibu field and the surrounding area. They attracted many people. Recently, the streets that surround the field are closed down due to the overflow of street hawkers and people.

Figure 1. (left) Gasibu field on weekdays' morning and (right) Gasibu field on weekends.
Source: (left) http://yulian.firdaus.or.id/wp-upload/Pasar-Gasibu.jpg and
(right) http://republika.co.id:8080/berita/51795/Kuliner_Pecenongan_Diminati_Warga_Asing

The phenomenon of Gasibu field in Bandung also occur in many parts of Indonesia in different ways. For example, Pecenongan street in Jakarta; the pedestrian are turned into a showcase of used-cars mostly on the weekends' morning and food stalls at night which happened daily. Another example is Pasar (market) at Ubud and Kota Gede, West Java. In Ubud, the sellers before 9 o'clock in the morning are different from the ones after 9.00. The early morning retailers sell clothing from Java, and they are replaced by those who sell food and Bali's souvenirs. Whilst in Kota Gede, the merchant used the street surrounds the market as the extension of the market. Temporary sellers in the formed of street hawkers are lined in the streets mostly on weekends mornings. Hence, these public space has different function, different atmosphere at different times.

Figure 2. (left) Street on weekdays and (right) street as extension of the Pasar Kota Gede on weekends.
Source: Yenny Gunawan.

From the examples mentioned above, it is clear how street hawkers can give interesting characteristics of public spaces: different function in different times. If a public space can accommodate several retail functions, from food stalls, small bookstores, to car sellers, then the issue of deficient space in dense cities can be reduced. Hence, this paper suggests that the temporary activities of street hawkers in using public spaces can generate new variation of public spaces' design.

II. TWO KINDS OF STRUCTURES

2.1. Temporary Structures

Apparently, the concept of temporary use of spaces is not new. It is not only occurred in the formed of street hawkers in cities, but also in many rural areas in different forms. If we looked aroud, we will notice temporary characteristics especially in relation to ritual ceremonies, for example: Toraja's and Bali's death ceremony. They also used public squares for the ceremony, such as: public area in the house complex in Toraja, as well as streets and beaches in Bali.

In order to accommodate the ceremonial activity, the people use bamboo structures. In Bali, the structures are used to hold the body and it is burned together. While in Toraja, the bamboo structures are used the guests to sit, ate and watched the ceremony. In this sense, the structures can be erected and dismantled easily because of the structural joints and it should use frame as the main structure.

Figure 3. (left) Bali's death ceremony and (right) Toraja's people are building the bamboo structures.
Source: (left) mikejkt.livejournal.com; (right) Yenny Gunawan.

Similar structures happens in Pasar Ubud in Bali. The structure can be dismantled and put up easily from around 9.00 till afternoon. The main material, as we can see in the picture is bamboo. The structures acted as an umbrella to avoid direct sun to the sellers' head.

Figure 4. Pasar Ubud (left) Seller put up the structure, (middle) The 'umbrella', (right) The details.
Source: (all) Yenny Gunawan.

2.2. Movable Structures

In some parts of the world, accommodating different activities at different times involves more permanent structures but it is movable. The structure is not dismantled but it can be moved by sliding it or opening it. For example: Drawer House by Nendo, Suitcase House by Edge Design Insitute, tatami room in Japan, and many more. The figure below shows how the movement of the structure not only functional but also generate interesting as well as efficient spaces. It also creates different atmosphere.

Figure 4. Drawer House by Nendo: (left) drawer house closed and (right) drawer house opened.
Source: http://i.treehugger.com/images

This movable structure is similar in concept as the street hawkers' kiosk. The kiosk has wheeled so it can be movable. In addition, some part of the kiosk can be opened or closed. And if we think about the square meters used by street hawkers kiosk as 'kitchen' compared to those of café, we can conclude that they are very efficient spaces.

The next part of this paper discusses how street hawkers' use spaces can be accommodated and the structures mentioned above can become a design idea in architecture. The two design samples are taken from UPH students' final studio. The students are Cicilia Angelina and Irene Setiawati.

III. FLEXIBLE SPACES

The two sites chosen have street hawkers' occurrence nearby. The first is a public square at Birah II Road, Southern Jakarta. And the second is a public square near Pulo Gadung Terminal, Jakarta.

3.1. Functional Analysis

The site was originally acted as a public square for the housing community. Street hawkers kiosks begin to occupied the periphery of the site. The school (SDN Rawa Barat) nearby provides an interesting diversity of function to the site. It is also acted as a football field for the students. Reading areas are seen necessary to be added to the site for the students. While the showroom of cars are added later for the bigger community. The design was generated by analysis of different function at different times at the site (Table 1).

Table 1. Analysis of different function at different times.
Source: Cicilia Angelina.

	WEEKDAYS			WEEKENDS		
	Morning 06.00-10.00	Noon 11.00-14.00	Night 15.00-24.00	Morning 06.00-10.00	Noon 11.00-14.00	Night 15.00-24.00
Football Field	●	●		●		
Street Hawkers (food)			●		●	●
Showroom of cars				●	●	
Reading area	●	●				
Administration Office	●	●		●	●	
Services (toilet)	●	●	●	●	●	●

The temporary activities that happened in the site became a central part of design idea. The goal is to create different atmosphere at different times. The chosen structures are movable structures for the faster functional changes such as area for football field in the morning and night market; street

hawkers area (nighttime), reading (mornings weekdays) and showroom of cars (mornings weekends), and temporary structures for the services area and administration office which can be dismantled in parts if necessary (not in daily or weekly basis).

Figure 6. (above) morning, (middle) noon, and (below) night.
Source: Cicilia Angelina

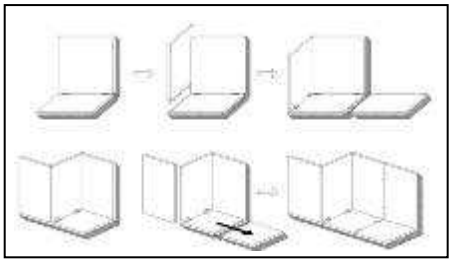

Figure 5. Reading Area, folded at night and opened in the morning till noon.
Source: Cicilia Angelina

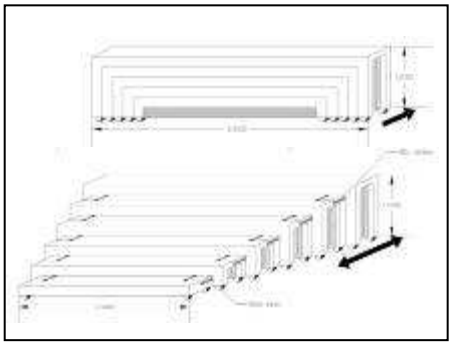

Figure 7. Movable structures for football field.
Source: Cicilia Angelina

3.2. Extended Space

The second design is generated by analysis of extension space in street hawkers, especially for food stalls and those who sells books. The extended space varied from 2 m^2 up to 5 m^2. Hence, the design is derived from how the structures can be moved and opened (figure 8) to be able to extend the space. The goal of this design

This structures applied to many functions in the site, such as especially car repair shop (mostly for buses and public transports that stop at Terminal Pulo Gadung), children playground (for housing area nearby), and the street hawkers. While hotels and gas station that involves temporary structures can be moved in longer times (if necessary).

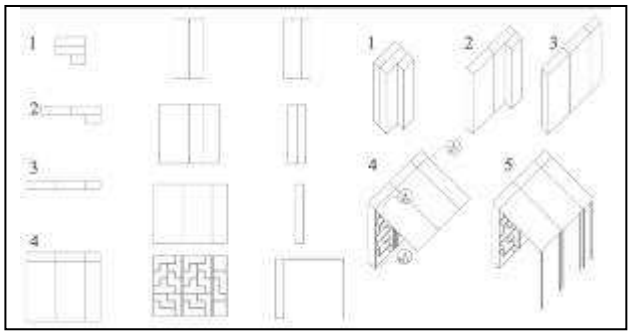

Figure 8. Movement of Street Hawkers Kiosk
Source: Irene Setiawati.

Figure 9. (above) extended space, (below) closed.
Source: Irene Setiawati.

Figure 10. Car Repair Shop
Source: Irene Setiawati.

IV. CONCLUSION

In the end, this paper put forward two things, firstly: detailed observation on local activities can generate unique design, and secondly, globalization should be viewed not as a threat but a potential reference to enhancing local culture. This can be seen by two design samples above.

More ideas can be generated from indigenous (or vernacular) architecture. They are the container of local activities. By understanding the relationship how spaces are used and how the structures are constructed, we can recognize the local potential while keeping our eyes opened to the global world. I believe that this is one of the many ways for adaptation.

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3.1.12

ARCHITECTURAL EDUCATION IN PAPUA: TO EMERGE THE LOCAL INDIGENOUS ARCHITECTURE IN BUILT ENVIRONMENT

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ABSTRACT

Papua is a province in east Indonesia and have a boundaries with nearest neighbourhood country, Papua New Guinea. The capital city of Papua Province is Jayapura. The development rapidly has been happened in this city. The local goverment ruled the guidance to new buildings. All of the new buildings must to use element from indigenous Papua architecture. One of the local indigenous architecture in Jayapura which can be transform into buildings is architecture of Tobati tribe. Indigenous building of Tobati is called 'Mau building' or 'Kariwari building'. Kariwari is the name of the roof of this building. The objective of architectural education could be thougt of as educating architects capable of creating meaningful environments (Salama, 2002). The paper aims to seek the role of architecture education in Papua for building the Jayapura city identity. The paper concludes that the architectural education in Jayapura should be regarded as the manifestation of the ability to execute the idea of building rooted in the indigenous architecture of Papua. For this aim, the course content should be leading to transform indigenous architecture into modern buildings. Thus, the cultural identity of Jayapura city will be form.

***Keywords**: Architectural education, indigenous architecture, identity, Papua*

I. INTRODUCTION

Since the early 1990's, the architect's consciousness in Indonesia aroused regarding the importance of the development of a city look which has a special identity. This is mainly because there is a tendency of formation of a universal city look in most of the city in Indonesia. In contrary, Indonesia is a country which has various indigenous architecture of many tribes. One of these is the indigenous architecture of Tobati tribe in Jayapura city. The local government of Jayapura also considers the problem and takes action in the form of producing a local regulation in 2004. The regulation states that each building in Jayapura city should include indigenous architecture element in their building, however, in their application most of the building disobey this regulation in their design. Private buildings tend to adopt modern architecture in contrary to governmental buildings which have included element of indigenous architecture. The paper wants to stress the role of architecture education in Papua in order to promote indigenous architecture in the development of distinct city look of Jayapura.

II. THE LOCAL INDIGENOUS ARCHITECTURE IN PAPUA

According to Eko Budihardjo (1997), local or indigenous architecture value is a benchmark for study and development of a city identity. This particular identity will have certain value, therefore avoiding the tendency of formation a universal city look. For that, architect should make sure their design can survive the influence of modern architecture by accommodating local architecture element.

Papua indigenous architecture in Jayapura called architecture of Tobati tribe. The indigenous building of Tobati tribe is called 'Mau building'. Tobati village is an over-water residence located in Youtefa gulf with area of 1.675 ha which is part of South Jayapura district. The location of the village which is close to Jayapura city influence its development. Rapoport (1997) stated that closeness to specific attribute, devices and infrastructure, micro climate and topographical condition will influence the resident development. It can be seen that location influences the development of Tobati tribes. Among the major influencing factors are devices and infrastructure, education, trade, entertainment, and social facility. The change include not only the settlement but also the community.

2.1. Spatial Pattern

Tobati inhabitants live in the small village called Nugh. This village is built above water using timber pile. The pattern of the settlement order is in linear shape where major connection pathway is straight with houses oriented to the pathway. In the middle of the residence there is an open space called "para-para adat". This space used as a place where indigenous ceremony and other activities of Tobati people done.

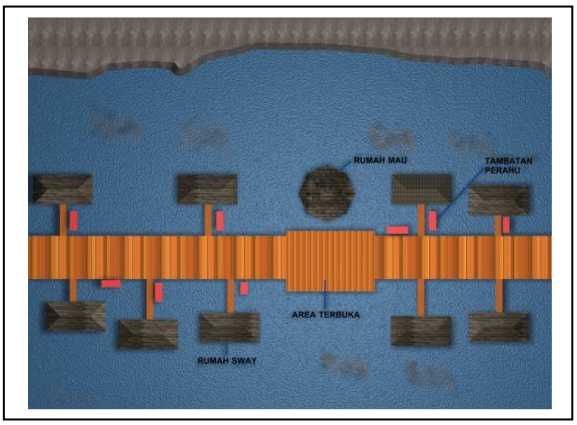

Figure 1.
Space order pattern of Tobati tribe residence
Source: Study of Indigenous Architecture of Irian Jaya, 1998

2.2. Type and Layout of Building

There are two type of Tobati residence building as follows:

- 'Mau building', which is the indigenous building of Tobati and used for indigenous ceremony as well as for youth initiation where the activities attribute more sacred, privacy, and close. Mau building has octahedral shape with roof has cone shape stack three layers. The roof is called Kariwari.

- 'Sway building', is used mostly for living and its shape is more simple.

Both of the building in Tobati tribe are used for different function so that they have different value. The layout of Sway building is at the edge of main pathway with orientation facing the street and

facing each other follow village order pattern. The layout of Mau building is placed at separate part of the residence because the function and characteristic of the building which is close and more religious.

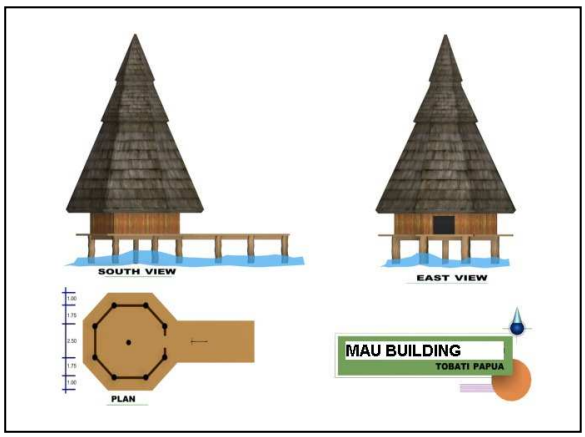

Figure 2.
Indigenous Building of Tobati Tribe
Source: Study of Indigenous Architecture of Irian Jaya, 1998

2.3. Building Philosophy

The basic philosophy of Tobati indigenous building is the harmonic relation between man and his creator. The most distinct of Mau building philosophy is the shape of the roof-three layer (Bappeda, 1998). The roof shape of the building is octahedral and in cone shape. The shape resembles mountain which is believed as the house of God. The roof also represent a complete shape of building starts from leg, body and head which overall describe harmonic relation between universe as macrocosm with God and also relation between man and universe.

2.4. Ornament

Ornaments which are made and used by Tobati tribe is closely related to their myth and religion. The pictures or patterns in the ornament are symbol of their ancient history. The ornament usually placed in certain place of the building such as in the wall and door. The pictures of the ornament mostly are man and animals (frog, lizard and fish). The most common picture is called ‘karkarau’ or ‘karau’, a word means man and frog pattern. Tobati people believe that this symbol protects the house and people who live in the house. The symbol also drawn as a tatoo in the back of a man’s body which show a frog and it is called ‘karau’. The same term used for the antropomorfic shape which is carved in wood stuff, dancing cloth and in war equipment. This motif ‘karau’ is frequently used makes it as an important cultural heritage of the village.

III. THE EXISTING ARCHITECTURAL OF BUILDING IN JAYAPURA CITY

The existing architectural of buildings in Jayapura city vary, modern architecture style and style that adopt indigenous architecture. The government of Jayapura city has published a regulation regard to building design and construction that state “each building which is construct in Jayapura city should include element of local indigenous architecture”. Nevertheless only very few buildings which have follow the rule. Mostly the governmental buildings have already follow the rule even though some of them have not done yet. It is in contrary to the existing private buildings which design mostly not

using local indigenous architecture. Consequently, the look of Jayapura city is still universal and not yet represent a unique identity.

Figure 3
Govermental Buildings Which Have Already Used Local Architecture Element in Modern Style
Source: Survey documentation, 2010

Figure 4
Govermental Buildings With Modern Style
Source: Survey documentation, 2010

Figure 5
Private Buildings With Modern Style
Source: Survey documentation, 2010

IV. THE ROLE OF ARCHITECTURAL EDUCATION IN PAPUA IN ORDER TO EMERGE THE LOCAL INDIGENOUS ARCHITECTURE IN JAYAPURA CITY

The existing architecture of buildings in Jayapura is vary. However, if we pay attention most of the private buildings prefer the modern style to indigenous one and this tendency arise a question why this phenomenon happen?. This phenomenon should be considered as a major aspect of architecture education in Papua so that the architecture graduate are architects which has the ability to design and build buildings that unite with the surroundings.

The design process should involve the synthesis of the selective combination of a series of function connections togeteher into built environment (Yeang, 1987). These connection include: a direct connection which involves the direct creative development and adaptation for contemporary uses of the existing range of building forms, devices, pattern and aesthetics that can be identified from the cultural tradition and architectural heritage of the place; and indirect (abstract) connection through the interpretation into form by design of those general principles and lessons derived through an analysis of the cultural tradition and architectural heritage of the place...

Such as applied in the design of several govermental buildings which already have used local architecture element for example in the roof of the building. Nevertheless, the placement of this element of local architecture should give the real meaning of the element and not become only an attachment in the modern building to give a indigenous impression. Nowadays there are a lot of discussions regarding the unproper use or placement of Tobati indigenous architecture element for example the use of kariwari roof in the entry security office of a building whereas the main building does not use the type of roof. The use of kariwari roof should be in main building the same as the meaning of Mau building which is a central building in indigenous residence of Tobati.

In 1994, architecture education for the first time opened in Papua that was in 'Technical Academy of Jayapura (ATJ)'. The degree level was Diploma of Architecture. The school changed its name in 1995 and 1999 to be 'Jayapura College of Engineering (STTJ)' and 'Jayapura Institute of Science and Technology (ISTJ)' respectively. As the school upgrade, the architecture study program offer degree level in Bachelor of Architecture. Finally the institution changed its name in 2003 to be 'Jayapura University of Science and Technology (USTJ)'. There are also two other institutions in Papua that offer study in Architecture other than USTJ. They are 'Biak Technical Academy (ATB)' and 'Musamus University" in Merauke'. In USTJ, education in architecture is follow for 4 years-8 semesters full time with number of courses taken are 48. The number of credits that should be taken is 144 consists of 60 percent national curriculum and 40 percent local curriculum. National curriculum consists of all courses in architecture which are the same for all universities in Indonesia. Local curriculum consists of courses which are designed by the study program to fulfill the competency of graduate of the program. National curriculum courses include basic design course, theory and development of architecture, design method, architecture building design studio, and building structure and construction studio. For local curriculum, it comprises courses in city architecture, housing and settlement, real estate and construction management.

The objective of architectural education could be thougt of as educating architects capable of creating meaningful environments (Salama, 2002). Therefore, the curriculum that is developed and the content of the coursework should be able to direct the competency of graduate to create a meaningful built environment. In order to produce architecture graduate who interest in local indigenous architecture for building environment, there should be more coursework in local indigenous architecture. Presently, architecture curriculum in USTJ consists of only one coursework regard to Papua architecture. Other coursework are mostly related to general architecture design such as classic architecture style, modern architecture, late-modern architecture, and post modern. This is one reason why local indigenous architecture not an interesting topic for student. It can be seen clearly where only very few topic of final graduation work taken by student related to local architecture. Most of the student is interest in modern and post-modern architecture because they are more functional and simple. This tendency should catch the attention of architecture educators in Papua to change the student paradigm for not only focus on modern or postmodern architecture design but can also center their design in indigenous architecture. The methodologies which can be used to change the paradigm are as follows:

- Making indigenous architecture of Papua as the backbone in every project of architecture design specifically in coursework such as design studio also taking into consideration other style of architecture.

- Improving basic design coursework content in local curriculum by putting more analysis regard to Papua indigenous architecture.

- Giving more opportunity for student in creatively thinking for combining indigenous architecture with others style of architecture like modern architecture.

- Comprehending the importance of specific city identity as a means of representation of the city and the resident in order to make easy the recognition of the city and people altogether.

V. CONCLUSION

The paper introduce a new paradigm in architecture education of Papua that should be taken into account by architectural educators in order to produce architects who concern with the local indigenous architecture to built a comprehensive environment. A literature review has been used in discussing the goal of architectural education and the formation of city identity using local indigenous

architecture value. Based on the observation of architectural education in Papua, it shows that very few coursework discussing the problem about indigenous architecture of Papua. Consequently, student has very little interest in indigenous architecture designing.

Althought the government of Jayapura city has published a regulation regard to building design and construction that state "each building which is construct in Jayapura city should include element of local indigenous architecture", the paper shows several examples of existing buildings in Jayapura which have already used indigenous architecture element and also that of using modern architecture. Mostly the governmental buildings have already follow the rule even though some of them have not done yet. It is in contrary to the existing private buildings which design mostly not using local indigenous architecture.

The phenomenon shows that the awareness of local architects to create a meaningful built environment using local indigenous architecture is low. This is a challenge in architecture education of Papua in order to produce architects with higher awereness regard to apply local indigenous architecture in their design. Finally, It is expected that they will be able to create a meaningful environment complete with a unique and distinct identity.

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3.1.13
SUSTAINABILITY OF THE TRADITIONAL FORM OF BATAK HOUSE IN SAMOSIR ISLAND

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ABSTRACT

Samosir Island in Toba Lake has a huge variety of traditional settlements which are still inhabited by the clan family and relatively well preserved by the inhabitants. As a matter of fact, many traditional houses are being abandoned by the inhabitants because of the large amount of money needed for the restoration and different needs of spatial uses of the modern household. Field research has been conducted to investigate the changing way of life of the inhabitants and the new needs out of these, that cause obvious impact to the spatial arrangement of the traditional houses. The research is expected to have findings in the relationship of socio-cultural and economical factors that govern the sustainability of SStraditional Batak Toba houses. Part of the field research will be presented in this paper, which illustrates the existing condition of traditional houses in Samosir Island and its recent development regarding physical changes undertaken by the inhabitants. The discussion will concentrate on the expansion process and method of the house and will analyze the typical pattern that may encourage or discourage the sustainability of the traditional form of the house.

***Keywords**: traditional architecture, sustainability, Batak Toba, Samosi*

I. INTRODUCTION

Each community in Indonesian ethnic groups has its own distinctive form of traditional house. The house provides the main focus for the family and its community. The house is the orientation of any other activities of its residents and becomes the center of social and religious life. Some parts of the house are not structurally essential but are decorative elements that have a cultural function. The traditional house of Batak Toba has a post and lintel structure with wooden walls and a thatched roof, and is built on stilts. The stilts are quite tall and can be set directly into the ground or rest upon flat foundation stones. The house is raised to a height at which cooling breezes can penetrate and away from the rain mud whereas in hot weather the breeze provides under-floor ventilation. The raised floor also prevents inhabitants from mosquitoes attack and adds security of the house. Foundation stones allow the house resting on them to move without damage during earthquake and to avoid termites. The substructure of the house adds stability by a system of beams into the piles, which creates also night-time stalls for cattle and chicken.

The traditional houses of Batak are renowned for the dramatically inclined roofs, which allow rainwater to run swiftly and safely away, and the overhanging eaves shade the windows and protect them from the rain. The walls of the house are dwarfed by a vast roof and have few windows. Compared to the roof, the wall is insignificant. The sloping roof ridge ends curve dramatically upwards like the prow and stern of a boat. The piles and structural beams are usually hardwood and the walls are made of soft- and hardwood. The roof is thatched with leaves of coconut and other palms, however nowadays zinc roofs have largely replaced thatch. A combination of joints, wedges, pegs and lashing ensures a sturdy yet flexible structure

needing no nails, which is better able to withstand earthquakes. The interior of Batak house is dark, cramped and smoky. The house is used for working, cooking and sleeping, while at the same time securing a domain separate from the surrounding wilderness. Most of the activities during the day are spent out of doors. The exterior of house is mostly decorated with painting and wood carving.

The original interior of Batak Toba house is just one common room for several families (mostly 4-8), with no walls and room divider. All household activities take place in the common room whereas the cooking stove symbolizes the existence of the inhabitants. The extension of the traditional house is usually arranged to cover various needs of the family members such as private sleeping room, kitchen and storage spaces.

Case studies for the research are selected out of the traditional settlements (huta) along the coastal areas in Samosir Island where most of the recent developments are taking place. The southern part of the island is more densely populated and more developed for international and domestic tourism. Most of the well preserved traditional settlements are to be found in this area although some of them are yet inhabited permanently.

II. RESEARCH METHODOLOGY

The field research is undertaken in four traditional settlements (huta) which exhibit distinctive character of traditional houses and apparent effort in preserving the heritage and keeping the housing environment well organized. All of the settlements selected are inhabited by the clan family and some houses mostly are in good condition to live in. A few settlements are targeted to be tourist destination but the rest of them are just housing for the family. The huta Siallagan is picked out as the core object and reference of the investigation for several reason, a) the settlement is still inhabited by member of the clan, b) the settlement is physically in a good state as it was in its origin, c) the settlement has been developed as an important tourist destination, d) the settlement is a typical traditional settlement of Batak Toba. Other huta being investigated are in the neighbourhood of huta Siallagan with a distance of approximately 20 km (1,2,3). All of the huta selected meet the same criteria as the core object, except the one as a tourist destination, in order that comparison between different contexts could be outlined. Houses that are being selected as samples of the research are representative of the outstanding physical changes that have undertaken in the settlements mentioned.

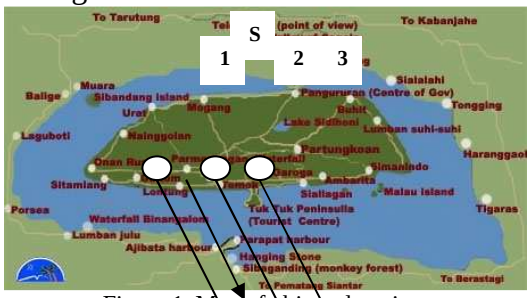

Figure 1. Map of objects location
Source : http://www.samosirtourism.com
(S) Huta Siallagan, (1) Huta Lumban Simarmata, (2) Huta Sibatu-batu, (3) Huta Janji Martahan.

The field survey is undertaken to identify and analyze the original form of the house and the physical changes that have taking place in the house, which significantly influence the image and overall design of the traditional architecture. The focus of the analysis is to identify the tendency and pattern of building extension and accordingly the roof composition that may

agitate the cultural image sustainability of Batak houses. The investigation is limited to the visual analysis of building appearance and arrangement of building elements, e.g. substructure, enclosure, wall opening, roof, and building material.

III. THE TYPOLOGY OF BUILDING EXTENSION

Figure 1. Type 1 Huta Siallagan
Source: Field study, 2010

The original house is extended at the back by imitating the original building style. A harmonious composition is being created by using similar building material and expression. Horizontal line in building façade is being kept up although its position is not exactly at the same level in old and new building. The same material is being applied for the substructure, building enclosure and roof. Variation of wall opening is being applied without disrupting the character of the old house. The new roof is a simpler version of the old one. The orientation of the new building is perpendicular to the old one and a kind of bridge structure is being put between the old and new building. The separation of the new from the old one is underlined by different color and system of the bridge structure, but rhythmic appearance is being set up by putting stone steps to the entrance of the house.

Figure 2. Type 2 Huta Siallagan
Source: Field study, 2010

The original house is extended at the back by constructing a different building system: masonry, with no reference to the old house. The new building is set up as an attachment to the original one, yet with a completely different expression. Anyhow, it stands as a subordinate of the main building. The substructure of the main building is not respected, but the original roof's inclination is being kept. The new roof is expressed as an extension of the main building. The mass of the new building is perpendicular to the old one, but there is no transition structure between them. Masonry and wood structure is attached next to each other disregarding of its position and system. A new space configuration is created in front of the

new building by putting lines for hanging clothes. The new masonry wall generates a spatial enclosure between two neighboring houses, which is not common in the spatial pattern of traditional settlement. The existing repetitive rhythm of traditional houses is distracted by the striking contrast of new building element and activities.

Figure 3. Type 3 Huta Siallagan
Source: Field study, 2010

The original house is extended at the back by a two-storey construction. Although similar material has been applied for the extension, but the contrast color and distinctive scale of the new building have interrupt the harmonious composition of the old house. The extension is by no means incorporated to the original house as it stands more as an opponent to the old one. The substructure and architectural form of the main building is not respected, and therefore, the new building is defined as another system in the house. Consequently, two separate architectural form and expression are being joined with no reference at all. The mass of the new building axially corresponds to the old one, but there is no unity between them. The bigger size of the new building disrespects the older one and disrupts the character and style of the settlement.

Figure 4. Type 4 Huta Sibatu-batu
Source: Field study, 2010

The original house is extended at the back by constructing a masonry house axially in line with the original one. Although building enclosure has a different system yet the wall opening adopts the pattern of traditional house: door opening at the front façade and window opening at the side façade. The opening system is restating the traditional art of putting one opening for each side of the building. Roof structure and its architectural style does not correspond to the traditional house, and the roof system applied is a typical small size modern urban building. Window and door opening are also typical of modern style of urban houses. The new building does not indicate the distinction of lower and upper level of the traditional

house, therefore there is no unity between the new and old building. They are purely two different houses with two different expressions, yet belong to the same ownership and household.

Figure 5. Type 5 Huta Janji Martahan

Source: Field study, 2010

The original house is extended at the back by imitating its building system. A harmonious composition is being created by using similar building material and expression. Horizontal line in building façade is being kept up although its position is not exactly at the same level in old and new building. The same material is being applied for the substructure, building enclosure and roof. Variation of wall opening has been applied without disrupting the character of the old house. The new roof is a simpler version of the old one. The orientation of the new building is perpendicular to the old one and a kind of middle roof has been put between the old and new building. The separation of the new from the old one is underlined by different roof system and building mass, but new wooden steps is imitating the older version of the house.

Figure 6. Type 6 Huta Lumban Simarmata
Source: Field study, 2010

The original house is extended at the back by a one-storey wooden house which is axially in line with the original one. The building enclosure has a different system following the construction system of the roof. Roof structure and its architectural style does not correspond to the traditional house. The roof system applied is typical for small size building structure that is usually incrementally built. Window and door opening are arranged randomly with no correspondence at all with the opening pattern in the old house. The new building does not indicate the distinction of lower and upper level of the traditional house, therefore there is no unity between the new and old building. The use of similar material for the wall and roof helps indicate the growing process of the house.

IV. ANALYSIS AND DISCUSSION

The extension of original house is identified and analyzed by making comparison to the traditional system according to its building system and architectural style. The building system is divided to three parts: substructure, main building and roof, following the classification of building system in traditional architecture: kepala (head) – badan (body) – kaki (foot). Hence, the changes of physical appearance to the original house can be clearly identified and described.

Table 1. Comparison of the new building to the traditional building system

Building system	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Substructure						
Structural system	**similar**	none	none	none	**similar**	none
Material	**similar**	none	none	none	**similar**	none
Usage	**similar**	none	none	none	**similar**	none
Main Building						
Structural system	**Post-lintel**	Bearing wall	Post-lintel	Bearing wall	**Post-lintel**	**Post-lintel**
Material	**wooden**	masonry	wooden	masonry	**wooden**	**wooden**
Usage	**kitchen, service**	kitchen, service	kit, serv, sleep	kitchen, service	**kitchen, service**	**kitchen, service**
Building mass	**1 storey**	1-storey	2-storey	1 storey	**1 storey**	**1 storey**
Architectural Expression	**harmony**	disharm	disharm	disharm	**harmony**	**harmony**
Roof						
Structural system	**congruent**	incongr.	incongr.	congruent	**congruent**	**congruent**
Material	**similar (zinc)**	similar (zinc)	similar (zinc)	similar (zinc)	**similar (zinc)**	**similar (zinc)**
Inclination	**dissim**	similar	dissim	dissim	**dissim**	**dissim**
Roof's ridge	**perpendic**	axial	axial	axial	**perpendic**	**axial**

Two types of houses consistently adopt the substructure and building enclosure of the origin to the new building. Both types compose new building mass in a configuration that is perpendicular to the old house, wherein it establishes a new interpretation of a housing layout which differentiates the representative front and the supportive back of the house. The new composition at right angles enhances the uniqueness yet nobility of the origin and expresses its potential to be in compliance with any new development and challenges. The dissimilarity of inclination of the roof underlines the hierarchy in composition and spatial usage, and further it helps sustaining the traditional values of the original house. The lack of substructure in house type 6, even though other components are in compliance, illustrates that discontinuity in the building system undoubtedly is unconstructive for the sustainability. The typology of extension in Batak Toba houses exemplifies the variation of people's responses to local tradition and traditional values.

The growing process of traditional Batak Toba houses is performed at the back of the house which indicates the consciousness and respect of the people to preserve symbolic expression and uniqueness of tradition. Nevertheless, new needs and new way of living of the people are accommodated by creating an adaptation mechanism which is at variance to their sensitivity and awareness on cultural values and to their means of financial resources.

In fact, instinctive and functional reasoning of the people has introduced a new classification of zoning mechanism in housing area. The front of the house is then identified as communal property that has to be preserved for the sustainability of tradition, and the back of the house is designated as private zone that is autonomous to be explored according to individual needs and potentials. Sustainability, in this sense, is defined and comprehended as available space for self determination in advancing cultural tradition and private life of the inhabitants.
New architectural form will turn up in response to new challenges through the process of adaptation and transformation along the time. Inhabitants has the authority to perceive and explore tradition differently either to solve their practical problems or to emphasis identity and originality. The stilts as substructure of the house are to signify the important continuation that has to be set up for a house composition which is partly modern and partly traditional. Further innovative changes may be exercised through different material and spatial arrangement.

V. CONCLUSION

The sustainability of the traditional architecture is governed by pragmatic motivations and functional considerations of the people inhabited the house. The reasoning about facts, decisions, beliefs and values to extend or renovate a traditional house is no longer considered to be based on the authority of cultural tradition, but instead intertwined with personal ambition, financial resources and pragmatic motivations. It is necessary to facilitate traditional architecture of Batak Toba to have a dialectical relationship with the inhabitants who have the need and authority to express and communicate their reasoning beyond tradition.
The transformation of the substructure into a kind of uninterrupted structure of the extended house is the key factor in sustaining the traditional character of the original house. Variety of roof architecture does not influence the sustaining charm of the traditional architecture, as far as the additional roof is subordinate to the original in scale and inclination. Architecturally speaking, building enclosure of Batak houses is very accommodative to the new interpretation and new challenges. Different combination of construction materials and methods may be developed for different solutions to the new needs, new uses and new inhabitants.

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3.1.14
TOBONG ROOF TILE ARCHITECTURE AND FEMALE LABORS IN WIRUN VILLAGE, REGENCY OF SUKOHARJO

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ABSTRACT

Wirun village in Sukoharjo is one of roof tile industrial central existed in Indonesia. Tobong roof tile in this village is converged with the residence area, which is located in each resident whose own yards in their house. Such condition is related with labors who are the roof tile craftsman. The uniqueness of this village is that the main labors are not male but they are female. Their occupation as roof tile craftsman is predominately held by female and takes place until presently.

The objective of this research is to find out the influence of female labor in tobong roof tile architecture. This research uses naturalistic method for it can find the relationship pattern of female labor and tobong roof tile architecture from empirical condition due to surrounding community-formed architecture.

The results of this research, of 14 cases, show the architecture compartment of tobong roof tile based on anthropometry and activity pattern held by the female labors. It shows the local wisdom by which able to provide added values as their living held by female workers by having no need to leave their houses.

Keywords: *Architecture, tobong roof tile, female labors.*

I. INTRODUCTION

Term tobong is familiar with Indonesian residents, especially those who live in Java Island. Tobong is derived from word to from boto (brick) and bong from word obong (burn). Although the name is derived from word boto (brick in Javanese), but tobong has not always to burn the bricks. In several regions, there known tobong to burn *gamping* (lime), earthenwares and roof tile.

Tobong in Wirun village of Sukoharjo is tobong to burn roof tile and having architecture uniqueness due to the activity holder. Labors who are the roof tile craftsmen are household women from related village. The existence of tobong can not be separated from their daily activity. Such condition shows the relationship of its architecture and the culture. Architecture is an agent to express culture to convey the messages from which a masterpiece created. Environmental circumstance and the availability of raw materials are influencing the architecture, but the activities held by the female labors in Wirun village is the one which establishing its own discrete. The main labors whom the craftsman are not male but female. The occupation as roof tile craftsman predominately held by female and it takes place until presently. Male labors are required on the time when loading and discharging the roof tile, which is when the roof tile being burnt in tobong.

Figure 1 *Tobong* roof tile in Wirun village of Sukoharjo

Wirun village in district of Mojolaban, Regency of Sukoharjo is the central of roof tile industry in Indonesia, and it primarily distributed for Jogjakarta and Central Java. In this region, there are 14 tobong roof tile which converging with residence's housing. In Mojolaban that is in Dukuh Godekan, Wirun village, tobong roof tile building is found by local community which served as the working place besides to process their agricultural fields. Wirun village is one of roof tile industrial center in Sukoharjo regency. Tobong architecture compartment in Wirun village has its own uniqueness because it converged with the housing. All activities related with tobong is conducted on the front side of the house. Tobong roof tile in this village is the part of the house, which located in the yards of their house.

Figure 2 The existing tobong roof tile in Wirun village of Sukoharjo

The objective of this research is to find out the influence of female labor in tobong roof tile architecture. This research uses naturalistic method for it can find the relationship pattern of female labor and tobong roof tile architecture from empirical condition due to surrounding community-formed architecture. Tobong architecture compartment phenomenon is analyzed to find the concept of its architecture.

As the background knowledge, there required some knowledge about the vernacular buildings. Such knowledge is required to explain the relation of physical compartment and cultures existed in the community. Tobong roof tile in Wirun village is indicated as vernacular architecture. Of preliminary research, there known the vernacularity of tobong roof tile architecture in Wirun village. Building construction and roof of tobong roof tile in Wirun-Mojolaban show the response actualization on the function and local climate. Materials used to build tobong roof tile are taken from surrounding hood such clay, woods and bamboo. The building construction of tobong roof tile uses modest structure system and having no designs.

Material form and building construction of tobong roof tile is the actualization characteristic (the product) of vernacular architecture.

II. DISCUSSION AND RESULT ANALYSIS

The driving wheel on the making of roof tile in Wirun village of Mojolaban is the housewives. The production activity of roof tile held alternately with their activity to take their house care. It has been conducted by most housewives and it has become their routines. Mothers whose no tobong in their house will make roof tile in their neighbor's house whose tobong roof tile in their house.

Field findings show that the tobong roof tile architecture compartment is based on the housewives activities. The making of roof tile is started from clay processing which held in the porch of their house. It is aimed to facilitate to reach the labors who are not their family member who own tobong. When the order is increasing, then their porch can accommodate more labors because the expanded working area in the yard.

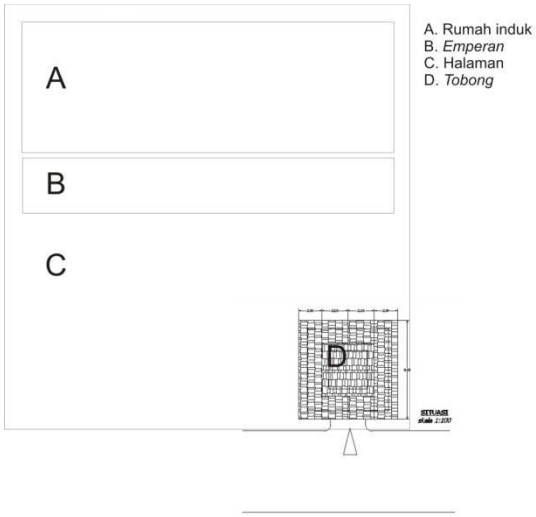

Figure 3 Location of tobong is in the front yard

Equipments and the supporting instruments in roof tile making using body size or anthropometry of the female labors. To blend the clay and make them into prepared mixture, there required strong labors. Therefore, the housewives use their feet to blend all materials. For the stronger power and not easily exhausted, then in material blending area, there is rope to be hold in 140-145cm of heights according to the labors heights.

Figure 4 Clay processing (roof tile material)

Figure 5 Manual roof tile making

Similarly, ther found on equipments to cast the roof tile. Bench and roof tile props are made on the base on the labors size. Manual roof tile making activity includes clay processing as the roof tile materials and sunbathe activity on the molded roof tile before burn on the yard or on the street.

The second finding is the use of compartment to hold two activities at the same time. The craftsman has responsibility to transform of their house to be a working area and kitchen as well. It does not usual for the Javanese. Kitchen or *pawon* is the place which shall be protected or covered. But it is not prevailed in Wirun village. Kitchen area has not always be on the back part of the house and the hidden one. There is sometime, the kitchen is in front side of the house converged with the porch used to cast the roof tile.

Figure 6 Porch as the working area and kitchen

Figure 7 Porch as the working area

Roof tile drying and storing before they're all burnt follows the labors daily activity. Sunbathing and drying of the roof tile held on the yard. Besides circulation, such condition provides easier method in monitoring on semi finished roof tile from the stealing. The second monitoring is the security from climate change, the raindrops. Access facility is the first basic consideration. Monitoring becomes the second basic consideration in tobong roof tile architecture compartment. Tobong architecture compartment is designed on the base of the labor daily activities who are the housewives.

Figure 8 Roof tile drying on the yard

Figure 9 Roof tile drying on the street

Figure 10 Roof tile arrangements on tobong

The third finding is the roof tile arrangement activity in tobong. Roof tile burning activity is the activity conducted collectively with the male labors. Roof tile are compiled in pile inside the tobong roof tile building by the male labor and then they burnt. On the roof tile burning process, the male labors are only supervising the roof tile condition being burnt. Fire controlling is for the combustion and the fuel is woods and rice straws. Such condition is influencing tobong building compartment. Fuel storing area is located around the roof tile burning location by which reaching facilitation and space efficiency. The fireplace size depends on the size of the labors' body when they squat.

Figure 11 Moving roof tile to *tobong*

Figure 12 Compiling roof tile in tobong

Figure 13 Compiling roof tile from tobong

Roof tile making activity with pressing machine is started from clay processing as the materials of roof tile in which also employing housewives as the labor. Tobong roof tile compartment in which using pressing machine is not significantly differ with the manual ones. Activity and the size of labors' body is the main consideration to build the compartment on the base of female labors anthropometry. Casting activity uses casting machine. Pressed roof tile is compiled in piles inside the tobong building, and they immediately burnt without sunbathing or only be winded before the burn.

Figure 13 Pressed roof tile making

Figure 13 Compiling roof tile on winding stage

Phenomenon observed contain a concept held by Wirun villagers in their daily life. The housewives activity who are the craftsman of roof tile is facilitated and formed the environment in which having effectiveness to support the activities. Such activities are their daily life activities and roof tile making activity. Activity leads to need and order so that it incurs space fixture, hierarchy, space relation pattern and shape influenced.

Compartment basically has existed since the beginning. Compartment can not be made by human but they feel it. The physical form of tobong roof tile objects in the middle of Wirun village hood visually involving rational to look for the meaning behind them so that there can be obtained the concept. Problem resolution in the design show the adaptation efforts on tropical climate both in the construction, materials, development method and labor availability.

Time and space optimization are the meaning behind the tobong roof tile phenomenon in Wirun village. The primary responsibility of a mother is that they have to take care of any

household necessities for the family. Conversely, the activities as the roof tile craftsman has facilitated by the compartment with its access accommodation and circulation. It is in accordance with a description about space layout and adjustment in space organization which supported with circulation (Ching, 2000). However, things become the uniqueness of tobong roof tile architecture in Wirun village is the utilization of porch to be a working area and kitchen. The possible porch expansion to the yard on increased order times is the space optimization. Of the technological side, it is also become one of consideration. Technology as the space forming element is translated by the craftsman and Wirun village in the shape of structure and contruction in which having flexibility. According to Pile (1988), structure serves its objective that is the building must have strength and considering maintaining aspect and also economical aspect. Facilitation aspect on maintenance and economical is realized from the porch utilization.

As the realization of vernacular architecture, then space optimization on tobong roof tile architecture in Wurun village show the characteristic of actualization/product of vernacular architecture suggested by Rapoport in Turan (1990). The characteristic is Effectiveness of the environment as a setting for hfestyle and activity system and Abbility of settings to communicate effectively to users.

Space optimization concept based on the housewives activities is a communication method held by Wirun villagers as the roof tile craftsman. Life harmoy is formed due to spare activities as the craftsman by which supporting their daily activities. Collectivity as a community is well maintained because mutual relationship condition. The tobong owner can not produce roof tile without female labors. Of the economical side, the housewives as the craftsmen are more profitable. It is due to the same wage while they can hold varied activities. Male workers as the craftsmen are only hold their work when they burn the roof tile.

