VERNACULAR ARCHITECTURE AND ITS RELATION WITH SUSTAINABLE CONTEMPORARY ARCHITECTURE IN INDONESIA

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ABSTRACT

The immediate accumulation observation for the surrounding usually used in developing the architectural design. In vernacular architecture, the design passed from one generation to the other even without designer and academic method. Vice versa, the contemporary architecture nowadays is barely care about the relationship of the building and its surrounding nature. This research will try to look at this phenomenon and emphasizing the prominent role of climate on the design development of vernacular architecture and how it is impact the contemporarly architecture in Indonesia. In addition, it will further discuss how the climate is having a close relation with the building physical performance in order to reach an energy efficiency. Architect should harmonize the building with its surrounding nature. They should consider more prominent elements in tropical-humid building, ie air temperature, wind, sun radiation and humidity itself. This paper consists of three main parts. First part consists of introduction about the climate in Indonesia. Indonesia known to be located in the tropical and humid region. Following that, the second part explains the basic characteristic of vernacular architecture in Indonesia from literatures and precedents. Lastly, the third section describes several case studies in which reflects the relation between vernacular architecture in its relationship with contemporary architecture. Through this paper, expectantly people can see that to solve the climate problem, architecture explorations are really needed as those affect the energy efficiency and construction cost in the building.

Keywords: *vernacular architecture, energy effiecieny, contemporary architecture, sustainable architecture.*

A. INTRODUCTION

An architect's creative powers need not an act in a vacuum; they are nurtured by the world he lives in, by the people he knows and with whom he must deal with, by the things he sees and the things he has learned, and also by old symbol and forms (Belluschi, 1955). While Berg and Dasmaan mentioned that living in place means following the necessities and pleasures of life as they are exclusively accessible by a particular site, and envolving ways to ensure long term occupancy of that site.

A society which practices living in place keeps a balance with its region of support through links between human lives, other living things, and the process of the universe – seasons, weather, water cycles – as revealed by the place itself. It is the opposite of a society which "makes a living" through short-term destructive explotion of land and life.

With the all-obliterating spread of nowadays architecture, the efforts which were made to highlight the local context were left without enough support to survive. Without being nasty, many architects couldn't recognize what the local context could mean on their project. Compare to buildings and projects of avant-grande, the referential tendency of being local has given the project itself a conservatife reputation.

One could hardly describe that present moment in architecture as anything less than a period of rapid change (Frampton, 1987). Architects nowadays are pathologically addicted to change,

regarded as something one either hinders, runs after, or at best keep up with.

Instead of thinking of a building as an isolated architectural expressions, we must conceive of what precipitated the need to create a building, the process of constructing a building, and the activities associated with the habitation of a building after it has been constructed as part of larger set of practices that occur as the scale of the contextual landscape. The design goal of an architect should not be to design a building that is architecturally contextual; the goal should be to design a building that has the potential to become contextual over time (Cassidy, 2000).

There area ways to both respect and respond to the local context. One of important way is to consider its surrounding nature which emphasizes more on local climate. Unfortunately, what we called as contemporary architectures nowadays is not discussed outside the realm of being local, rensponsive to environment, and thermal comfort. This is not to say that these architectural considerations are not important or significant, only that they, of themselves, are not neceserally part of a larger set of lived practice that actively engage the contextual landscape and reveal its eloquence.

Architecture which responds to climate is the building which forms and structure considered climate for its user comfortability and well being on its design thinking process. There are many benefits resulted from this design thinking process, such as: building energy efficiency and lower construction cost. Despite its benefits, there are architectural projects which still neglect that prominent value.

Looking on its benefits, this paper aims to be a persuasive research for architect to realize the architecture roles of being responsive toward local climate. This paper takes Indonesia as its specific research object. Indonesia is choosed because of its acquaintance with the writters background.

Indonesia within its tropical climate has a unique architectural respond to bring comfort for its user. The development of its architectural design methods has started hundread or even thousand years ago along with its local culture, and well known as Indonesian Vernacular Architecture. Without any academic know how or research, the ancient people build their shelter based on learning by doing. The long processed resulted many design keys which are used until now. There are several keys such as: thatched rood, stilted house, and structural system.

In view of the values of Indonesian Vernacular Architecture, this paper will talked about the ancient vernacular ways to respond the climate (precedent) and how the ways still used until now in several contemporary architecture projects (case studies).

B. LITERATURE REVIEW

Climate in Indonesia