As a cultural product, architecture is basically influenced by environmental, cultural and technological factors. Environmental factor includes natural condition of the environment, such like geographic, geologic, climate and temperature. Tobong roof tile architecture in the middle of Wirun village housing is designed by the craftsman, not by an architect and built by local technique, local materials and local environmental, those are the climate, tradition and local economy. The activities and the actors are two things which form the tobong roof tile architecture. Vernacularism of material being used, technique and adaptation on local climate is confirmed by space and time optimization due to the labors activities.

III. CONCLUSION

3.1. Vernacularism of tobong roof tile building not only includes the material use and local construction technique. There are much more other local knowledge which become the base of tobong roof tile building actualization as the vernacular architecture product. For further research, it is recommended to explore all local knowledge potential existed in tobong roof tile building in Mojolaban. It is expected that the exploration of tobong roof tile building vernacularism can be deeper, by which can find more potential so that it will strengthen the base in its original preservation.

3.2.Tobong architecture compartment in Wirun village housing is the residents' activity setting to survive by using existed resources. Human resources is the female workers who are very productive in their spare time to hold the household activities. Circulation and

compartment organization of tobong architecture in Wirun village of Mojolaban is existed and made on the base of housewives activities.

Roof tile industrial center improvement in Mojolaban have to accounting and preserving on activity system that are conducted by the housewives.

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3.1.15
UNDERSTANDING SPACE BASED ON THE SYMBOL OF BATANG GARING ON DAYAK NGAJU HOUSE

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ABSTRACT

Characteristic of the symbol is multivocal. Symbol have basic operational and agreed meaning. Symbol can be given a new meaning when associated with shapes, events or activities. Giving new meaning should be done carefully so as not to change early understanding. Meaning of symbol in traditional societies can be used to get to know their culture.

Batang garing is a symbol which is owned by Dayak Ngaju. The symbol of batang garing that represents Dayak Ngaju's philosophy of life. Meaning of batang garing can be used to understand concept of space in a traditional house of the Dayak Ngaju. In this paper, the concept of space will be seen in one of the traditional house of Dayak Ngaju namely Huma Gantung (high house).

This paper is based on literature review. The results of this paper is expected to enrich the traditional architecture of Dayak Ngaju. This paper also expected to provide inspiration for architects/designers who will use the traditional concept of Dayak Ngaju to design the building.

Keywords: *symbol, batang garing, space, huma gantung*

I. INTRODUCTION

Background

Traditional architecture realized in the form of a house is a result of physical culture. The traditional house was influenced by socio-cultural community. Traditional house is the embodiment of community traditions (folk tradition). House for traditional society is a form of symbolic macrocosm into the nature of microcosm. Differences place geographically and culturally caused differences in the architecture of their house.

Traditional architecture is influenced by cultural, traditional value, view and perception of nature and the Creator. Existing spaces in residential are formed based on the philosophy of communities life. Formation of house in a traditional society based on rules or specific guidelines. But for traditional societies that have no such guidelines would be more difficult to understand its traditional architecture. Especially for the cultural society who does not know the written language.

One of the cultures that are not familiar with written language is Dayak Ngaju. Dayak Ngaju in the past has no script, that's why a written document was not found. Culture inheritance performed by oral. Understanding of the Dayak Ngaju's architecture can be done with the understanding three relations which are manifested in behavior and adaptation. They are, relationship to the Creator, relationship to other human and relationship to the universe. The three relationships are became Dayak Ngaju's philosophy of life. Philosophy of life is manifested in *Batang Garing* symbol which means Tree of Life.

The understanding of symbol can be used to understand the architecture of the Dayak Ngaju house especially on the concept of space. This paper tries to explain how the meanings of *batang garing* can be interpreted to describe concept of space on the traditional house of Dayak Ngaju. This paper based on literature review. Concept of space will be seen in one of the traditional house of Dayak Ngaju namely *Huma Gantung* (high house).

II. LITERATURE REVIEW

2.1. Symbol

The symbol is part of signs system that expressed by Peirce (Van Zoest, 1996 in Anwar, 2009). The symbol is a sign that has a relationship with its object base on convention, agreement, or rule. The symbol is a sign that indicates natural relationships between signifier and signified. A sign is unity from form of signifier with an idea or signifed. Signifier is a sound meaningless or meaningful graffiti. Sign is the basic of reasoning. Sign allows humans to think, relate to others and give meaning to what is shown by the universe.

Peirce added that the meaning of the symbol is determined by an agreement or accepted by the public as true. Symbols in terminology has a sense of visual language embodied in material form an image that has been mutually acceptable. Meaning of the symbol is an integral part and interaction from various patterns of thought and communication which made agreement (Anwar, 2009).

2.2. Space

Space is a medium of communication in which people use them to show expressions and feelings, behaviors and attitudes, as well as various types of activities associated with the space. Space is the essence of architecture that is designed to accommodate function, change value from time to time in accordance with need, development of knowledge and understanding about conception of space (Van de Ven, 1995).

Creation of space on the western architecture refers to the space needs of the human body. Space that is created tends to value-free (without symbolic meaning), with no local content

because of the universally accepted measure of standardization and homogeneous character. While the architecture on the east rather the thought that rely on the experience and feelings (Kartono, 1999). To explain the meaning of space must be associated with culture. Culture is very unique because it affects human behavior and values (Tuan, 1977)

Space according to Lefebvre (1991) is a universal phenomenon created by God. This space is called an absolute space. This space is not located everywhere, because this space occupy all places and have a clear symbolic existence. This Space implies the existence of religious institutions, the relationship of the cosmos and the nature of the universe. In micro-form, this space symbolized the ritual space forms of religion.

III. DISCUSSION: UNDERSTANDING SPACE BASED ON SYMBOL OF BATANG GARING

3.1. Symbol of *Batang Garing*

Symbol of *batang garing* take the form of a tree. The tree symbolizes the natural environment. Dayak has a view that nature has a linear relationship with human. Human and nature have a bond that can not be released. Humans use nature to meet their daily life and nature give affect to human behavior.

Paembonan (1993) describes *batang garing*-shaped spear (*duhung*) and pointed upward. At the top exists hornbills. Hornbills is a symbol of God who called *Ranying Mahatala Langit*.

The bottom of batang garing marked by jar/*balanga*/*runjan*. It is containing sacred water that symbolizing *Jata* or underworld. The notched tree trunk symbolize *Jata* while the leaves (*dawen dandang tingang*) symbolize hornbills tail (*Ranying Mahatala Langit*).

Batang garing fruit (*garanuhing*) represent large groups of people as the descendants of *Maharaja Sangiang*, *Maharaja Sangen* and *Maharaja Bunu*.

Resting place of batang garing called *Pulau Batu Garing Nindan Tarung* where first human life before it descended to earth. Picture of *batang garing* can see in Figure 1.

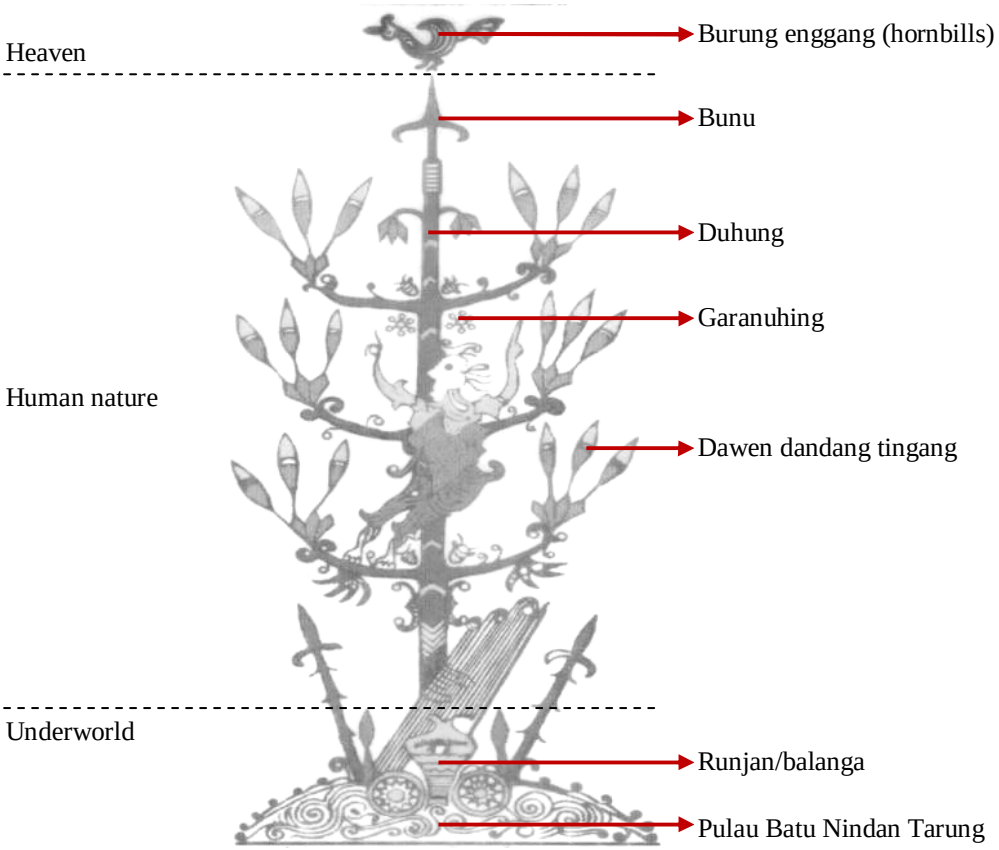

Figure 1: Symbol of Batang Garing

(Sangalang, 1997; Darma, 2003; Qalyubi, 2009)

In the picture of symbols can be seen third division that is heaven, human nature and underworld. Heaven dominated by *Ranying Mahatala Langit* and underworld controlled by *Jata/Tambun*. Two Mahadeva essentially is one because *Jata* is shadow of *Ranying Mahatala Langit*. Human Nature describe everything that relates to human life in the world.

If related to the three relations in Dayak Ngaju's philosophy of life therefore heaven and underworld connected by *duhung* describe human relationship with the Creator, human nature describe relationship of human with other human meanwhile relationship with nature described by batang garing that takes form of tree. Meaning from parts shown in the image can be seen in Table 1.

Table 1: Part of Symbol and Meaning

(Saililah, 1978; Paembonan, 1993; Sangalang; 1997; Darma, 2003)

Part of Symbol	Meaning	Division from Symbol
Burung enggang	The origin of life is derived from the top (heaven)	Heaven
Bunu	Human only serve to God so that all human behavior must be in accordance with God's will	Human nature; relation human with God
Duhung	The existence of spear that connect top and bottom symbolize the world over (heaven) and the world under (underworld) are one unity and interconnect	Human nature; relation human with God
Garanuhing	Human should direct their view not only downward but also upward. Human must appreciate Ranying Mahatala Langit and Jata equally. In another meaning that human should be able to maintain a balance between worldly interests and interests of the afterlife	Human nature; relation human with God
Dawen dandang tingang	Humans must have patience in facing life. Humans must be able to control self so as not to lose direction. Humans must be able to maintain and preserve nature	Human nature; relation human with God; relation human with nature and other human
Runjan/balanga	Wealth and prosperity that given by God	Underworld; relation human with God
Pulau batu nindan tarung	The world is a temporary residence for human because human homeland is actually the world's top called Lewu Tatau	Underworld

3.2. *Batang Garing* and Architecture

Batang garing understood by Dayak communities as the basic meaning of their philosophy of life. The contained of meaning in *batang garing* can be developed based on what the symbol

is used. In the Dayak community, a symbol of *batang garing* used for ritual activities such as *tiwah* (Vredenbregt, 1981), ornament and etc.

The development of meaning can also be provided by the architecture. Meaning of *batang garing* can be associated with the concept of space in architecture. The purpose of is to know about concept of space at the traditional house of Dayak Ngaju.

3.3. The Concept of Space in *Huma Gantung*

The process of Dayak life originated from residential. It has been arranged in such a way as to create a life in harmony and balance, among fellow residents, with other people, with nature, and with the Creator. Communal spaces created by promoting the transformation of ethical values and an egalitarian culture. This can be seen from the functionality within a designated space for those needs. There are, room for deliberation and interaction (public space), occupant rooms (private room), and kitchen as a place to meet the needs of its inhabitants. One dwelling *Suku Dayak Ngaju* known as *huma gantung* (high house).

Huma gantung is another form of *huma betang*. *Huma gantung* has different forms with *huma betang* in general. The difference lays on the size, the pole of building and the space order. *Huma gantung* is located in Kampung Buntoi. *Huma gantung Buntoi* is specific for the kampung leader. *Huma gantung Buntoi* built in 1870 by *Demang* (customary chief). *Huma gantung Buntoi* facing towards the east (sunrise) and parallel to the river side. River and sunrise symbolizes the source of life (Figure 2).

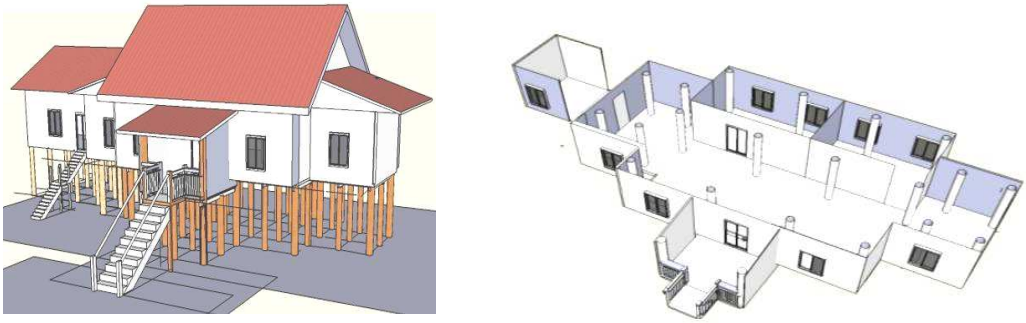

Figure 2: Ilustration of *Huma Gantung* in Kampung Buntoi

(sumber: Nathalia *et al*, 2007; Sangalang, 2008)

These spaces contained therein is *henderasi*, *balai parung/karimui*, *karung*, *dampuhan*, and *karayan* (Syahrozi, 2004; Guntur, 2007). *Henderasi* located on the front of the house. This space serves as a transition between outer space and space inside. *Balai parung* is the main hall which is at the heart of the house. This space is located in the middle of house. *Balai parung* serves as a place to receive guests, family activities (*eka keluarga*) and the place of ritual activity. Then on the left there is dampuhan (kitchen) used as a cooking and dining (*eka kuman*). The left side there is space to store equipment room (*eka garantung*). At the rear the main hall there is a bed room called *karung (eka batiroh:* bedroom*)*. *Karung* lies parallel *balai parung*. *Dampuhan* left side there is a room like a terrace, called *karayan*. All rooms are

located parallel to the east or river in front of the house. *Huma gantung* have 2 doors there are on *balai parung* and *dampuhan*. Occupants when performing daily activities more often used door from *dampuhan* to go out. The relationship of space on *huma gantung* can be seen in Figure 3.

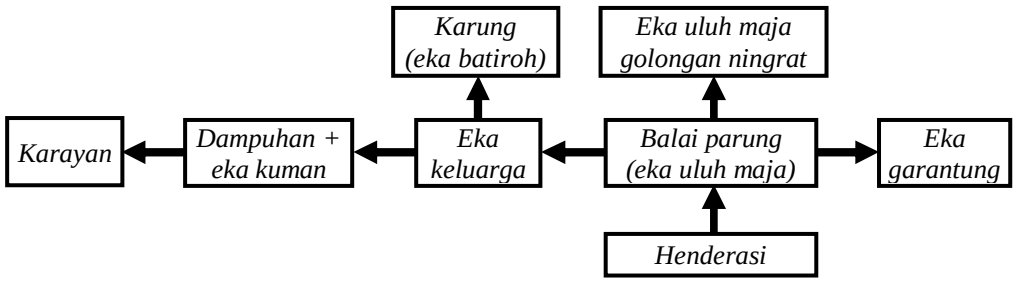

Figure 3: The Relationship of Space on *Huma Gantung Buntoi*

(sumber: Syahrozi, 2004; Nathalia *et al*, 2007; Sangalang, 2008)

Based on the spatial functions that *balai parung* is the center of the house. This space has a value higher than any other space because the main function as a place for ritual activity. *Dampuhan* is a place for daily activities residents. Residents will exit through the door from *dampuhan* if they will go to work for the farming and fishing. *Karung* is a place to rest.

According to the explanations above, *huma gantung* has two main groups of the space that is first group includes *karayan*, *dampuhan*, and *karung*; second group is *balai parung*. The functions of the existing space when viewed on the basis of *batang garing* that *balai parung* depict heaven while *karayan, dampuhan* and *karung* depict daily life of human beings (human nature). Human go to *karayan, dampuhan* and *karung* means entered earthly realms. Human go to *balai parung* mean go to heaven (place of Ranying Mahatala Langit).

Based on the three relationships that exist in the Dayak Ngaju associated with *huma gantung* so the relationship with *Ranying Mahatala Langit* embodied in *balai parung* at the time used for ritual ceremonies. Relationship with humans is manifested in *balai parung (eka uluh maja:* parlor and *eka keluarga*: living room*)* when used for communal activities such as receiving guests and family gathering place. Relationship with humans are also manifested in *dampuhan* which used for cooking dan dining. Relation with nature is embodied in the adaptation of house in its natural environment.

IV. CONCLUSION

Characteristic of the symbol is multivocal. Symbol have basic operational and agreed meaning. Symbol can be given a new meaning when associated with shapes, events or activities. Giving new meaning should be done carefully so as not to change early understanding.

The meaning of symbol in traditional societies can be used to get to know their culture. One of these culture is traditional house. Utilizing the symbol is one way to understand traditional house that is sometimes difficult to be understood by naked eye. The implied meaning of traditional house is sometimes only be understood on the basis of symbol that are understood occupants of the house.

Understanding of space in a traditional house of Dayak Ngaju can be seen in three relationships that are understood by Dayak Ngaju. Three relationships symbolized by *batang garing*. In addition, the concept of space can also be understood from the meaning contained in the parts of *batang garing*.

The use of *batang garing* to understand the concept of space in a traditional house of Dayak Ngaju may be the new thinking that will require mutual agreement. But at least review the concept of space in a traditional house aims to open new horizons. This study is the first step that opens the opportunity to conduct further research about the meaning behind the traditional house of the Dayak Ngaju. To develop this study into a better research that important to do a variety of explorative research on the history and cultural development process, especially the various aspects associated with traditional house. Although studies in this paper are simple but is expected to provide inspiration for architects/designers who will use the traditional concept of Dayak Ngaju to design the building.

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3.1.16
RECYCLE-MATERIAL BLOCK FROM REPULPED PAPER FOR WALL OF LOW-RISE BUILDING

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ABSTRACT

In this decade demand of low-rise buildings for low and middle-income people increase in metropolis of Indonesia, this matter represents effect of growth of residents. Development for this building is very urgent and building construction must be executed with using fast construction system. In other hand, design Issue about sustainable design must be paid attention to design this building. One of characteristics of building material to supports sustainable design with use recycle material for element of building.
This paper discussed research about material for the wall of interior in low-rise building which is processed with utilize raw material from repulped paper, namely mush from waste of domestic paper. This wall is representing lightweight wall and it used as partition wall.
Raw material of this wall material is repulped paper while additional material is soil that contains a lot of sand and cement in low quantity used as an adhesive of materials. This research is experiment research with uses methods of compaction and drying with natural air. As experimental variables are percentage of repulped paper and soil percentages, while cement represents independent variable. Percentage of material is measured by weight of material.
The problem in this research is how to find way to determine percentage and weight of composition material is optimum in efficient of quantity material and has standard strength. The result of this research is ideal of composition of repulped paper, soil and cement for building wall. Ideal composition contains 80% repulped paper, 20% soil and 10% cement from weight of repulped paper. Density composition is 0.93 g/cm3. That composition meets standard for wall building.

Keywords: *recycle; repulped paper; soil; composition; lightweight*

I. INTRODUCTION

The need for housing in big cities in Indonesia is growing; this is in line with the population due to urbanization. In connection with this problem, the government announced the construction of low-rise building in major cities in Indonesia. The program was soon realized to solve the housing problem. Building design, construction and building materials systems affect the accelerated development of these buildings.

Relatively rapid construction system for building affordable housing is a precast system; the system uses building elements that are printed in mass before reinstalling. On the other hand, building materials supporting this system are building materials, which have characteristics of light for vertical transport of energy becomes lower.

In addition to the material qualifies, as a fast and relatively light in construction, building materials must meet the concept of sustainable architecture or green design. The concept is a world issues about environmental. The current building design must use materials that do not damage the environment and reduce the use of building materials that cannot be renewable. In other words, building materials should use as many building materials that can be reused (reuse material) or the result of recycling (recycle material). According Amatruda (2004), recycle materials is low embodied energy material, so the buildings have walls with this material would have embodied a relatively low energy buildings.

Alternative wall materials are lightweight and allows for the system of precast, lightweight and environmentally friendly is the wall of the repulped paper. This raw material is recycled building

materials from waste paper that cannot be used again. Waste paper raises problem in waste system of urban, and would be more useful if it is processed into walls material.

The walls of buildings made from the repulped paper are currently used for low-cost building materials that have minimal impact on the environment (Manuel, 2002). A lot of paper waste meets waste landfills; on the other hand, millions of people live in sub-standard housing. With the use of waste paper or waste paper as raw housing wall will be able to solve both these problems.

Paper made of polyethylene and a layer of aluminum (Tanumiharja, 2003). According Djamaran (1993) and (Joedodibroto, 1983), waste paper is a lignocellulosic fiber material that can be recycled into pulp and paper. Paper pulp sludge or derived from processing waste into paper pulp fiber, contain minerals such as kaolinite and calcium carbonate, the amount depending on the type of paper, usually 50-20 g/m2 (Andang, 2008).

Possible use of other raw materials to add strength to repulped paper block is sand or clay. Sand is the basic ingredient of good but relatively expensive, whereas soil easily available and relatively cheap price. The use of soil to mix repulped block are rare. Therefore, soil will be used as additional ingredients in this research. Repulped wall is not resistant to weather, so the wall needs to get out of wall coverings.

The question in this research is how to determine the optimal composition of pulp and soil to produce a compressive strength of wall building materials that meet the standards. The results of this study are the composition of the optimum wall repulped peper, which is the beginning of pulp-walled building design. Repulped paper wall is a wall of buildings in Indonesia the concept of sustainable architecture or green design.

II. METHOD

The study was conducted to find the ideal composition of the mixture of repulped paper, soil and cement. The main raw material is repulped paper, whereas soil as an additional material to increase the volume of repulped paper. Cement is the adhesive material.

This research was an experimental study that uses a variable composition from a mixture of raw materials. The method used to increase the mechanical strength is by compressed the mixture. Drying method uses a natural way, i.e., drying without using the combustion process as it is commonly done in the process of making bricks. A further measurement of compressive strength was measured using gauge press.

The main raw materials in this study are repulped paper, soil and cement. repulped paper waste paper is the result of immersion or domestic households are not used anymore. The paper used is a waste, so it does not reduce the function of the paper. Used soil containing sand, clay and silt, in this study the preferred content of the soil is Sand, because a lot of influence on the adhesion with cement. According Rigassi (1995), a good percentage, Sand content in the soil structure is 30-40%. Cement used is of good quality, relatively new and there are no clumps.

The stages of the research activities as follows (see Figure 1):

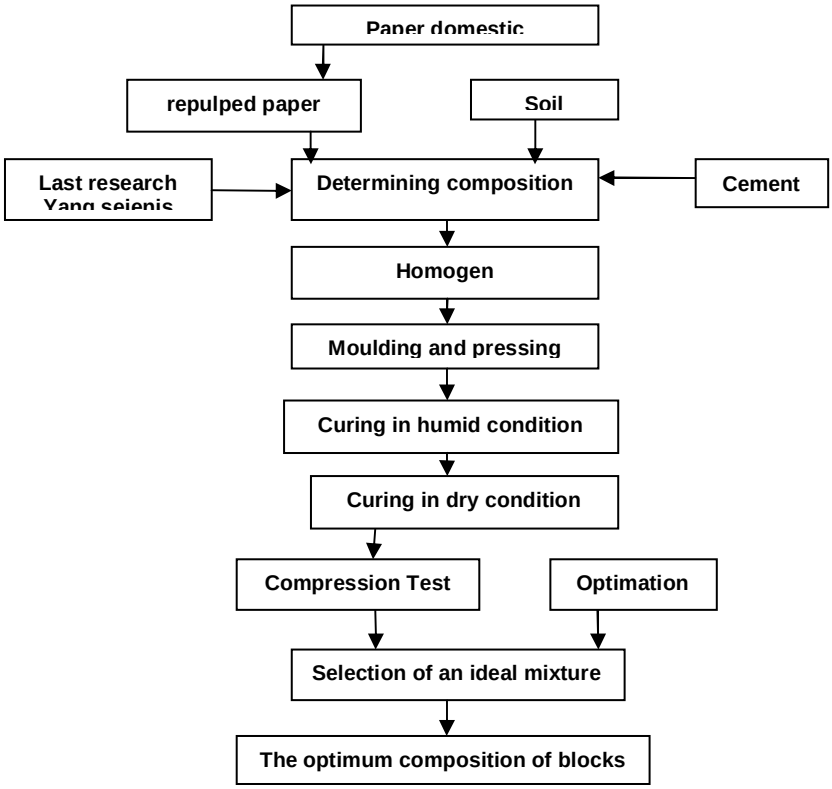

Figure 1. Flow work of research

Repulped paper and soil is variable, while the cement is a fixed variable. The composition of materials and supporting materials is measured by the weight of material. Determination of repulped paper composition is greater than the soil based on the consideration that the repulped paper is the main material in this study, while the soil just as additional material to enlarge the volume of material. Determining the composition of cement in this study is based on that during this research by using a good percentage of soil is 10% of material weight. Material composition can be seen in the table below (Table 1).

Table 1. Percentage of repulped paper, soil and cement

No. Samples	repulped paper %	soil %	Cement % of repulped paper
I	100%	0	10
II	80	20	10
III	70	30	10
IV	60	40	10
V	50	50	10

Sample is a cylindrical shape with a diameter of 3.5 cm and height 4 cm. Each composition has five samples. Samples compacted until it reaches the appropriate height. Percentage and optimum compressive strength was analyzed by comparing the samples using the Gradient method. This method uses 2-axis variable on its axis, the compressive strength of samples found on the Y-axis and the percentage of repulped paper samples found on the X-axis the optimum sample would have a balance between the percentages of repulped paper with strong compression.

III. RESULTS AND DISCUSSION

The paper used in this study is the paper that comes from household waste that is a scrap of paper books or papers that are not used anymore. In general, the type of paper obtained were HVS paper type, because the paper is the paper that most of waste households and offices (see Figure 2).

Figure 2. Pieces of paper ready to be destroyed

Figure 3. Repulped paper

Soaking the paper uses plain water. The main purpose of soaking is to destroy the paper so it can be slurry, in addition to separate paper from the adhesive and the fibers within the paper. Dipping time depends on the type of paper; the average paper may crash take a week. To speed up the process of destruction of paper required mixing process. Paper into pulp can be seen in figure 3

Drying is done by compressing the pulp until the water contained in the slurry out of the pulp. The dried pulp into clumps (see figure 4)

Figure 4. Clump repulped paper

Soil mixture obtained in general are still in humid conditions and mixed with other organic materials, while additional material for this experiment soil material should be free from organic material. It is necessary for the drying process by using sunlight. Condition soil can be seen in figure 5.

Figure 5. Condition of the soil

The dried soil should be separated from organic materials and other material embedded in the soil. After the soil was cleaned of any dirt that disrupts the bonding process, the soil until finely crushed. The fine soil sieved using 2 mm sieve. (See Figure 6).

Figure 6. Soil sieve

The content of the soil can be identified by using sedimentation manually or with laboratory tests. In this study the identification of the content of this soil, use sedimentation method manually. Based on observations of soil to be used as experimental material found in three layers, the higher layers of sand and silt by 40% from the high ground in the glasses. Soil that meets the requirements as the raw material contains 40-45% sand (Rigassi, 1995). It can be concluded that the soil used meets requirements as a raw material.

The process of mixing between the repulped paper, soil and cement mixing begins with these elements in dry conditions, with the aim that the composition of the mixture can be homogeneous. Mixing process begins with mixing between the repulped paper and soil. After both became homogeneous, cement is mixed into the both composition. In fact mixing between the repulped paper with soil in dry conditions is difficult to do, because the repulped paper of forming clots is very difficult to mix with soil that has been finely.

Sample manufacture is done by using the compaction mould. A problem in this compaction is water coming out of the mix come against the force of press compaction. Therefore, that compaction is done by gradually and water coming out of the mixture can be reduced, because the water contains cement. This is a weakness in the process of compaction. Because of reduced water of cement can affect to decrease compressive strength in the sample. The number of samples is 5 pieces for each composition, so the total sample is 25 pieces. The condition of the sample can be seen in Figure 7.

Figure 7. Condition of the samples

For samples not dry quickly which causes cracks in the sample, the sample should be kept in humid conditions. For that sample must always be soaked every day. Duration wetting performed in this study for 3 days and samples are protected from direct sunlight by covering with plastic sheeting. While in the protection of plastic sheets, samples are “sweating" which means the water removed from the samples. After quite moist sample was dried by wind, and still be protected from direct sunlight. This natural drying time is 11 days. Further samples are ready to be tested.

Compressive strength test results from each sample composition can be seen in Table 2. Based on the composition table, high compressive strength is a composition has 80% repulped paper. While the composition of which has the lowest compressive strength is 100% repulped paper composition. Minimum compressive strength of walls of the building is 30 kg/cm2. So that, almost all samples meet the requirements as building walls, except the samples have a composition of 100% repulped paper. All samples are mixed with soil has a compressive strength above the minimum standard.

Table 2. Composition of mixture and compressive strength

No. Samples	Composition of repulped paper%	Compressive strength kg/cm2
I	100	11.11
II	80	112.50
III	70	90.97
IV	60	58.25
V	50	91.57

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Density of samples was relatively similar for all samples, which is 0.97 g/cm^3. This indicates that the block of repulped paper is light compared with red brick or hollow concrete. Red brick has a density of 1.7 g/cm3 and hollow concrete has density of 1.4 g/cm^3. Thus, the repulped paper block is categorized as a lightweight material.

Block pulp in these experiments were soaked in water for 3 days without any damage or change in shape. However, given the raw material of this block is paper, the possibility of wall absorption of water would still exist. Therefore, the repulped paper wall will need to be coated by plaster to keep the bad influences of the outside air.

Block repulped paper ideal in this study is blocks that uses as much repulped paper but it has relatively high compressive strength. In figure 8 shows, the composition use highest repulped paper is sample I, whereas sample V uses repulped paper is minimal. Largest compressive strength is owned by sample II. Smallest compressive strength possessed by the sample I. Samples II has a high compressive strength and using the largest pulp, it is the optimum sample.

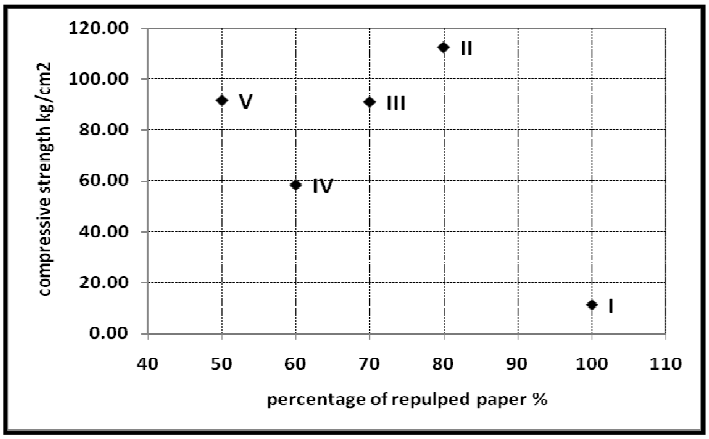

Figure 8. The relationship between compression strength with percentage of repulped paper

Sample II is the optimum sample and an appropriate composition is used as the composition of the repulped paper wall. So that the composition of the pulp 80%, soil 20% and 10% cement is a composition that can be used as wall building low-rise building. The walls on the outside need to be plastered to resistance to climate

IV. CONCLUSION

Composition of repulped paper without using a mixture of soil has a low compressive strength and do not qualify as a building wall materials. The wall has a relatively lightweight.

Ideal composition in this study has a maximum quantity of repulped paper and high compressive strength. This composition contained the repulped paper 80%, 20% soil and 10% cement. This shows that the use of a large quantity of repulped paper can still produce a greater compressive strength.

Repulped paper walls have compressed strength is higher than brick and hollow block walls. The wall also has a lighter load than brick or hollow block wall. So that, this wall can replace brick or hollow block walls in low-rise building.

Use the maximum repulped paper will be able to reduce paper waste in urban areas, so that the waste problem can be reduced by using waste paper as building material in accordance with the standard wall.

The walls of the repulped paper is a new alternative for affordable housing wall for the future, because the raw materials are relatively cheap and easily available for commercial and domestic activities associated with the paper is still running.

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3.1.17
PRELIMINARY STUDY ON THE THERMAL ENVIRONMENT OF THE FLORES'S VERNACULAR HOUSE FOR DEVELOPMENT TROPICAL RESPONSIVE DESIGN

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ABSTRACT

Based on the field measurements of the thermal environment parameters and a short-term auto-recorder of the indoor and outdoor temperature at a typical vernacular house (Bena) at Flores island area, some climatic responsive viewpoints about vernacular houses design are reviewed. Also, with the analysis of the house element design such as the wall, roof and floor by the measurements of temperature, humidity and wind velocity. Some design principles of the vernacular house in Flores area are revealed, of which sun shading and insulation are of great importance while the natural ventilation is just considered as an auxiliary approach. So the strategy of envelope design is to restrain the passive cooling at daytime and to boost it at night.

Keywords: *Thermal environment, tropical responsive design, Flores's vernacular house*

I. INTRODUCTION

In the study areas of housing and thermal comfort, a vast literature exists. When the two areas are connected, they are mainly referenced under bioclimatic design or the vernacular architecture, with the emphasis on basic, good design principles. Bioclimatic design literature is on the whole more technical and scientific in nature (Szokolay, 2009), while works on vernacular architecture address issues of culture, tradition and aesthetics as well as comfort (Bourdier, 1989). In this paper, both tropical responsive design and vernacular design are discussed for the specific setting of the region of the Wogo, Flores Island of Indonesia and its mountain tropical climate. The discussion is seen as urgent due to the proliferation of what is often termed the new vernacular or the selfbuilt housing phenomenon. Rural settlements are adopting a specific style of building which can be found to have aspects of vernacular architecture. Linking tropical responsive design with features of the local traditional, it is hoped to create a design method for an appropriate domestic architecture for the rural settlements in Indonesia. Vernacular architecture can be described as building new structures with old techniques, repeating dwelling types based on an old model with few technological changes. The model similarity consists of specific elements of massing and volume, fenestration and use of building materials. The vernacular is also said to show efficient use of resources with distinct preoccupation as to climate responsive design (Rapoport, 1989).

The first vernacular settlements were rural in nature and determined the principal vernacular of Flores. With time, the continuous permanence of the settler in the new territory and problems with supplies made rural activities necessary. The indiscriminate import of a vernacular architecture over a vast territory ignored new local conditions and necessities. On the other hand, since climate across the territory is on the whole mild, the local vernacular did not ask for rigorous thermal comfort requirements. This vernacular has several bioclimatic elements, however. Building materials of timber were used and breathing or ventilated walls were predominantly applied. Small opening sizes were generous in relation to room area and permitted hot air to escape from high roof. On the negative side, the vernacular is not specifically conscious of climate. Orientation is random, cross-ventilation is not a specific design element. Shading is largely ignored and in the rural scene landscaping is not used to its full comfort potential. The local vernacular thus did not adopt for strong climate conscious design as is common in other cultures with appropriate rooms for specific seasons such as the summer and winter rooms (Al-Hinai, 1993). Later additions and modifications are frequent, especially in the form of extending the roof over the side setback and rain protection to entrances. Complexity and variety are increased over time as in true vernacular architecture. Thus local building practices are perpetuated

and regionality is valued. However, the house model of this rural vernacular lacks an authentic development. Effectiveness of response to climate, which in the local vernacular was not a main feature, is only sustained by the use of adequate building materials in the region of Flores. To correspond to the definition of vernacular, self-built houses need adjustments of design, especially concerning environmental comfort. A regard for thermal comfort must be emphasized. Thermal comfort should include concerns for ventilation, insulation and thermal resistance of materials. Adding climate response attributes to the small rural houses in Flores can be achieved through the principles of bioclimatic design.

Tropical responsive design relies heavily on architectural science, especially architectural energetics, but goes well beyond that. It rejects fashion-dominated architecture, it returns to basic human needs and values, it encourages regionalism. Bioclimatic design employs appropriate technologies, as dictated by the particular task, by given socio-economic conditions, but it avoids the trap of romantic neo-primitivism. Specific climate definitions will then ask for a number of design strategies: orientation of building in relation to sun and wind, exterior ground treatment and landscaping, wall thickness, choice of construction materials and color, shading conditions, roof construction detailing and permanent ventilation of the space between ceiling and roof, often termed attic ventilation, location and size of openings and presence of crossventilation. Evaporative cooling and solar heating are often considered part of bioclimatic design, since passive conditioning is energy efficient and non-wasteful. Examples of the vernacular are often used in the tropical responsive design literature as climate appropriate designs. Specific strategies are related to specific vernacular design. Building in the traditional way, and therefore encouraging the repetition of good custom versus innovation, is repeatedly presented in the literature, but often without checking the full range of necessities of design, conveniences of sanitation, lighting, heating, as well as separate areas for distinct functions (Rowe, 1993).

II. METHODS

The field study is a Wogo house in Flores Island, Nusa Tenggara Timur, Indonesia. The Wogo vernacular architecture is usually located at the foot of mountains (Fig. 1). Mountains have a great effect on the local climate. Through a suitable relation with mountains, architecture has been able to control the effect of climate. Wogo vernacular architecture has utilized the effects of mountains and responded to the seasonal climate changes. Selecting the envelope material of buildings to utilize solar energy has been one of the most important elements in controlling the architectural environment. The wall of Wogo house have had a variable and complex function so that the architectural space might have variability and adaptability. The spaces room to room, room to outside, could be easily divided as well as combined into one. This characteristic has made Wogo house responsive of climate. As the wall of house are composed of double facade, on the outside made from bamboo trees and on the inside made from wood pairs. In Wogo's vernacular architecture, a room accommodates everyday life, including sleep.

Figure 1. The Wogo housing at the foot of Mountains

Figure 2. Bamboo Wall of a Wogo Vernacular House

The Wogo vernacular house is surrounded by lush landscaping and the longitudinal axis of the house is oriented east-west. The roof component providing shelter from external climatic forces, such as solar radiation, rain and wind. The eave of the roof extends about 1 m from the external wall thus controls the solar penetration even at low solar angles. The middle zone is enclosed with 80 mm bamboo horizontal louvered panels and 12 mm thick solid timber walls. The wooden horizontal panels cover 80% of the wall area and positioned in all two cardinal orientations. The design intentions of these horizontal bamboo louver panels are to provide secondary skin for passive heating. The floor is constructed with 25 mm and 150 mm wide bamboo stripes. The height between the natural ground and the raised floor of the building differed from 1 m and 0.8 m. The authors carried out a survey to determine the thermal parameters of a Wogo house in Flores island. The measurements were collected starting from 1 July to 2 July 2010. The instrumentation consisted of sensors with a data logger system. The sensors were setup to monitor outdoor and indoor climatic conditions. Fig. 3 shows the positions of the instrument installation within and outside the investigated house.

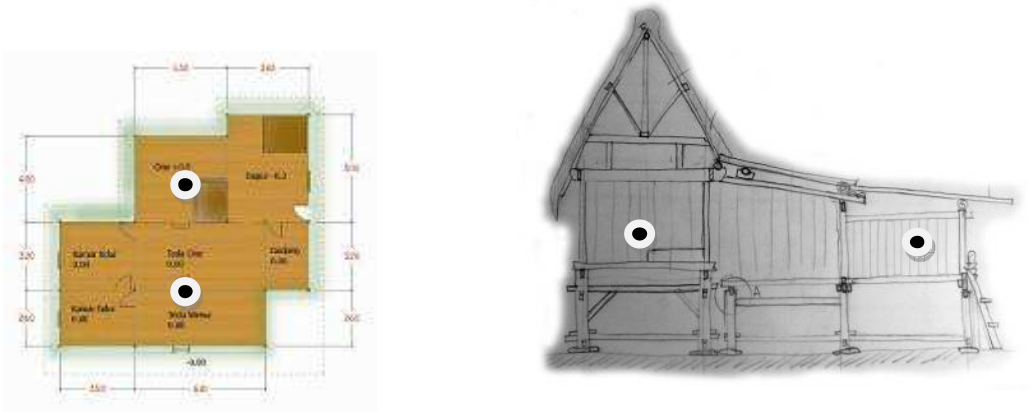

Figure 3. The positions of thermal data logger (○) a is plan and b is section

The physical measurements were carried out using air temperature and humidity data loggers. The temperatures for both internal and external were recorded at every 60 minutes interval. The data were averaged for every hour to obtain the hourly values. The temperature accuracy of the loggers ranged between 0.2°C to 0.5°C. The positions and the measured variables of the data loggers are described in table 1. The building was occupied during this period.

Table 1.
The Measurement Items and Method

Position	Data Type	Equipment	Height
Middle of the space	Air temperature, humidity and air velocity	Lutron data logger	900 mm above the floor
Outdoor	Air temperature, humidity and air velocity	Lutron data logger	900 mm above the floor

Indonesian modern architecture ignores the natural material of building envelope. Therefore, modern architecture has a lower capacity to control its architectural environment arising from change in climate. However, all contemporary wall are different from the vernacular wall, which consist of both bamboo and wood wall. A bamboo wall is not used. Therefore, there is less variability and adaptability than in vernacular architecture.

III. EXPERIMENTAL RESULTS

3.1. Wogo Vernacular as a representative Responsive Environment

The existence of the transitional space dominated the development of the spatial organization of the Wogo house. Beyond the circulation activities, the transitional space is utilized for leisure and domestic uses; moreover it is a regulator of privacy, climate, indoor and outdoor interactions. The verandah as transitional space between indoor and outdoor spaces provides shade to the wall as well as creating a cool and shadowy area. Additionally, the use of the vernacular materials such as bamboo and wood in the construction of the load bearing walls provided appropriate micro climate for the human comfort inside the closed spaces. In principle, the traditional thick walls acted as natural heat barriers. The adaptability to the changing topographical conditions by using available local building materials has to be pointed out as another positive feature of the Wogo house. While, the developments of rural houses on the flat topography are observed as particular prototypes and their variations without any topographical constraint; those on the steep topography are logically developed in relation to the topographical conditions. Thus, the fundamental types of the traditional rural house can be suitably adapted to different topographies

In Wogo's vernacular architecture, a room known as an "ONE" is the main space for living. Constant natural ventilation can purify the inner air as well as maintain proper humidity. This is because the Wogo's heating system known as fireplace generates a convection current which is used for bamboo walls, ceiling, windows and doors, is a material that can breathe. In the room, the nearest side to a fireplace is warmer compared with the opposite side. The difference in temperature causes a convection current in the inner air. Incidentally, according to traditional oriental medicine, it is very healthy to keep the head cool but the feet warm. Both the walls and floors are made of bamboo and wood pairs. Bamboo, as a natural material, capacity for insulation is comparatively high and . The roof which is made of a grass material has a very high insulating effect in comparison to other materials and has many minute gaps that allow air circulation. Despite the wall being closed, the inner air can be ventilated continuously through the roof. Therefore, the room's environment is controlled according to the change in the surrounding environment. Therefore, Wogo's vernacular rooms can purify their air and retain an agreeable level of humidity with the fireplace and the wall. In Indonesian modern architecture, the inner air is excluded from the outer air and materials such as concrete and brick. These problems arise because of controlling the environment with energyconsuming equipment.

3.2. Role of Climate Factors on Responsive Wall Technology

After a close examination, it can be seen that temperature and humidity are very important in the Wogo housing region, and that solar effects and wind factors are influential enough to be investigated. These climatic parameters are the factors that determine the structural characteristics of the region and that separate the region from other regions in Flores.

Temperature, the most evident characteristics of the Wogo housing region in terms of climate are that it gets cold temperature than any other region in Flores. The only reason for so cool temperature is that the mountains in the region are very close. The repercussion of low temperature is evident in the selection of outer wall materials in the vernacular houses. The excessive rain has hindered the use of unburnt soil as an outer wall construction material. Double facade materials are deliberately used on the facades that connect with outdoor condition and suitable materials and constructions are chosen according to the directions.

Relative Humidity, the rate of humidity in the Wogo housing region is above the average of the heavy rain effects. The average relative humidity goes as high as 80%. The reason for the difference in the humidity contents is the atmospheric movements and topography. The measures taken against

humidity in and around the buildings are as follows. In all Wodo house, bamboo walls and different types of wood have been preferred, which makes the flow of moisture from the inside to the outside possible. It has been observed that there is an increased use of frame walls in places where the moisture content is high, whereas bamboo walls are used in places where the moisture content is low. The excessive moisture has a decaying effect on the wood components that are connected to the soil. For this reason, the floor and wall of the Wogo house are made 1 m up from the soil.

Wind and Solar Radiation, it has been observed that there are no windows on the walls facing the winds that do not create undesirable conditions in terms of heat and comfort, especially in the coldest times. There are few windows on the other walls sides. The windows of some houses have window shutters to keep out the cold and wind. The verandah or transition space in front of Wogo House blocks the sunlight and reduces its density. The settlements on the sides facing the east do not receive direct sunlight in the afternoon, and the settlements on the sides facing the west may not receive direct sunlight in the morning. Frame wall and bamboo wall systems are used mostly as the wall construction material in the sunny. The level of daytime illumination of the living spaces in the greatest part of the vernacular houses is very low. When considering the whole house, the natural illumination is also far below the acceptable levels. Bamboo wall are used more in the bedroom sections than in other sections. The heat averages have an effect on the sizes of the bamboo wall in the vernacular houses. It was observed that the warmer sides have more bamboo wall.

3.3. Preliminary Study of Thermal Environment

The purpose of this paper is to assess the responsive wall technology for comfortable traditional house in Wogo house. The results are analysed by comparing the internal and external temperatures by the wall element. Figures 4 illustrate the results of the internal temperatures obtained at 0.9 m height from the floor level over the period of one day. This period was taken in order to establish the preliminary study the temperature over one period a day (24 hours).

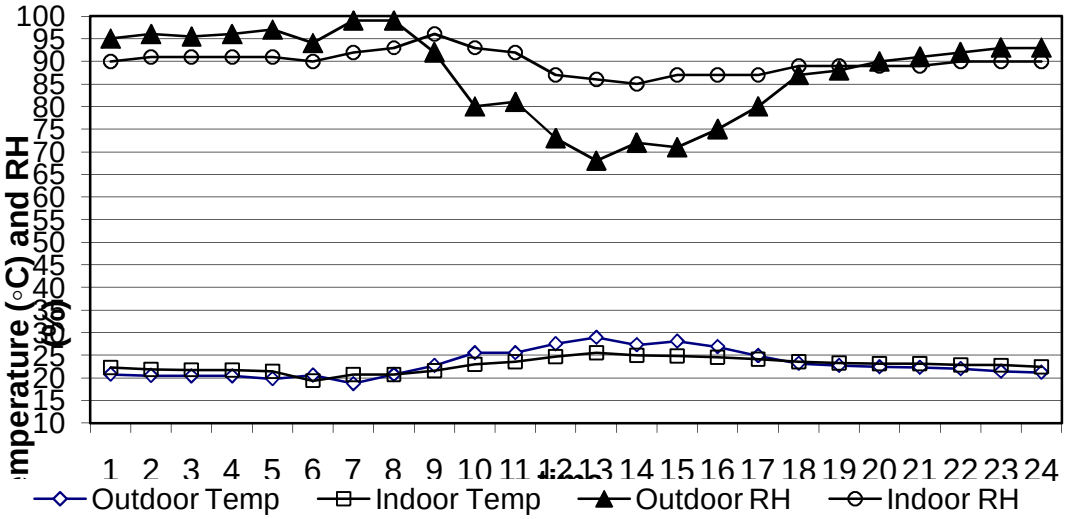

Fig. 4. Comparison of internal-external temperature and
relative humidity at 0.9 m height from floor level – 14 to 15 April 2010 at Wogo Vernacular House

The indoor temperature showed higher value during night time, while lower value during daytime compared to the outdoor temperature. The review of maximum and minimum temperature data on each day indicated that the air temperature vary little between the day and night. The comparatively smaller temperature differences indicate that building envelope can cool down sufficiently in the day and warm up in the night therefore the responsive wall constructions are recommended. Both relative humidities indicated a higher value compared to outdoor and indoor in the night. During the daytime the indoor relative humidity measured higher temperature than the outdoor. The maximum relative humidity was indicated at 07:00h and 08:00h on respective days. However, the maximum indoor relative humidity was measured at 09:00h on both days. This means the indoor relative humidity

measured high over 80% of hours within a day. This indicates that the iradiating temperature from the wall surface not influence on the indor humidity especially during the daytime. The use of bamboo as wall element had more effect on reducing the heat transfer from outside to inside during daytime compared to timber pairs. The elevated floor reduced the heat gains from the ground surface to the interior during daytime. However, the stored heat from the floor influenced the indoor air temperature to be higher than the outdoor air temperature during the night time.

IV. DESIGN IMPROVEMENTS IN CONTEMPORARY CONTEXT

Increased awareness of improvement possibilities must be the first step to create a climate for changes in design and construction. This awareness must not cause distrust of unknown technology. New strategies should be restricted to local ways of building to avoid cost problems, cultural rejection and therefore quick abandonment of new positive elements. This is especially true with regard to basic construction techniques, wall material, plan configuration and aesthetic elements. The local construction techniques are positive in relation to thermal comfort, since they are based on the use of materials with adequate thermal resistance. Positive design elements such as verandahs and large overhangs should be favored. Here verandahs should be encouraged. Verandahs, as positive shading elements, are only useful when added to house designs of adequate size, to avoid the incorporation of the outdoor space into the interior functional area. Increased awareness of the importance of vegetation in relation to thermal comfort should be part of the design recommendation as a whole. The positive influence of landscaping must be stressed in the self-building environment. Grassed areas promote evaporation and absorption of solar radiation. Construction detailing of the houses must concentrate on the conscious introduction of cross-ventilation into the design. Small, but shaded, openings on all sides of a room should be used when possible, with good control over the solar shaded mechanisms. The lack of control will interfere with privacy and cause discomfort on infrequent cold occasions. Construction detailing of this feature must include security needs and avoid animal access to the space between roof and ceiling.

One of the design problems of recent houses is embodied in the space formation which neglects the environmental conditions. In fact, the reinforced concrete structures reflect the general design approach in terms of the unawareness of material characteristics and the inappropriate solutions of materials in general. The interactions between the building materials and the climatic constraints are not properly interpreted. Together with correct precautions such as additional insulation materials and necessary constructional decisions, the climatic response of the new materials can be improved in comparison with the current ones. Additionally, the local traditional materials, such as bamboo, can be developed and adapted for today's conditions by considering their sustainable features. Today's modern building materials and techniques are being used in new architectural practices with the eclectic compositional character of past images. The consequent image conveys the ambiguity of the formal expressions. Series of reinforced concrete arches with different styles and dimensions are commonly observed in the modern built environments of Flores island. The buildings have to be designed according to the nature of the building materials for reflecting the structural honesty. At this point, the role of architecture can be emphasized in terms of providing livable and peaceful habitats. Proposing new buildings that are in harmony with the existing environment is as important as the rehabilitation of the old fabric.

V. CONCLUSION

It can be shown that a specific vernacular architecture exists in Flores, Indonesia. This style is an evolution of the vernacular Indonesian house. Climate appropriateness is a strong feature of the local settlement, although the vernacular house has a number of positive elements.The new vernacular is proliferating around growing settlement with varying degrees of satisfaction due to thermal comfort conditions. Simple design strategies can, however, improve the houses of the rural tropical settlement. Design elements and methods are shown which respect local habits and references. The aim of the study is to assess the tropical responsive design approach for comfortable vernacular house in Wogo house with the actual data on a selected date. The Wogo House is within the comfort range during night time when the external environment is cooler. During the day time, efficiency of the wall and louvered bamboo panels are high in order to reduce the indoor air temperature in the day and to increase air temperature in the night. Louvered bamboo panels provide required night ventilation to

bring the temperature within comfort range at night. The elevated floor reduced the heat gains from the floor surface to the interior during daytime. However, the stored heat from the wall and floor influenced the indoor air temperature to be higher than the external air temperature during the night time. The heat gain from the wall surface especially bamboo material enabled to maintain the internal temperature within the comfort temperatures.

The responsibility of designers is to find the ways of analyzing and interpreting the Wogo house for the continuity of the tried, developed and evolved design principals in the Indonesia vernacular architecture. Hence, climatically responsive and environmentally sensitive can be created. Instead of merely copying the vernacular architectural elements without questioning the concept behind them, the new designs have to surpass the existing ones in the light of a new understanding. The re-interpretation and re-use of shared images and values can transfer the regular houses to Indonesian vernacular house.

VI. ACKNOWLEDGEMENT

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3.1.18
PACITAN: CITY WITHOUT LOCAL WISDOM FOR TSUNAMI HAZARD

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ABSTRACT

Pacitan city, one of the regions residing of south Java. This location meeting of Indo-Australia plate with Eurasia plate and if these plates are colliding head on, it will generate tsunami wave. This existing condition hence needed a study to know vulnerable level of south Java regional to tsunami disaster. This research focused by city vulnerable level of tsunami disaster in Pacitan, especially to settlement area, patterns of tsunami coverage, and analysis the morphology of settlement in coastal area. The whole result of this research about Strategy on housing and settlement land use planning for assessment impact of tsunami in Pacitan become a recommendation of settlement plan in coastal area, about housing and re-settlement pattern and as reference to other coastal area which has similar physical condition and character that have potency to hit by tsunami wave.

Keywords*: Tsunami, settlement, disaster, computerize*

I. INTRODUCTION

Indonesia, a country which is laid on the across of two oceans as Indian and Pacific, and two continent plates – Eurasia and Indo-Australia, also become meeting-point of the two world's volcano lines. Those geographic brings thankful of great natural richness, as gratefully by the richness of natural blessings, the Indonesian also face the large number of natural hazards; tsunamis, volcano's eruptions, earthquakes, landslides, etc.

With this condition, studied by urban planning strategy of coastal area on Pacitan city related of mitigation aspect to tsunami wave, that is by creating simple simulation to know high risk area and safety area of disaster impact, database of existing road to make a map of band evacuate to go to disaster safety area, and other technical approach which assumed to need like planting of coastal edge, develop of coastal edge building, etcetera.

1.1 Characteristics of Pacitan

Pacitan was a District in East Java Province, in front of south Java Sea with high intensity of volcano and earthquake activity. Good place for urban housing and settlement the other side this condition bring Pacitan in high risk damage if tsunami wave attack this city.

Density of people that stay in this city around 852 people/km^2, high people density in Baleharjo and Arjowinangun more than 3,200 people/km^2 but low density in other villages such as Kembang, Sedeng, Banjarsari, Sambong, Ponggok, and Tambakrejo under 500 people/ km^2.

If compared between existing land use and land use plan in Pacitan, almost land in front of beach dominate for yellow uses or as housing and settlement area. These policies about land use plan make this city as potential damage area and the local government should have some legal aspect treatments to build a house in beach side and nearest area with seaside especially for housing and settlement area.

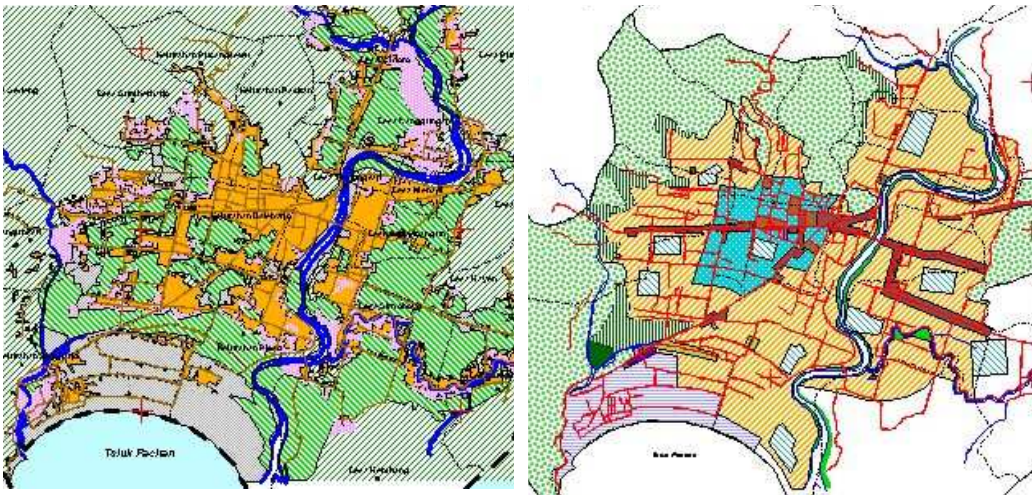


Figure. 1. Land use and land use plan

Source: RDTRK Pacitan City 2002 - 2012

1.3 Prediction of Tsunami

Pacitan city which position is seaside with Java south coast of is including town with high risk of damages by worst disaster impact. If south of Java sea go up although only 8 meters of sea surface, half of town of Pacitan will be covered by sea water, so that require to plan settlement of coastal areas, specially in district of Pacitan.

Figure. 2. Earthquake histories nearest Pacitan

Earthquake history in coastal area of Pacitan was happen in 1818, 1840, 1859, 1883, 1904, 1921, 1925, 1957, 1994 and 2006 (Ardiansyah, 2006), source of earthquake from Indo-Australia tectonic

plate activity, which means frequently of earthquake around 20 years and figure 3 above shown an earthquake history activity nearest Pacitan.

1.4 Strategy for a Tsunami-Proof City

a. Tsunami Prevention Plan for Pacitan

Tsunami disaster prevention plan for Pacitan start work a step by step research story, like a time line on a movie track. First stage, all about identification; land use, soil investigation, vegetation coverage area, settlement, road and accessibility, public facility, etcetera.

Every variable in first stage equal a single study object, after identify all of research variable, and continue to second stage in analysis. Fig 4 Shown a diagram process of whole research program for tsunami disaster prevention plan on Pacitan city; start from identification, analysis, research result and finally to create some recommendation for Master Plan of Pacitan Disaster Prevention.

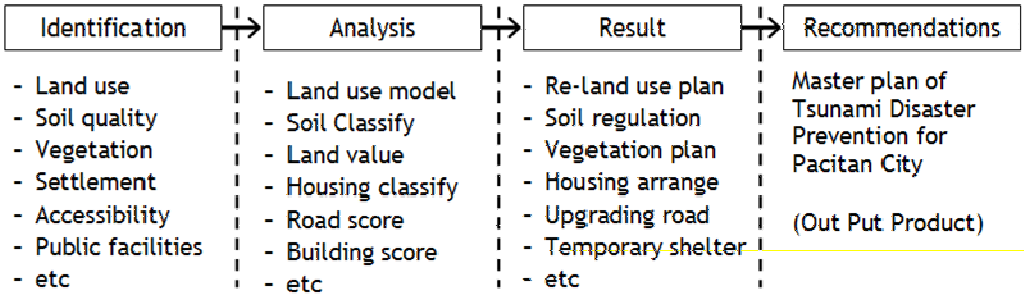


Figure. 3. Diagram for tsunami prevention plan

II. METHODOLOGY

This paper was a report result for informal settlement as basic development for housing improvement using parametric computational tools for sustainability city planning in Pacitan city region. People character, government policy, and settlement pattern as variable of this study.

Possibility of the inundation areas will spread to landward deeply because of Pacitan topography. Vulnerable level base on topography; elevation 6 m, 10 m and 12 m, in this paper, risk of damage concentrate on 6.00 m elevation.

2.1 Data Utilized

This study relies primarily on two sets of survey data, a brief overview of each part of data set follows.

2.2 Questionnaire

When conducted on March – June 2010, 235 people as respondent from four villages (Sukoharjo, Ploso, Kembang and Baleharjo), geographical scope in Pacitan city especially on coastal area.

2.3 Site survey

Housing and settlement on coastal area of Pacitan city, using digital camera that integrated with GPS to know building position (coordinate) on earth, and verified topography data with government land use plan in Pacitan.

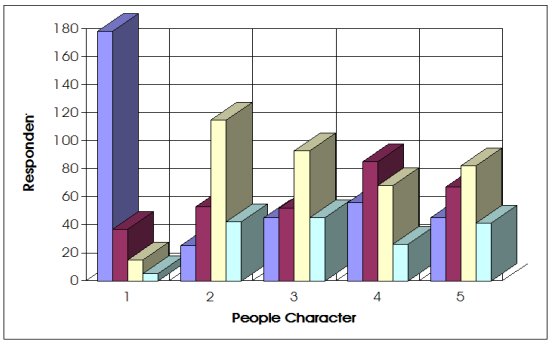
III. PROCESS OF ANALYSIS

The analysis was performed in two stages, namely spatial analysis and analysis of results questioner. Spatial analysis of residential areas to produce tsunami inundation based on elevation, and to analyze the public facilities are safe from tsunami wave. Output of the spatial analysis was to create spatial map of inundation area and disaster safety zone.

The results of questioner analysis to know character of people that living in tsunami-prone areas based on housing conditions, building age, length of stay and level of social economic and cultural. The correlation between level of education and knowledge about the tsunami is needed to formulate an appropriate way to disseminate the earthquake and tsunami hazards, while for the condition of houses conducted to determine the level of vulnerability of homes and settlements to disasters, while for the purposes of the accessibility of the areas prone to the area safe to do by comparisons between the questioner results and spatial analysis especially on housing and settlement area.

3.1 People Character

The results of questioner recaps show that public education in the survey areas are dominated by a population with high school education level or equivalent of 48.9% with incomes of less than 2 million rupiahs per month amounting to 36.2%.



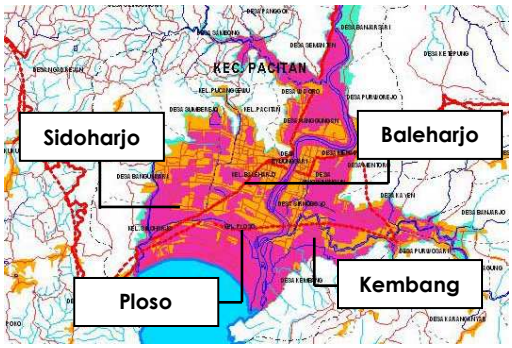
Information:
1. Ethnic
2. Education
3. Occupation
4. Salary
5. House age

Figure. 4. People character base on social and cultural

The choice of each variable in questioner to know people character; Ethnic (Java, Madura, Sumatra, China), Education (primary school, junior high school, senior high school, higher education), occupation (government employees, merchant, businessman, employee), salary (Rp <500 thousand, Rp 1 million, Rp 2 millions, > Rp 2 millions) and house age (>50 years, 35 years, 20 years, <15 years).

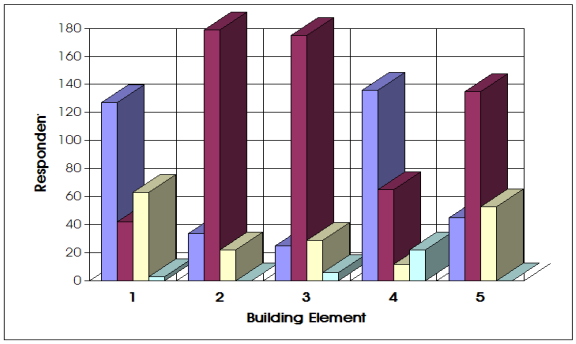
3.2 House Character

From all of village on coastal area, we found that Baleharjo village have greatest density with minimum amount of house if compared with other villages and for structure and building construction, 54% foundation by brick, slof for wall structure 76.2%, column material using brick 74.5%, 57.9% wall material using brick, 27.7% half brick and half woods or bamboo, and for last result for housing quality; 19.1% permanent, 57.4% semi permanent and 22.6% non permanent, all shown on figure 5 and figure 6 below.



	Sidoharjo	Baleharjo	Ploso	Kembang
Population	5221	3291	6033	2047
Density	625	3428	1648	435
House	1044	658	1207	409
Respondent	65	60	70	40
Permanent	14	15	9	7
Semi Permnt	39	28	46	23
Non Permnt	12	17	15	10

Figure. 5. Respondents, villages, density and typical of house



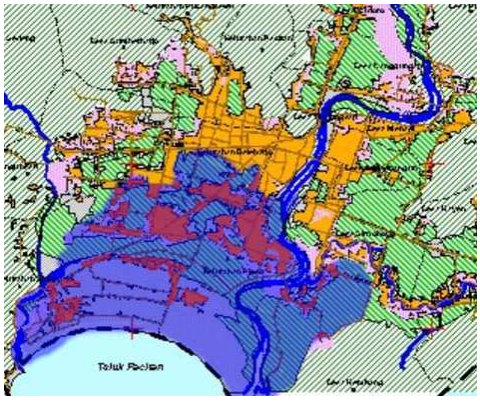
Information:
1. Foundation
2. Slof for wall
3. Column
4. Wall
5. House type

Figure. 6. Building character and structure elements

Figure. 7. Typology of house in Pacitan; non permanent, semi permanent, and permanent

3.3 Settlement Pattern

Assumed that around 5.4 km^2 of 10.8 km^2 of resident areas in Pacitan city are inundated, and around 76% of them are inundated more than 1 meter water depth. It is because resident areas are mainly located on the low land area in Pacitan city. (Sutikno, 2010)



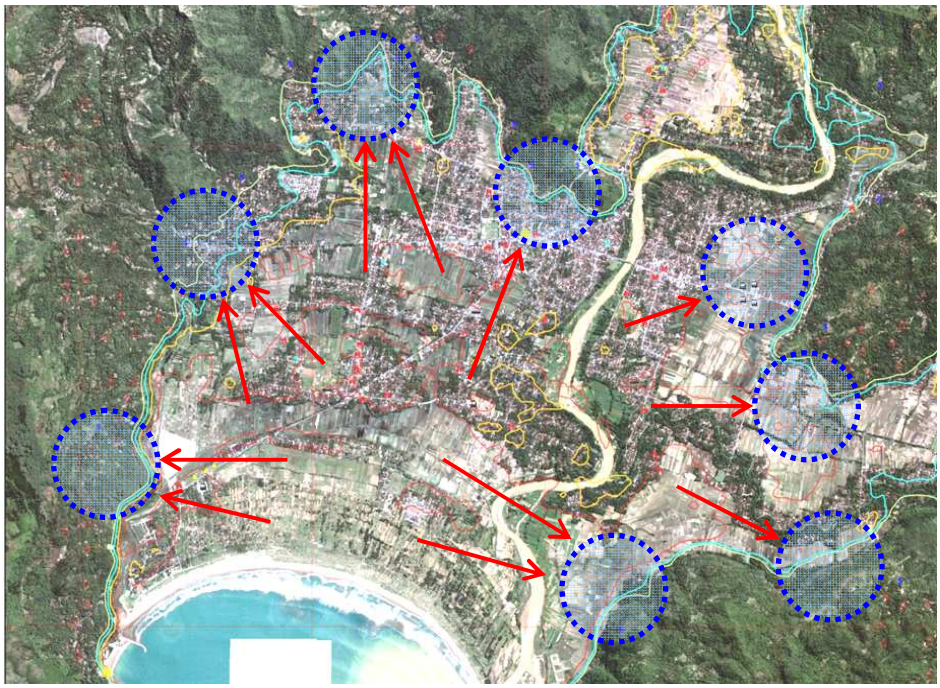
	Sidoharjo	Baleharjo	Ploso	Kembang
Inundated (%)	64.33%	81.62%	100.00%	19.21%
Inundated Area (km^2)	5.378	0.784	3.660	0.905
Resident Area (%)	89.23%	84.55%	76.16%	78.32%
Accessibility	83%	72%	100%	78%

Figure. 8. Inundated and resident area base on elevation 6.00 m

Figure 8 above show that half of city covered by water base on 6.00 meter elevation, more than 75% coastal area covered and around 80% area lost from accessibility. Possibility for evacuate by permanent shelter, temporal shelter and evacuate zone. Necessary to collecting street and accessibility data, this part needed to design accessibility from high density living at beach side area to save area from tsunami wave coverage.

Figure. 9. Possibility of temporary shelter

Three kind of safety zone in disaster prevention plan for Pacitan; (i) permanent shelter, (ii) temporary shelter and (iii) evacuate zone. Permanent shelters build as new building will be located near people concentrate so that people in the area wherever they may be living can sheltered themselves and safe from tsunami wave, temporary shelter was existing building in the city but still possible and strong enough to accept number of people in it and evacuate zone was a field and outdoor area with the maximum numbers of refugees each open shelter could accept. Figure 9 above is a building that can be used as temporary shelters such as house with two levels floor, schools, government buildings, mosques, and many more, but that building must be considered in the strength of the building to accept the burden as a shelter.
Figure 10 below shows that the most rational safe zones based on topography, so that much needed temporary shelters nearest with settlements, especially with high density.



3.4 Government Policy

This figure below shown existing condition of land use on Pacitan in 2003, in this urban and detail planning product show that settlement area concentrate beside the street of Pacitan city. Public facilities concentrate at central of the city and there was no mitigation act on this urban and detail planning product

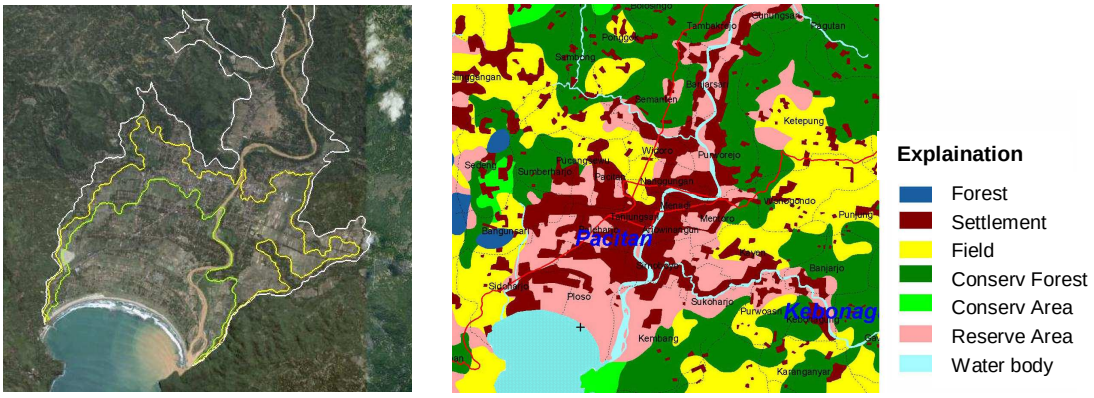


Figure. 11. Between topography and Pacitan city spatial pattern
Source: RTRW Pacitan District 2006 - 2025

If we compare between land use in 2003 and land use plan of Pacitan 2003-2013 (Figure 1), the scenario of housing and settlement area concentrate on flat area. That means beach side as coastal area will use for housing and settlement development plan. Trend to using beach side area as settlement area were not happened and people still concentrate build their house and other building at central of the city. This is an opportunity and a chance to re-plan Pacitan city base on tsunami mitigation and prevention, and government policy should follow the result of disaster preventive research for better concept in planning of settlement area and other building plan area

3.5 Philosophy of Disaster Prevention

Nowadays most cities continue to change in some aspect or other without stopping at any stage of growth. As the planning of cities, has paid little attention to the long-term preventive mechanisms for urban disasters, they have turned out to be filled with many disastrous factors and will not get rid of them unless efforts are taken to re-construct using new concepts of city planning. Since the term *"city planning"* was first introduced in tsunami research, it has been considered to be a useful tool to produce a maximum effect in a confined urban area planning. But many lessons obtained through repeated urban disasters and ruin taught us that a city needs a sort of room put aside for easiness, comfort, and soundness. As city problems became more complex and multifarious, city planning turned out to need the help of new adjacent concepts and urban strategies.

Among urban issues city planning must deal with are, for example, environmental pollution, urban disasters caused by nature or people, and so on. One of them is what we call disaster prevention city planning, a city planning for the prevention of urban disasters, in this case especially these brought about possibility of tsunami wave by frequent of earthquakes. To make a city safe from natural calamities and any urban disasters, we need comprehensive and systematic city planning that includes the fundamental reconstruction of urban structure and function (still possible?). The method of the reconstruction may have two aspects – long-term construction of a disaster-proof city, and comparatively short-term re-land use planning of the existing city condition. But these cases are not enough to prevent the spread of area in the city. If we choose to survive tsunami disasters we must tackle large-scale wide-spread area plan, which will finally lead to city-wide reconstruction. We must fight our way to the construction of the comfortable and safe city, not only by planning on the monitor screen or using useless urban planning product but by act, step by step start from our children, formal education, informal education, and others.

3.6 Model of the Disaster Prevention Plan

Create a model of disaster prevention plan we should have support from local government. This support need for every stage and phase of research; collecting data, interview, socialization, internal meeting, data analysis, coordinative, disaster game, evaluation of mitigation program, and other activity in research.

First stage of the whole research were to create a model of city disaster prevention plan for Pacitan and for other places that similarly physic character condition like Pacitan as coastal area in south Java seaside. After all of first stage, we will continue this research to make a city with disaster proof system, especially from tsunami and earthquake.

After an analysis of recent data in Pacitan City, particularly in preparedness against of tsunami disaster, there are some things that need to be done to establish a model of disaster prevention plan, the readiness of infrastructure (roads, clean water and temporary shelter) and Pacitan city needed a lot of improvements so having the ability to survive the disaster, and of course from one city to another city have a different technical approach in making models of the disaster prevention plan, because the end goal is not just about the plan but the implementation plan as rational guide and acceptable for.

3.7 Local wisdom as preparedness knowledge

Local wisdom is the knowledge that discovered or acquired by local people through the accumulation of experiences in trials and integrated with the understanding of surrounding nature and culture.

Good commitment very useful for forming good preparation. The preparation contains risk assessment and risk mitigation / risk management. Kates and Kasperson (1983) on Smith (1996) had comprised the three steps of risk assessment: An identification of hazards likely to result in disasters; what hazardous events may occur? An estimation of the risks of such events; what is the probability of each event? An evaluation of the social consequences of the derived risk; what is the loss created by each event?
Risk assessment and risk perception combine in the managerial adjustments made by society to environmental hazards (Smith, 1996:71).

To create a model of the disaster prevention plan for Pacitan, technical parameters required, such as roads, houses, shelters and many more, but to create local wisdom approach the role of society become dominant. Based on analysis of questionnaire data showed that the level of education, employment and income has a linear correlation to the knowledge of the tsunami disaster, Pacitan already often get information dissemination about the tsunami but Pacitan communities vulnerable to disaster preparedness very far from the expected. If the people must run to the hilly region, access to and from the hilly region was minimal even, slick, and rough, temporary shelters yet (not even) have a marker or signage as a shelter, bad accessibility and others.

IV. CONCLUSION

Disaster mitigation and preparedness not only talking about every single of house but environment system, culture, economic, infrastructure, public facilities, before disaster and or after disaster, so that a thorough research on all variables related to disaster prevention plan can not be negotiable.

Pacitan is a city that potentially affected by the tsunami with the worst damage, that’s why technically readiness of the city should be prepared early. The other side, non-technical approach to people upgrading skills through education can be initiated through an early education at school, using simple media like comic, movie and others.

Preliminary results of respondent from four villages in Pacitan show that communities of Pacitan have not enough preparedness of tsunami disaster. That needs maximize efforts of local governments, communities, researchers and all elements to create Pacitan city have the great ability, at any time whenever the tsunami attack.

V. ACKNOWLEDGEMENTS

We would like to thank to Housing and Settlement Laboratory, University of Brawijaya, Malang, Indonesia for technical support in this research.

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3.1.19
SPATIAL PERCEPTION STRATEGY IN ORIENTATION DESIGN
How the Environment Create Harmony Between Human Made and Nature to Help People to Orientate

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ABTRACT

Space perception means awareness of depth and distance, and relations to the object around us. The human being has perception to recognize, accept, learn and do the act according to movement, and to do the action that information and signage system guides and proposes the human being to do the action.

Designing space has to consider human perception of space,human perception of information system in space. Information and signage system give instructions for people to behave.
The signage system will work if human beings who use it as guidance have the same perception to fulfill the sign's goal. In other side, some buildings have identity as signage system to guide and to give instruction to people who inside the building behave as they should do, for example in a church, no sign inside tells anybody not to eat or drink beer, or in another building, people could recognize which of the several entrances is the main entrance, and how to react, without any sign. In this case the human being has experience or cultural knowledge which guides him to act and to behave.

This study analyses the connection of human perception, space perception, with signage systems for designing space according how design could successful give people information. The knowledge is developed by observing and analyzing determinant factors, which develop the information system factor in space designing. The study proposed to develop a concept of designing information of the space. The design of space will consider to spatial human perception of signage system. The focus of the study is the way finding design, movement and behavior as a tool to measure the interpretation of human perception to the signage system, in the selected location or place, which represents the complicated signage system.

I. SPACE ORIENTATION

The perception of information refers to the brain organizing and interpreting sensory information. Until fairly recently, perception was considered by the school of psychology called behaviorism to be largely a passive and inevitable response to stimuli.
Today's cognitive scientists, however, explain perception as an active process in which the brain treats external stimuli as raw material to be shaped, aided by our experience. Perceptions are shaped by three sets of influences: the physical characteristics of the stimuli, the relation of the stimuli to their surroundings, and conditions within the individual. While the first two sets of influences are both related to stimuli, the last set of influences is the only reason that makes perception a personal trait. Factors that influence this frame of reference include learning experiences, attitude, personality, and self-image. Zaltman and Wallendorf found that there is a large body of literature on perception discussing how people's perceptions are influenced by various factors. These factors are people's moods or frames of mind, their physical abilities to experience sensation, their personalities and motivations, the social and physical context in which they perceive things, the social and physical context of the stimuli being perceived, and the physical composition of the stimuli.

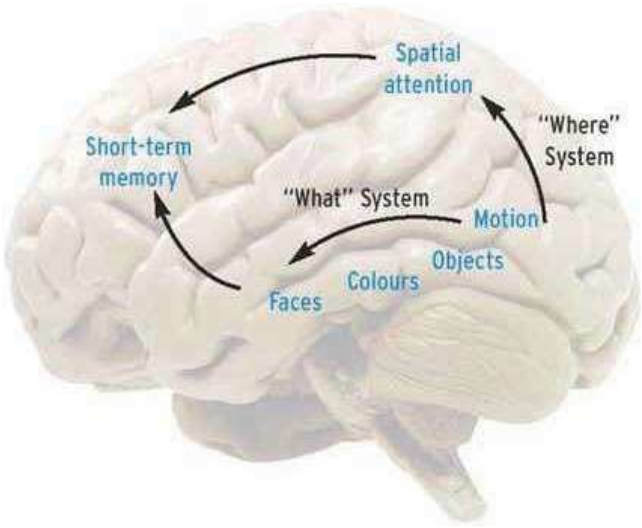

Figure 1. The brain will process all information which received from the surrounding

Perception is something that must be learned. As we recognize things in our environment we gather experience and this experience in turn colours our perception. Our perception of objects depends on our prior experience with them. Expertise sharpens our ability to notice details. The more we learn about objects and the more familiar they become, the more details we recognize.

Thus, we continue to make generalizations, but these generalizations get better and more accurate all the time. The human being has perception about depth and distance, this is important for movement and orientation in the environment. It is space perception. The human being has awareness of the relative positions of their own bodies and objects around them. They will recognize, learn and achieve the goal which is pursued by the system that works as information. Information such as maps, graphics, texts, or signs will guide the human being to do the action.

The signage systems are visually oriented information systems, consisting of signs, maps,arrows, colour coding systems, pictograms and different typographic elements. Signage systems differ from other methods of information presentation because they are typically used to guide people‘s passage through the physical world; road signs on a highway, station identification signs in a subway and overhead signs in an airport are all common examples of signage systems. The act of following a signage system is known as way finding, way signing or signposting. (Wikipedia)

The space as spatial space which is intervened by signage system, will guide people to have particular behavior about spatial. A signage system will construct human spatial behavior and human perception about space and signage will influence the designing space and designing information. A signage system influences human perception to behave and interact with space or environment.

Space is the boundless, three-dimensional extent in which objects and events occur and have relative position and direction. Familiarization, with and adaptation to a situation or environment;

In psychology it means awareness of one‘s environment as to time, space, objects, and persons. To orientate is a period or process of introduction and adjustment To understand space in term of spatial perception will be explained more easily in psychology than understood in physical term. Psychological references to define space are used by architect or designer to give effect of spatial feeling and psycho logics experience for the user.

The concept that space can have a quality other than emptiness is difficult to grasp. When a building is entered, floor, supports, walls, and a ceiling are seen, all of which can be studied

and perhaps enjoyed, while the space, in the sense that one is accustomed to think of it, is void: the absence of mass, filled by air. Space will be “translated” in design as an empty space
which makes the whole space having meaning. Space understanding in terms of understanding space in physical meaning could be found by humans in consciousness of perception. Humans can percept spatial environment and detect also assume the space element. The space element which is human could percept directly to measure the distance with reckon, understand and recognize the changing of environment, also recognize and realize the differences of environment and space.

The change of the environment surroundings refers to an orientation decision to reach a certain goal or certain place. For example, someone who is in a totally new environment had no clue of the place before, and without any knowledge or experience to find or to go to another place. He or she will try to combine or to bind together all the information as seen in the first time.

The brain will collect and sort the information which could be used for recognition and helps to make decision about orientation. Information which have been collected could be information in visual object. Information on visual objects in physics can be seen, touched, graped, and constituted in signs, symbols, maps, and names of places. The other information is physically only recognized by feeling, heard, and smells. For example the sound of cars, trains, beach, people speaking or even a bird could be the first information to have orientation.

The sound of vehicles indicate there close to the place might be a road. And the intensity of sound could indicate the size of road,which could be imagined. The wind, sun, and stars direction could be used to recognize and to decide an orientation in any place. The smell of delicious baked bread could be a “sign” there is a bakery shop or a home which gives a clue to orientate.

The other information is psychological feeling of the consciousness of being in certain environment in psychological. Conscious psychology could be a feeling of scariness, frightening, crowded, emphasized, free, narrow, wide, extensive, far away, and near.

Psychology consciously processed by the brain in based on the information which was felt at the same time. The feels is adaptation the surroundings become an impulse for the brain to analyst about the orientation on space. The other impulse process by the brain includes information that has been seen by the eyes.

The information could be colour, textures and shapes of objects around. The brain will process all information with filtering, arranging, put in order, classifying, categorizing information in preference and similarity. To explain the categorize in preference and similarity in orientation will seems clear in the example how to find a certain brand of milk in supermarket. Every product has been ordered and classified in similarity and preference of the type and kind of product. The order of products in the supermarket make the user easily get what he or she wants, because the order guides him or her to make orientation to find it.
The changed environment surroundings as consciousness influence by human capability to percept the psychological impulse as information and apply it to orientate the space. The psychology impulse for example could be captured by the eyes in colour, shape of space, and texture of space. Colour, shape and texture are visual objects which influence the psychology of spatial perception.

Perception of visualization are figured in object or situation and condition of space. The object to percept the space visually could be a building, landmark, or nature object. Building with its character or different from another buildings could be used as a sign to orientate. For example even the complex of building has the same shape, and there is one building in pink when the other buildings are Grey , it is made different, looks special, and is easily to recognized and to remembered as reference to orientate.

A building or even a house could be used as visual sign because it has a unique , different, and special in character and looks different and protruding in its environment. Landmarks could be a monument,

historic building or a park which everybody knows about it. Known nature objects as visual sign could be a valley, hills, rocks, rivers, and lakes in their environment.

The entire visual object is already known as sign to have orientation in place for every body, even he or she never has been there before. With experience and knowledge humans could easily find orientation in reading a map, as cognitive skills.

Orientation in space is fundamental for all humans and most animals. Accomplishing goals often requires moving through environmental spaces such as forests, houses, or cities. Several mechanisms have been evolved in order to solve these orientation problems, including spatial updating, route navigation, and reorientation by landmarks and geometry. Human orientation capabilities are built upon these and other fundamental mechanisms.

Compared to non-human animals, humans demonstrate a greater flexibility during orientation tasks. They are able to apply various strategies to fulfill one orientation goal, such as navigating to a known location.

To make an orientation, we recognize our positions. First, positions can have an appearance that makes them recognizable by difference, nature or design. Second by, positions can be relative, recognizable due to their surroundings. Third by, positions can be labeled with identification signs. Positions can also be recognized by global positioning.

II. INFORMATION AND PERCEPTION

Human understood the spatial perception because the function of all human senses perceiving information in living environment. The information which caught by eyes, hearing, smelling, taste and the important is tactile, collected and processed as a complete information. The information could showed to him the orientation where he is now.

Information which has been already received percept already as the processing in our brain works as representation to guide the action. In this stage, information is an object which already manipulated, processed, filtered as data to do certain particularly action. Information in its wide meaning could be in different kind and type of media, different aim and goal, and different restriction and rules.

Information in its wide meaning is contained in announcements, advertisements, signs, symbols, and other kinds of media. People in a very new environment will try to find information to know a precisely where they are and how to make orientation of the place and to decide where they want to go. Information will give data to the human brain to be processed, to be percept with the filter of knowledge, experiences, and somehow culture.

The same information could be percept in different ways by people with different background. Information which is designed to give the same perception is often designed as visual object.

Signage systems differ from other methods of information presentation because they are typically used to guide people‘s passage through the physical world; road signs on a highway, station identification signs in a subway and overhead signs in an airport are all common examples of signage systems. The act of following a signage system is known as way finding, way signing or signposting.

People who find themselves in unfamiliar environments need to know where they actually are in the complex, the layout of the complex, and the location of their destination in order to formulate their action plans. On the way to their chosen destinations, people are helped or hindered prior to their visit, the building‘s architecture and signage. The physical environment has a positive effect on how users perceive the way finding system, if it seems easy to use it or not.

Faulty sign design can cause navigation problems in unfamiliar environments. Some signs lack „conspicuous,“ or visibility, because lettering lacks legibility when viewed from a distance.

Others contain inaccurate, ambiguous or unfamiliar messages; many are obscured by obstructions or contain reflective surfaces, which hinder comprehension. Consequently, many people do not read signs--often it is easier to ask for directions.

Because way finding problems are not confined to signs alone, they typically cannot be solved by adding more signs. Instead, such problems can be unraveled by designing an environment
that identifies logical traffic patterns that enable people to move easily from one spot to another without confusion. Signs cannot be a panacea for poor architecture and illogical space planning.

2.1 Building‘s elements as way finding information

Way finding could be designed with the Principe of human perception. Human perception
is influenced by environment perception. The environment could be designed by set the space with colour, texture, and changed of space in its shape, distance, scale and with any other way of arranging lighting inside the room. The change of environment will influence the emotion and feeling of the user.

Way finding could be designed as unity with the existing objects, for example building or landmark. In architecture, buildings which is since first step of designing concept, will have
a certain function will have building characters, with accurate planning of the use of the rooms inside. With accurate planning of room, in some building does not need more sign, names or symbol for the explanation of function. Placement of the buildings elements will show directly and clearly how the building will function. It will show how it can accommodate the activities inside the building. The user of the building will easily find the way and will behave without need of explanation of sign.

The placement of buildings elements which shows how user could find easily where they want to go to some place and how to behave does not need additional signs. The example of placement of building element as a sign is placement of the main doors, except it has certain character to shows; the main door is the main entrance, the placement in right position of orientation, will explain more to the user. The other placement is placement of back door, public area and private area use the arrangement of rooms, hierarchy, and others building elements.

Design of way finding is related with connection to each rooms, each place, and connection of room in place with building and the environment. The connection inside building will be also connected with the city or even more with other city and district.

A building which is built with special characteristics could works as sign to show the way and to recognize some place. A building could be a landmark which makes it easier for people to

find the place, remember it, and to find the orientation. Except of building, another object for example a statue, monument, fountain, pond, plaza, park or even just the utility of city could
be a guidance to get the orientation.

As a guidance to find orientation, we need the whole figure of the place and surroundings. This figure of place will be needed to decide the position; where am I, and where will I go. In this case the direction, maps, and sign are connected each other. In some special condition, for example in a small city or a village which the inhabitant know each place they want to go, and the movement activities are not really complicated, then the direction sign and map are not really needed.

2.2 Human Perception to Space Orientation

Space is both that which brings us together and simultaneously that which separates us from each other. Space is the essential stuff of very fundamental and universal form of communication.

The human language of space, whilst it has its cultural variations, can be observed all over the world wherever and whenever people come together.
Architecture organizes and structures space for us, and its interiors and the objects enclosing and inhabiting its rooms and facilitate or inhibit our activities by the way they use this language.

Of course good architecture does not actually waste space, it is just often space is needed in order to prepare us for change of mood, to establish relationship, to separate activities, and to suggest or invite appropriate behavior.



The concept that space can have a quality other than emptiness is difficult to grasp.
But spatial experiences that express something are common to everyone, though they are not always consciously grasped. One feels insecure in a low cave or a narrow defile, exhilarated and powerful on a hilltop; these are psychological and motor reactions that result from measuring one's potential for movement against the surrounding spaces, and the same reactions take root even in language ("confining" circumstances and "elevating" experiences are spoken of).

As a person enters the architect's space he measures it in terms of the degree and the quality of his potential for movement. The concept of potentiality is important, first, because the observer can anticipate where he may move merely looking about him and, second, because he can conceive movements that he cannot execute.

Of course, one does not use his eyes alone to feel spatial quality, because only the simplest spaces—a cubic room, for example—can be wholly experienced from one standpoint. In a complex of spaces, the observer walks about, gaining new sensations, seeing new potentials
for movement at every step.

In order to understand our relationship with space, we first need to explore how we become aware of it. Primarily of course we see it, since it is largely evident to us visually. The processing of visual sensations into perceptions of the world around us involves a complex interaction of the eye and brain.

Our own characteristics are such that our visual sensations largely dominate our perceptions, since over two-third of the nerve fibers that enter our central nervous system are from eyes.

Space perceived through the sensation of sound, smell, and even touch. Perception is actually more than just sensation. Perception is an active process through which we make sense of the world around us. We integrated experience of all our sense without conscious analysis. There was an incongruity between perception and expectation based on memory.

The perception of space will be trained as experience, when we walk through the space, experienced with the distance, different expression of the space, Expression of space could be just the transition of room to another room, function to another function, activity to another activity.

The connection between different place considered on how the function served, the activities connection, how long and how far the distance between different and continuity for the activity. The circulation room as hall or alley designed to be efficient and not make people feel tired and bored.

People using the environment bring with them unique abilities, limitations, and memories about navigating which must be accommodated by any overall wayfinding strategy. The number of repeat visitors, sight and mobility limitations, emotional state of the user, and whether the facility is entirely new or a revision to an early facility all must be taken into account when developing a wayfinding plan. Special needs populations, cultural and ethnic minorities and the elderly all must be able to use the facility with a minimum of assistance.

III. CONCLUSION

The architecture which surrounds in the human space environment influences human thought, and how to behave in space. Understanding the relationship between the environment and human perception of spatial is important to design human space. Human brain not only to interpret certain spatial characteristics in certain ways, but also plays role in making decisions based on those interpretations. Architecture designed space and surrounding could be impact to perceive the world, and interact within.
The interaction, the behavior and the thought to the spatial perception are the result of the sense impulse as information which processing by the brain.

As architecture gains greater and greater flexibility, it will get better at providing for such variations in occupant needs. In addition, architecture's ability to coordinate with other surrounding elements, like nature, also makes architecture a wonderful way to feed the thoughts via human senses.

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3.1.20
SUSTAINABLE DESIGN AND CONSTRUCTION IN THE JAVANESE ARCHITECTURE CASE: KAMPONG LAWEYAN SURAKARTA

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ABSTRACT

The study tries to reveal the sustainable design and construction in the Javanese Architecture in which the space of the house are able to cater for the ever changing activities of the inhabitants, to include batik industry's activities.

The study is a very old traditional settlement of the batik industry called Kampong Laweyan located in the city of Surakarta, Central Java, Indonesia which started during the 19th Century.

The method used in the research is explorative and qualitative method. The changing use of space observed in the Javanese houses also includes houses of the batik industry workers.

The result shows that during the period of 1900-2007 the house spaces remain constant, while the activities of the dwellers changed, from household activities to home based batik industry's activities. The study shows that the design and construction in the Javanese Architecture can sustain.

***Keywords**: dynamic usage of space, houses, sustains, the Javanese Architecture.*

I. INTRODUCTION

Based on cultural history, Laweyan (Figure 1.1) was an oldest area than city of Surakarta which separated into the inner city and outer district. A sociologist, Soemardjan (1981) and an archeologist, Adrisijanti (2000), suggested that segregation based on to cosmological concept divided Surakarta to some conceptual spatiality, i.e. *nagarigung* (centre, inner city) and *mancanegara* (outer district). There are some heritage areas in *nagarigung* district for example: Kampong Kauman, and Kampong Laweyan. Kampong Laweyan has grown into a settlement of batik industry in the early 20th century. Kampung Laweyan, an ancient district in Surakarta, is well known for its home based batik industry. It is a heritage area with vernacular Javanese architecture. As a heritage settlement, the vernacular architecture within the settlement should be preserved. However the development programmes and the increasing needs of the settlement's dweller may affect the design of the Javanese houses.

In order to keep the Kampong Laweyan as a heritage area, special attention must be given to the approach to sustain the vernacular Javanese architecture.

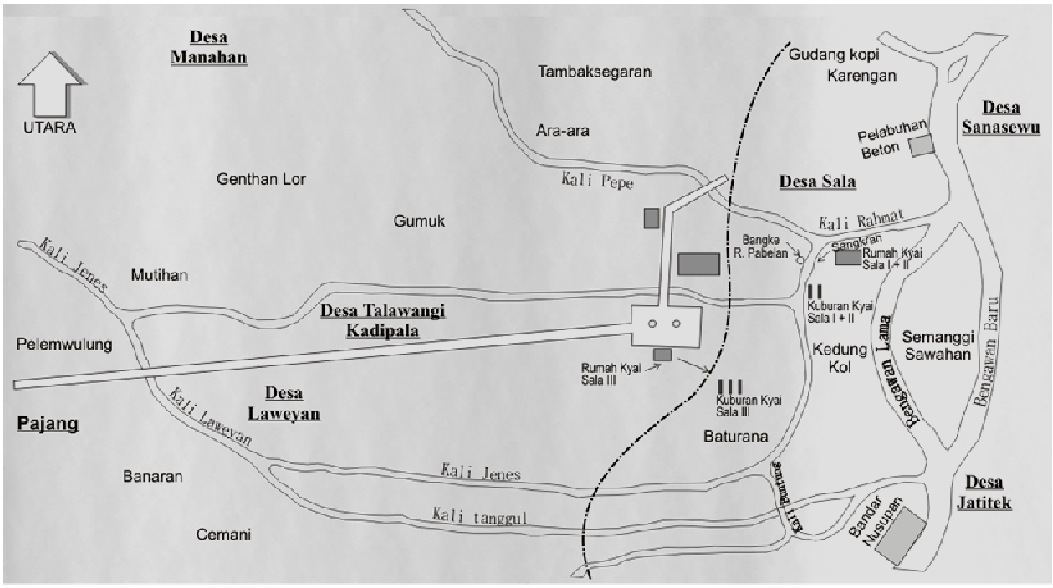

Figure 1.1 District of Laweyan in 1700s where Sala is located in Eastern
[Source: Redraw from Sajid (1984)]

II. THE JAVANESE HOUSE

Omah (house) is the most common of several Javanese words meaning house. The word *omah* symbolises a particular concept as well as the dwelling where, domestic practices mainly take place (Santosa, 2000). The *dalem* or noble's house is usually a complex of buildings which consists of two until four buildings and it is surrounded by a high wall. Each building has a different type of Javanese traditional architecture, i.e. *pendhapa, dalem, gandhok*, etc (Figure 1.2). Almost all of the *dalems* have a gate (or two gates), through which one passes to enter the *dalem*. The orientation of *dalem* is always north-south orientated. The users of *dalem* are usually the noble and his family, and also *abdi dalem* (servants) and his family. *Abdi dalem* usually lives in the *magersari*. The *magersari* is a symbiotic relationship of mutualism between the *abdi dalem* and the noble's family. The users of the *magersari* can be divided into two groups: the *abdi dalem* (noble's servants) families who live and work, and the noble's family whose members belong to the *priyayi* (the higher Javanese communities).

The Javanese houses as research samples are typological of Javanese house which refers to some of traditional manuscripts on the Javanese house (*Kawruh Griya, Kawruh Kalang*), i.e.: Javanese house is a house which consists of a specific expression or form, i.e.: *Joglo, Limasan, Kampung,* and *Mesjid* (Prawiro, 1969). The Javanese house is a large settlement and the houses are of wood's construction (Kridosasono, 1976). According to the Javanese house's theories mentioned above, it can be mentioned here that the Javanese house is a house (*omah*) which consists of *pendhapa* (front hall), *dalem* (main space, living room), and *gandhok* (extension building, attached/side pavilion). The Javanese house also has a specific roof typology such as *pelana* (*kampung*), *limasan*, *joglo*.

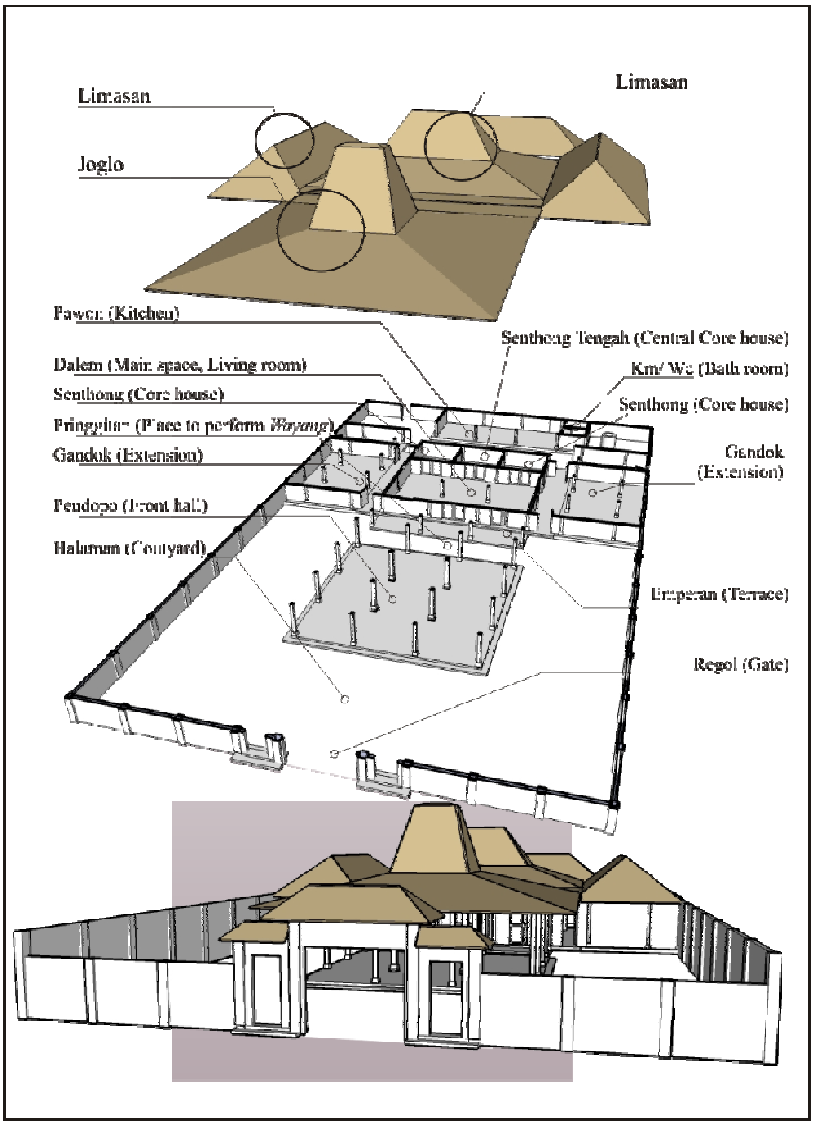

Figure 1.2 Basic Concept of Form and Spatial Pattern of the Javanese House

III. SUSTAINABLE DESIGN AND CONSTRUCTION

This study relate to analysis of sustainable design and construction context. Sustainable perspectives refer to how building can maintain. Architecture or built environment can be developed into dynamic ways: for both continuity and spatial arrangement changes.

IV. RESEARCH METHOD

The method used in the research is explorative and qualitative method. Firstly, the survey was conducted to investigate the Javanese houses. The Javanese houses as samples are chosen by purposive sampling. Looking at the domestic practices and batik industry over a substantial periode of time from 1900-2007, samples chosen are at least seventy five years old and have been inhabited at least by three generations, thus these houses have accommodated their inhabitants' entire life cycle. It is also considered that the originality of the Javanese house embodies cultural sensitiveness. The study is also investigated the continuity and change of space.

Twelve Javanese houses were chosen for case-study. The method used was deep-observation, and data gathering from a variety of the inhabitants' entire daily-life activity. For data cross-check and information, physical-traces and interviews with informants i.e. a person who has authority, were done.

V. SURVEY RESULTS

Kampung Laweyan inhabited by the batik producers and built during the 17th (Rajiman, 1984) is one of the heritage places in Central Java. The settlement pattern is unique with the historic mosque and Javanese architecture. The Settlement is bordered by a river and the pattern is a combination between linear and grid patterns. Most of the houses were built on north – south orientations. The Settlement supports the inhabitants in their everyday lives and economic activities as batik producers through generations. Hence Kampong Laweyan is a living heritage, where the authentic Javanese houses still exist. The dwellers sustain their traditions and the vernacular houses, and obtain their incomes by using the houses as a place for the batik industry.

Figure 1.3 shows the original plan of the Javanese house and Figure 1.4 shows the continuity and plan changes of the Javanese house. According to the dweller, the house was built in the 19th century. Since then the house was used for batik processing. Due to facilitate the need of batik's industry, the dweller re-arranged this house i.e. covering the *pendhapa* (front hall) with walls, and changing it into the batik showroom. The usage of *dalem* (main space, living room) is for batik packaging. The *gandhok* (extension building, attached/side pavilion) becomes the living room, bedroom, and office. Other building extensions at the right wing are for the garage, kitchen, dining room, and sleeping room.

Figure 1.6 and Figure 1.7 show the pictures of the house when the research was conducted from 2006-2008. From Figure 1.6 one can see that the house has a spacious front space, called "*pendhapa*" (front hall). This space and the front yard are usually used as a place for batik making activities done by the women. The inner of the house, called "*dalem*" can be used for the other batik craft activities and storing of the products. The everyday life activities are at the left wing of the house and have also been extended to the right wing of the house. The local wisdom such as the arrangement of the house spaces and the yards are still preserved, and proved to be very useful for home based industries and for everyday lives. This arrangement shows the changing of space at the dwelling level, but not at the block level.

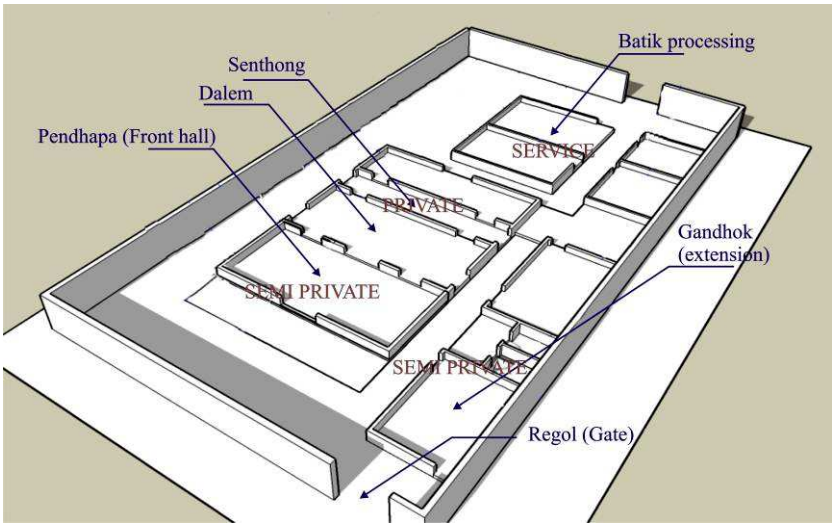

Figure 1.4 Sample [A] of the Javanese house: Original plan.

The figure shows that the semi private spaces are *regol* [gate], front yard, *pendhapa*. The private spaces are *dalem*, *senthong* and *gandhok*.

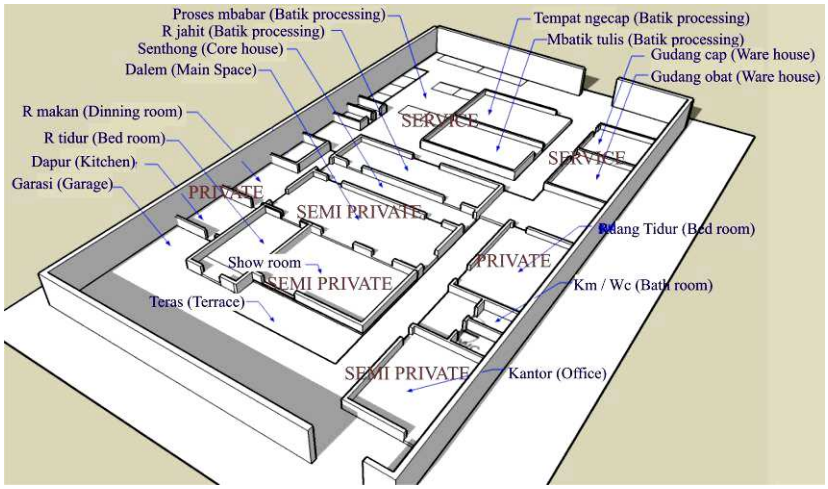

Figure 1.5 The Present Plan of sample [A] of the Javanese house.

The figure shows that the changes are *dalem* becomes semi private space because it is used as the showroom and batik packaging; and the *pendhapa*-the front hall for receiving guest now becomes the batik showroom. The stability is shown from the *senthong* as private space, and batik processing as the service area.

Figure 1.6 The picture of Javanese house showing the front yard and pendhapa
(As batik showroom)

Figure 1.7 The *Dalem* (main space, living room) as batik packing place and showroom.

Figure 1.8 shows the original plan of sample B and the changes in space usage can be seen in Figure 1.9. Basically the house has no significant change even though it must be divided for two families, due to the increasing number of families settled in it. The house divided by semi-a permanent wall (block-wood). At the present time, the batiks activity is not continued. Nowadays the dwellers only sell the batik but not produce it. Based on the dwellers information most of the houses are not utilized. All of the dwellers live in the *gandhok* (extension building, attached/side pavilion). For temporary (semi-permanent) activities, they use *pendhapa* and *dalem* for example: for marriage ceremonies, religious activities (*pengajian*) etc. Figure 1.10 and Figure 1.11 shows the *pendhapa* and the *dalem*. The dynamic usages of the spaces in the houses prove the Habraken (1976) theory that the Javanese house will be changed depending on how dwellers need to use it even though it has stable structure.

The "*pendhapa*" is usually open, without walls. However, due to some of the dwellers need places for storing, the "*pendhapa*" was then closed with a bamboo curtain. Most of the houses in Kampong Laweyan were built about 200 years ago, and were occupied by 3 or 4 generations. The houses can be seen as memories to the dwellers and also to the observers.

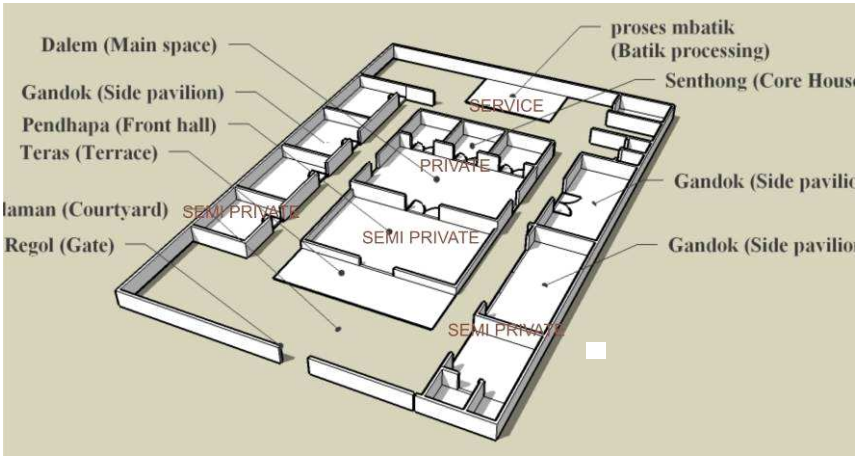

Figure 1.8 Sample [B] of the Javanese house: Original plan.

The figure shows that the semi private spaces are *regol* [gate], front yard, *gandhok* and *pendhapa*. The private spaces are *dalem*, and *senthong*.

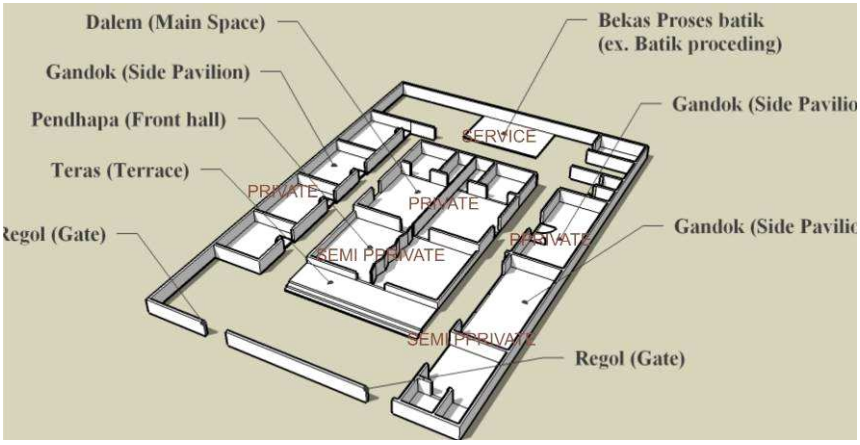

Figure 1.9 The present Plan of sample [B] of the Javanese house.

The figure shows that the changes are: the house is divided by two parts [see the wall in the middle]; regol [gate] become two gates; and batik processing [service area] unutilized. The stability is shown by *senthong* as private space, and *pendhapa* as semi private space.

Figure 1.10 The picture of Javanese house showing the front yard and *pendhapa* which is now covered with bamboo curtain.

Figure 1.11 The picture of Javanese house sample B showing the main space or living room (*dalem*)

5.1. Continuity and Change of Space Usage

The survey shows that batik productions in this locality have experienced changes from a house as a processing-place to both a processing-place and market-place. This change greatly shaped the way the batik marketing itself was conducted. In the past batiks were sold in the "*Klewer*" market (city textile-market of Surakarta). Today batiks are sold in the Javanese houses, particularly in the *pendhapa*; hence the *pendhapa* becomes the 'showroom'. On the other hand, temporary activities have been conducted in the *pendhapa*, such as wedding parties, *pengajian* (religious activities), communal meetings etc. Due to its need to accommodate the batik industry, the main house and the *dalem* is also arranged as the showroom, even though this room is meaningful for the inhabitants as their transcendental domain. The extension of the Javanese house is the *gandhok* (attached/side pavilion) which was used to facilitate daily activities in the past, is now changed as a place to print batiks. In contemporary usage, the Javanese house refers to a wide variety of modern life style.

As mentioned before, some of the Javanese houses in Kampong Laweyan have building extensions, called *gandhok* (attached/side pavilion), *lojen* (front attach pavilion), and *omah mburi* (back hall). Most of the extensions are used to facilitate the processing of batik.

a. Design and Construction Regulations

In order to adapt the changing uses of space, the Javanese house needs design and construction regulations. The Javanese house needs new regulations for building renovation, such as building coverage, building material, façade etc. The regulation should consist of detail arrangements for the interior such as doors, windows, tiles, and wall-colours. In exploring the spatial aspects of processing batik in the Javanese house, it can be concluded that future standards should consist of circulation (flow) standards, batik display arrangements, batik storage, and fitting-room.

VI. SUSTAINABLE DESIGN AND CONSTRUCTION IN THE JAVANESE ARCHITECTURE

The Javanese house should be maintained the spirit of rule of building construction (*kawruh kalang*). From the research, the writer explored the changing of space usage in the Javanese house. Then, the problem is how to educate the design principles of the Javanese houses with the dynamic use of space. Concerning the sustainable architecture, I recommended arranging a design guideline for inhabitants. Firstly, the design guideline should consist of the concept from both the traditional Javanese house and the contemporary Javanese house. Secondly, a comparison of a previous spatially used and a contemporary spatially used in Javanese house.

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3.1.21
THE SPIRIT OF REVITALIZATION VERNACULAR ARCHITECTURE: RESPONSE TO DECLINING ENVIRONMENTAL QUALITY

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ABSTRACT

The development of technology and building materials is very influential on environmental sustainability. The use of eco-friendly building materials alternatives is very urgent to meet the increasingly demand for housing in particular and urban facilities in general. Architects apology, they pressed and inevitable fabrication materials, because it was difficult to obtain organic materials in large quantities. The organic building materials such as bamboo, wood, stone, marble and even, can only fulfill its surrounding environment.

The spirit of moderation focus in the design architecture that is based on empowering possibilities of technology, local carpentry skills and natural materials to produce unique for each region. As efficiently and minimum possibilities in creating buildings, and avoid waste in many aspect and cost.
(1) The sense of belonging to the local culture, and social environment
(2) Using technology and local resources, and expression of craftsmanship
(3) Realizing that local nuances by a good design, technological, and cost-effectively.
The indigenous architecture and the new, modern architecture, is a series of cultural events. So, it is a new way of thinking to the new aesthetics and meaning.

***Key word**: frugal, sustainability, and local culture*

I. THE SPIRIT OF ARCHITECTURE TODAY

The practice of architectural design was released from progress in industrial technology. While the fabrication of the construction industry generated a lot of residues, waste, causing environmental not sustained anymore. The process of environmental degradation sometimes not so subtly detected, either on particular place and time, then will be effected in long-term consequences.

The propaganda of the use of metals, such as aluminum, fiberglass, asbestos, stereo foam, was mistake and misleading. The producers always say that the materials were not destroy the environment like forest or mountain and sea, and not spend a natural organic material, making the environment clean. The environment degradation very worst, because reclamation rare, not to say never. In many areas such as Sumatra, Papua, environmental damage is not offset by benefits to the surrounding community. Now, the exploring these material not only affects the damage of the environment, but even worse, to cause misunderstanding the problem of architectural design.

Many architects who apologies and argue, they driven to use material fabrication, because it was difficult to find organic materials in large quantities. The reason that organic building

materials, like bamboo, wood, stone and even local marble, can only fulfill its surrounding environment. With a loud they challenge that can not possibly create a new city, tall buildings, avant-garde architectural by using local building materials. No wonder the local construction materials end and finished. No place at all in the realm of architectural aesthetics. They necessarily believed that in global era spirit and universalism, architect not dwell on the local materials and locality only.

II. THE SPIRIT OF GUERILLA ARCHITECTURE

In Ubud, Bali and other tourist areas that rich natural and beautiful landscape, many foreign architects do the experiment architecture with local material and local wisdom. They try to understand the indigenous culture and the popular style, to response people taste. They designed by utilizing the excess-owned locus with specific, local, potential nature. And the amazing architectural design is born. The new order was proposed, which the local culture and local taste with novelty indigenous lifestyle. The range of distances between local culture and foreign architect culture causes them to look more charming than indigenous architect to understanding Bali culture. Not just a sense of Bali as a place to tour, but the further he felt Bali as a place to recognize the essence of our selfhood.

Alternatives architect, including humanist and artists, share about the importance of determining the future for this nation. They try to find a more appropriate way of looking at the culture that had been fashioned of old Indonesian people. There was importance on revitalization of traditional culture and local wisdom that has tested. Habits of local communities, and things of the past, local relics are starting point for the future. Revitalization of old buildings, as well as the reuse of old buildings, *lawasan*, on several successful projects is real image that we can see in many places.

But in many case it is not adequate yet. Still need alternative and ideas that can change the way of thinking in architecture design. Utilizing the junk of traditional house element, *lawasan*, using non-permanent building materials or simply semi-permanent building, is a not necessity be felt as a pain and compulsion. Architecture paradigm in this opinion is to use natural resources carefully, not excessive or sacrificing but agreed the standards.

The material utilization through recycling and reuse is still not enough feasible in the work of architecture. Walls should be made of brick or concrete blocks, floor tiles properly, the roofs made of tile or asbestos, window glass *Naco* at least, is still irreplaceable standard in architects and the public thought. Bus framework waste, scrap metal, is not yet properly used as a kind of caravan house. House made by cardboard or plastic is not popular. Waste treatment also has not been done on a large scale. And now the wood dust residue furniture easily found in every office and residence in cities.

III. THE SPIRIT OF *UGAHARI* ARCHITECTURE

Ugahari means frugal. Ugahari architecture spirit focused in the design based on the empowering possibilities of technology, the ability of local crafts and natural materials to produce unique for every place and region. As efficiently and as minimum as possible in realizing the building, and avoid waste in every aspect. The little is enough, to realize a lot of demands by a little physical form.

(1) Sense of belonging to the local culture and contemporaneity, necessarily sharpen the focus of the design to the needs of site and social environment

(2) Using technology and local resources, avoid replica by presenting a typical expression of skilled artisans
(3) To realize the design of nuance localities both in the formation, technology, and cost-effective in providing excellent service.

This concept is a backed of international phenomenon movement. It is not about globalization problem solving because it does not present the only single method for every people and any places. This concept is an alternative idea, to react driven by the argument that the industrial world has been actual powerlessness of ends meet without having to leave garbage, toxins and environmental damage. Ugahari, promoted by Bruno Zevi Foundation based in Italy. Invite the architects to design with their argument;

(1) Building materials (recycled, alternative, natural)

(2) The construction process

(3) Financing

(4) Leisure and quality of life

(5) The quality of spatial

(6) Impact low environments.

IV. EXPLORING THE SPIRIT OF LOCAL ARCHITECTURE

Back to the past is not always easy. Life is motion, and motion should give newer meaning to life. Presenting local architecture, architecture in the past, and then use it in totality, for the benefit of present and even for the future is the decadence and moral collapse. Architecture in the past should be criticized in an objective, thinking more deeply, to find his identity back. There are obsolete things that need to be abandoned, and there are still relevant to be developed again.

Various studies on local architectural began popular. The books about Javanese House, the work by Arya Ronald, 1997, explain the position of Javanese architecture in its cultural, social and mental health community. Book re (construction) of Java Architecture, work by Josef Priyotomo, 2006, is a important research work in local architecture, especially in Java. At least two books can be the starting point for generating ugahari architecture. Both provide new opportunities to improve understanding of local architecture, that is always and most, discussing visual aesthetics.

Ugahari Architecture is important for the future, especially for the fast growing, high density state like Indonesia. Efficient, not excessive, functional, symbolic, and comfortable, is something unit that fought. While the local architectural is lessons that have tested, its still a symbol for most people. One and another can be associated based on the fundamental things, like the level of usefulness, and the level of imagery.
Based on this understanding, the shape and tectonic architecture become part of a work that gives preoccupation for architects to be explored. The method of precedent in architecture is born, jargon and naming of the style, and so on. Efforts to bring local customs and culture-specific will give a new enlightenment. Thus the work of imitating the shape and plagiarism will not earn a place. Architecture becomes a necessity rather than desire.

Figure 1
The frame structure in simple system, open plan, but hierarchical. Central manifestation focus, and its space without activity. 'Central' very strong, but in fact is rarely a functions, and left blank. A space that formed a tight and tangible by the walls and roof brings emptiness. Real and virtual present simultaneously.

Figure 2
Structure system unique so distinctive, is the local potential for further development towards the needs of space and building diverse increasingly. Through a systematic series of dimensions of each element, beams and columns, will determine the proportions and aesthetics provided a specific symbol, both for users as well as the typological function.

Figure 3
Born from the nature, manifested as a natural material, becomes a part of nature itself. Local architectural fully follow its natural condition. Now the higher the density of occupancy, particularly in the cities, does not mean unfit and outdated. Ugahari architecture is a chance to revitalize the local cultural for the welfare of society, through various own way.

Figure 4
It takes a week and only handled by two carpenters, two aides to re-establish a series of *pendapa* building, size 9m x 10.5 m. There's hardly any equipment is required other than a bamboo ladder and temporary crutch. A sophisticated architecture system so that energy-efficient and cheap. It’s only need craftsman, who knows the technique of timber, that while this number decreases.

A. Indigenous Architecture as Basic Architectural Design


Figure 5
Construction building system is very simple, so give simplify to assembly. Just to put and tighten every joint of beams and columns by hammer. Locking two beams, *sunduk kili*, in perpendicular are very sturdy even without nail or bolt.


Figure 6
Sanggit, means accuracy, the key word to creation of ancient house. Various conditions, such as wood type, size and grafting techniques are preferred because it will determine the level of comfort and architectural proportions.


Figure 7
The goals ancient architecture revitalization is connecting the work of the past with contemporary issues. Starting this process with open perspective and objectively, creativity work required that can enhance public appreciation.


Figure 8
Look about architecture as an important part of urban lifestyle, will bring us to improve the divers creativity. Diversity becomes the key, so that solving of the problem will always be different according time and place. In this case architecture position is very strategic.

V.THE SPIRIT OF ARCHITECTURE FOR THE BETTER FUTURE

What about the life of the city whose population is growing rapidly, high density, while the dwelling space is relatively narrow? How modern culture 'homy' can be directed through the creativity of architecture? How with the poor people in city who (also) need a house?
Ugahari Architecture offers a space for different temperate. Provide an alternative choice of fabrication building materials, in order to keep green environment. Utilizing material surrounding us, with friendly technology, effective, energy saving, realize the quality of prime space, specifically, and anti-imitation. The goal for cultural diversity and meet the physical and mental needs of our society come true.

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3.1.22
THEORETICAL UNDERSTANDING AND ANALYSIS MODEL ON DISASTER PREPAREDNESS AND POST-DISASTER SPATIAL TRANSFORMATION OF THE INDONESIAN INDIGENOUS CULTURE OF DWELLING

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ABSTRACT

This paper presents an approach for socio-spatial analysis upon a post-disaster spatial transformation in the context of Indonesian post-tsunami and post-earthquake culture of dwelling. This theoretically approaches proposed a framework for theoretical understanding about socio-spatial relationship that link people and environments. It is intended to define theoretical instruments for developing criteria of the spatial transformation analysis and studies on sustainable post-disaster culture of dwelling.

The analysis model derived from historical interpretation in questioning what ways and on what basis do people react to environments; how do they create their habitat and give the meanings of their environment in term of creating culture of dwelling. This historical interpretation will be a starting point to construct social settings and their spatial patterns as spatial analysis model and theoretical instruments in finding suitable approaches for understanding the current phenomena of post-disaster spatial transformation in Indonesia. Which in turn, these approaches will be valuable contribution in finding the significant roles of indigenous culture of dwelling in disaster preparedness and post-disaster transformation.

Case studies will be focused on socio-spatial analysis of the post-disaster community development in Jogjakarta Indonesia as the study model to observe indigenous strategy in different levels of spatial transformation and disaster preparedness.
Keywords: Theoretical framework, socio-spatial analysis, Indonesian culture of dwelling, , sustainable post-disaster spatial transformation

I. Culture of Dwelling: Weaving Environmental Meaning between Habitat and *Habitus*

Human habitat is the environment in which human beings exist and interact. The term habitat comes from ecology, and includes many interrelated features, especially the immediate physical environment, the urban environment or the social environment. Environment itself can be seen as a series of relationships between things and things, things and people, and people and people. These relationships are orderly, that is, they have a pattern and structures – the environments is not a random assemblage of things and people any more than a culture is a random assemblage of behaviors or beliefs (Rapoport, 1982, p.178). Meanwhile Habraken mentioned that intimate and unceasing interaction between people and the forms they inhabit uniquely defines built environment (Habraken, 2000). In addition, Habraken argued that built environment is universally organized by the *Orders of Form*, *Place*, and *Understanding*. These three fundamental, interwoven principles correspond roughly to physical, biological, and social domain.

When environments are being designed, *space*, *time*, *communication* and *meaning* as four elements are being organized (Rapoport, 1977). Intuitively, *space* can be understood as the three-dimensional extension of the world around us, the intervals, distances, and relationships between people and people, people and things, things and things. *Space organization* is, then, the way in which these separations (and linkages) occur and is central in understanding,

analyzing, and comparing built environment (Rapoport, 1982, p.179). In addition, Rapoport defined that people, however, live in *time* as well as space – the environment is also temporal, and can, therefore, also be seen as *the organization of time* reflecting and influencing behavior in time. The term *communication* refers to verbal and nonverbal communication among people, while *meaning* refers to nonverbal communication *from the environment to people*. In other words, when people defining the meaning of their environments by conducting verbal and nonverbal communication based on their perception and worldview is leading us to the understanding of *habitus*.

Habitus is a complex concept, but in its simplest usage could be understood as a structure of the mind characterized by a set of acquired schemata, sensibilities, dispositions and taste[23]. The particular contents of the habitus are the result of the objectification of social structure at the level of individual subjectivity. Marcel Mauss[24] defined *habitus* as those aspects of culture that are anchored in the body or daily practices of individuals, groups, societies, and nations. It includes the totality of learned habits, bodily skills, styles, tastes, and other non-discursive knowledge that might be said to ``go without saying`` for a specific group. Furthermore, Pierre Bourdieu[25] elaborates on the notion of habitus by explaining its dependency on history and human memory. For instance, a certain behavior or belief becomes part of a society's structure when the original purpose of that behavior or belief can no longer be recalled and becomes socialized into individuals of that culture.

Furthermore, in place of an unsustainable dichotomy between objectivism and subjectivism, Bourdieu proposes a `theory of practice` (Bourdieu, 1977). 'Practice' refers to the ongoing mix of human activities that make up the richness of everyday social life. According to Bourdieu , social practices neither represent the working out of objective social laws operating, as it were, behind the scenes, nor stem from the independent subjective decision-making of free human beings. Instead he argues that practices arise from the operation of 'habitus'. The concept of habitus is absolutely central to the Bordieu's work. It is the mediating link between objective social structures and individual action and refers to the embodiment in individual actors of system of social norms, understanding and patterns of behavior. Moreover habitus is both the product and generator of the division of society into groups and classes. Habitus is thus shared by people of similar social status, but varies across different social groups. In a clear explanation, habitus in Bourdieu's formulation is a set of *dispositions* that incline agents to act and react in certain ways. The dispositions generate practices, perceptions and attitudes which are regular without being consciously coordinated..

What then, is the relation between dwelling and those thinkings above? There is a certain thoughtfulness necessary in dwelling, according to Heidegger. Our everyday lexicon can and does direct our minds away from the true meaning of what it is to dwell and to build. When building becomes associated with mere construction of houses, offices or shops, it becomes habitual and we tend to forget what we mean by building (as dwelling). For Heidegger, this is

[23] Scott, John & Marshall, Gordon (eds) *A Dictionary of Sociology*, Oxford University Press, 1998

[24] Mauss, Marcel.. "Les Techniques du corps", *Journal de Psychologie* 32 (3-4),1934. Reprinted in Mauss, *Sociologie et anthropologie*, 1936, Paris: PUF.

[25] Bourdieu, Pierre, *Outline of a Theory of Practice*. Cambridge University Press, 1977

a very meaningful semantic[26] shift: "something decisive is concealed in it, namely, dwelling is not experienced as man's Being; dwelling is never thought of as the basic character of human being." It is precisely our everydayness that dulls our understanding of dwelling, which thus makes it harder for us to dwell as mortals. The truth of dwelling does not die; rather, becomes atrophied and hushed.

Building is the activity that produces, that brings things forth, either through cultivation or through construction…. All human being involves building, and so stands in an important relation to the Greek *"techne,"* itself understood by Heidegger in terms of the disclosing or "letting-appear" that lies behind our word "technology." Yet the productive activity of building is not simply identical with technology, with any technique, nor with any technical enterprise such as architecture or engineering. Building is that mode of productive activity that articulates the world in a way that allows for human dwelling. But this means that building must be understood as arising on the basis of dwelling rather than being that on which dwelling is itself based. Thus Heidegger writes that "Only if we are capable of dwelling, only then can we build."[27] Building is the productive activity through which human beings make a place for themselves in the world and so by means of which their own dwelling is articulated.

In Heidegger's later thinking, however, it becomes one of the central ideas in his articulation of the enriched conception of place, one that includes both spatial and temporal elements to which human being is tied. In this respect, it is a mistake to see the notion of dwelling as tied to some pre-modern mode of life. Not only does this interpretation renders the concept superficial but also constitutes a highly partial reading of Heidegger's articulation.

What is at issue in Heidegger's talk of dwelling is not a comparison in the "quality of life" between different historical periods but, rather, the nature of human being as intimately tied to place. Dwelling is Heidegger's name for the topological mode of being that belongs to human being—not merely the human in some selected historical period but to the human "as such." (Malpas, 2006)

II. Culture of Dwelling in the Process of Production and Consumption Space on the basis of Everyday Life's Spatial Practices

In *The Production of Space*, Henri Lefebvre (2007) argues that space is continuously produced through various human actions and undertakings. Adhering to a Marxist tradition of thinking, Lefebvre tends to favor the concept of production ('production of space') at the expense of consumption. In addition, space is not only produced; it is equally consumed or becoming a space of consumption. Consumption is always spatial: it is based on the spatial-aesthetic arrangement, associations, and display of commodities in social space. Lefebvre gave greater emphasis to the rise of advertising and the media, the expanding role of consumption in daily life, and the increasing systematization of urban life. He considered

[26] Semantics (from Greek *sēmantikós*) is the study of meaning. It typically focuses on the relation between *signifiers*, such as words, phrases, signs and symbols, and what they stand for.

[27] Heidegger, M., "The Thing," in *Poetry Language Thought*, trans. Albert Hofstadter.NY: Harper Row. 1971

everyday life more significant than work itself in determining experience and social transformation.

In accordance with Lefebvre, both space and the duality production/consumption are thus dynamic concepts based on practices. When the notion of spaces of consumption is employed in this theoretical analysis, it is used in this fluid and fragmentary manner, both embodying a produced space and the dual nature of consumption (i.e., consumption as the termination of production/consumption as a form of production). Spaces of consumption are in brief; a space of becoming, a space where consumption is taking place, where commodities are appropriated and used. Thus the notion of spaces of consumption is not intended to serve as a fixed and ready-made construct but rather to serve as an ideal type model for an emerging form of social space.

According to Lefebvre, *Spatial practice* refers to the production and reproduction of spatial relations between objects and products. It also ensures continuity and some degree of cohesion. “In terms of social space, and of each member of a given society’s relationship to that space, this cohesion implies a guaranteed level of competence and a specific level of performance” (Lefebvre, 2007, p.33).

What seem most relevant to architects today are the cultural dimensions of Lefebvre’s critique of everyday life. His rich, complex, and joyous vision of transformation serves to counter, on the one hand, the banality and mediocrity of most the built environment – the product of technical rationalization and market forces – and, on the other hand, escapism, heroics, and machismo of so much contemporary architectural thought (McLeod, 1997, p.27). From the perspective of everyday life, such neo-avant-garde strategies as ‘folding’, ‘disjunction’, and ‘bigness’ deny the energy, humanity, and creativity embodied in the humble, prosaic details of daily existence. In this context, McLeod (1997) explained that Lefebvre’s desire to ground philosophy and culture in the everyday – in the ethics of ordinary choices – offers an important check to the deracinated rhetoric and mystical claims that continue to be propagated by the neo-avant-garde. Everyday life embodies at once the direst experiences of oppression and the strongest potentialities for transformation.

III. Culture of Dwelling: from the Indigenous Knowledge on Disaster Preparedness towards Post-Disaster Spatial Transformation

The traditional houses and settlements of several hundred ethnic groups of Indonesia are extremely varied and all have their own specific history. In Reimar Schefold’s view (2003), the vernacular building traditions of Indonesia represent an architectural heritage that is spread throughout a vast region in maritime Southeast Asia, inhabited by groups with different linguistic affiliations. Despite the great diversity of local forms, the houses display a range of common formal features that reflect both a basic prehistoric relatedness and continuous later contacts in this architectural field of study. In his analysis, Schefold consider practical and social reasons, aesthetic principles, and symbolic meanings. The symbolism is sometimes secondarily attached to the form; other times it is a case of ‘form following meaning’ that is, where the execution of a form appears to be modified by symbolic ideas or even entirely motivated by them. It illustrates the fundamental meanings of the house in its technical construction as well as its symbolic richness. The multifarious ways in which this heritage is given shape in each local situation bear witness to an amazing creativity in adapting to regional circumstances and social changes.

If we consider culture as a giant process of learning and transforming so we then could say that culture of dwelling transforms following the social changes and its transformation process. The main issue in this context is thus diachronic change as it affects houses and settlements as parts of the built environment, both in their material aspects and in their functions as objects of social value and meaning (Schefold, 2003, p.6). Moreover, since most houses are parts of settlements and are arranged in some kind of ordered relationship, the spatial layouts are included as well. While the main issue is change 'through time', synchronic variation or change 'through space' also receives much attention. Indeed, the variation itself often demonstrates that changes through times do not become manifest in the same way in all buildings. At the same time as some of these represent the latest results of past developments, in other, more conservative ones, various archaic traits continue to survive. In this sense, synchronic variation in related houses in a given region can play a crucial part in the reconstruction of the course of local processes of transformation, particularly in cases where available historical sources prove insufficient for purpose (Domenig, 1992).

Change in a house form may of course also involve changes in its structural framework (Schefold, 2003). This often makes it difficult to realize that a complex building was historically developed by successive addition to a smaller core. In whatever guise the variation appears, however, it is always worth looking for evidence of structural indications that shed light on the course of development within a given building tradition. As an architectural analysis approach, the study of structural change and variation, a typical component of the architectural approach, should be included much more frequently in in-depth study of vernacular buildings.

It is reasonable that Indonesian archipelago which is located on the critical natural disaster areas makes vernacular houses of the Indonesian pre-disaster cultures of dwelling developed their own local knowledge about how to live harmoniously with the nature (including how to defend against its disaster). It is expressed in their conceptions of spatial order, tectonic culture, building techniques and the usage of sustainable local materials like bamboos and wood. Nevertheless, modernization process that introduces modern way of life system, new techniques and specialization in building culture gives significant influences in their transformation process.

Indonesian archipelago is located on the critical natural disaster areas of tsunami and earthquake. Hundreds million inhabitants live dangerously on this tropical archipelago throughout the years. Hundreds thousand peoples were killed during the massive tsunami and earthquake disasters in 2004 (Atjeh and Nias) and 2006 (Yogyakarta and Centre of Java region). One of the most visible consequences of those disasters is the widespread devastation of houses. This explains why many humanitarian agencies are increasingly focusing their recovery assistance in housing reconstruction. Nevertheless, the complexity and cultural sensitivity in housing and the links between the built environment and sustainable development are sometimes still not fully appreciated. Most post-disaster housing reconstruction projects are agency-driven and have a narrowly technical approach (Twigg, 2002). They entail the employment of construction companies that consider modern building technologies the only option to achieve hazard resistant houses. Organizations that in normal times are committed to sustainable development, in an emergency context often make technological choices without keeping into account socio-cultural, environmental and economic implications (Barakat 2004, Duyne 2006).

The challenges of housing reconstruction projects in the post-disaster situation are similar to those challenges met in many low-cost housing projects in developing countries. However, in the post-disaster situation, there are some added challenges: (a) the scene is generally very chaotic and resources are in scarce supply, with simultaneous projects being launched by numerous local and international organisations for housing and infrastructure repairs, for livelihoods creation, and for a range of other social programmes, (b) projects must be completed as quickly as possible to foster recovery and to satisfy donors who want to see results and (c) the post-disaster period is generally seen as good opportunity to engage in activities that will increase the level of development and reduce vulnerability to future disasters, implying that projects must be implemented with sustainability in mind.

Nevertheless, on one hand the quick housing reconstruction projects speed up post-disaster urban transformation process in order to recover disaster-affected urban life and socio-economic activities. On the other hand, the fast transformation driven by non-local and modern approaches could endanger the sustainability of indigenous cultures of dwelling since sometimes the transformation process itself does not take into account socio-cultural, environmental and economic implications.

IV. Analysis Model and Case Study

In the context of finding suitable approaches for understanding the current phenomena of post-disaster spatial transformation in Indonesia, it is important to learn how people (local and indigenous) in particular area view and interact with their environment; whether or not they have local knowledge that help monitor, interpret and respond to dynamic changes in ecosystems and the resources and services that people generate; and whether or not their knowledge can be used to design appropriate interventions, including disaster preparedness.

For those grounds, morphological study is an attempt to investigate how the pre-disaster social structure and cultural system give contribution to characterize spatial patterns of the production of space with its culture of dwelling on the different levels of the post-disaster spatial transformation. This study model will critically observe and analyze to introduce and identify the conception of spatial transformation, which is driven by culture of dwelling, socio-economical condition, and emergency situation upon the post-disaster reconstruction and community development. In the morphological study, interpretive-historical research is an important qualitative method to analyze and to collect as much evidence as possible concerning pre-disaster spatial order and architectural forms and meanings of the indigenous culture of dwelling and its domestic setting of settlements. This requires searching for evidence, collecting and organizing that evidence, evaluating it, and constructing a narrative from the evidence that is holistic and believable. Throughout the process, interpretation is the key as it should be developed correlations and causal explanations among those historical evidences.

To develop actual understanding of the post-disaster spatial transformation, there are theoretical instruments to be used in order to define and interpret correlations and causal explanation between spatial behaviors and spatial transformation. In *The Production of Space* (2007), Lefebvre defines ontological transformation of space as *Lived (Intuitus), Perceived (Habitus) and Conceived Space (Intellectus)*. By employing this triad instruments it can be developed actual understanding and interpretation of the post-disaster spatial transformation on the basis of everyday life's socio-spatial structure. In addition, to understand environmental structure, elements and configurations must be designated in ways that relate to

the actions of agents. Because transformation results from agent action, it highlights parts and configurations under agent control[28]. Nevertheless, some of post-disaster housing reconstruction projects have introduced new building systems and building culture without certainly involving indigenous knowledge and competencies of the affected community as the most important agents of transformation in a participatory based development. In turn, it will create anomaly in the process of transformation which oppressed indigenous culture of dwelling must be hardly adjusted to the new building system.

In the post-earthquake reconstruction project done by Domes for the World in Nglepen New Village Prambanan, Jogjakarta – Indonesia can be seen that extremely new concept of building form and spatial structure being adjusted to the previous existed culture of dwelling. This case study analysis showing how the indigenous building culture is being ignored just for coping the dangerous earthquake hazards by introducing new safe building style. But adaptation process that showing insisted spatial adjustments creates unique spatial practices (habitus) when the dwellers try to give the meaning of their new built environment. This natural process works as the consequences of cultural exchange.

The reconstruction project in Ngibikan Village Bantul Jogjakarta – Indonesia shows a more participatory concept where local knowledge and building skill have been fully appreciated and actively involved during the process of reconstruction. The new architectural construction enlightens and intertwines smoothly with the local knowledge of building culture. However, the new way of thinking about an earthquake responsive building construction is certainly inspiring the local knowledge about tectonic culture without insisting a new building style. Afterward, transformation process finds a strong baseline rooted on the indigenous culture of dwelling.

V. Postscript

The understanding of the post-disaster spatial transformation on the basis of respectfulness thinking-frame about indigenous culture of dwelling requires new analytical tools. The documentation of diverse and innovative production of space and its spatial practices in reconstruction process could provide an alternative tool box of ideas that could be used along with other tool boxes to observe, understand, and create diverse environments and to inspire innovations. In order to substantially engage the habitat and habitus, any research and development should understand the local production of space and develop an empathy towards the local inhabitants.

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3.1.23
SPACE FOR THE DEAD: A PRELIMINARY STUDY ON THE CHANGING URBAN ENVIRONMENT

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ABSTRACT

It is amazing that cemeteries are 'suddenly' exists in the middle of commercialized urban areas in the court city of Yogyakarta. The growth of the city is fast enough that reorganizing the cemeteries, the last destination of the living is hard to keep up with. The space for the living is more imperative. So, as shown by the city, the informal sectors have changed not only the face of the city but also the way people value their culture. Under the surface of a bustling city, lies a basic question how the city dwellers of today will carry on their cultural heritage for the future. It is a matter of changing perception about life. The depiction of the informal sectors tells us that the growing of the city of Yogyakarta has inspired its people to do anything at their best to empower their economic life. As a result it changes people perception about the space they live in. This phenomenon can be reviewed through the fact that existence urban cemeteries are unnoticed by most street passerby. It also a sign that cemeteries are overlooked by the authorities in trying to improve public environment.

Keywords: *space, cemetery, commercialized urban area, death*

I. INTRODUCTION

Cemeteries, for hygienic, socio-cultural and spiritual reasons, are usually located at the edge of a city. It clearly divides the space between the living and the dead. However, the growth of many cities at present has made cemeteries come into sight in the middle of commercialized urban areas. Noticed or not this condition is actually a sign of disintegrated urban design and plan that often overlook potential social and cultural problem hidden under the problem that a cemetery has toward the socio-cultural life its residents. Modernity has affected not only the way people perceive their world but also their attitude in daily practice. According to Hannerz, the growth of urban sectors in a Third World city is an attestation of a situation where economic life has become the major concern of the city. It represents the construction of space that intentionally created to accommodate the economic drive which underlies it. An important part that connects the all aspects in a city is how space is utilized by human. It is due to the fact that city dwellers take parts in the city life according to the opportunity provided by the space in a city and it depends on how it is created through a design and plan (Hannerz, 1980).

The social theory of space explains the correlation between space and people lies on the arrangement of people in space and the arrangement of space itself and how those two conditions show in the way the society work and reproduces itself (Hillier and Hanson, 1990). It means that space influences behavior and spatial change consequently changes people behavior. Following that condition a tradition and culture of the people is likely to change as well. Therefore, the success of urban design in dealing with urban planning can be accomplished if attention in designing is also given to the social and cultural aspects which

are preserved by the city dwellers. However, this matter receives the least attention in an urban development program. As a result the urban design and plan which is expected to create a better life for the people inside it ends up with ambiguity for the people in giving response to their social and cultural space. The fact that many people are unaware of the presence of cemeteries in commercialized urban areas illustrates how this matter slips off the authorities' attention. This paper is a preliminary study about urban cemeteries that can be taken into account to improve the urban design that aims at the improvement of the life quality of urban people.

II. URBAN CEMETERIES IN YOGYAKARTA, IMAGE AND REALITY

Yogyakarta is an example of an Indonesian city which is developed with a reference to the national-strategic development program. Accordingly, the grand design of this city at present is no longer submitting to the cosmogony concept as the main reference as the time when the city was built as a court city. To fulfill the need of the present society which tend to be economic and political motivated becomes a drive for a traditional court city such as Yogyakarta to get involved in a competition with other cities in the world in order to be part of the world cities. It also changes the management pattern of the public sector which is said as the outcome of globalization and the national economic crisis as well. For that reason a business development concept called a strategic plan is adopted in the plan for the development of this city (Hariyono, 2010). Similar to the development of other cities in the developing countries, its development is recognized mainly through its physical and economic developments that usually express modern characters rather than its traditional ones but overlooking social and environmental aspects which are not less important for a city to sustain its identity. As a result, it promotes an uncontrolled behavior in utilizing space (Hariyono, 2010) as it can be observed from the construction of temporary and permanent structures.

Here, the dilemma may emerge for the people of how they should treat the dead. People usually perceive cemetery as a place where the living disposes the dead. However, what is disposed is actually not really vanished. It still remains with the living, the people, and occupy the space. Lefebvre calls this space as an 'absolute' place, meaning it can be everywhere no matter it is labeled as a place for the dead. He emphasizes that in that situation the dead is still exist among the living and even rules the living. Lefebvre points out that monuments for the dead whether it is a tombstone or a commemorative monument actually provide evidence that the dead has the power and authority to interfere the living (Lefebvre, 2007). It is also true for cemetery. It becomes a source of identity for people and to carry on with the custom underlies it. Cemetery is a legacy from one generation to the next in a strand of a tradition. So when Yogyakarta wants to keep its identity and customs, people perception about death, ancestor worship and cemetery cannot be ignored.

The unexpected existence of cemeteries in growing commercialized urban areas in Yogyakarta is actually evidence that shows how its residence experiences a shift in their tradition as well as the identity. Of course there are always many factors behind a changing tradition, however modern urban people tend to be motivated by economic rationale when come to make a decision about human welfare. So considerations fall on tangible materials first rather than the spiritual ones. If a good balance between those two aspects cannot be reached, the disintegration of modern city life which was economic driven will result in cultural disintegration (Wertheim, 2007). It means that a place like cemetery can no longer support the present day urban people as a source of identity. Shifting point of view from

spiritual to economic has its consequence on the urban design. It impinges on the urban design and plan which comes out of economic concerns.

2.1. The cemeteries in the commercialized urban area.

Gejayan District is a fast growing urban area where Affandi Street lies. Its physical appearance is a story of a cultural and social transformation of a society. Thirty years ago, there were only some patchy houses, shops, and yards (*tanah pekarangan)* on that street so it allowed the passerby to sneak a look in between the string of shops along that street. Now, as the sides of the street are densely populated by all kinds of shops, houses, cafes (*warung*), boutiques, and mini markets, passerby may not even realize that there are five cemeteries in that area just on the side walk.

Affandi Street is a busy not-too-wide street with a permanent road divider in the middle of it to separate the heavy two-way traffic flow that passes on it. The width of the street on its each side can only accommodate two cars to pass side by side. However, the street divides as well as links some important areas that serve as residential, educational, trading, and leisure areas. It has transformed its surroundings from a quiet outskirt area into a busy commercial urban area. The transformation took place as a result of the city growth which was also accelerated by the improvements of roads and streets to provide better access to places that two decades ago considered as distant. The mushrooming of businesses along the street has pushed the cemeteries right into the middle of commercialized urban area.

The cemeteries in this area are old cemeteries. Based on observation on the gravestones and interviews with some people who are connected with the place such as relatives of the dead, cemetery attendants, and shopkeeper or owner of the house or shop next to the cemetery, it is found out that they did not know exactly how old the cemetery is. According to Ibu Yitno (85 year old) who spends all her lifetime in the Soropadan village, Soropadan Cemetery which is next to her village at that time was all surrounded by pekarangan (traditional yard with some houses in it). She said further that the cemetery was already there since *Jaman Kumpeni* (the Dutch Colonial Era), at least as far as she could remember as a small child. Pak Pringgo, a man who lives near Karangasem Cemetery (Makam Jl. Kamboja) frequently visits her wife's grave who died in 2007 and buried there. He showed me some gravestones that set side by side next to the grave of his wife as belong to his family. According to him they have buried their ancestor there for three generations. So the family gravestones represent the lineage of the family too. In another place, the Santren Cemetery ('Makam Mirota Gejayan, Jl. Mawar), there is a motorcycle garage (*bengkel motor*) just next to it. The owner lives there with her family and uses part of the land as a boarding house for male students. She said her husband bought the land in 1993 from the local owner all together with the boarding house which had already been there. The reason for buying the land was because it was inexpensive. At that time their garage was the only shop there. The other buildings are some houses in the kampong not far away from them. Up to the present the price for the land near a cemetery is usually lower than the average price. People still think, may be for psychological reason, that it is better to have a house which distance from cemeteries if one still can afford the price. However, in a developed urban area this kind of thought is put aside. They think they can live side by side with a cemetery as long as they show respect to it.

Figure 1. Aerial view of Affandi Street and the cemeteries. Source: Google Earth

2.2. People imagination about their urban environment

The construction of space along with the existence of the cemeteries alongside Affandi Street shows how people shift their values towards space they lived on. As people's attention is absorbed more toward the development and expansion of residential and commercial urban areas, the cemeteries are left alone and receive the least attention. People accept the transformation of their city outlook as a natural process. The way they think about the transformation is parallel to the transformation of their own life in experiencing the city.

Yogyakarta, according to its development strategy, is aimed to be a metropolitan city (Hariyono, 2010). The effort to reach this vision has influenced the way people imagine their city. However, while pursuing the vision, they do not want to loose the city character in its first place as a court city. It is precisely on this matter that the city identity is challenged by its own plan of development. The city dweller seems do not have a clear imagination of how the city will be in the future without keeping its marked identity as a cultural city (*kota budaya*) while the identity itself rooted on their appreciation toward traditions and customs of its people.

Taylor said imaginations about social environment that common people have and shared with other city residents about their city are usually conveyed in images, stories and legends which become knowledge that justify their daily practice (Taylor, 2004). Yogyakarta, at its first place, had been designed with the underlying concept of Javanese cosmogony. This concept has mutually exercised both by the designers and the city dwellers so that the values embedded in the design have been able to facilitate the society to live according to it. As a result the space provided by the concept has been able to sustain the life of the city for a couple hundred years. Magnis-Suseno noted that Yogyakarta which fortunately was built as a capital city of Mataram Kingdom is more than a center of social, political and cultural activity for the Javanese at that period. People who lived in it believe that it was the magical center of the Kingdom with the royal palace and the king as the concentration of cosmic power. It is this understanding that conditioned the Javanese concept of the state as well as a city (Magnis-Suseno, 1997). It is a concept that shared and lived by people of Yogyakarta. However, after generations, and with the coming of modernity this worldview is diminishing. It is no longer perceived as the only one understanding to live people life. If now Yogyakarta people want to keep this city as a special province (*daerah istimewa*) together with its ideal to inherit the city as it was in the past, then the question is how the city will sustain its identity as they wish when its city dwellers create and live a space which is not in favor of their own aspiration. It is a challenge for a city to sustain its inherited identity that rooted in the past while moving forward creating modern way of life for the future.

Three central forms of social self understanding about modernity are the economy, public sphere and democracy practices and viewpoints (Taylor, 2004). It is in accordance with the present outlook of the urban design and plans that clearly aiming at economic prosperity. This situation affects almost all life aspects of its residents. Lefebvre said, “Occupants of the house perceive, receive and manipulate the energies which the house itself consumes on a massive scale” (Lefebvre, 2007). Comparing the situation of people in a house and in a city, the statement reflects the situation of the Yogyakarta urban people, who are adjusting themselves with the urban design while trying to navigate their present economic and socio-cultural view under the inheritance of the shadowing traditions of the past. The problem started, as Wertheim noted, in 1870 when the modernization of the East Indies cities started. The free trade system applied to public economic along with the increasing urban population had encouraged the development of urban construction. It was marked by the extension of the size of an urban and the agglomeration of housings and commercial buildings along the new roads that had been built to facilitate the city (Wertheim, W.F. 1999).This condition produced a society who were experiencing space according to their daily practice while following a certain model of city development constructed on different parameters. As a result ‘making money’ seems to be most likely become the first concern of people who live in the urban area. Anything else can follow as long as it goes with it.

This new viewpoint is stronger at present with the introduction of globalization where competition is becoming a way to survive. It means that attention to the living becomes bigger

than to the dead so that the space for the living should compete with the space for the dead. Death, because of its natural character, is a universal experience. However responses to death can be culturally varied. It is related to the rituals that they are accustomed to. Cremation and burial are usually two options to choose. If cremation is chosen, there is no need to provide a space for the dead. Yet, if burial is chosen a space should be made available. It is also a matter of how the family wants to commemorate the dead and will involve a post mortuary ritual that can be part of their everyday life. Those consequences have created a tradition that can be observed at the old cemeteries along the Affandi Street at present.

2.3. From the Javanese perspective: cemetery, death, and mortuary ritual

The existence of cemeteries is closely connected to the life of a community in terms of the relationship between the dead and the living. For that reason, the way society takes care of the dead member is a cultural expression performed in their everyday life. As Yogyakarta belongs to the land of the Javanese culture, the people are lived by that tradition. It becomes an identity that touches every life aspects of the people in this province that physically is also expressed in the setting and design of their cemeteries. This identity makes the Javanese cemetery different from others with different religious and ethnic backgrounds. Referring to the gravestone designs, there are three common types of cemetery in Yogyakarta namely, the Javanese, Christian and Chinese cemeteries. Javanese cemetery, for example, are mostly used by the Javanese regardless their religious background as it can be notified from the by inscriptions on the gravestones. Meanwhile, gravestones in a Christian cemetery are decorated with Christian symbols represent their religious background though the dead could have different ethnicities. The Chinese cemetery with its various gravestones also has its own characteristic. There are symbols from some religious backgrounds depicted in the gravestones but the cemetery is designated only for the Chinese community.

Here cemetery zoning is interesting to study. Based on observation, a Javanese graveyard is usually located at the edge of a village, on a village border (*batas desa*) adjacent to another village. On the other hand, Chinese cemetery is located outside a town or a city, on border line with the neighbor village. Christian cemetery, another type cemetery which exists in urban area, is usually still located inside a town and considered as old burial ground to. Its historic past started when Christian colonial settlers buried their family in an adjacent church graveyard, the *kerkhoff* (*kerkop,* Jw*)*. They set their burial ground in the city since all the other facilities are inside the city too. In the following periods that practice was continued by later on local urban Christian community. The cemetery was located inside the town but the cemetery is no longer adjacent to the church yard. The cemetery zoning proves that it does not only represent political, administrative or social boundaries, but also represents all cultural traits exist in a society.

Referring to the types and the zoning of the cemetery, the study of cemeteries in Yogyakarta can be scaled into three social pattern interpretation for burials suggested by Hodder, namely regional patterning, within-cemetery patterning, and within-grave patterning (Hodder, 1982). Based on surface observation cemeteries at Affandi Street can be studied through observation of its social and within-cemetery patterning. On this level the Gejayan cemeteries can be mapped through its regional and social significance within the cemetery. As Hodder wrote, regional cemetery usually set according to political, administrative or social boundaries (Hodder, 1982). So, actually the political and social boundaries of Gejayan cemeteries lie on the social dimension of ethnicity expressed by each graveyard. The administrative aspect is related to the geographical location where they are located. However the burial zoning tradition has changed, the present condition of urban cemetery is not depicting the tradition

anymore. Nowadays, all of those cemeteries are encroached by the city and population growth. The growth of the city has marginalized the cemetery. Its zone status, instead of on the border of an agriculture village as it used to be but, is now located right in the middle of a commercialized urban area.

Changing location of cemetery actually reveals how the way the present day urban people take care of the dead. It shows not only their concern toward the dead but also how they perceive their own life it means that the notion about death that someone has reflects his own view about the world and the place for the 'after-death'. The Javanese describes death in a word that means 'going home' (*mulih*), the returning home to become one with God (Hadiwijono, 1983). So, cemetery is part of 'home', it is a house for the dead. This insight, according to Pandian, can explain about the creation of the world, humanity and death (Pandian, 1991) that someone has. It means that how someone perceives a space that he lives on and functions as human. For the Javanese, cemetery has been functioning as source of spiritual life. Magnis-Suseno wrote this as the following,

> "The unity of the social and spiritual worlds is exemplified by the reference displayed by Javanese for their ancestors. Their graves can be visited to solicit blessings, to seek guidance when faced with difficult decisions about job promotions, money or debt problems. Gravestones of one's ancestors are cleaned and decorated every year during the month of Ruah, and most villages possess a village shrine in which their founder of the settlement (cakal bakal) is remembered." (Magnis-Suseno, 1997).

The citation describes that according to the Javanese view about the world space is shared between the living and the dead and both of them take benefit from each other from that relationship. Remnants of rituals found at Gejayan cemeteries such as potsherds, incense-burners made of clay, ashes and fresh charcoals, used cigarette lighters and dried offering flowers on the gravestones are evidences that urban people are still performing mortuary rituals. It means that they are still keeping their tradition, although may not be as active as in the past, and connected with the space of the dead. Cemetery may be marginalized, yet it is a source of spiritual life for the society.

III. CONCLUSION

Cemeteries may post a challenge for urban designers and urban planners since they consume a great deal of space. Their historical tie to the living as a sanctified place of the ancestors sometimes makes it hard to be relocated. A cemetery is not attached to individual but a community and they do not usually expect to remove the place of their ancestors from their place. So they usually oppose to the idea of relocation. Cemeteries are indeed part of urban aspect that makes a city lives. For that reason a sustainable urban design should put into consideration more on cemetery in terms of technical and cultural construction. A cemetery cannot only be understood as a disposal site for the dead but should be comprehended as a cultural heritage of the society, for within it the life and sustainability of culture and identity are depended on.

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3.1.24
IN SEARCH OF "MAMMINASATA STYLE": MODEL FOR THE APPLICATION OF LOCAL ARCHITECTURAL CHARACTERISTICS FOR CONTEMPORARY DESIGNS BASED ON SHAPE GRAMMAR

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ABSTRACT

Retain local identity while at the same time keeping up with rapid technological advancement in the context of global challenges is of prime importance for multi-ethnic developing nation Indonesia. Therefore, expression of local identity in contemporary architecture is a fundamental necessity for our living environment, including for Mamminasata Region of the Makassar-Bugis ethnic groups in South Sulawesi.

This research aims to develop a model for the design of Mamminasata-style contemporary architecture based on shape grammar. Samples comprise 7 ordinary and 3 nobility houses of the Mamminasata region which were selected purposively based on topographical types, building age, and originality of shape, form, spatial composition, and detailing. Analysis results in identification of essential shape, classification of major and minor shapes, also formulation of the 'shape vocabulary' and 'rule schemata'. By means of Borland Delphi program we present various possibilities of compositions for contemporary architectural design using essential vocabulary and grammatical schemata. a distinctive architecture style which appears to strongly recall the shapes common in Mamminasata Region. Accordingly, we conclude that shape grammar model enables generation of locally-based contemporary architecture by employing of modern-vernacular and neo-traditional shapes.

Concluding discussion urges further development of the try-outs in this in order to enhance both quantity and quality of the generated shapes. This leads to the formulation of guidelines for future design of modern-contemporary buildings. Moreover, other cases of local architecture in Indonesian archipelago could adopt and adapt the model in similar approach and similar aims for the search of distinctive characters based on local wisdom. This do not necessarily limit to architecture, but could cover other types of built-environment such as urban, landscape, and housing and settlement designs.

Keywords: *shape grammar model, local architecture, contemporary design, Mamminasata*

I. INTRODUCTION

1.1 Background

Nowadays Mamminasata region in South Sulawesi faces the problem that its recent architectural developments tend to ignore local characteristics of traditional origin. We are actually aware that characteristics of the traditional architecture proved to have been compatible with local environment, particularly in terms of maintenance of ecological

balance, conservation of irreversible energy, and prevention of global warming. However, current architectural developments seem to have been more fascinated with alien characteristics of vague origins which commonly are incompatible with the place. Uncheck, this could result in the lost of local identities which could lead to uniform and monotonous characteristics of built-environments.

Retain local identity while at the same time keeping up with rapid technological advancement in the context of global challenges in modern-contemporary life is of prime important goal for Indonesia as a multi-ethnic developing nation, as well as for Mamminasata region in particular. Creating contemporary architecture that expresses local identity is a fundamental necessity to achieve such a goal. The search for a model for the application of traditional architectural characteristics to modern-contemporary designs is thus an utmost crucial theme.

Previous research studies on traditional Bugis-Makassar architecture commonly conclude with typology and/or morphology of spatial and/or formal characteristics and the changes over time. These studies seem lacking of identification of essence pertaining to traditional building shapes. Moreover, they also lack of further exploration towards proper application of the essential shapes to modern-contemporary buildings. Considering that essential shapes – both the major and the minor – constitute architectural attributes to be most comprehensible by the public and most applicable to contemporary design, the search for a design model based on compositions of essential shapes would be an utmost appropriate.

On the one hand, local identity formed by traditional architecture in general has limitedly derived from characteristics of residential buildings i.e. houses and palaces. On the other, contemporary architecture in terms of building types and scales has complexly developed in accordance with advancement of human needs in contemporary life. Hence, necessity to apply traditional architectural characteristics for various contemporary public buildings meets difficulties in terms of appropriate shapes and compositions. However, shape grammar theory offers a method for the identification of essential shapes and the ways to explore various possible compositions of the shapes. Accordingly, the search for a design model by means of shape grammar method which is aided by a computer simulation technique would be challenging. Thus, this research aims to develop a shape grammar model for the design of Bugis-Makassar modern-contemporary architecture which is expected to be able to generate “Mamminasata-style” shapes.

1.2 Objectives

Three objectives comprise: (i) Shape vocabulary & schemata: to identify essential shapes and classify both the major and minor shapes of Bugis-Makassar traditional architecture, in order to formulate shape vocabulary and its rule schemata; (ii) Shape grammar model: to develop a model for architectural design through explorations of possible grammatical compositions of essential elements in shape vocabulary and its rule schemata with computer simulation aid using Borland-Delphi program; and (iii) Try-out: to test the shape grammar model for new design of modern-contemporary public buildings. In order to test the degree of applicability, the try-out needs to cover large-scale public facilities and amenities, such as: office, apartment, commercial centre, industrial facility.

1.3 Theoretical Review

Three decades ago, researchers had previously carried out studies on the topic of shape grammar theory. Methods in both studies were geometrical and mathematic al analysis. However, their aims limited to the examination and formulation of shape grammar principles pertaining to existing architectural design cases, i.e. the Mughul Gardens in Pakistan (**Fig.1**) and Wright’s Prairie Houses in USA (**Fig.2**).

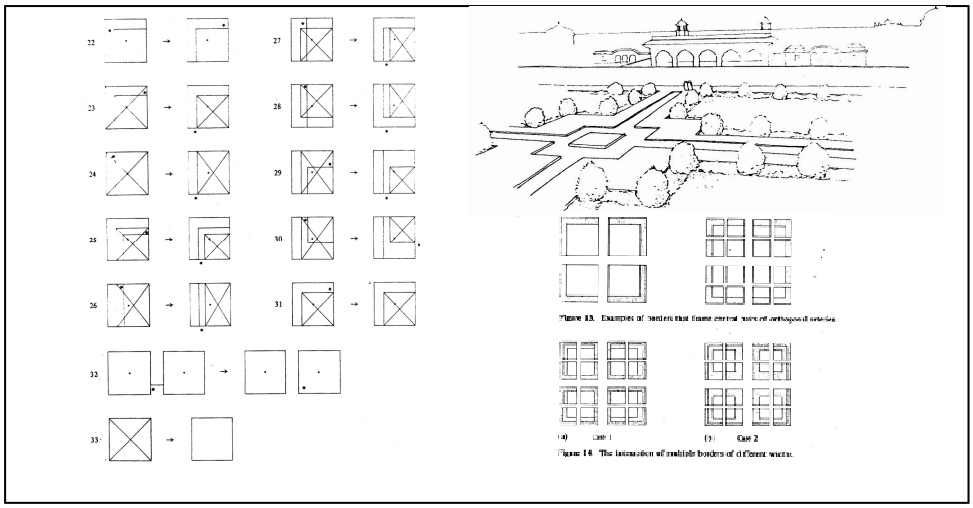


Figure 1.

Case of Mughul Gardens (Stiny & Mitchell, 1980)

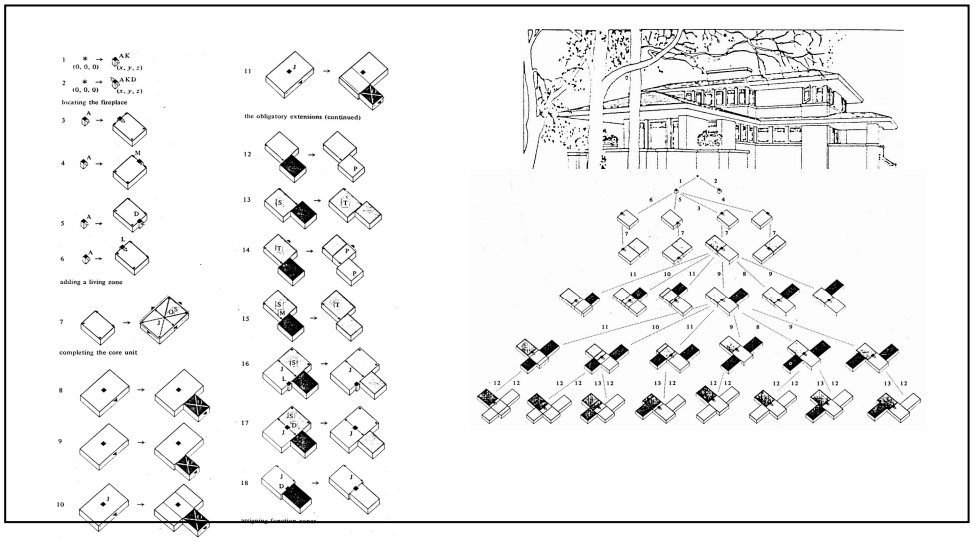


Figure 2.
Case of Wright's Prairie Houses (Koning & Eizenberg, 1981)

1.4 Conceptual Framework

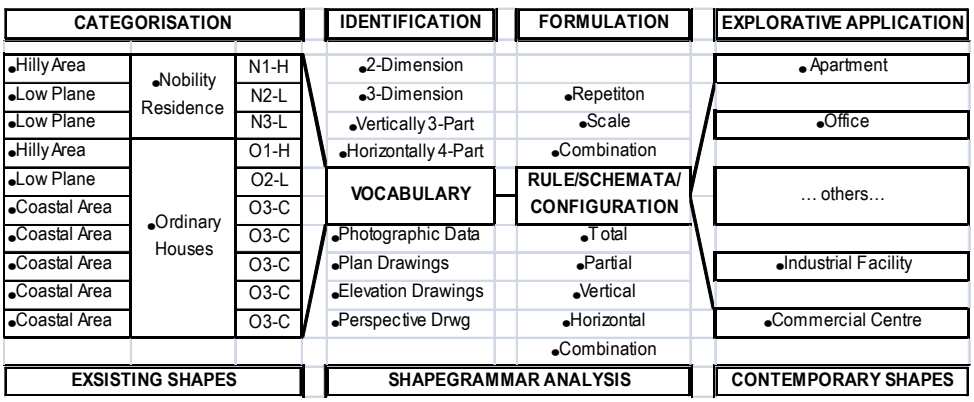


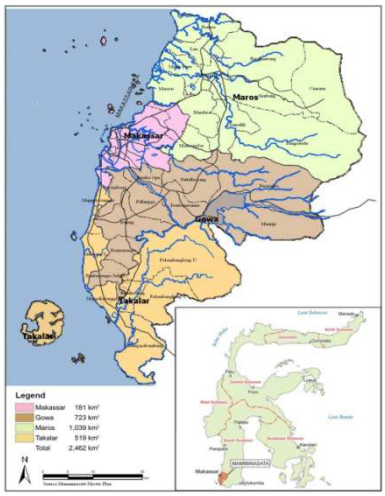
Figure 3.
Conceptual Framework

II. RESEARCH METHOD

2.1 The Study Area: Mamminasata Region

Mamminasata situates to the southwest tip of South Sulawesi Province, comprising Makassar City (about 1.4 million of population) which is surrounded by 3 Regencies: Maros to the north, Sungguminasa-Gowa to the southeast, and Takalar to the south. A number of small islands scatter to the west of Makassar city.

Field surveys covered villages and islands, comprising: Pajukukang and Kasikebo of Maros Regency (Coastal Areas), Baranglompo and Barangcaddi (Small Islands), Bulutana of Gowa Regency (Hilly Area), and Patani and Patalassang of Takalar Regency (Plane Areas),.



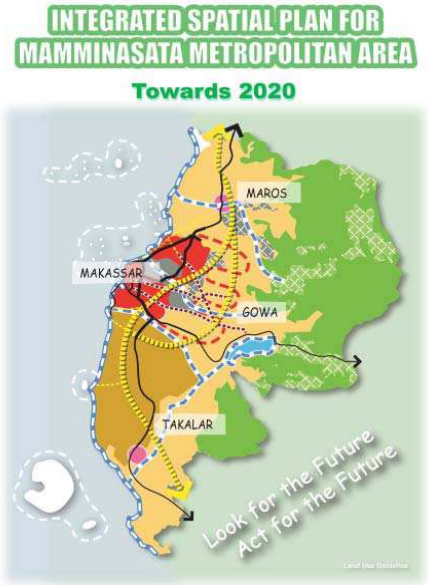


Figure 4. Map of Mamminasata Region (*Mamminasata Report*, KRI International & Nippon Koei, 2006)

2.2 Analysis Technique

Analysis technique comprises descriptive, interpretative, formulative, and explorative, involving 10 buildings which were selected through cluster and purposive sampling. The cluster was based on geographical contexts i.e. hilly area, low plane, and coastal area including small island. Purposive sampling was based on criteria of building age i.e. about 50 years and originality of building form i.e. steep and simple gable roof. The samples comprise 3 nobility residences and 7 ordinary houses.

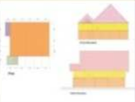
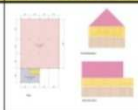
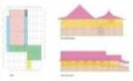
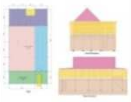
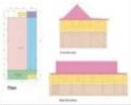
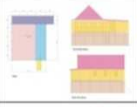
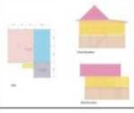
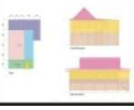
Computer simulation using Borland Delphi program serves for geometric and visual analysis in order to formulate shape vocabulary, to develop shape grammar, and finally, to try-out applications of the shape grammar model for cases of modern-contemporary public buildings;

2.3 Existing Conditions of Samples

Below is description of the 10 samples, each consists of photograph of the building and drawings of the plan, elevation, and perspective image.

Table 1:

The 10 Samples and Their Existing Condition

	NOBILITY			ORDINARY		
	EXISTING	PLAN & ELEVATION	PERSPECTIVE	EXISTING	PLAN & ELEVATION	PERSPECTIVE
HILLY AREA						
LOW PLAIN						
						
COASTAL AREA						
						
						
						
						

III. SHAPE GRAMMAR ANALYSIS

The following analysis identifies primary architectural elements which serve as 'vocabulary' of the shape grammar, and identifies the configuration rule as schemata for the shape grammar. (**Table 2**).

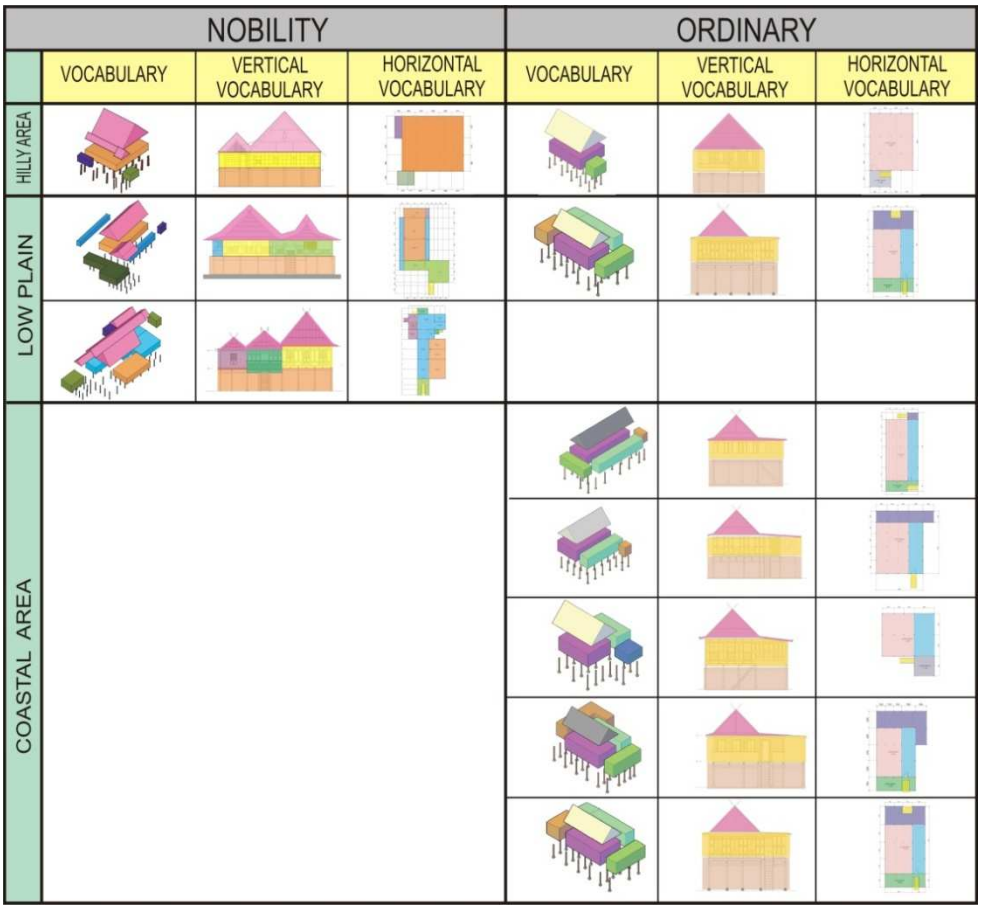
3.1 Identification of Vocabulary: Architectural Primary Elements

The primary elements consist of: A. Vertically 3 elements: (i) void space on ground resulted from raised floor floor of the building (*siring*–Mks; *awabola*–Bgs), (ii) main house (*kaleballa*–Mks, *alebola*–Bgs), and (iii) roof with attic (*pamakkang*–Mks; *rakeang*–Bgs). B. Horizonally 4 elements: (i) open veranda (*dego-dego*–Mks; (ii) *lego-lego*–Bgs), (iii) main house, side circulation (*jambang*–Mks; (iv) *tamping*–Bgs), and service area (tamping–Mks; dapureng–Bgs).

Result shows that: vocabulary in hilly area tends to be simpler for both nobility and ordinary buildings, compared to ordinary ones, nobility buildings differ in scale of elements and complexity of schemata. Moreover, variety reveals in existence and position of veranda.

Table 2:

The Vocabulary



3.2 Identification of Rule Schemata: Architectural Configuration

The above Table (**Table 2**) also reveals that the architectural configuration includes primarily: (i) 'repetition', enabled easily by characteristics of single building mass, simple shape of rectangular mass, and covering with simple gable roof; (ii) 'mirror reflextion', revealed in possible positioning of entrance and stair, whether on left or right side pf the house, (iii) scale modification, showed in possible blow up of scale inspired by 2 differing scale between noble residences and ordinary houses; (iv) combination of above configuration.

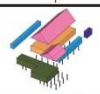
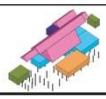
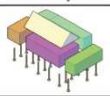
Such a basic rule schemata can develop further and enrich as is the case of verbal language. For instance, configuration considers: (i) grammar types i.e. prosaic type, poetic type; (ii) grammar styles i.e. comparative style (such as hyperbolic style, *pars pro toto* style), (iii) accentuating style such as para-rhyme, parallelism, exclamation style); and figures i.e. reflected figure, rotated figure, repeated figure.

IV. SHAPE GRAMMAR SIMULATION

The simulation consists of two parts: Firstly, existing architecture as source of traditional vocabulary and traditional schemata; Second, contemporary architecture as result of simulation generated from possible schemata such as: repetition, scale modification, or combination, whether in a total or partial way, and whether oriented horizontally or vertically.

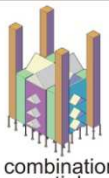
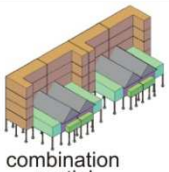
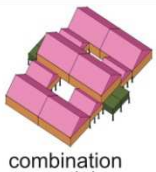
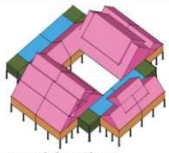
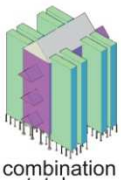
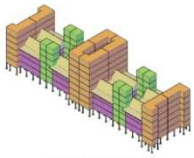
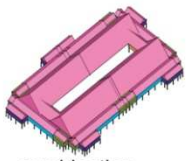
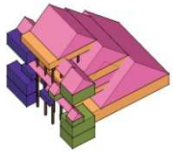
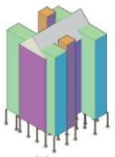
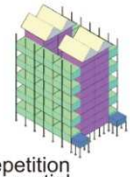
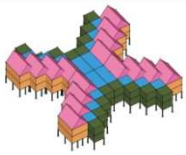
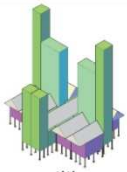
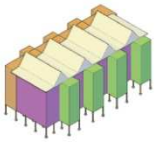
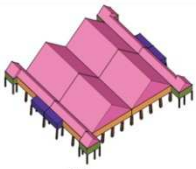
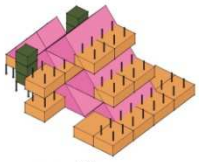
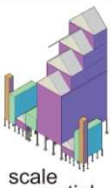
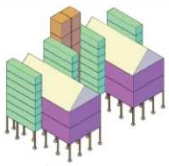
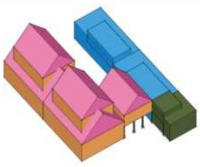
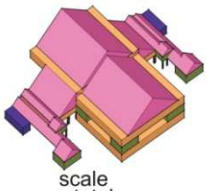
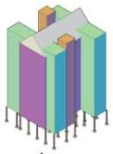
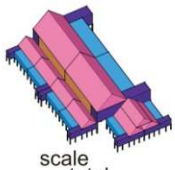
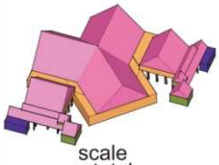
4.1 Shape Grammar of Existing Architecture

Table 3:
Shape Grammar of Existing Architecture

	NOBILITY	ORDINARY
	SHAPE GRAMMAR FOR EXISTING	SHAPE GRAMMAR FOR EXISTING
HILLY AREA		
LOW PLAIN		
		
COASTAL AREA		
		
		
		
		

4.2 Shape Grammar for Contemporary Architecture

Table 4: Shape Grammar of Contemporary Architecture

OFFICE	APARTMENT	INDUSTRY	MALL
 combination partial vertical	 combination partial combination	 combination partial horizontal	 combination total combination
 combination total vertical	 combination partial horizontal	 combination total vertical	 combination total vertical
 repetition total horizontal	 repetition partial horizontal	 repetition partial vertical	 repetition total combination
 repetition total combination	 repetition total horizontal	 repetition total horizontal	 repetition partial combination
 scale partial combination	 scale partial horizontal	 scale total combination	 scale total combination
 scale partial vertical	 scale partial vertical	 scale total horizontal	 scale total horizontal

The above table shows explorative examples of the shape grammar for contemporary buildings of several usage types, i.e. office building representing commercial type, apartment building representing residential type, industrial building representing industrial estate, and mall representing retail trading type.

The schemata applied includes: (i) scale, repetition, or combined scale and repetition schemes; (ii) horizontal, vertical, or combined horizontal and vertical schemes; and (iii) total configuration or partial configuration.

V. CONCLUDING DISCUSSON

The above analysis reveals a distinctive architecture style that appears to strongly recall shapes common in Mamminasata Region. Accordingly, we can conclude that the shape grammar model enables generation of Mamminasata shape in the design of locally-based contemporary architecture of the future.

The try-out in this research needs to be further developed to enhance both quantity and quality of the generated shapes. This could result in the form of guidelines for the future design of modern-contemporary buildings, particularly in Mamminasata region. Moreover, other cases of local architecture in Indonesian archipelago could adopt and adapt the model similar approach and similar aims for searching local characters based on local wisdom. This not necessarily limit to architecture, but also other types of built-environment such as urban area, housing, and landscape designs. Accordingly, professional architects and policy-makers may find the shape grammar model handy for the creation of appropriate contemporary architecture and environmental design;

Application of the model will be most useful for the creation of local identity on large-scale structures of modern-contemporary architecture which necessitate high-tech construction methods and novel building materials, for instance: commercial facilities and amenities, inter-regional transportation terminals, industrial structures. Such type of buildings proves to be the most prone to identity loss due to hindrances and difficulties in retaining traces of local characteristics. Particular attention therefore needs to be paid for attempt to create both the subtly perceivable characteristics and the obviously observable characteristics that strongly evoke local identity in architectural design.

Large amount of research works remain and need to be undertaken for future research. Further explorations of shape grammar model may cover various development aims, various usages, and various scales that express local characteristics, among others: (i) Refuge shelters in post-disaster recovery program: main objective is to find out proper shapes for refuge shelters in terms of local identity and maximum comfort whilst efficient construction time and cost. (ii) Underground urban spaces for business development: main objective is to bring out proper shapes of underground spaces in terms of local identity and maximum comfort whilst spatially attractive and economically beneficial. (iii) Waterfront and/or off-shore themepark development: main objective is to initiate proper shapes of waterfront/off-shore structures in terms of local identity and maximum comfort whilst visually attractive and dreamlike expressive.

VI. ACKNOWLEDGEMENT

We would like to express sincere gratitude to Japan International Cooperation Agency (JICA) Technical Cooperation Project – Hasanuddin University for granting 2010 Laboratory-Based Education Research Fund that made this research possible. We would also like to express greatest appreciation to graduate students Ms. Marwah, ST., Ms. Siti Belinda, ST., Mr. Kamil, ST, for the hardworking and actively participating along the research process, also to undergraduate student Ms. Siti Fuadilla for assisting in field surveys. Our sincere thanks go community leaders and people in Mamminasata Region who provided valuable information and permitted their houses to be measured and recorded.

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3.1.25
THE CONCEPT OF *BANUA* IN MANDAILING ARCHITECTURE

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ABSTRACT

Mandailing architecture as an unique culture in North Sumatera have several potencies that rarely publised. The potencies like traditional settlements, traditional buildings and also the concept of Banua are very interest to discussed. The concept of Banua was one of an indigenous architecture as basic architectural design in Mandailing settlements. Banua has been used to organize Mandailing settlement and also has been shown in life setting of Mandailing community, not only in micro scale, like their houses; but also in macro scale, like their spatial environment.

This paper discussed about the concept of Banua in Mandailing Architecture. The concept of Banua is a cosmology of three world, namely (1) Banua Parginjang, (2) Banua Partonga and (3) Banua Partoru. Banua Parginjang (upper world) was a God world; God have control over this upper world who called Datu Natumompa Tano Nagumorga Langit. Datu Natumompa Tano Nagumorga Langit believed as creator and one in authority of earth and sky. This world is simbolized with white colour. Banua Partonga (middle world) was a human world, world for work with many activities everyday. This world is simbolized with red colour. Banua Partoru (bottom world) was a world for dead men or called soul world. This world is simbolized with black colour.

The concept of Banua has been applied on traditional building models by pillar houses and arrangement of environment settlement by setting of traditional main buildings in the middle of huta.

***Keywords** : Banua, Paginjang, Partonga, Partoru and Huta*

I. INTRODUCTION

The existence of *Mandailing* has been recognized since 14th century based on the word of honor of Palapa Gadjah Mada on verse 13 *Kakawin Negarakertagama* by Mpu Prapanca as the expansion territory of Majapahit in 1287 Caka (1365 AD). The *Kakawin* hand writing was found at *Pura Cakranegara* Lombok and afterward, Dr. J. Brandes from Holland published it

in 1902 based on its origin language and letter with the title *Negara Kertagama, loftdicht van Prapanca op koning Radjasanagara, Hajam Wuruk van Majapahit* (Lubis, 1986 : II, 1)

The settlement of *Mandailing c*onsist of some villages which their locations spread in *Mandailing Julu* and *Mandailing Godang.* At the beginning, those villages were *huta* called *desa*. The pattern of the settle has been exists since the first inhabitant came to this area. By living as permanent residence, those people build their own villages as *Huta*. The newly forming *Huta* could be a main village by process of *Horja* which is symbolized as a king and a building named *Bagas Godang* as the mansion of the king and the other building *Sopo Godang* as public hall meeting and *Sopo Eme* as the rice barn. *Huta* village has also a large yard *Alaman Bolak Selangseutang* as a place for all village activities which located in front of *Bagas Godang* (lubis, 1999:VI,82).

The interesting phenomenon of *Mandailing* settlement is that the pattern setting of the building and its element form certain unique structure. Their traditional buildings consist of some types and each type has its physical characteristic with certain ornaments and symbols. Each building and its element in *Huta* has unique pattern based on concept of *Banua* which has been believed since long time ago.

II. THE STUDY OF MANDAILING ARCHITECTURE

2.1. The Belief System and Banua Concept in Mandailing

Before Islam came and became a majority religion in this area, *Mandailing* people had a belief that this universe is divided into three parts or called *Banua*, they are :

a. *Banua Parginjang* (upper world), this is a place where God, the human master that called *Datu Natumompa Tano Nagumorga Langit* as the creator and the owner of this sky and earth;
b. *Banua Tonga*(middle world), this is a place where human does daily life activities. This place is symbolized by red color;
c. *Banua Partoru* (bottom world), this is a place for dead people or called as spirit world. This place is symbolized by black color.

The three beliefs world can be seen in *Mandailing* social life setting as micro scale(house) as well as macro scale (spatial domain). The three world cosmologies, *Partoru*, *Partonga* dan *Parginjang* are applied by *Mandailing* people to build their houses. House is lifted from the ground (bottom world) as the reason that it is considered as a place where the dead people are evil and dirty, thus, the type of this building is grandstand house.

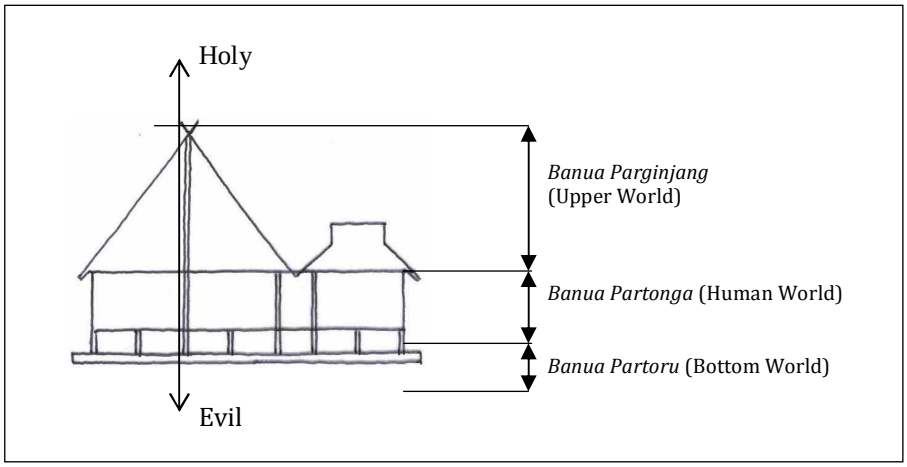


Figure 1. Mandailing People Cosmology
(Source : Sudjatmoko, Eko, 1999)

2.2. Mandailing Traditional Architecture

Mandailing traditional architecture as a product of high culture and enriched by symbols like the other traditional building in Indonesia. Product of *Mandailing* traditional architecture consist of *Bagas Godang* and *Sopo Godang* which are equipped with *Sopo Eme* or *Hopuk*. These building spread in *Penyabungan District, Kotanopan* and *Muara Sipongi*. These traditional building are the inheritance of kingdoms from *Lubis* and *Nasution* clan in Mandailing.

Bagas Godang is also called village *bagas* and this is house for the *huta*'s king or *tunggane ni huta* or *King Panusunan* as the leader, *huta*'s regulator, upholder and as the village guardian. *Bagas Godang* as a main village building in a *huta* and a clan symbolizes *bono bulu* which means a custom unity with *namoranotoras* (honorable leaders), *kahanggi* (family in same clan), *anak boru* (family for son-or daughter-in-law), *datu*, *si baso*, *ulu baling*, artist and king *Pamusuk* as king of the village.

Bagas Godang also has a function as a place for gathering or meeting and as a place of protection for each member of the society who has disturbance from other *huta*. Closed by *Bagas Godang*, a *Sopo Godang* which is used as museum for art instruments like *gordang sambilan*. *Ogung* is a place for discussing and conference, place to decide customary, place for visitors and *tortoar* as stage for art performance.

Bagas Godang and *Sopo Godang* are also equipped with *Sopo Eme* or *Hopuk* whose their function as rice barn. *Sopo Eme* and *hopuk* have a meaning of social prosperity and each member of society who doesn't have enough food, they could ask help to the king.

In front of *Bagas Godang*, there is wide flat ground as the yard of *Bagas Godang* or *Alaman Bolak Selangseutang*. This yard is a place for traditional ceremony and protection from outside disturbance. Every member who takes cover at *Alaman Bolak* could not be disturbed, hurted, or hit because that person has been under protection of the king. The King will bring the justice by discussing with the honorable leaders. Today, this yard also becomes a place for art performance *gordang sambilan*, *monortor*, martial art training and other Islamic occasions.

The other facility in a *huta* is *Pancur Paridian* or *tapian* mandi. A hut in rice field called *Sopo Saba*, and in garden called *Sopo Ladang*. The king graves are protected by a building called *Bale*.

2.3. History of Huta

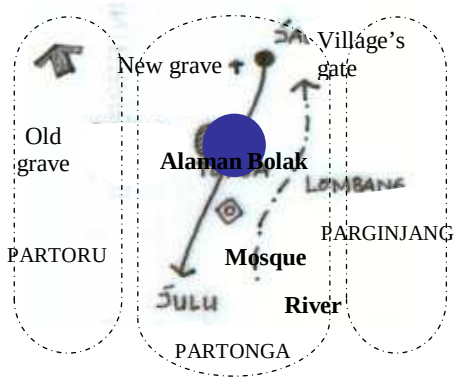
The settle living pattern has been exist in *Mandailing* since the ancestors of *Mandailing* people came to this area. At the beginning, *Mandailing* people lived in mountain range and being nomadic. At that time, they did not have a certain belief and only believed *Sipelebegu*, an invisible creature and their ancestor's holy spirits. Afterward, they moved from the mountain range and made new village for settle. They still used their lands in mountain as agricultural field even though they had settled in their new village (source: direct interview with some main informants, 2002)

The classification of *Huta* (kampong) in *Mandailing* are divided into some phases which reflect the status of *huta* by some certain traditional ceremonies:

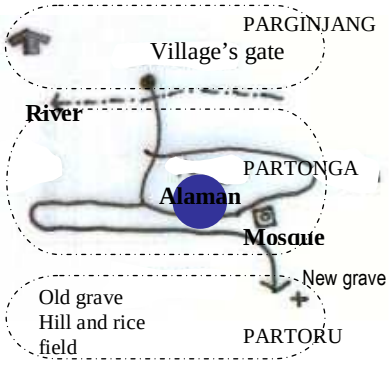
1. *Banjar*, a small *kampong* (village) with two or five houses.
2. *Pagaran*, kampong that consists some *banjar*.
3. *Huta* or *huta adat*, kampong that has already completeness of mores and becomes a mansion of the King. *Huta* has a king and its apparatus.

During the existence process of a kampong in *Mandailing*, it is always started by the building of people houses or ordinary *bagas* by certain group of clan who come from mountain range. Each group has only three or five houses called *pagaran.* Henceforward, a *pagaran* could become a *banjar* and a *banjar* would become a *huta*.

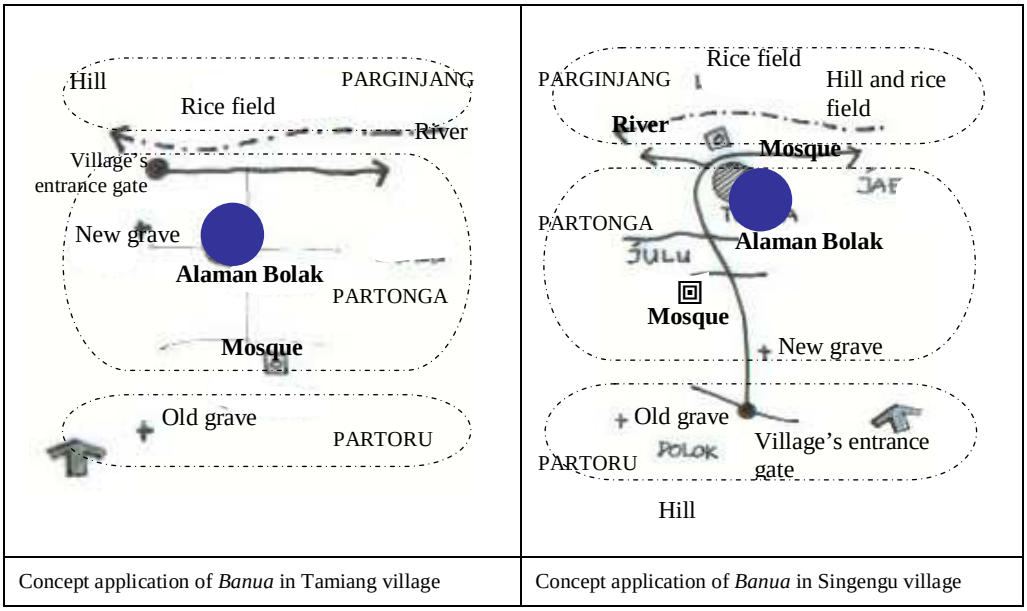
To become a *huta*; a *pagaran* or a *banjar* must have a completeness of *mores* to do *horja* (traditional ceremonies to legitimize a *huta* becomes a *huta adat).* Thus, the process to become a *huta* does not always need some steps, like mentioned above. A *pagaran* or *banja*r can be directly become a *huta* if they could fill all main conditions as *huta adat* by equipping the completeness of mores and showing the ability to do *horj*a. Other condition is that a *kampong* must have a small kampong as the expansion territory from its origin kampong that would be a *huta adat* (sumber: direct interview with some main informants, 2001).
At the beginning, the kampongs had a rule between king and people that to build *Bagas Godang* – it is forbidden if its position back of the sun, while people houses usually back of the sun. It is believed that only king who can face the sun power and also as the source of life. Beside as intellectual, the king must have magic and spiritual power.
A matter of fact, only some *Bagas Godang* that lead to the sunrise or east but the position do not back of sunrise in the east. In some cases, geographically, this is the position of Bagas *Godang* in *Huta*. When *Bagas Godang* leads to the east like the first belief, it should be put in the west while west is the position of *Alaman*. It is impossible to be directed to the north due to the other buildings and also it is not quite wide for *Bagas Godang* because its big size. In that condition, the most possible is position directed to the south or south east or the elements setting are influenced by environment.



Concept application of *Banua* in Tolang village



Concept application of *Banua* in Rao-rao Lombang village



Concept application of *Banua* in Tamiang village	Concept application of *Banua* in Singengu village

Figure 2. Concept application of Banua in Mandailing
(Source : Analysis Result, 2002

Nature and environment character are not the only factor that make the difference of building in *Alaman Bolak*. In some cases, most of *Bagas Godang* have the oriented direction to the others houses (ordinary people houses) and houses of king's relatives (conversely, the houses around *Alaman Bolah* orient to *Bagas Godang*). Beside that, the position of *Bagas Godang* face to the entrance road to the village even though indirectly. Everyone who comes to the village can find *Alaman Bolak* location because the entrance road always directs to the *Alaman Bolak*. It is related to the kinship system and social system *Dalihan Na Tolu* that keep custom values by an homage to the king as the founding father of Kampong, leader as well as servant of the people and to the *Kahanggi* whose privilege as decision maker is more important that the king in society life.

Dolok and *Lombang* are decided based on their position to the river and not only used as normative value but also in all cases contextually. From cosmology concept, it can be seen that *jae, julu and tonga* are part of *Banua Partonga* or middle world. It is appropriate to the *Mandailing* ancestors belief that have made *Banua Partonga* as a place for human to do daily activities, in such a way *Alaman Bolak* as center activities for the people in *Banua Partonga*.

Lombang that shows the "bottom world" and closed to the river is part of Banua Parginjang. Literally, *lombang* that has meaning "bottom", it is not appropriate with the meaning of *Banua Parginjang* that has meaning "upper world" as sacred place of the Almighty Creator. However, for farther observation, *lombang* with the river is always close to the hill. The hill and river are believed as *Banua Parginjang.*

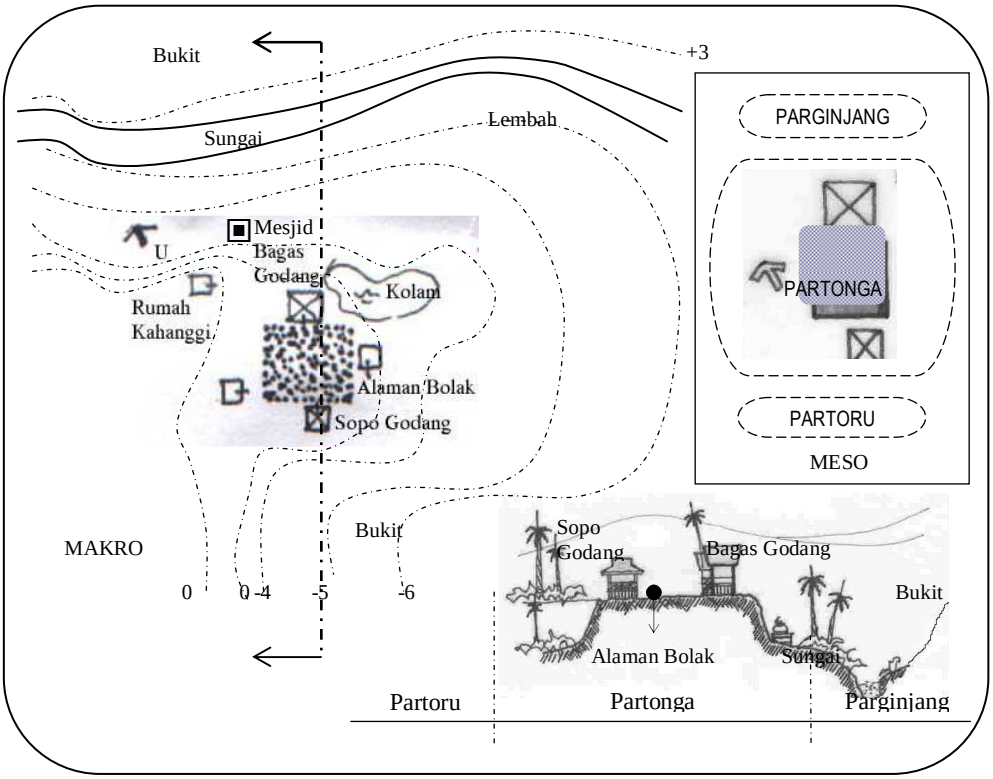


Figure 3. *Alaman Bolak* position based on *Banua* concept and Geographic.
(Source: Analysis Result, 2002)

River and mosque throughout its side are located in *lombang*. From cosmology concept, this position is in *Banua Parginjang* area. As source of life, water is sacred for *Mandailing* people and it becomes a basic of water division in the village. *Banua Parginjang* as sacred upper world is symbolized by a river.

Dolok (Hill) is a part of *Banua Partoru* which means "bottom world" where the dead people stay. Literally, *dolok* is also not appropriate with the meaning of *Partoru* (beneath or humiliated). However, from all cases show that *dolok* is part of *Banua Partoeru* because it is always marked by the existence of old graves. The graves in *tonga* and located closed to people houses are new graves. Therefore, the "bottom world" as a place for the dead people is not place in bottom place as the meaning of *Partoru*, but precisely in upper place and far from the river. It is appropriated to the *Mandailing* ancestors belief that the dead people should be kept away from life source "sun and water". For farther observation, it can be seen that all old graves are always located in the west area (sunset spot) and far from river. Although some graves are located closed to the river,, there is always certain difference such as a sharp contour, thus the grave is always located in upper place.

Banua Parginjang which means sacred upper world is always located in the east or north east and not in the west. It is appropriated to the belief of *Mandailing ancesto*r. Before Islam came, they had a belief of sun power as the source of life and the Almighty *Datu Natumompas Tano Nagumorga Langit* who created and controlled the sky and the earth, thus *Banus Parginjang* is always area in the east where the sun rises.

Mosque as a worship place which was built when Islam came to this area. Its function as a place for worship activities and it is placed in Tonga which part of *Banua Partonga* zone.

Basically, *Mandailing* people still use the older cosmology concept to decide a location and the placement of *huta*'s elements. The change of a certain element location which is not appropriated to cosmology concept occur due to the system belief alteration from *Sipele Begu* to Islam, therefore the grave as an humiliated area must be kept away from human area where the location is closed to the people houses even though it is located in the higher area.

III. CONCLUSION

The placement of each element in *Huta* is classified based on 3 aspect as well as hierarchy, i.g. (a) *Banua* cosmology, (b) belief system which related to the river and sun power, (c) nature condition. Physical object location is decided according to the sun position. If natural condition did not support, the orientation could be change but it would be the opposite of the direction where the sun rises. In this case, *Banu*a concept application and belief to the river during orientation direction decision in *Huta* are consistent , while belief system to the sun power depend on nature condition.

Alaman Bolak has a function as the center of activities, which means it is located in *Banua Partonga* zone. The position of *Alaman Bolak* and configuration of the buildings depend on Huta's status, the existence of *Bagas Godang* and *Sopo Godang*, Physically(environment) or non-physically (*Banua* concept, custom and belief. *Alaman Bolak* is an important element and a main condition for every *Huta* which becomes Huta adat and power state. *Alaman Bolak* position is decided early than *Bagas Godang* and *Sopo Godang*.

In macro side, the position of *Alaman Bolak* on *Huta* is configurated to its function as a center for people activities which is wide enough as well as in the right zone. The proper places as *Alaman Bolak* location in huta is (1) *jae* means downstream area; (2) *tonga* means middle area of *huta* and (3) *julu* means headwater area. Those places are located in *Banua Partonga* zone.

The position of *Alaman Bolak* is a manifestation of older *Mandailing* people belief which came from their ancestor tenets as (1) *Banua* conception which is believed as 3 different worlds, i.g. (a) *Parginjang Banua* or *tua haratan*, as *upper world where the Almighty Datu Natumompas Tano nagumorga Langit, (b) Banua* Partonga or *hanjonjongan diha sianganon* as middle world where human does the daily activities, and (c) *Banua Partoru* or *honding situmandok* as bottom world for dead people or spirit world; (2) The belief to the river as a sacred element and a foundation to decide *Banua kampong* zone and the power of the sun which means morning sunrise as a sacred direction.

Alaman Bolak dan *Sopo Godang* as a center of mores occasion is located in *Banua Partonga* zone, while *Bagas Godang* is located in *Banua Parginjang* Zone. The orientation of *Bagas Godang* is not the opposite of the morning sunrise. The grave as a place for dead people is located in *Banua Partoru* zone, as the sunrise spot and kept away from *Banua Tonga* as place human and river as sacred place in *Banua Parginjang*.

In meson scale, the position of *Bagas Godang* is located in *Banua Parginjang* and *Sopo Godang* in *Banua Partonga*. The personification of non-physic belief aspect, placement and configuration of Huta's elements also consider physical aspects such as nature and environment condition. If the nature condition does not support, it is supposed to be in other zones except *Banua Partoru*. Thus, nature condition becomes a consideration to apply or to

personified the non-physic belief aspects into physic aspect. The exception is in the placement of *Alaman Bolak* in *Banua Partoru*.

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3.1.26

SUSTAINABLE INCREMENTAL HOUSE WITH MODULAR CONSTRUCTION

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ABSTRACT

Dwelling is an essential needs of human being; unfortunately, housing development is the main contributor to the problem of climate change and environmental degradation. Thus, it is important to build a more sustainable house.
One of the sustainable models of dwelling, which has been proven over time, is the traditional architecture. Most traditional houses in Indonesia are constructed with the local wisdom of traditional people in responding to the local climate, using the local materials and influenced by their culture. Some have a flexible lay-out with easily adaptable space, others are incremental houses which expand bigger over time.
This paper proposes the new concept of sustainable house. From a study of three traditional houses with space adaptability, an incremental house is designed to accommodate the owner's changing phase of life (from single, married, up to having some children). The house uses a knock-down system and modular construction, and incorporated with many sustainable features to make it not only comfortable, but also sustainable and adaptable.
Keywords: *incremental house, adaptable, modular construction, knock-down*

I. INTRODUCTION

Every human being naturally wishes to fulfil all of their needs, not only material necessity, but also emotional and spiritual satisfaction. According to Maslow's hierarchy of needs, there are five basic needs; existential needs, safety, social needs, esteem and self-actualisation (Simons *et al*, 1987). Dwelling is important not only to house human activities, but also to protect them from natural environment and climate. It accommodates the social and cultural activities, and also a means to self-actualise and gain respect from others. Thus, it is an essential needs which can satisfy the five basic needs mentioned above. Due to social and economic differences in the world, criteria of a feasible house differ from one country to another. However, housing development has become major problem of the construction industry all over the world.

Nowadays, climate change and resource scarcity have happened globally and put the future of civilisation on jeopardy. The main reason behind this is over consumption of resources and over emission of greenhouse gasses caused by population explosion, massive urbanisation and industrialisation. Among other causes, construction industry is responsible towards 50% of natural resources used, 40% of energy used, 16% of water used and 45% of CO2 emission (Akmal, 2007), with a significant contribution from residential sector as the primary needs.

Facing the current environmental problem, global action for sustainability has emerged. In here, housing as one of the largest construction industry, should be designed in a sustainable way to ensure not only minimum consumption of energy and resources, and minimum environmental impact, but also enhancing human condition and accommodating their social and cultural needs.

Most houses in Indonesia, especially in the big cities, have been far from being sustainable. The trends show that while low-income people are still struggling to have a proper dwelling, other people are trying to build bigger and more prestigious houses. These houses are likely to be over consumptive towards resources and selfish to the surrounding. There is still lack of knowledge about the importance and how to build a sustainable house. A house is frequently designed only to accommodate the present needs of its occupants. More investment is made to achieve thermal comfort through active system

such as air-conditioning, rather than to pursue a healthy house which works in integration with the local climate.

Other common issue in housing development is the needs to adapt the house according to the developing needs of its occupants. It is likely that throughout years, the activities and needs of the occupants will change, and thus the house needs some adjustments. Some examples are the needs of an extra room when a baby is born, or when the children have grown and need individual space. Changes, which are not anticipated in the design phase, will cause unplanned renovation cost or even early demolition of the house when it is no longer proper. A sustainable house should take into account space adaptability and flexibility to prolong the building lifespan. This is aligned with the concept of 4R (reduce, refurbish, reuse and recycle) (The Institution of Structural Engineers, 1999). In Indonesia, as in other developing countries, people tend to emphasis the short-term benefits. Thus, most houses are not designed to respond to the changing needs of the owner.

Consider the needs for a more sustainable dwelling, this paper presents a sustainable incremental house to be implemented in Indonesia. The research is carried out in several stages; starting with exploration of traditional houses in Indonesia, the principles coined are integrated with the sustainable strategies to produce a model of incremental house with modular construction. The research has involved literature study, case studies, design drawing and modelling.

To find a proper model of sustainable house, exploration should be carried out towards the local climate, culture and the strength of the local community. Therefore, observation has been done towards several traditional houses in Indonesia, focussing in the flexibility of a house to respond to the changing needs of its occupants. From the study, it can be seen that some traditional houses are incremental houses with flexible lay-out. Thus, an incremental house is proposed.

Modular construction is cost and work-saving, and due to this benefit, it is more likely to be implemented to achieve a sustainable construction. With modular construction, the construction components can be standardise and produced with fabrication and thus the construction becomes faster and cheaper. Moreover, if the joints between modules are not fixed, the construction can be easily dismantled and hence it means an increase of reuse potential of construction materials.

II. LEARNING FROM TRADITIONAL ARCHITECTURE

From exploration of traditional houses in Indonesia, it is found that most houses have a flexible lay-out. These houses use only limited partitions between rooms, so that the rooms are easily adjusted according to the needs of the occupants. Some houses are incremental, they grows bigger/longer over time to satisfy the addition of the family member. Three traditional houses with adaptability towards functional changing are taken as the case studies to be examined - The Bornean Longhouse, Kampung Naga House, and The South Sumatran House.

2.1 The Bornean Longhouse

The Bornean Longhouse is a typical house of Dayak communities in Borneo Island, known now as Kalimantan Island between 1850-1990. Different with a single-family house, which one family usually lives in a house, one village of Dayak communities used to stay in a single longhouse. The longhouse can be 20 to 200m in length, 8 to 20m in width, with the floor raises between 2 to 5m from the ground (Guerreiro, 2004). It is a raised-floor construction with a simple rectangular plan which grows longer along with an addition of the family members. By raising the house from the ground, the occupants get a large platform to dry crops, cloth, etc. It is also protected from humidity, wild animals and flood.

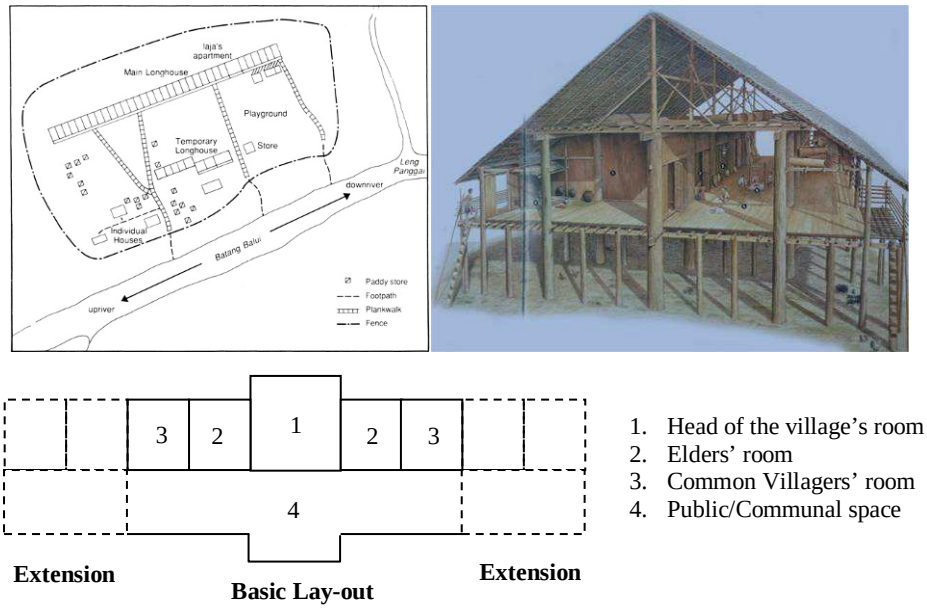


Figure 1. Typical Dayak Settlement and House

Source: Millet (2002)

Longhouse has a simple and flexible lay-out. Along its width, the lay-out is divided between private rooms for families and public spaces, consisting of passages, corridors, halls, platforms and stairs. Each private room belongs to each family, and it is a single flexible room without any partitions inside. Meanwhile, the public spaces accommodate social interaction between families. This place is used regularly for social, agricultural and ritual activities of the community (Figure 1).

The construction is made majority of local hardwoods and shingles. The main structural elements - posts, beams, rafters, cross-beams and floorboards, are all made of the local hardwoods joined with mortise-and-tenon joints, so they could be reused several times (Guerreiro, 2004). The simple gable roof and the timber construction make the longhouse is possible to be lengthen according to the occupants' needs.

2.2 Kampung Naga House

Kampung Naga is located in Neglasari Village, 30 kilometres from Tasikmalaya, West Java. In here, more than 100 families live in a typical house. From 10 hectares area of Kampung Naga, only 1.5 hectares is used as housing area, while others are forest, farms and open spaces (Hermanto & Malangjudo, 1987).

Each house is typical and has a standard dimension of 7.5m by 4.8m. It is rectangular in plan with a single gable roof, with construction made of wood and bamboo. This modular house is proven to have an earthquake resistance. The flexible joints make the house able to withstand a 7.3 Richter scale of earthquake in Tasikmalaya, while the knockdown system makes the house easy to be fixed and moved to a new location after the catastrophe (Rambay, 2009).

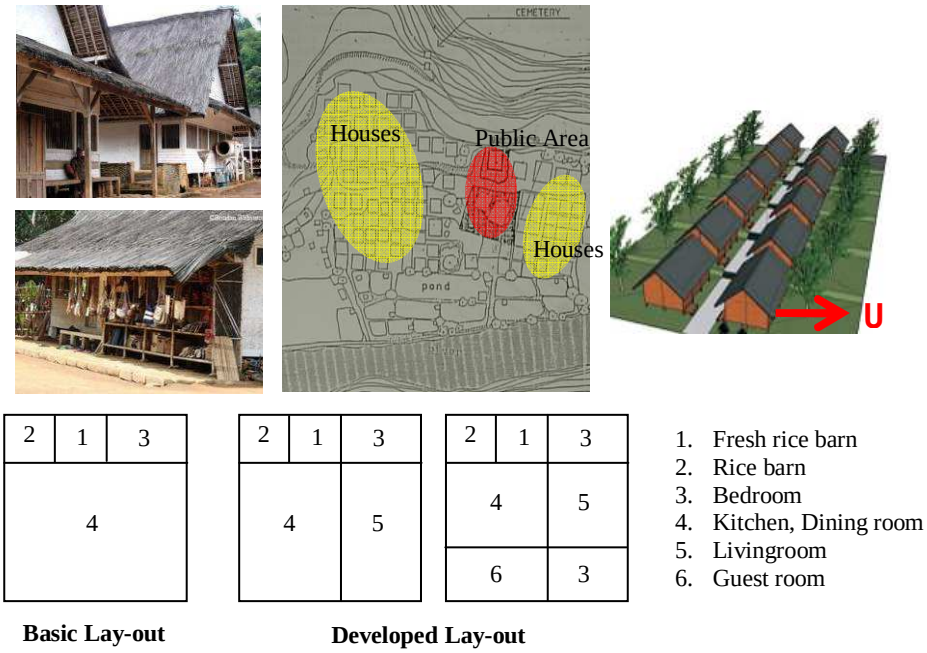


Figure 2. Kampung Naga Settlement and House
Source: Hermanto & Malangjudo (1987) and Indartoro (1987)

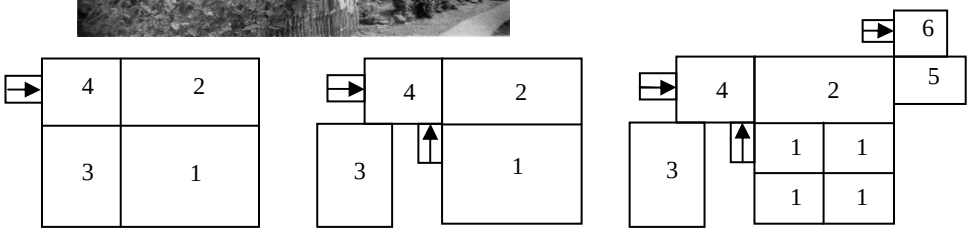
With a standard dimension, the house is prohibited to have an enlargement. This is done to preserve the quality of outdoor spaces in the neighbourhood, since the houses are arranged in a linear organisation with 2-3m distance between houses. However, the house has a flexible lay-out, so that the lay-out can be adjusted with the occupants' needs by addition of partitions (Figure 2). As in any traditional houses, the house also uses a raised floor construction and has no underground foundation. Its posts are simply supported on stones.

2.3 The South Sumatran House

A typical South Sumatran House is largely found in the South Sumatra regions of Bengkulu, Jambi and Lampung. As in Kampung Naga, each house is inhabited by a family. This traditional vernacular house is a square, raised box-frame construction with gable roofs, which sits on six to nine main posts stands on river stones.

The house usually consists of one main room with two difference floor heights. The lay-out of the house is very flexible with minimum partitions between rooms. The core of the house is called *luan*, is usually built first and then *tempuan* is built later with a lower level floor. *Luan* is the core of the house, used as bedroom and sitting room, while *tempuan* is the dining room and kitchen (Barendregt, 2004). In its development, the lay-out of the house can be adjusted according to the occupants' needs through addition of extra building as in an incremental house, or by adding more partition to create more rooms (Figure 3)

1. Luan (Bedroom & sitting room)
2. Tempuan (Dining & kitchen)
3. Front gallery
4. Entrance
5. Kitchen (separate from Dining room)
6. Back terrace



Basic Lay-out **Developed Lay-out**

Figure 3. South Sumatran House
Source: Barendregt (2004)

From the study of three houses above, some sustainable feature coined are:

- The space flexibility and adaptability is produced through either addition/adjustment of indoor partitions or addition of a new structure outside the house (incremental house). The second strategy is possible since these traditional houses are timber construction with flexible joints and have no fixed foundation below ground surface.
- The raised-floor construction is used as a protection from nature – humidity, floods and wild animals.
- All houses are tripartite house with simple gable roofs, reflecting the characteristic of tropical house with high rail fall.
- Constructing using local materials such as wood and bamboo, the house is designed with passive system to ensure a comfortable indoor environment by maximising natural ventilation and daylight.

These three houses are indeed sustainable; however, not all of their features can be implemented in today's housing development. Therefore, to design a new model of sustainable house, the sustainable characteristics of these houses are taken and combined with the development of construction industry and the availability of resources at the moment.

III. THE PROPOSED MODEL

The sustainable house presented in this paper is an incremental house which grows larger along with the extension of the family member. The house is designed to maximise natural ventilation and daylight, to minimise the energy use. The knock-down system is applied to make the house easily dismantled to increase the adaptability of the house and its reuse potential, while modular construction is used so that the occupants can easily purchase the additional components needed for the refurbishment in the maintenance office inside the development area.

In designing the sustainable house, 2.2 hectares site in Citra Raya housing complex in West Surabaya was chosen. This complex offers an independent city concept with complete facilities so that the occupants can live, work and study near their house. Many young families and young professionals live here, since the Central Surabaya area has become too dense and the price of land is very expensive. It is expected that this sustainable house does not only satisfy the growing needs of the young families and professionals, but also influences and teaches the surrounding neighbourhood about the concept of sustainable living

The house is designed with the principle of sustainable housing (AIJ, 2005);

a. Working with nature

   The use of natural ventilation and daylight, and the creation of open spaces around the house show that the house is designed to work integrated with the natural environment.

b. Conserving energy

   Energy conservation is achieved by reducing the use of energy for lighting & AC through the use of the passive system. In addition, the roof angle and orientation are designed to provide an additional option of solar photovoltaic cells and rainwater harvesting.

c. Resource management

   To minimise the use of resources while increasing the possibility of the space adaptability, this incremental house is designed with a modular construction and a knock-down system. This automatically increases the space flexibility and possibility for the house to be refurbished and reused in the future.

d. Human comfort

   Occupants' comfort and health is achieved by ensuring adequate ventilation inside the house and the use of non-toxic materials.

Although emphasis of the research is to design a single family house which can increment through out time, a sustainable house can not be designed apart from its environment. Thus, the communal spaces are also planned, such as public facilities (club house, eating area, repair, maintenance and management office), open spaces for each cluster, and centre for waste and water management.

A. Club House & Commercial Area
B. Management Office
C. Maintenance/Repair Management Office
D. Waste Management
E. Water Management
F. Swimming Pool & Recreation Area
G. Houses (arranged in cluster with open space in the middle)

Figure 4. Lay-out of Three Clusters Sustainable Housing with The Public Facilities

3.1 The Incremental House

In traditional houses, space adaptability is produced by the flexibility of indoor lay-out and the possibility to enlarge the house with additional structure. In here, a flexible timber construction allows the house to be easily expanded or dismantled.

Currently, with the extinction of natural forest, using timber is not always sustainable. Concrete, the most usable structural material, is heavier and less flexible. It is less ductile and do not have reuse and recycle potentials (Lawson, 1996). Besides, different with traditional structures which are simply

located on the ground, today's structures are usually supported by substructure below the ground. These are some issues dealt in designing an incremental structure. Addition of a new structure attached to the primary one is difficult to be performed several years after the initial structure due to the issue of differential settlement and the joints.

In this research, steel is utilised as the main structural materials with secondary components made of light steel, due to its reuse and recycle potentials, especially when it is assembled with a pinned joints. The main structural frame is planned to be fixed and do not have to be added if the house is enlarged. Thus, an incremental space is created by designing modules of rooms between the main structures.

Four basic configurations are designed, to accommodate occupants' changing phase of life - one-bedroom plan for single occupant, two-bedroom plan for married couple, three and four-bedroom plans for families with child/children (Figure 5). The dimensions of each room required for all configurations are studied and standardised to determine the structural frame module. With a standardise dimensions, a modular construction is produced. Thus, the occupants can easily purchase an additional room in the maintenance office, so that the renovation cost and time can be minimised.

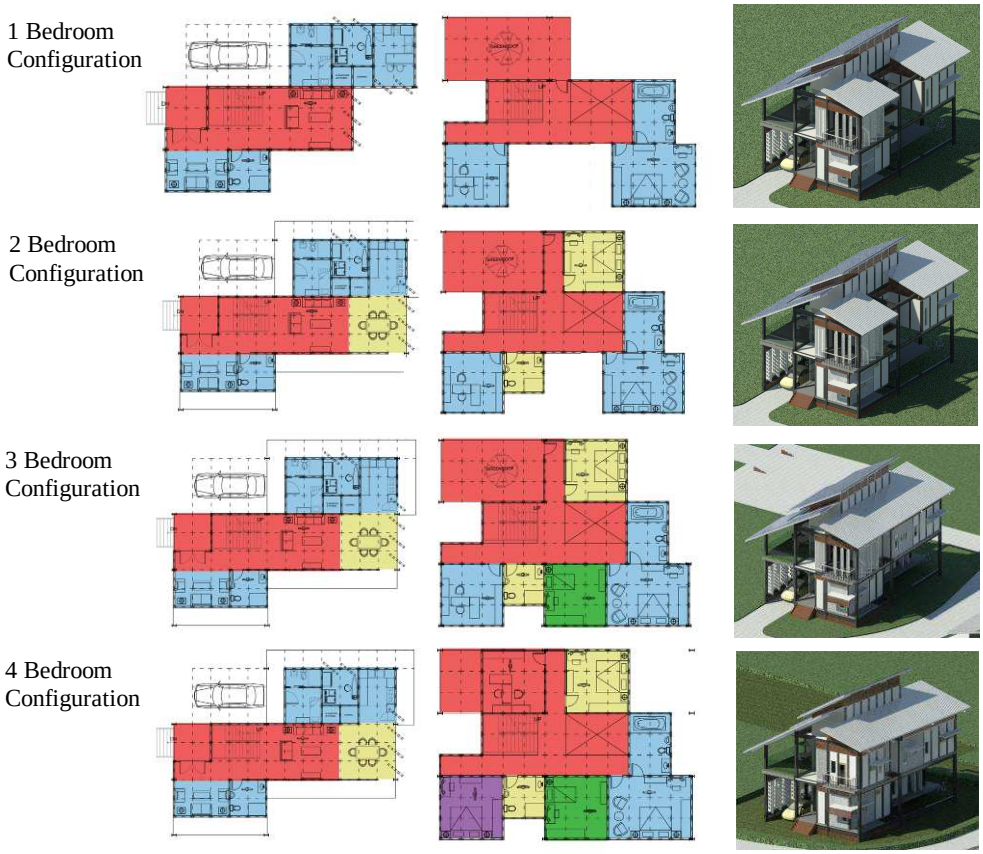


Figure 5. 4 Development Phases of The Incremental Houses

The four configurations above are designed by applying the sustainable features coined from the traditional houses studied and the sustainable design principles. The house uses a raised-floor construction to avoid humidity, minimise the building footprint and maximise the water absorption in the ground. The house position and orientation are arranged to allow every house has an adequate wind flow. The lay-out is designed to maximise natural ventilation and day lighting for each room to ensure a healthy and comfortable house. Instead of a simple gable roof, the roof is cut in the middle and elevated to create additional openings as hot air outlets and additional day lighting. The roof is also designed for additional option to use solar photovoltaic panels and rainwater harvesting. Two separate voids are designed in the core of the house as the light wells. The materials used are all sustainable and non-toxic, some are local materials, some are not.

3.2 The Modular Construction

Modular construction has grown enormously at the moment, especially in industrialised countries. It is work and cost-saving construction, since the construction elements are pre-fabricated in modular sizes and can be easily assembled on site with simple joints.

Some modular constructions use a knock-down system, so that that they can be easily assembled and dismantled, means possibility for refurbish and reuse. In a knock-down system, the construction flexibility is determined by the flexibility of the joints. Thus, in this house, instead of welded and fixed connections, the structural frames and the secondary members are all joined with bolts.

In designing the house as a modular construction, it is important to find a minimum variation of modular components without limiting the possibility of module combinations. Through the study of various room dimensions, five standardise construction modules which can be combined to produce diverse lay-out configurations are obtained (Figure 6). Using only these five modules, owner can build his house in four different configurations offered or even create his own design. Moreover, the house can be easily enlarged and dismantled by addition and subtraction of certain modules with a knock-down system.

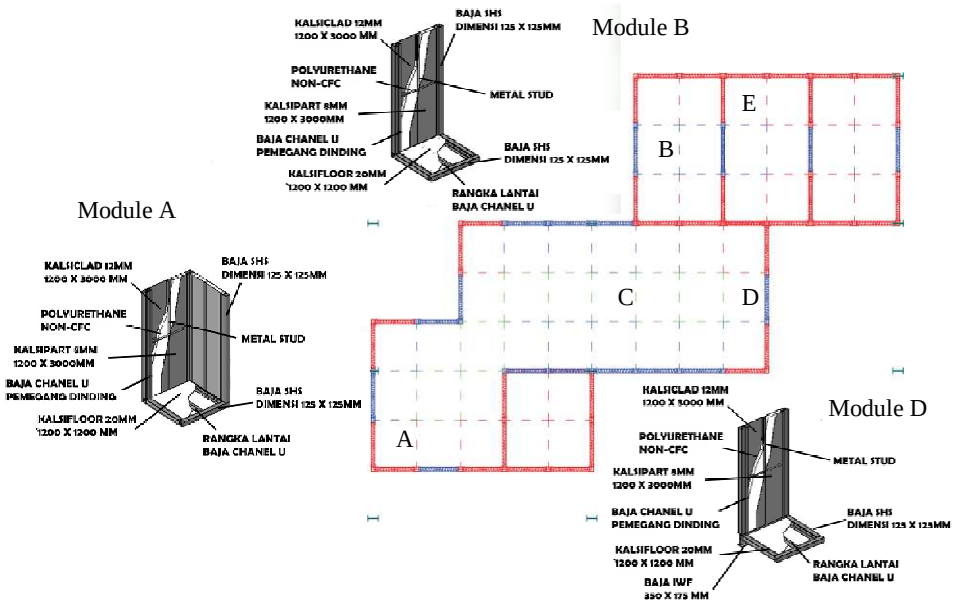


Figure 6. Lay-out of Modules for 1 Bedroom Configuration & Details of Some Modules

IV. DISCUSSION

Realising the necessity for a more sustainable house at the moment, especially to anticipate the continual growing needs of housing and the global environmental problem, this paper presents the concept of sustainable incremental house with modular construction. This concept was developed by integrating the sustainability of traditional houses with sustainable design principles and today's development of the construction industry. The result is an incremental house which can adapt to the changing needs of the occupants, while incorporating sustainable features to reduce the energy and resource usage, and maximize the occupants' comfort.

Several advantages of this sustainable incremental house are:

a. Its adaptability towards the occupants' changing phase of life.

b. Reduction of energy usage and carbon emission by designing the house to work integrated with the climate.

c. Efficient use of resources through the use of modular construction and knock-down system.

d. Healthy and comfortable house is ensured by the use of non-toxic materials and adequate air flow and lighting in the house.

e. Maximise water absorption on the ground and avoid humidity by a raised-floor construction.

It is realised that the research has some limitations. Thus, some possible future works are finding alternative materials to develop more economical modular components and studying the issues related to the joints between each module more thoroughly, such as the issue of insulation and acoustic.

V. ACKNOWLEDGEMENT

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3.1.27

”ONE KAMPUNG ONE PUBLIC FACILITY” AS AN INITIAL PHASE OF KAMPUNG ORIENTED DEVELOPMENT: STUDIO`S CONSIDERATIONS

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ABSTRACT

Kampung is an integral part of urban structure in developing world, especially in Indonesia. Undoubtedly, kampungs and its entities that embrace social, economic, culture, as well as physical dimensions showed an important role to represent urban settlement model in Indonesian cities that dealing with many related problems. Kampung should consequently be believed as entry point and has direct role to spread both idea and concept of sustainability in Indonesian cities. Kampung Oriented Development (KOD) will be a strategic approach through a comprehensive policy using kampung as focus area of development. It ideally encompasses several intensive developments based on characteristics of kampung. Consequently, it is important to carry out One Kampung One Public Facility (OKOP) as an initial strategy to examine on how kampung might be changed as KOD objectives. The aims of the paper were to discuss consequences of OKOP implementation theoretically and to assess performances and effects of OKOP through some models, which were developed in the urbanism studio at the Department of Architecture and Planning, Universitas Gadjah Mada. Place making framework was used intensively to undertake high-density kampungs at Malioboro surrounding districts in Yogyakarta City as cases of study. The results showed significantly that OKOP in term of bringing back urban activities inside kampungs and collating kampungs as cores of urban activity system should be considered as an effective infill process of sustainable urban development in Kampung Oriented Development ' s context.

***Keywords**: Kampung oriented development, one kampung one public facility, sustainability model*

I. INTRODUCTION

Inevitably, kampungs are an integral part of both urban spatial structure and urban life in Indonesia. They are body as well as soul, where the cities in Indonesia is growing and facing at the same time many development problems. Almost all aspects of urban life, whether social, cultural, political, and of course physical environment can be traced using kampung as a basis unit of analysis. However, up to now urban kampungs are still seen as less strategic to deal with recent urban development. Many people assume that by looking at a macro strategy in advance, all urban problems can be overcome. In fact, this assumption is not easy to do and often the outcomes are difficult to be traced through the most representative unit in the city, the urban kampungs.

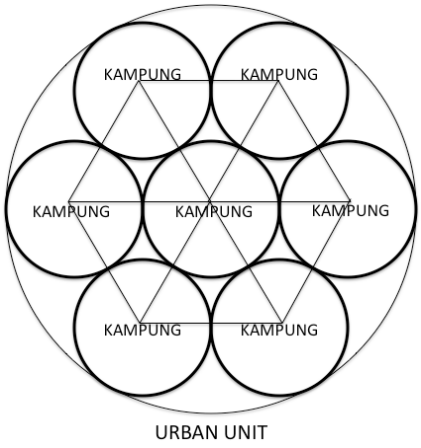

Figure 1. Kampungs that represent compactness condition as an integrative urban unit

Similarly, kampungs should have a crucial role as a backbone of implementation issues for urban sustainability. Because of its role, undoubtedly any initiation of sustainable urban development in Indonesia should need to think about kampung as an entry point for the implementation. This fact really showed the importance of Kampung Oriented Development (KOD). Of course, traditionally there has been plenty of local knowledge that has been running well in the urban kampung. For example, how harmoniously living in dense residential or mixed-used of space that is lately suggested by the west, has always been present and growing in kampungs for a long time. Thus, our task now is to try to formulate how actually universal values of sustainable urban development such as high population density, high activity concentration, optimal urban size than can easily control the environment, supported system for a good mobility, and achievement of good welfare, can be integrated in the developments inside kampungs, as illustrated in Figure 1.

This paper becomes one of scientific media of school activities to observe the important role of kampungs in facing current demands of finding sustainable development model. One Village One Public Facilities (OKOP) is consequently taken as a representative theme of the kampung oriented development`s strategy. The purpose of this paper is two folds. The first is to observe theoretical view point of OKOP application, associated with actual condition of kampungs as well as some ideas of sustainable development strategy. The second is to look at application and transformation of OKOP based on the actual condition of densely urban kampungs in the center part of Yogyakarta City. This application is carried out through a thematic studio at the Department of Architecture and Planning. Universitas Gadjah Mada, Yogyakarta. In the future, the results of the developed works in the studio may be used as important references to further application of OKOP`s concept.

II. ONE KAMPUNG ONE PUBLIC FACILITY (OKOP)

Why must we start to think and act urban development from the urban kampungs? As previously mentioned, kampungs have a direct connection with the urban systems. Discussing about urban and its entities in Indonesia, it will not be possible without put kampungs in core position of the discussion, direct or indirect. Therefore, preposition of this paper is that kampungs can be seen as "entry point" to solve the problems of the city, despite all of these attempts seem to be ignored recently. "Kampung Oriented Development" should be a jargon of urban development in Indonesia today. It should be believed that kampungs that grows (or developed) sustainably, then the city also would be sustainably developed respectively.

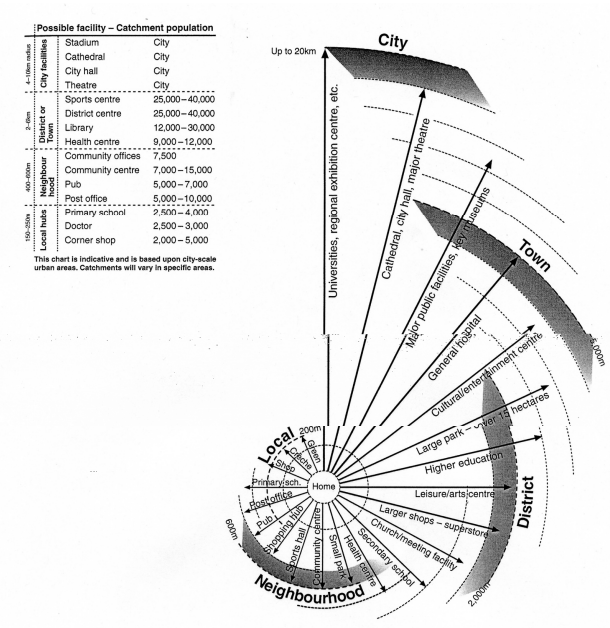

Figure 2. Scope and access of services for each environmental facilities (Urban Task Force, 2002)

In Roychanyah (2008), kampungs have a good tendency for both high population and built environment density, as well as good performance for delivering mixed-use in various urban functions. However, this positive diversity is still presumed as either individual creativity or forced strategies incidentally. Another visible phenomenon is inequality in provision of public facilities required by kampung`s residents. Spatial standard in environmental service for public facilities as confirmed by the Urban Task Force (2002) and shown in Figure 2 has not been taken into account proportionally, so the result of its services are not so optimal. As a result, in some kampungs the residents are often seen out of the kampungs to access public facilities they need. Therefore, the idea of public facilities provision could be a vital alternative for structuring concept of more intensified kampung.

As identified by Wachter (1996), Long and Hutchins (2003), indeed there are two main factors how the neighborhoods could create and sustain the existing communities. They are social environment and physical and services environment. The neighborhood as a social context could be viewed as any particular local communities consists of a variety of social networks such as social support and community engagement activities. Whilst, the neighborhood as a physical and services environment could be seen as public facilities and infrastructures that are essential services such as shopping centre, parks and leisure centers, transportation hub, provision of sidewalks, and other facilities may promote or discourage the physical activity and social interaction of the local communities. As pointed by Poplin (1979), the neighborhoods that provide good social networks and physical facilities, mainly in public facilities, have a direct influence on the better performance of community.

Neighborhoods decline when the people who live there lose their connection and no longer feel part of their community. Recapturing that sense of belonging and pride of place can be as simple as planting a civic garden or placing some benches in a park (Walljasper and Project for Public Spaces, 2007). They explained how most struggling communities can be revived, not by vast infusions of cash, not by government, but by the people who live there, community based development as kampung in Indonesia also already have “gotong royong”. One of the methods is “place making” that elaborates process of transforming public facilities or public space within small steps and contains motivations to others to make change should be as main choice.

One kampung one public facility (OKOP) should be one way on how kampung should be placed back as the smallest unit of a community center in the city. In this case, kampung can be equivalent to the neighborhood in other parts of the world. There, similarly, attention to public facilities is also included as important strategy in neighborhood planning towards a centered place of sustainability implementation. Chira and Wann (2003) or other practical transformation by towns and cities in the US and England put the provision of public facilities among other keys of place making such as human scale, size of access, resource management, open space, streetscape, variations, multi-function, coordination, and maintenance. In Japan, concretely, planning a "public realm" will be started sby focusing on the provision of public facilities (Koizumi, 2009).

Together with some concepts or findings that are running recently, such as a high-density condition of urban kampung and an abundance of urban functions inside kampung, elaborating all these attributes as a maximizing model would be interesting. In addition, by combining several constraints, such as limited access, weak transport mobility network in the city, and socio-economic gap among residents (Roychansyah, 2008), also becomes a strong challenge in elaborating kampung complexities into planning and design output. This OKOP is expected to generate the ability of kampung and its community towards better growth. Indeed it may be impossible for a public facility in a kampung to answer and tackle problems of urban sustainability more broadly by its single entity. But if the model is distributed into more widespread and systematic urban policy, for instance they are built in every kampung, then the result would be extraordinary.

III. PLACE MAKING OF “OKOP” THROUGH STUDIO MODEL

Here, the concept of OKOP was tried to introduce to students of Thematic Studio 1 (semester 6). The theme of studio in 2010 was "Jogja Sustainable Future". In this studio, students choose and rely on supervisor interest (the author) in which should be associated with the major theme. By studying

kampung, practically students will better understand problems that exist in their surroundings. They are expected to put kampung at the core context consciously for working. Learning the urban problems through kampungs, they basicallly will be able to portrait the existence dichotomy inside kampungs, such as formal-informal, modern-traditional, legal-illegal, as well as urban and rural life (especially kampungs that receive many villagers that migrate to urban areas). Spatially, students are expected to understand and should be challenged to propose a spatial strategy in solving urban kampungs: dynamic mixed-function, flexibility in spatial separation, uniqueness of social spaces, and others. As a final target, they should be able to produce the problem solving through planning concept and design.

Table 1. Basic working reference by "place making" (Project for Public Space, 2010b)

Place Making Is	**Place Making Isn't**
Community-driven	Imposed from above
Visionary	Reactive
Function before form	Design-driven
Adaptable	A blanket solution
Inclusive	Exclusionary
Focused on creating destinations	Monolithic development
Flexible	Overly accommodating of the car
Culturally aware	One-size-fits-all
Ever changing	Static
Multi-disciplinary	Discipline-driven
Transformative	Privatized
Context-sensitive	One-dimensional
Inspiring	Dependent on regulatory controls
Collaborative	A cost/benefit analysis
Sociable	Project-focused
	A quick fix

In particular, framework used in this studio is a bit different. Besides conservative method of finding problems, doing surveys, collecting data, making analysis, developing alternative solutions, and issuing a proposal, there is an emphasis on a framework of place making. Place making itself as expressed by Bohl (2002) is a way to optimize the potential, problems, and identity in a place so that all the elements that had to be engaged to work well. So in addition to the design at the end, place-making also requires a strategy to bring the uniqueness as well as the need for local communities. Thus required an intensive exploration of the object of study. Whyte (1981) wrote that the social life in public spaces contributes fundamentally to the quality of life of individuals and society. He suggested that we have a moral responsibility to create physical places that facilitate civic engagement and community interaction. Jacob (1961) for example has always stressed an importance of seeing the phenomenon based on the place. She highlighted the importance and led the way in advocating for a place-based, community-centered approach to urban planning, decades before considered sensible such approaches were the resource persons.

Project for Public Space (2010a) wrote that there are 11 key elements in place making. They are respectively community as the expert; creating a place, not a design; looking for partners; see a lot just by observing; having a vision; starting with the petunias: experiment is vital action; triangulation; all should be done; from supports function; money is not the issue; and the place is never finish. In addition, PPS (2010b) wrote that place making is not just the act of building or fixing up a space, but a whole process that fosters the creation of vital public destinations: the kind of places where people feel a strong stake in their communities and a commitment to making things better. Place making capitalizes on a local community's assets, inspiration, and potential, ultimately creating good public spaces that promote people's health, happiness, and well being. Completely in Table 1 is shown a basic reference that should be used when people works in place making`s framework. Besides working with the basic reference, students are also asked to be able to synchronize data-quality-attribute of place in the case studies as depicted in Figure 3.

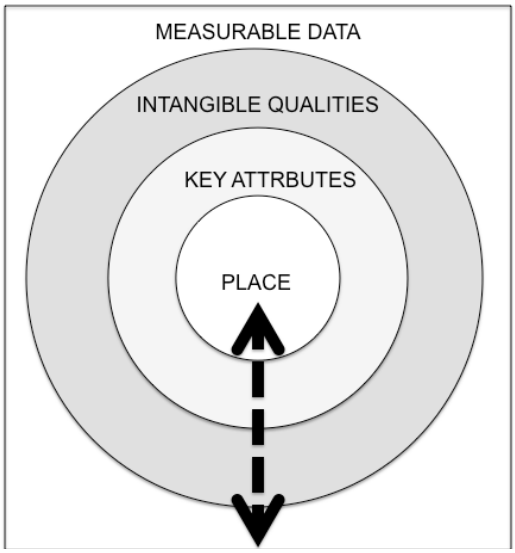

Figure3. The place diagram is a tool to help communities evaluate places. The inner ring represents key attributes, the middle ring intangible qualities, and the outer ring measurable data

(Project for Public Space, 2010b)

In the studio process, a semester was divided into 3 phases. First, completely the student understood the big themes of "Jogja Sustainable Future" itself. Here there were 2 key words that need to be mastered: Jogjakarta City and its characteristics, and the concept of sustainability. The second phase was decision in undertaking appropriate case studies, begun with an activity of kampung exploration ("jelajah kampung") as well as organizing related activities such as expert lectures and intensive discussion about kampungs. From this phase students were expected to be able to select a potential kampung as their "pilot projects" in the studio. Final phase was the most crucial sequence in which they should answer the needs of the kampung public facilities. Inevitably, because it emphasized process of the studio within place-making framework, some activities like discussion and collaboration with the kampung communities to catch their participations is a must. The outcome was a provision of public facilities that should merge various functions, such as public libraries, media center, cultural center, community center, transit house, social house, rental house, museum in kampung, even mass public toilet or MCK (bath-wash-toilet). Essentially, the target of the studio is how to create kampungs to become center of urban activities. This public facility should be able to be used optimally by the kampung communities themselves, as well as used by urban communities at large as shown in Figure 4.

Figure4. Graz Cultural Center (kunsthaus) in Graz, Autria by Peter Cook and Colin Fournier (left, courtesy of www.avoe.org) A simulation of Kampung Ratmakan, Yogyakarta and some scenarios of its "infill mixed-use facilities" (right, private collection)

IV. RESULT AND DISCUSSION

Using developed framework, participants of the studio (total of 6 students) were asked to perform and complete all the steps above. Kampungs in the city center of Yogyakarta was used as the case studies. One person arranged a different kampung that located and has direct access to Malioboro Street. The kampungs are administratively included in 4 different districts/wards in Malioboro Street (Danurejan, Gondomanan, Ngampilan, and Gedongtengen, see Figure 5). These districts have also been recorded as districts with the highest density in the city of Yogyakarta, more than 20,000 person/km2 (Yogyakarta Statistics Bureau, 2007). However, the distribution of each participant with the case study is 1. Kampung Ratmakan (Gondomanan District), 2. Kampung Suryatmajan (Danurejan District), 3. Kampung Pathuk (Gedongtengen District), 4. Kampung Sosrowijayan (Ngampilan District), 5. Kampung Notoyudan (Ngampilan District), and 6. Kampung Tegal Lempuyangan (Danurejan District).

In doing process of the studio, all participants were consistently implementing a simple framework in "place making". In this case, they mainly observed the kampungs precisely and advocating community`s opinions for multi-purposed public facilities they want. As shown in Figure 6, in the case 1, an optimal result that could be issued was a multi-purposed community center for meetings, libraries, and sports. In the case 2, it was appeared a model of social housing that can accommodate other activities in linear space, such as traditional linear markets, children's playground, and open spaces. The case 3 was unique because the location of the existing work was on a linear market inside the kampung. Here, the case only added a shared public-facility such as office space for the market traders association, multi storage, and sport gym. Meanwhile, for the case 4, several parcels were created simultaneously that each should be able to serve and accommodate kampung communal activities, such as art workshop, community center, shops, and so forth. The case 5 has not only produced a multi-purposed room for the public, in addition it also resulted an ideas of rearrangement of building density. For the case 6, it was a scenario to facilitate integration between transit and stay in the kampung where it was directly adjacent to a vital railway station in the city. All cases identified that infill process in adjusting public facilities will be effective strategy to deal with existing context of kampungs.

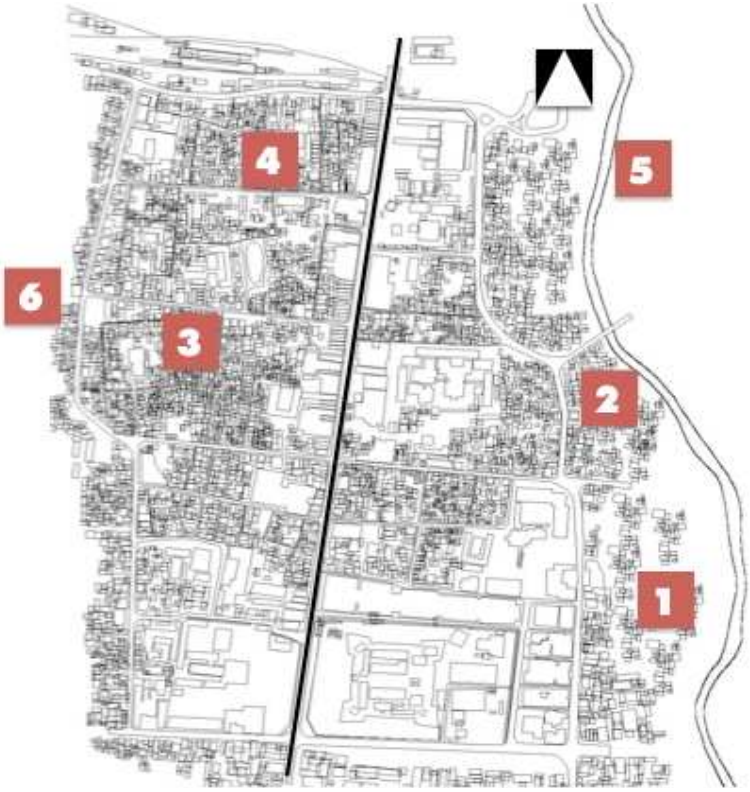

Figure 5. Distribution of kampungs that were taken as case study of OKOP Studio

From overall process, it seems that in a concrete substance, kampung residents can accept the idea of development based on urban kampung (KOD). This finding is coincided with previous finding that kampungs traditionally have awareness and wisdom to carry out activities inside kampungs (Roychansyah and Diwangkari, 2009). Both discussions through rapid assessment with limited key persons or group forum group discussion with many participants of kampung residents always get the same picture of optimism for future implementation of sustainability in the kampung daily life. They recognize that kampung problems in various dimensions always appear. Nevertheless, they are explicitly always optimistic to state that the problems could be resolved if all kampung residents have a similar vision. From what the studio participants have seen and explored to the kampungs community, actually they are enthusiastic about the idea of inserting a multi-purposed public facility that is able to strengthen their presence in the kampung daily life. Even so, these residents are also not sure how it could be realized to their real life. In addition, land issues related to ideal location for its public facility must be placed proportionally since it still becomes subject of lengthy discussion among residents. Advocacy for the residents on how the role of optimized public facilities would be essential. Technically, at the beginning of the studio, the kampung communities have a reluctance to discuss about the conditions of their kampungs and public facilities that will be applicable for their kampungs. For the time being and through some further intensive discussions, they could openly express their opinions. In this case, it is recognized that the place-making framework requires a very high level of communication and it is very decisive.

Figure 6. One kampung one public facility (OKOP) scenario for 6 different kampungs as case studies.

V. CONCLUSION

This paper is part of a sequence of research in kampung oriented development (KOD), particularly to observe appropriateness of sustainable development`s implementation in Indonesian cities. KOD has been chosen with strong background that however, urban kampungs should be an entry point of sustainable development initiation in urban spatial level. Focusing urban activities in each respective kampung could be one of important ideas to strengthen the kampung existence that has already a high density performance and mixed-function of activities on it. Development of multi-purposed public facilities in each kampung could be a strategic agenda to achieve a successful implementation of the KOD.

One Village One Public Facility (OKOP) was attempted to observe its possibilities through an urbanism studio (thematic studio) at the Department of Architecture and Planning, Universitas Gadjah Mada, Yogyakarta. During one semester, 6 student participants conducted an intensive studio with 6 densely kampungs in the center of Yogyakarta City. In the studio process, a simple framework of place making was applied, especially to find a “place” that suitable to the local preferences. The end result was a public facility in the kampung that has various functions (multi-purposed) and possibly its scope of activities extends to accommodate wider urban residents. Despite it is still far from an ideal process, especially in relation to the research method that should be carried out coherently and tight, but in general the results showed the enthusiasm of kampungs and their residents for the idea of

OKOP and KOD. At the very least, the public appreciation to this idea seems positive. It might promisingly be followed up in further level through more proportioned researches and related campaigns.

VI. ACKNOWLEDGEMENT

The author would like to thank to my students and the kampung residents who participated and contributed in the urbanism studio and made this paper possible. The student participants were Heppy Eka Ramadani, Gana Ganesha, Dewi Mayangsari, Aisyah Zakiyah, Zaqi Fathis, and Zuardin Akbar. They seriously elaborated instructions of the author to carry out the studio properly based on a heavy enough content within a tight schedule.

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3.1.28

LOCAL ARCHITECTURE IMAGE OF SAWAI BAY, IN CENTRAL MALUKU

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ABSTRACT

Sawai Bay is a regency part of Central Maluku, that can be reach by sea (from west and east). It is 170 kilometres from Masohi city (the capital of Central Maluku) during 4 hours passing roads. This area is supported by water resources that flow to the sea directly, so that can used for development of tourism areas.
Research method uses the character of a qualitative and eksplorative. The discussion is conducted architectural matters which related to building appearance. It is refer to the image of local architecture (Sawai).
Sawai village has a locality in architecture, housing, and urban environment. It is a traditional kampong that known as fisherman kampong. Two traditional houses of sawai village are house of Luma Salaola and stage houses above of water.
Locality of stage houses are consist of three parts that is classified function: (1) Ulu (head) is placed at roofs or part of plafonds. It is called kinati, that made from dry sago leaves; (2) Hatan (body) is placed at core of building, that is functioned as activity of building users; (3) Ai (foot) is in the form of structure foundation that made from local wood as lingua, ulin, etc.

Keywords*: architecture, customs, Bay, Sawai*

1. INTRODUCTION

The capital of Central Maluku is Masohi which has an area of 147.480 km2. It is consist of 136,116.1 km2 as sea and 11,364,6 km2 as land. Administratively, it is made up of 11 districts.

Figure 1. Peta Maluku tengah
Source : www.potensidaerah.ugm.ac.id

Boundary of Sawai Bay area:
- To the west: Sawai Village
- To the east: Supun Stone and the Village Saleman
- To the north: Sea and Island Lusan
- To the south: Cliff Stone Supun

Figure 2. Peta Teluk Sawai
Source : Lisar Bahari Maluku

Sawai Bay with area is a area of Sawai village area, can be reached by sea from the west (the village of Sawai) and east (Saka hamlet, Saleman Village). Sawai village can reached from Masohi City (the capital city of Central Maluku) with travel distance of 170 km. Travel time of less than 4 hours by landline, it adjusts to road conditions are surging road. Sawai village can be reached within 1.5 hours through Saka Hamlet. The distance from Saka hamlet to the City Masohi own is approximately 83 km or takes 1.5 hours. Good location is surrounded by cliffs, with stunning coral reefs are very beautiful so that become a good value in developing the region as an international tourist area.

Figure 3. Some cliffs in the Bay of Sawai
Source : Documentation writer

Figure 4. View of Sawai Village from east to west
Source : Documentation writer

The area of this site is supported also by the existence of a spring that flows directly into the sea water so that it can be used as a source of clean water for the development of the region as a commercial area that can be inhabited.

Based on data from the Board of Tourism in Maluku, Sawai Bay is one of the tourist central in Maluku, that have Maluku tour packages four, included maritime adventure tour (marine park of Sawai), nature adventure tour (National Park of Manusela), cultural tourism (cultural village of Sawai), and beach tourism (Sawai beach).

Beautiful of nature and cultural tourism in Sawai Bay have great potentials to improve the regional income. It requires a great attention from the government in providing adequate facilities and infrastructure to be able to support the Sawai Bay area as a famous tourist area.

2. RESEARCH METHOD

Research method has the character of a qualitative. The discussion is conducted architectural matters which related to building appearance. It is refer to the image of local architecture (Sawai).

a. Results and Discussion

Sawai Village is a fisherman kampong, because most of people living as fishermen. Sawai village is located in the bay area, namely in District Sawai Bay north Seram, central Maluku Regency.

The village has a wide petuanan and it is a combination of six residential areas as Sawai village. Sawai village is a core of residential, and there are five subordinates include Masihulang, Rumaholat, Iron, Openg, and Olong.

Wide of Sawai village is 275 km², that consist of:

a. Ocean25%
b. Mainland 75%, that consist of:
   - Forest land 42%
   - Agricultural and settlement land 30%
   - Marshland 2%
   - Bare soil and rocky 1%

Sawai village have had two types of traditional houses, included the traditional houses of Luma Salaola and stage houses above the water.

b. Custom house of Luma Salaola

It was an old house or a custom house as gathering place of IPALATU and ANIALA could be used to discuss indigenous issues or meetings to accommodate parts of village and landlord in Sawai).

- IPALATU : eye of house or landlord in Sawai
- ANIALA : parts of village from Sawai

IPA LATU consist of :

a. Musiin : lessyyain (first person)
b. Ipaenin : Malakau and Luma suci
c. Rumasoreng : Latukahuny, latuikini, niharepiti and Nihulain
d. Letahiit : sea of Kapitan laut

ANIALA consist of :

a. Amala titalopun (rumah olat)
b. Amala tapinulun (Loaulu/Naulu)
c. Amala Hatamalu (masihulan)
d. Amala masihulan
e. Amala patahoran (horalle)
f. Amala silalohun (opin)
g. Amala tolo sei (hatilung)
h. Amala Tuaparan (warasiwa)
i. Amala Paku wau (Pa'a)
j. Amala waranuellai (pupue)
k. Amala lusiala (saleman)

Eleven Aniala had duty to support of roof (Kinati) to determinate a traditional house (luma salaola) and in the process of Aniala was installed the first roof (sintimatanhulun) then proceed with a general roof.

In the roofing process of luma salaola since ancient times was required two human head (called Tinahan). Person in charge of taking and installing was called malessy. Malessy came from the clan musiin (lessyain). Tinahan was fitted above the last roof truss. Now in accordance with the development of time (since the entry of religious norms and legal norms), this culture was removed.

Figure 5. Traditional house village Sawai
Source : Documentation writer

c. Stage houses above the water

Stage houses consist of body and columns. Columns is continuous from home base to the foundation. The foundation used the house on stilts over the sea is piling. Minimum depth of pile on the stage house foundation is 3 ft or equivalent to 1 m.[29]

Most users of stage houses over the sea is fishermen community. The residentials tend to adjacent and building orientation overlooking the waters (sea). This is consistent with the image of the fishermen communities who have been already accustomed to living on the sea, utilizing the sea as a source of livelihood and also the main transportation route.[30] However, in its development of stage houses is now not just as a settlement of fishermen, but also have begun to be used as commercial buildings such as resorts etc.

In the development of stage house areas are various potential negative impacts, including damage to marine ecosystems such as coral reef destruction of habitat due to construction of buildings, marine pollution caused by waste bin, and others. For preventing, It requires more attention from building users and local government. Selection of appropriate development sites, the availability of facilities and infrastructure are adequate garbage disposal and holding of special programs related to the natural environment revitalization can be a kind of solution in tackling the impacts caused.

Figure 6. Captive breeding of coral reefs in the village of Sawai
Source : Documentation writer

Figure 7 . Examples of stage houses in the village of Sawai
Source : Documentation writer

This village has a specific local architecture, most of stage houses have local wood such as lingua, ironwood, etc. This is supported by Sawai sea state is very quiet because it was dealing with a group of small islands, so protected from the dangers of tidal waves, etc.

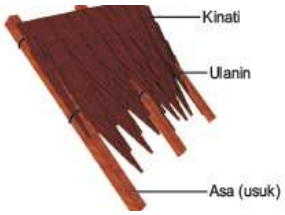

Figure 8. Elements of Ulu
Source: Author survey results and analysis

[29] M. Hestin. (2008). *Perancangan Bangunan Tepian Air*. UTY, Yogyakarta
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A. Indigenous Architecture as Basic Architectural Design

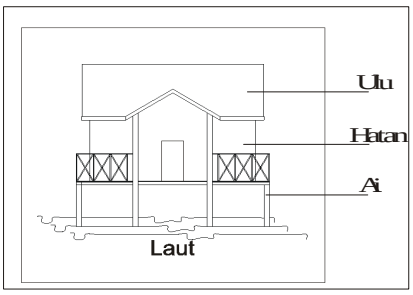

Figure 9. Analysis of local architecture building philosophy Sawai.
Source: Author survey results and analysis

Indeed stage houses buildings consists of 3 parts which are separated by function and role including:

- Ulu (head) that is placed on the roof or sky cover part of the building. Closing the roof in a traditional building in a language called kinati Sawai, which is made from dried sago palm leaves woven throughout 1.5 m. Sago palm leaf roof will be installed on usuk (asa) using bound (ulanin).
- Hatan (body) is placed in the core area of the building, which as an activity for building users. Walls and floors in a traditional house Sawai is made form wooden planks that arranged both vertically and horizontally.
- Ai (feet) in the form of truss structure is placed above the sea. This column is usually continuous from ringbalk to the foundation (underground of sea land). Type of wood is selected from nisat wood or nani wood (the best type), because its type is very strong and it is also one of a endemic wood species in Seram Island and has a fairly high level of durability in water.

Figure 10. Materials for Hatan elements
Source: author survey results and analysis

Figure 11. Position board of floor sloof
Source: author survey results and analysis

Figure 12. Position of hinin and skor
Source: author survey results and analysis

Column under sloof consists of two kinds is namely:

- *hinin* (truss construction)
- *skor* (underpinnings of *hinin*)

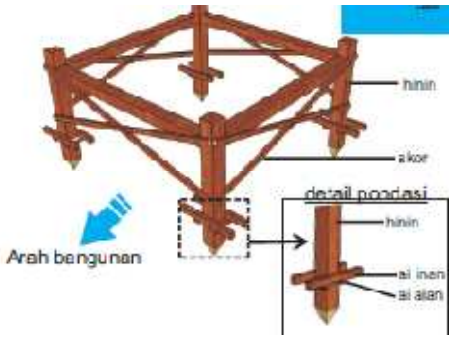

Figure 13. Direction ai inan always opposite to the direction of the house or building
Source: Author survey results and analysis

The type of foundation is piling. Based on the architectural culture of Sawai, there is no official limit on the level of depth of pile foundation, but by the standards of the buildings on the water, the minimum depth of underpinning is 1 m.

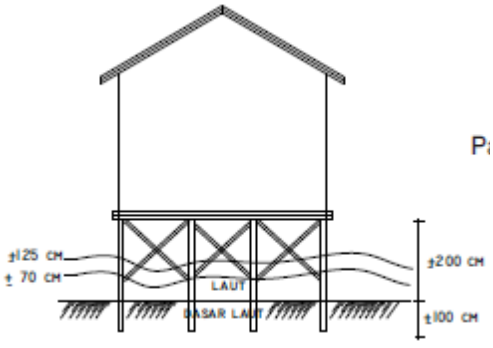

Figure 14. The minimum depth of underpinning
Source: Author survey results and analysis

The pattern of Sawai traditional house building design is a square shaped, and divided into three parts, namely the area front, middle, and back. Front area is a terraces, usually used to relaxing well as interacted with their surroundings (neighbor). Central area which contains the living room, family room, bedroom, kitchen, etc. The living room is joined with the living room and without a teritory with a kitchen and a dining room. This agrees with the philosophy of Sawai community namely "itaem basudara" which means we all are brothers, so for them, guests were already regarded as his own family. Behind of the Sawai traditional home is a pier.

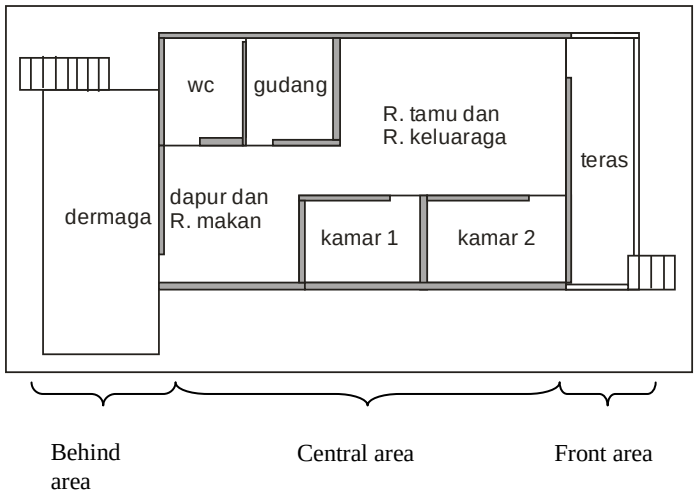

Figure 15. The composition of the common room house in the village of Sawai
Source: author survey results and analysis

Figure 16. The pier in the village of Sawai
Sumber : Dokumentasi penulis

All the stage houses in the Sawai village has a special dock (tapalan). This pier has a crucial role for the community of Sawai because it serves as dock of their boats which is the main transportation there, also used as a place to wash dishes, hang dry fish and sago. Besides it is also often used as a family gathering area.

Spatial pattern of Sawai village has been formed elongated linear pattern of West Sawai, Central Sawai and Eastern Sawai. In the center of the village are in the middle of the kampong, namely in the area around the field, mosques, community halls, and the custom house. In this area is often used in place of important events held villages, including for weddings, ceremonies, ceremony welcoming guests, celebration of holidays, etc. Based on information from local traditional leaders, in the mid 1800s the area was still a sea area, while the village of Sawai has been almost the entire village above sea level (except for custom house and leaders traditional houses), but because of the times, the influence foreign cultures and the growing number of Sawai people, then be made a permanent home on the ground with how to create artificial land settlement. Approximately more than 60% area of residential land on the ground in the village of Sawai now is made in the area (Reclamation).

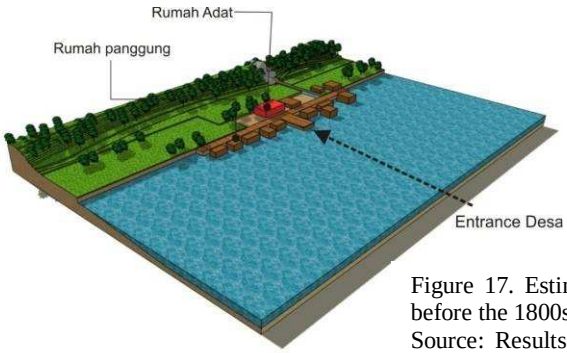

Figure 17. Estimation of Sawai village spatial before the 1800s
Source: Results of interviews and analysis of the author

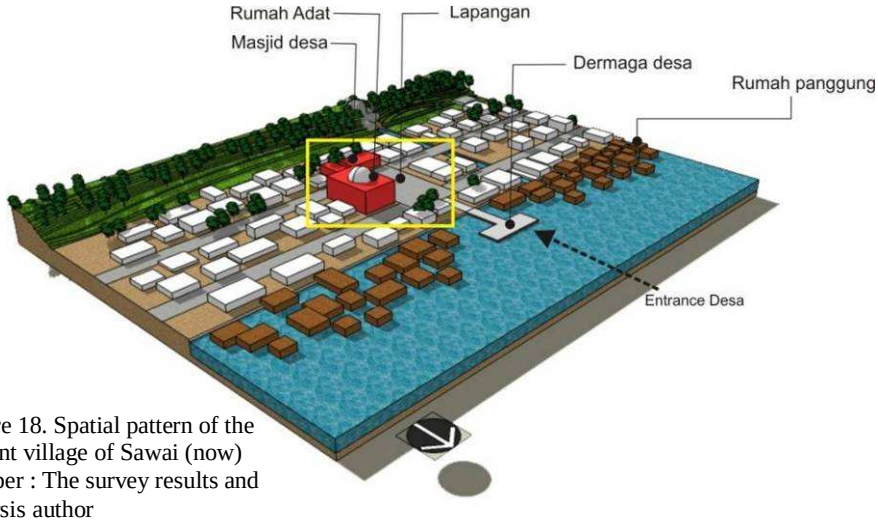

Figure 18. Spatial pattern of the current village of Sawai (now)
Sumber : The survey results and analysis author

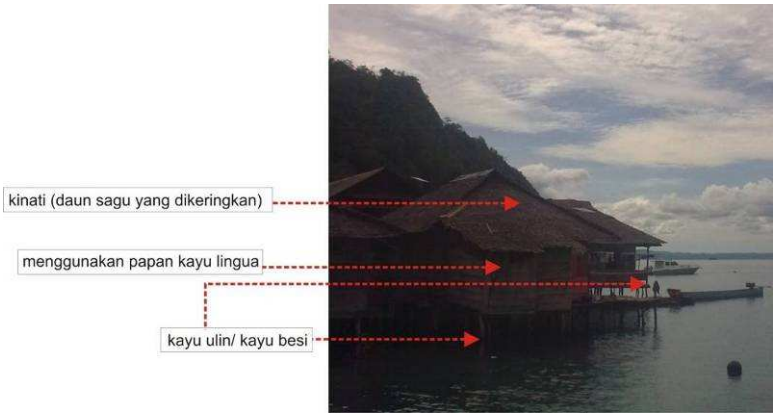

Figure 19. Materials of stage houses in the village of Sawai
Source: author survey

Materials and structures of stage houses are dominated by local material such as ai eta (ironwood) in the structure of the building and kinati column (from dried sago leaves) on the roof of the building material. In certain parts of the building materials are adjustedcto the needs of the building. With little to give more local character of the structure and materials are expected image of local architecture easily caught visitors.

3. CONCLUSIONS

Sawai village has a locality in architecture, housing, and urban environment. It is a traditional kampong that known as fisherman kampong. Two traditional houses of sawai village are house of Luma Salaola and stage houses above of water. Stage houses have roofs, walls, floors and columns that penetrate to land (under water). The settlement of stage houses tend to at close quaters, and orientation of buildings face to the sea.

Locality of stage houses consist of three parts that is classified function: (1) Ulu (head) is placed at roofs or part of plafonds. It is called kinati, that made from dry sago leaves; (2) Hatan (body) is placed at core of building, that is functioned as activity of building users; (3) Ai (foot) is in the form of structure foundation that made from local wood as lingua, ulin, etc. It is supported by beauty of the sea which have little islands, so that is covert from high wave.

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3.1.29

MORPHOLOGICAL ON LOCAL WISDOM COASTAL COMMUNITY SETTLEMENT AS A PRODUCT VERNACULAR ARCHITECTURE

Case Study of Coastal Settlements In Central Sulawesi

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ABSTRACT

Central Sulawesi is a region where the majority of communities toreside in coastal areas. This is because the dominant region consists of terrestrial and coastal beaches. Therefore, people with livelihood as fishermen to build houses and settlements in places where they can easily blend with the area and live with the results obtained from the environment. This study used a qualitative approach to naturalistic/phenomenological with inductive analysis techniques.

Settlements of coastal communities in Central Sulawesi was formed because the geography environment vulnerable to disasters, with a house on stilts where part or in full standing over the water, serve as access roads, public space and open space. Structure and construction systems using bond system, the connection of the tongue and pen, with building materials of wood, bamboo, thatch roofs (also called sago palm leaves or leaf), as well as the foundation rock. Openings of doors and windows, using the cover or without cover, where cover is made of wood, glass palm leaves. Facade building more open, porous wall systems made because it is made from local materials so that the building is catching heat and hot successor received by the building. The stage-house and simple layout, effectively respond to outside temperature, so cooling the material more quickly and allow for cross ventilation due to space -space has no barriers. The concept of defense is formed because they were allied or kin, related to the sea, with a limit of territory connecting road that is naturally formed group homes, social compatibility, common perception of residential environment and atmosphere and environment that supports all activities of the settlers.

Key Words: Local Wisdom, Coastal Settlements.

I. INTRODUCTION

Indonesia is an archipelago consisting of various ethnic groups that occupy both spaces and spaces of the mainland coast. These spaces are on the coast almost all the islands so that evolve into communities that inhabit coastal areas or coastal areas. This society then formed settlements as their residence. In general, this settlement is not planned well, because it was built by the community according to their level of knowledge that are not familiar with the standards or norms of the standard, but built as needed at the time.

These communities develop according to their own local as a specific characteristic in managing their lives. Habits is then developed into customary laws that govern various aspects of life in both the aspects of social relationships, rituals, beliefs, and others. Those things are reflected in the shape of their lives, both on the physical environment, as well as community social environment, which is the character, uniqueness, and cultural imagery typical of each region. Uniqueness, both in the social

environment and physical environment that can contain local wisdom become an attraction and the potential areas that could be developed as the value of local or indigenous knowledge is very valuable.

II. COASTAL REGIONS, VERNACULAR ARCHITECTURE, SETTLEMENT AND LOCAL WISDOM

Physically, the region is a meeting between mainland coastal ocean with restrictions to the mainland and the ocean is determined by the influence of the land to the sea and the influence of the ocean to the mainland. Based on political policy, coastal areas is a good administrative regions into land or into the sea. Based on the area of culture *(cultural area)*, local coastal culture is an area that supporters are the people who process of enculturation and socialization are and live along the coastline. The style pessir society in general is characterized by his straightforward manner, egalitarian, spontaneous, said words that are used tend to be rough, and in communication tend to prioritize content to be conveyed (substantive) than the way of delivery (Mattulada, 1997).

Coastal settlements by Suprijanto, I. (2002), namely: the development of which began with the arrival of a particular ethnic group at a coastal location, which then settle and grow for generations to form a clan / specific community and tend to be very homogeneous, closed and developed a tradition and certain values which in turn is the hallmark of the character and settlement. Oliver, P. (1997) argued Architectural Vernacular as a collection of houses and other support buildings that are very tied to the availability of environmental resources. Forms of houses and other support buildings materialize to meet the specific needs and accommodate the culture that influence it. Vernacular architecture was born in a collection of people who go through life in nature togetherIf the community is still a relative, this collection will be homogeneous, traditional (to be written or not) to handle living together that is transmitted from generation to generation became a tradition, so the collection is called the traditional collection. They built their home together, as an architect and workers. This community is called the village, located in rural, more traditional, adaptive to local customs and natural. Communities tend to settle down through the generations, so assume that's where their homeland.

Manifestations of residence and all the amenities more in terms of the process of its products, always communal society based on woodworking techniques at their disposal, where there is no necessity to apply the process of initiation of each phase of development, which is based on the tradition (eg in the form of festivity, intent, salvation, and other etc.). Architecture is not only manifested in the elements of house, but on social and symbolic space - a space that reflects and demonstrates a creative and *inhabitants* (Walterson, R, 1990).

Sugihen, BT, explained that a settlement pattern is closely related to the dominant socio-cultural characteristics in the settlement concerned. Settlements formed from the settlers who still has family ties will be different from other settlements there is no linkage among the settlers. Similarly, the vital need, the level of knowledge and technology possessed often plays a role in determining the layout (space) of a settlement. In addition, geographical and topographical condition factors also influence and determine the shape and layout of a settlement. So there will be differences in form and pattern of a settlement.

Culture is a major factor in the process of settlement forms, while other factors such as climate, location, geography, politics and economics is a factor modifier *(modifying factors)*. So in this case environmental conditions is one of the factors which influence the patterns and forms of settlement and architecture inside the building. Man and society has a different character, reflected in the differences in lifestyle and value systems to follow are them. This fact obviously has a huge influence on how they design and shape their environment (Rapoport, A, 1977). Rapoport, A, (1969), argued: *'Environment'* is not just the environment or settlement but lead to the building and its environment or home, village and city *(house, village and town)*. Form of house not only the result of physical force or a single causative factor, but the consequences of the overall socio-cultural factors It also is a modification of climatic conditions, construction method, the use of materials, and technologies. Major factor is the social culture is another factor that is enabling factors.

Tread houses are grouped into 3 (three) categories, namely: land, water-land transition, aquatic (marine). Residential center located on the beach that is protected from waves. Buildings connected by bridges made of wood, are not connected with the bridge, using a boat canoe as a liaison. The layout of the buildings lined up along the coast who have access to water. Piles of rocks as breakwaters made in mutual assistance in case of pairs, but it also serves as a border village, so that the land was being used as fish ponds and places *berlabuhnya-Lopi Lopi* (small boat) to them. The position of the existing house on the seafront block the house at the back in the house which is located on the side directly facing the open sea. Amid the township is located home *village* leaders called *ponggawe Same* (chieftain). Each house occupied 2-3 family homes in accordance with the composition of their philosophy that is *pupok patepik-tepik dipadijer* (assembly, and adjacent rows). Especially for occupancy which is above water, the position of a row with another row of boats there are streets, and direct access to the sea (Syam, S, 2003).

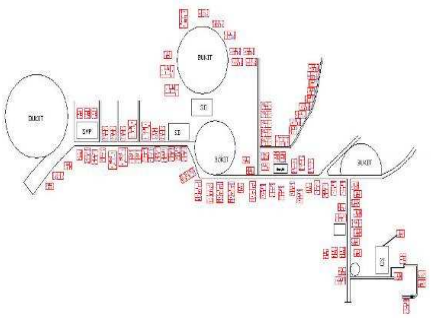
Public spending most time on the chart *(daseng)*, township over the water. Residents in this area generally foraging at sea or farmed, many are still using traditional nets and outrigger canoe. Ownership of land is still customary rights generally, such as land inheritance *(Pasini)*, there is no system of ownership over the reef flat and shallow waters. They maintain live near the sea by building houses on stilts, above the shallow sea (0.5 - 3m). Linear pattern of their settlements along the coast, with the type of linear settlement pattern along the coast, with the type of settlement pattern of spread. The road network connecting their houses made of road bridge from the mainland until well above the sea (Rusmalianasari, 1992).

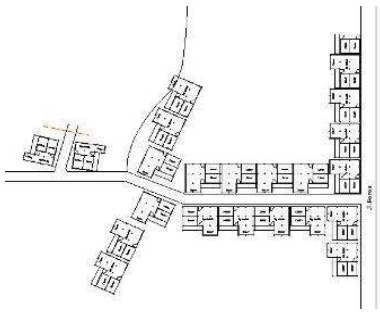
III. MORPHOLOGICAL COASTAL COMMUNITY SETTLEMENT IN CENTRAL SULAWESI

3.1. Forms of Settlements Coastal Communities in the Central Sulawesi

Jayabakti Village Luwuk Municipality

Kabalutan Island





Village Labuan Ampana District Municipality

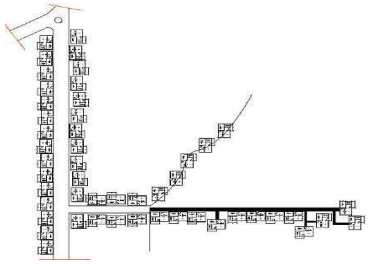


Figure 1. Settlement Patterns in Desa Jaya Bakti Village
Kabalutan Island, and Labuan The Village of Tojo Una-una
Source: Results of Analysis, 2009

Settlements formed a group with a *'typological view'* of building the Mosque by the court or the vast land, so that in building the mosque there is *open space* used as a hangout room and interact socially

with fellow settlers. As the center of orientation, building mosques situated on the highest land, so that the sanctity and holiness still reflected in the building.

3.2. Housing and Dwelling Characteristics

Settlement form groups consisting of clumps family, or have a familial relationship. They are tribe known as the sailor with the main livelihood as a 'fishing' cause settlement and their home is located in the water, or having contact with water. Although in its development has been living on the mainland but still have the traits or characteristics that they are sailors, so the settlement or their home environment there is still a room or a place to store the tools that support their livelihoods as fishermen.

Dwelling house or settlement is still the type of houses on stilts with a height varying according to place or environment where it is located, especially in the water with a height of approximately between 3.00 to 10.00 m, so that when the tide is almost completely submerged homes water, particularly at the rear of dwelling house associated with the sea.

3.3. Settlement Pattern and Dwelling

The pattern of settlements generally still chaotic and irregular, only at the front overlooking the street neatly organized. Other Residential located on the back scattered into the sea or the line of sight for approaching the road bridge made of wood or still in the original soil. The density of buildings in some parts of residential environment is very dense and solid (on the area near the sea or in sea), while the other part is located far from each other.

Their homes are always close to the sea so that they build their home lined up along the coast, partly or wholly located on the sea, so that the back or the back porch is a dwelling house boat moorage at once a place to store fishing gear, fishing season and a place to rest after a few day or all day at sea.

In general settlement on the mainland and coastal areas already equipped with electricity and clean water facilities, while on the islands has not been equipped with electricity and clean water infrastructure, so they use gen-sets are clean water is still taken on the nearest mainland, except in Village Kabalutan've got clean water sources. Dwelling house settlers and socialize a shelter, so the house is the center orientation of the settlers, especially the family left behind by the head of the family who went me'laut '. Their homes with a very simple condition, equipped with rooms, or just a *'space' is* without limits.

No.	Mainland	Coastal Beaches	Water (Sea)
1			
	Form dwelling house which occupies the land is still shaped stage, as high as 0.50 to 1.00, or made the foundation of rock material with a height of 0.50 to 1.00 m.	Form dwelling house which occupies the coast-shaped stage, as high as 2.00 to 4.00.	Form dwelling house which occupies the sea is also shaped pan from 4.00 to 9.00, or made the foundation of the rock material in a rather shallow sea.

Figure 2: Typology House Based Characteristics on Location
(Source: field data, 2009)

They built a house by way of mutual cooperation, using materials from the environment they live are wood, sago leaves, and palm leaves. Skeletal structure as the main structure houses or other buildings using wood materials that are associated with *joint* or tongue and then tied relationships. On the roof using roofing materials Nipah, but a small part already using zinc. The walls are generally still use the board and sago leaves, using a wooden foundation, rock, and foundation pedestals joined by wood (on the sea area), while in coastal areas use wood or pedestals (concrete or wood material), and the land use stone coral, coconut wood, or wood.

3.4. Factors that Cause Changes in Settlement

There are several things that caused the changes in residential housing and the knowledge that increasing rapidly, the need for shared values decreased because of the knowledge and technological advances in building.

This is evident from the patterns of settlement, they have started to build housing in areas away from the sea or water that is inland, so it is more easily reached by land transportation facilities and fully equipped with environmental infrastructure ie public toilets, garbage bins, electric grids and water supply. In building their homes were no longer doing 'ritual' is redundant because it is considered no longer in accordance with the teachings of Islam that they have adopted. The use of a more modern building materials have also been done of the use of zinc, ceramic, doors and glass windows.

On the mainland most of the settlers have been using adobe as building material in their home, as well as on other piblik buildings such as mosques, schools, and others. Similarly, in their home layout, they have started to make the spaces in a way insulate or make a boundary as a border *territory* and *privacy* settlers to the environment or other settlers nearby.

3.5. The concept of Defence (*Defensible Space)*

Existence or the existence of the coastal communities of their neighborhood now, because one family is still the family or relatives, so they remain settled in the area. Although in some places because the settlers had moved too dense housing environment but they still choose the place where environment is still an or related to the sea and settlers is still a relative where they formerly resided, and form a new community in the new environment.

These groups constitute a defense to the limit of *territory* which is the border connecting road or naturally form groups of houses associated with the *space* as a road, and stands on land or sea, giving rise to its own *image* of the limits created in an environment where they live. PIn general, the existence of others created by maintaining the neighborhood because they feel comfortable with a dense environment, easy accessibility, suitability of the social environment, common perception of the environment and maintenance of residential atmosphere and the environment is very supportive of all the activities of settlers.

3.6. Conditions Economic Social and Cultural Society and their Effects on Residential Development Activity

Houses not only as a place of refuge, but the house is a venue for cultural process in which humans live and thrive. Houses are part of an overall housing environment, so that settlers can live comfortably so that the settlers to adapt to the house and its surroundings. The socio-economics they have built their home better by using materials more durable, is using wood with good quality and adequate, roofing material and walls with material that is easily obtained from the environment around the tin, bamboo, leaves Nipah, a board with good quality also, and use materials more durable foundation that is one or two grade wood, using a rock, or stone base, which is also easily obtained

from the surrounding environment. Openings wall of doors and windows have been using good cover using wood, glass, sago leaves, so the settlers remained in the house safer and more convenient to the surrounding environment, namely the influence of nature both on land and in water.

Some settlers with better socioeconomic conditions to build their home with a different area using a higher quality material, as well as priority needs for identity is also against the social needs of its inhabitants. This does not cause the differences (within settlements) because for them remains as a clump of family or relatives in a single unified whole and harmonious, mutually mundukung and help in living the life of the present and future.

The socio-cultural, residential settlers had begun to change, because the level of need was also changed. Houses not only as a place to gather and interact, but there are values that must be maintained, namely value and territorial privacy, so that residents began to build their home by making the boundaries of both the space inside and outside space. Dwelling house is equipped with a front porch as a transition space from the street into the space, serves as a public space and places to interact with other settlers as part of other public spaces on the street environment as a liaison and interaction space.

In the space in the residence was found sealed bedroom both with doors or without doors, so occupants particularly 'female' or 'parents' should be in the room, while other spaces relate to one another without insulation or with different heights or without different heights, so that these spaces function as semi-public spaces or semi-private is a place where residents perform activities of both their social interactions with fellow residents or other settlers. Private spaces other than sleeping room is a kitchen, bathroom, laundry room and back porch. They are as a sailor, with cultural backgrounds have different perceptions and needs of the physical manifestation of their home also influential on his home layout. This can be seen on the 'extra space' that serves as a boat moorings, where the drying of fish, a place to store fishing gear.

3.7. Economic Social and Cultural Rights

Culture was born and developed as a result of the process of human adaptation to the environment, both of the surroundings as well as certain social conditions. This means that cultures can vary according to differences in the neighborhood where the man played a part.

Religion and Belief Systems

Generally still believe that nature is full of secrets in touch or to find out and take advantage of these secrets or called Shari'a Therefore created a variety of ceremonies that contain traditional values such as ceremonial boat building, build a house, marriage, death, lawyer-Islam's, tula'bala (refusing reinforcements) and others. Boat-making ceremony held on the grounds "boat" is represented as a human being that has lifeIn making the boat first perforated bottom of the boat with the middle and then closed again. This section is referred to as the 'navel'. Similarly, the ceremony to build a house, need to consider many things, ranging from material selection, measurement, placement of building elements and others. Prior to founding the column, making the stairs, making the roof, and so on, and after the house is finished and ready to be occupied-upacara.adat ceremony.

Similarly, other ceremonies, all have their own ordinances. In performing this ceremony, the royal objects plays a role, because without these things will likely get a curse. Principal object is what is called 'Ula-Ula', a kind man flag framed rectangular long. The flag is usually flown over the home front as well as red and white flag on the back. Generally, this flag-raising was raised three days before the ceremony begins. There are three colors of yellow-Ula Ula for the highest social status, social status of black and white to the middle, and red and white for ordinary people or ordinary people.

Hubungan Sosial Social Relations

To build their homes considering that their habits in entertaining guests and close relatives and the habit of visiting each other each other. Close friends or relatives entertained on the patio or living room, while guests entertained in the living room. To socialize with their environment, people living in aquatic environments make roads or bridges of wood or bamboo, is a residential neighborhood located in the island by boat as a means of connecting. The relationship between the home does not like fences, roads are the barrier between the residence.

Knowledge and Lifestyle

Knowledge citizens against environmental conditions settlement has been applied in building their home, for example on the floor height of the tidal sea water. Other knowledge that is held against the measures of length, width, and other home sizes that meet the size of the human body. Cultural involving human behavior in daily life that characterizes the life of society is the habit of community rainwater for cooking and drinking every day, affects the shape and slope of the roof of their home. Habit people wash, bathe and defecate on the ground so that the occupancy is not available km / wc. Habits of people playing in the sea causing the unavailability of *open space* on land, but the road is an *open space* that is most often used by the people in social interaction with fellow settlers. Habits and behaviors people will indirectly affect the architecture of settlements.

IV. CONCLUSION

1. Settlement orientation center is a mosque, as a reflection of the majority population is Muslim, and serves as a public space. Ruang interaksi publik lain yaitu jalan, yang juga sebagai akses bagi pemukim yang menghubungkan antar rumah, dan fasilitas permukiman lainnya, Other public interaction space that is the way, also as access to the settlers that links between home and other residential facilities,

2. Dwelling house is located parallel to and facing the street as public space, created through a long process *(trial and error)* to form a building shaped stage,

3. Form four-square house, with additional buildings on the side of right, left, or behind the building, saddle-shaped roof, and Limasan, with 'override Laja' tiered one or two layers, residential layout consists of the main building that is: space bedroom, living room, family room, while the additional building is a terrace, kitchen, laundry room and drying room. The pattern of simple plan with one-layer system allows cross-ventilation occurs where the spaces in the building does not have a bulkhead between the position of the inlet-outlet window,

4. System structure and construction of the skeletal system consists of: roof, walls, and foundations, with tongue system, *joint*, and bonding. Building materials used are of local materials in the form of wood, leaf thatch or palm leaves, sago leaves, and rocks as a foundation,

5. Opening of doors and windows with cover or without cover. Materials cover the openings in the form of wood, glass, or the leaves of sago palm leaves, orrnamen only found in the terrace residential buildings. Position openings in accordance with the wind orientation and area of openings as the conditions required for a dwelling house, ventilating the roof space helps cool the building because the heat that accumulates in the roof space easily removed or deleted by the wind flow through these openings.

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3.1.30

USE OF RECYCLED AGGREGATES FROM CONSTRUCTION AND DEMOLITION (C&D) WASTE FOR BUILDING CONSTRUCTION IN DAR ES SALAAM, TANZANIA

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ABSTRACT

Dar es Salaam city faces the shortage of building materials even though more than 50% of the builing materials produced are produced for Dar es Salaam market (Kimambo, 1988). In Tanzania, the major building materials used in building construction are building blocks. Concrete blocks are gaining importance in developing countries (Kaosol, 2010). According to the survey conducted in Dar es Salaam, it is estimated that about 70% of building materials is concrete and building blocks, whereby blocks occupy about 30% for high rise buildings and 70% for single storey buildings. The source of aggregate comes from quarry sites more than 120 km afar. Transportation of aggregates from far distant increases the cost of materials, energy consumption, traffic and environmental degradation. Since, Tanzania is one of the poor countries; it is very expensive to get building materials from far distance. Authors suggest that recycling of concrete rubble can be an alternative source of aggregates. In Tanzania, recycling of building material from construction and demolition rubble does not exist. About 20% of rubble is reused for backfilling of pothole, foundation and the rest is thrown away. The experience from developed countries shows that concrete rubble has great recycling potential; producing aggregates for stabilization of sub-base in road construction etc. These applications are lower applications (downcycling). The ongoing research project is investigating the possibility to recycle concrete rubble to generate load bearing concrete blocks for building construction.

Keywords: Reuse, Recycling, C&D waste, building materials, concrete block

I. INTRODUCTION

The demand for construction materials increases daily all over the world. The construction industry accounts directly and indirectly for nearly 40% of the material flow entering the world economy (Roodman and Lenssen, 1995) and in developing countries for around 50% of the total energy consumption (Levin, 1997; Bonini and Hanna, 1997). Tanzania faces the same pattern.

Tanzania is a developing country with a tremendous need for housing especially in urban areas such as in the capital city, Dar es Salaam. The Dar es Salaam city is oldest and rapid growing city in Tanzania. Its population is estimated to be 3.5 million (in 2010) compared to 2.5 million in 2002 (NSB 2002), i.e. 39% increase for 8 years. This shows that the demand of accommodation is increasing. This puts pressure on the availability of building materials to meet the growing demand of the shelters (i.e. buildings). The major building materials used in residential and small industrial buildings in Tanzania are concrete and sandcrete blocks (Egmond, 2000). According to the survey conducted in Dar es Salaam, the buildings construction can be classified into two groups namely single storey and multi-storey buildings. The construction of these buildings differs from materials used, equipments, skilled people required. For example, in constructing single storey building, building blocks (i.e. concrete blocks) are used as load bearing material; columns systems applied for multi-storey buildings as load bearing materials while the sandcrete blocks used as infill materials. So every type of building construction system consumes a substantial amount of building blocks. The study done by Kaosol,

(2010) indicates that the concrete blocks are gaining importance in developing countries. It is estimated that about 70% of building materials is concrete and building blocks, whereby building blocks occupy about 30% for high rise buildings and 70% for single storey buildings in Tanzania. The demand for blocks is expected to increase even more as the population and demand for shelter are increasing. This will result in a deficit of building materials in future. In order to support building construction to be sustainable, innovative production of building materials by recycling concrete rubble into load bearing building materials is essential especially in Tanzania

The raw materials for making concrete blocks are a hydraulic binders, water and aggregates (Jackson and Dhir, 1988, GTZ, 1991). The aggregate is an economical filler material with good resistance to volume changes which take place within the concrete after mixing, and it improves the durability of the concrete (Jackson and Dhir, 1988). The common aggregates used in Tanzania are those derived from natural source (quarry sites). Out of 30 formal constructed buildings and 11 building blocks manufacturers visited and interviewed, non of them using the recycled aggregates from concrete rubble instead all are extracted from quarry site. As we know the aggregates are non-renewable mineral materials; according to high growth of building construction the supply of aggregate near future might be limited and results conflict among users (Mufuruki et al, 2007; Sabai et al, 2009).

This paper focuses the aggregates material for building blocks production from crushed masonry rubble (i.e. concrete rubble) of construction and demolition buildings in Tanzania. The demand for aggregates in Tanzania in 1997 was about 60 millions tonnes (Woodbridge, 1997), equivalent to 2 tonnes per year per capita. It is estimated that the demand for aggregates such as that used in the building blocks in Tanzania might almost triple from the estimated 87.4 million tonnes in 2009 to 219 million tonnes in 2050 (PRB, 2009, WBCSD, 2009). The share of locally available raw materials used to producing building materials in Tanzania is about 47% of the required amount (NCC, 1992); the rest is imported which puts quite some strain on the country's economic situation. Dar es Salaam city consumes more than 50% of all building materials produced in the country, but the capital still face shortages of building materials (Kimambo, 1988). An increased use of local resources and a disproportionate future demand for the availability of local building materials will result in a depletion of the natural resources due to the expansion of the construction industry in Tanzania. To ensure the sustainable building construction in future, the alternative source of aggregates is inevitable. This recycling the concrete rubble from demolished and constructed building is under investigation in the on-going research.

The construction of these buildings differs from materials used, equipments, skilled people required. For example, in constructing single storey building, building blocks (i.e. concrete blocks) are used as load bearing material; columns systems applied for multi-storey buildings as load bearing materials while the sandcrete blocks used as infill materials. So every type of building construction system consumes a substantial amount of building blocks. The demand for blocks is expected to increase even more as the population and demand for shelter are increasing. This will result in a deficit of building materials in future. In order to support building construction to be sustainable, innovative production of building materials by recycling concrete rubble into load bearing building materials is essential especially in Tanzania

II. BUILDING CONSTRUCTION AND DEMOLITION IN TANZANIA

2.1. Building Construction Condition in Dar es Salaam City

The on-going projects up to January 2010 which includes buildings, civil works, electrical and mechanical works that costs amount of more than ten (10) Tanzania millions shillings (about USD 7000) was 2219 (data from Contractors Registration Board (CRB). Out of these projects, building construction occupies 1227 (55% of total registered construction projects). While in Dar es Salaam city contains 544 buildings (44% of all buildings in Tanzania). This reveals that building construction is higher and is growing faster in Dar es Salaam. This shows that the generation of waste from building construction and demolition is expected to be higher (see Figure 1 below).

Figure 1. a) &b) buildings under construction; c) many of high rise buildings are under construction (*taken at Ilala, 2010)*

Dar es Salaam city comprises three municipalities namely: Temeke, Ilala and Kinondoni. The Municipal Engineers from Temeke, Ilala and Kinondoni municipalities revealed that the available building permits records were 1806 from 2008 and 2010 as shown in Table 1 below. From the Table 1, the single story buildings are 83%, 55% and 34% on other hand multi-storey were 17% 45% and 66% in Temeke, Ilala and Kinondoni municipalities respectively. It indicates that in Temeke and Ilala municipalities more single storey buildings are under construction, while in Kinondoni municipality the multi-storey buildings are higher.

Table 1 Building permits classification in Dar es Salaam, Tanzania.

Type of the buildings	**Temeke Municipal Sept. 2008 - May 2010**		**Ilala Municipal Nov. 2008-May 2010**		**Kinondoni Jan-May 2010**	
	Bldg permits issued	%	Bldg permits issued	%	Bldg permits issued	%
Single storey buildings	741	83	306	55	120	34
Multi-storey buildings	157	17	246	45	236	66
Total	**898**	**100**	**552**	**100**	**356**	**100**

From Table 1 above, by sorting and analyzing the use/function of the buildings in terms of residential, commercial, Institution, residential together with commercial and residential together with institutional buildings; it found that residential buildings are many compared to others as shown in Figure 2 below. This indicates that most of the residential buildings constructed are multi-storey building in Kinondoni municipality, while in Temeke and Ilala most of the buildings are single storey buildings. The reason for this is attributed by economic capability of people because in Kinondoni most of people are constructing multi-storey building for residential. It occupies 84% of residential buildings while Temeke is 85 % and Ilala is 58%. The Temeke Municipal Engineer supported this by saying that "most of people residing in Temeke are poor compared to other municipalities". Also Kinondoni is highly populated (i.e. 1.1 million people in 2002 census) while Temeke was 0.78 millon people(NBS 2002). The land scarcity problem due to high population in Kinondoni may influence the multi-storey buildings construction. The land scarcity problem caused people to encroach even to live in the borrow pits at the quarry sites like Kunduchi quarry sites in Kinondoni municipalities. The land problem not only affects the space to live but also reduces potentials areas for building material source. The problem of building materials in future is giving bad signal, and therefore scientists have to work out to find more alternative sources for obtaining the building materials for future use. Being aware on this problem, authors join other scientists all over the world to investigating the possibility to recycle

concrete rubble as an alternative source for production of aggregates that can be used to manufacture the load bearing concrete blocks for building construction.

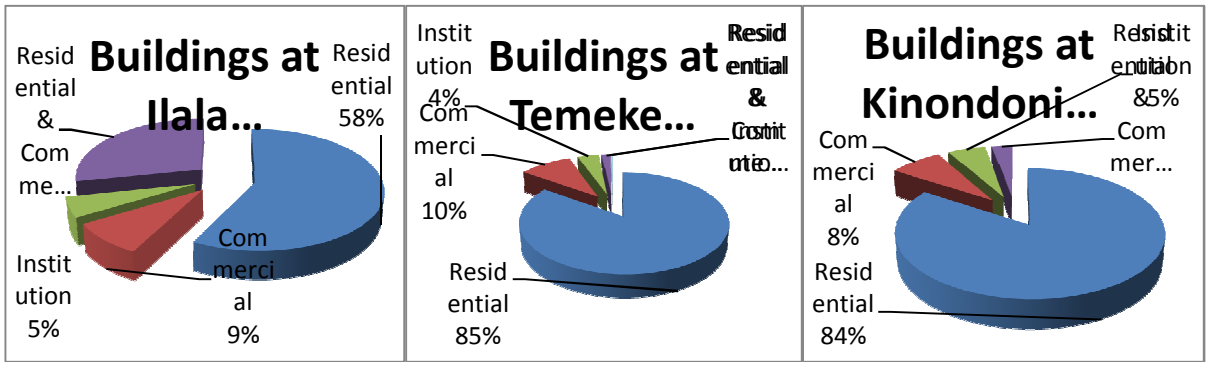

Figure 2 show the functions of the buildings constructed in Dar es Salaam city
[*in Temeke Residential and Institution reads 0% because it was only 1 building permit out of 898 permits issued*]

According to Dar es Salaam city council, informal settlement occupies 70% of the total build up area. Data from informal settlements are difficult to obtain even though they are also generating construction and demolition waste. It is indicated that there are buildings are under construction within the city which are not registered and regulated by respective authority.

2.2. Building Demolition Condition in Dar es Salaam City

Most of the permits issued in Ilala Municipalilty especially city center and outskirt areas like Jangwani, Kariakoo, Kisutu, Ilala, Buguruni are involving permits for demolition activities. The reason stated by Municipal Engineer was land scarcity. The number of demolition permits issued from July 2009 to May 2010 by Ilala municipal council were 23; Temeke was 1 while Kinondoni no specific data. But this figures do not reflect the actual situation of building demolition because there were thousands of buildings that actually demolished at Kipawa areas (near the Mwalimu Julius Nyerere International Air Port) which were situated in Ilala municipality and others located at Temeke municipality situated near the Dar es salaam Port (*known as kurasini Shimo la Udongo*) were demolished. The reason stated was, that buildings were demolished following *government order* after building owners were being compensated. Therefore, there was no need to procure demolition permits. Thus there are a lot of buildings demolitions which are conducted in various areas in Dar es Salaam without requesting permission from responsible authorities (i.e. Municipalities). At Temeke, there were also 8 blocks of 3 storey buildings demolished as shown in the Figure 3 below. Unfortunately regarding those demolition activities, there is no record information in the Temeke Municipality while the event occurred almost 4 km from Temeke municipality headquarter. When asked, why the demolition of the buildings like that can be demolished without information to the municipality, the answer was that, "*most of demolition activities are done during weekend nights, and the same time, all rubble are removed from the site; so it is difficult to be controlled by the Municipality*". There are poor records on building demolition activities while there is no data on amount of C&D waste generated in Dar es Salaam.

Figure 3. Rubble generated from building demolition in Dar es salaam, Tanzania
(taken at Changómbe, Temeke in 2010)

Also, information from National Construction Council (according to an interview Dr. Fundi) it found that in the period of 10 years (1996-2006) there were 840 high rises (7+ storey) buildings were constructed in Dar es Salaam. The construction of those buildings involved demolition of existing buildings. Experience learnt from Tanzania National Housing Corporation (NHC) is that there are 46 buildings in Dar es Salaam which are demolished and new ones are under construction instead. Also according to 30 buildings sites visited and interviewed, 20 (66%) out of them were accompanied with demolition of old buildings. This indicates that there are many buildings that are demolished and new ones are constructed in Dar es Salaam city which end up to generate a lot of C&D waste (e.g. concrete rubble). Besides of construction, renovation and demolition activities, there are other sources of C&D waste generation, these include: natural disasters like earthquakes (*e.g. in Italy (2009), Haiti (2010), Chile (2010)*), avalanches and tornadoes; man-made causes like war and bombing and structural failures (Chan *et al*, 2000) which may happen in Tanzania as well (e.g. US embassy bombing in 1998 in Dar es Salaam, Tanzania). This reveals that the generation of C&D waste is rather extensive even though there are no records on amount of C&D waste generated. These C&D waste have great recycling potential (Hansen, 1992; EU Commission, 2000; Masood *et al*, 2002; Poon *et al*, 2009). And therefore the reuse and recycling/upcycling of these material resources from C&D activities back to building redevelopment instead of disposing or throwing them away required.

III. REUSE AND RECYCLE OF CONSTRUCTION AND DEMOLITION WASTE IN TANZANIA

In Tanzania, the metal e.g. iron and plastic wastes are locally reused and recycled but the masonry/concrete rubble there is no formal reuse or recycling in Tanzania. All reusing and recycling of this material waste is informal because the recent enacted Environmental Management Act (URT, 2004); the C&D waste addressed as solid waste and its treatment suggested is disposal. The current reuse and recycling of C&D waste (i.e. concrete rubble) is described below

3.1. Reuse of Concrete/masonry rubble in Tanzania

The Masonry rubble is reused for backfilling or hardcore in building construction. Also in road maintenance for filling potholes (see Figure 4) including landscaping in general. According to Eng.

Mwankusye (from NHC), the C&D waste i.e. concrete rubble is used for non-structural applications because its quality is not well understood. It is regarded as unfit for new building construction because the by-product is assumed to be weak. Buildings owned and operated by National Housing Corporation (NHC) when demolished, it is estimated that about 20% of masonry rubble is reused as hardcore material in new reconstructed building(s) and the remaining (about 80%) is thrown away. At the same time, information from central dumping sites (at Pugu Kinyamwezi) it is rare to find the concrete/masonry rubble dumped in to dumping site. According to Dump attendants the drivers dump it on the rough roads, stabilize soil at the area with swamp in nature and other uses as explained above. These kind of use the C&D waste is the same as other countries like The Netherlands, Germany, (EU Commision 2000;Hendriks and Pietersen, 2000), USA (USA PW Technical Bulletin, 2004), Thailand (Kofoworola *et al.*, 2009), Japanese and Singapore as well. At least other countries are crushing them before use but in Tanzania applied rubble as it is. This ends to make disturbance to road users especially for small cars (see Plate 3 below). All in all these applications are low application known as *downcycling*.

The blocks recovered have been used for light weight structures i.e. temporal toilets (both super structure and pit lining), fence the construction site. Others have been used for construction of the septic tanks and soakaway pit in many houses low income people. This application is dangerous for users because the quality of blocks is not known whether can withstand stresses from both horizontal and vertical. Therefore, the structures built with materials in which their quality is not known is dangerous and not recommended for safeguarding users like and other ecosystem downstream.

Figure 4. The reuse of concrete rubble for filling pothole in Dar es Salaam
(taken Ukonga and Mwenge, 20010

3.2. Recycling of concrete/masonry rubble in Tanzania

The common aggregates used in Tanzania are those derived from natural source (quarry sites). Out of 30 formal constructed buildings and 11 building blocks manufacturers visited and interviewed, non of them using the recycled aggregates from concrete rubble instead all are extracted from source. As we know the aggregates are non-renewable mineral materials; according to high growth of building construction (Table 1 above) the supply of aggregate near future might be limited and results conflict among users (Mufuruki *et al*, 2007; Sabai *et al*, 2009). To ensure sustainability of building construction in future, the alternative sources of aggregates have to be investigated in Tanzania to aid the existing one.

There is one group of young people that situated at Jangwani, Ilala Municipality which collects and crushes the concrete rubble from demolished building structures mixes with flesh stones from source (they call it *shamba*). This is good step towards the recycling of the by-products generated from the

construction and demolition structures in Tanzania. The rubble and stones have been mixed in order to to ensure the quality of resultants aggregates. The quality of aggregate is neither tested in the laboratory nor monitored but assumed is good. The crushing of masonry rubble has been practiced in most of developed countries like The Netherlands, UK, USA etc. Most of the crushed aggregates have been used for sub-base material in road construction and some has been used as aggregates for fresh concrete and non-structural paving blocks (Hendriks and Pietersen (2000), MacDonough *et al* (2002), Poon *et al,* (2002), Poon *et al,* (2006)). In the Netherlands, crushing concrete waste into aggregates has became the common practice for many years due to a shortage of natural aggregates and a lack of available landfill space (Kirby and Gaimster, 2008).

Since the aim of the research project is to explore the extent to which the crushed aggregates from concrete rubble can produce load bearing blocks; the conventional production method of concrete block have been adopted. The processes and conditions for production of concrete block from recyclable materials will be the same as those produced from conventional production method except fine and coarse aggregates have been derived from crushed aggregates. Then block products will be tested in the laboratory. The compressive strength and other quality parameters will be tested and documented. The outcome of this experiment will be presented in a different paper; it is beyond of the scope of this paper.

The recommended nominal compressive strength of the concrete blocks in Tanzania ranging from 3.5 – 21 N/mm^2 (TZS 283:2002(E)). From the literature, the recommended minimum compressive strength is 7 N/mm^2 (Jackson and Dhir, 1988). The recycling/upcycling of the crushed aggregates from concrete rubble to generate the load bearing blocks, the focus is to meet the minimum compressive strength of 7 N/mm^2. For the time being the standards and specifications for the recycled materials do not exist. So the existing production methods, procedures and specifications will be adopted.

IV. THE PRODUCTION OF CONCRETE BLOCKS FROM CONCRETE/MASONRY RUBBLE IN TANZANIA

Concrete blocks have been opted and presented in this paper because the concrete waste (as C&D waste) apparently makes up the largest portion about 40% of solid waste stream (Dolan *et al*, 1999; Macozoma, 2002) in the world also in Tanzania where the C&D waste generation in urban areas such as Dar es Salaam continues to increase. Concrete blocks are the major building system used Tanzania whilst it is gaining importance in the majority of developing countries (Kaosol, 2010). Concrete block masonry has the advantage that it offers little waste and any broken or unused block can be recycled or saved for future projects rather than being disposed of (USA PW Technical Bulletin, 2004).

The aggregates required for concrete block production are fine (passed 5 mm sieve) and course aggregates (i.e. retained on 5 mm sieve and pass in 75 mm sieve) *http://www.tpub.com/content/engineering/14070/css/14070_287.htm*. Coarse aggregates in this paper defined as those aggregates which are used in production of concrete blocks. The recommended particle size for blocks production is ranging from 5 mm to 13 mm (Jackson and Dhir, 1988; GTZ, 1991).

4.1. Aggregates sampling and sample reduction

To get aggregates from recovered concrete/masonry rubbles, stratifies random sampling was used to sample the samples of rubble from the construction and demolition building as well as from the single and multi-storey buildings in Dar es Salaam city. Samples from natural source also sampled. Due to economic constraints, to get the representative samples: ten (10) samples of concrete rubble were collected from generation points and then crushed into aggregates. These samples include three (3) from multi-storey and 3 samples single storey demolished buildings; 2 samples from building construction (i.e. multi- and single storey building). Two (2) samples of coarse and fine aggregates from natural source also sampled for control purposes.

After crushing the heap of rubble, the 50 kg sample were sampled by quartering method according to recommended standard methods of aggregates sampling and test methods (TZS 58 (part1-3);1980) in order to get the representative sample. Then the 50 kg samples were sent to University of Dar es Salaam (*the building material laboratory*) for testing and analysis. The particle size distribution of the all-in aggregates was done by following the standard methods of the TZS 58 (Part1- 3):1980 & BS 812 (part 1-3):1975. To get the appropriate minimum mass of the sample for sample grading, the 15 kg was applied as recommended in Table 2 below. Since the crushing process was manually, the 37.5 (40) mm nominal size of material was applied. Therefore, 15 kg mass of each sample was determined by sample divider method to get the representative sample except for fine aggregates (sand), the 2 kg sample was used.

Table 2 the recommended an appropriate minimum mass of sample for the laboratory testing

Source: TZS 58 (Part 3): 1980

Nominal size of material (mm)	Minimum mass of sample (kg)
63	50
50	35
40	15
28	5
20	2
14	1
10	0.5
5	02
3	0.2
Less than 3	0.1

4.2. Grading crushed aggregates derived from construction and demolition waste

After sampling the representative samples, the grading by sieving analysis was done. The square hole perforated plate sieve of 300 mm diameter conforming to TSZ and having aperture size of 37.5, 28, 20, 14, 10, 5 mm and wire cloth sieves of 200 mm diameters and aperture sizes of 2.36, 1.70, 1.18, 0.600, 0.425, 0.300, 0.212, 0.150 and 0.075 mm were applied (TZS 58(Part 3):1980. The results of particle size distribution (sieving analysis) are presented in the Figure 5 below. Almost the curves of all samples (all-in aggregates) behave the same except for the fine aggregate sample from source. By calculating fineness modulus (FM) of each analyzed sample (see equation 1 below), the results were 5.6, 5.1, 6.0 for demolished multi-storey buildings (DM1, DM2, DM3) and 6.6 for constructed multi-storey building (CM) respectively. For single storey buildings FM were 5.3, 4.0, 5.8 for demolished buildings (DS1, DS2, DS3) and 4.6 for constructed building (CS) respectively. The FM of aggregates derived from natural source were 6.3 for coarse aggregates (NCA) and 2.0 for fine aggregate (NFA) respectively. According to Schoner *at al.*, (1987), the grading curves following curves A,B,C are recommended for structural concrete. For particles with maximum size of 37.5 mm the recommended fineness modulus of A was 6.4, B = 5.2 and C = 4.3 respectively; whereby A-B graded as *'Good'* while B-C as *'Fair'* (Schoner *at al.*, (1987).

Therefore, based on this fact, all recovered aggregated from construction and demolition buildings can produce the structural building material element because all most all curves fall within Good and Fair grade. Furthermore, the building material i.e. building blocks will be produced. The on-going research project will produce the building blocks from these recovered materials and presented in a separate paper. Therefore, the grading of the aggregates is important. According to Roberts *et al.*, (1996), the aggregates gradation helps to determine almost every important property characteristics of the concrete product made from that particular aggregates including stiffness, stability, durability, permeability, workability, fatigue resistance, frictional resistance and resistance to moisture damage.

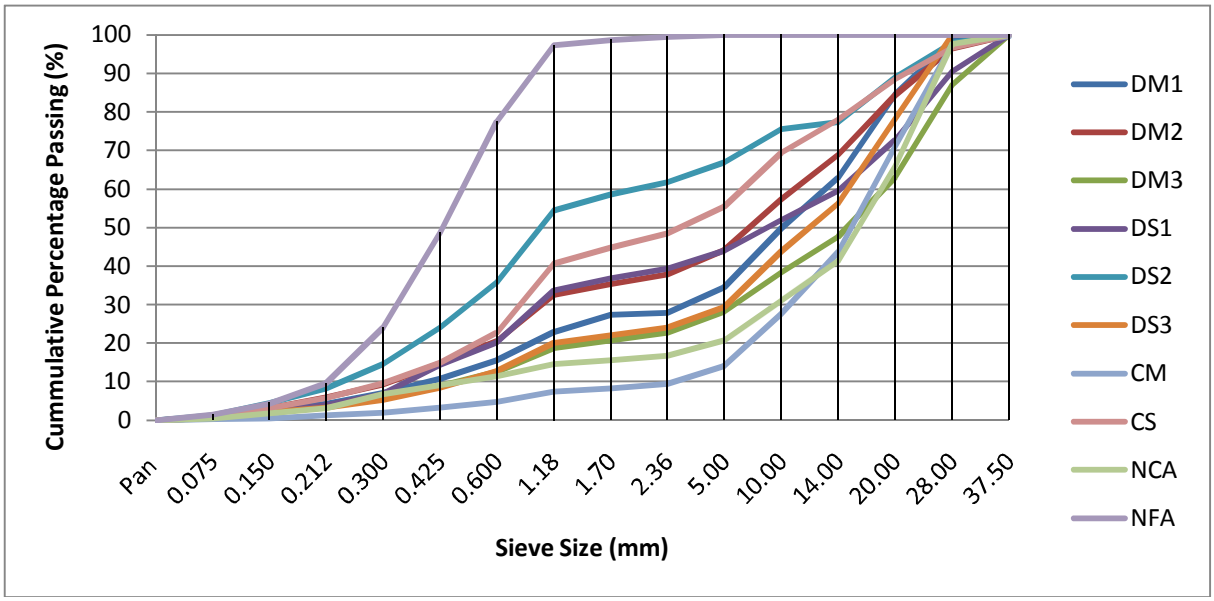

Figure 5 Particle size distribution (sieving analysis) results

Fineness Modulus is described in ASTM C 125 and is a single number used to describe a gradation curve. It is defined as:

$$F.M. = \frac{\sum (cumulative\ \ percentage\ retained\ \ on\ specified\ \ sieves)}{100}$$

(Source: ASTM C 125) …….eq. 1

where: FM = fineness modulus

specified sieves = 0.150 mm, 0.30 mm, 0.60 mm, 1.18 mm, 2.36 mm, 4.75 mm, 9.5 mm, 19.0 mm, 37.5 mm, and larger increasing in the size ratio of 2:1.

The larger the fineness modulus, the more coarse the aggregate

V. BARRIERS IN REUSING AND RECYCLE AGGREGATES IN TANZANIA

Acceptability of recycled material is hampered due to a poor image associated with recycling activity, and lack of confidence in using the product made from recycled materials (Rao *at al*, 2007). According to interview conducted in construction sector stakeholders e.g. contractors, consultants, regulatory bodies, building block manufacturer, C&D waste recyclers include:

- Acceptability of recycled materials by the building owners (clients)
- Lack of skilled people
- Lack of appropriate equipments
- Lack of appropriate technology
- Small quantity of construction and demolition waste generated compared to the demand of the materials
- Lack of awareness
- Lack of government support e.g. no policy in place directing the disposal of high potential recyclable materials like concrete rubble

- Bureaucracy
- No specific codes and standards for the recycled product(s)

VI. CONCLUSIONS AND RECOMMENDATIONS

There is building material scarcity problem in Dar es Salaam besides the demand is increasing. The rapid growing of the building construction and demolition activities generate more C&D waste i.e. concrete/masonry rubble. The low applications of C&D waste reveal that the waste material has the value in the local market. The recycling/upcycling of concrete/masonry rubble into valuable building is needed. By grading the crushed aggregates showed that the aggregates can be used for production of structural concrete element. The ongoing research is investigating the opportunity to recycle/upcyle the crushed aggregate from construction and demolition buildings to produce the load bearing blocks for building construction for sustainable construction and natural resource conservation.

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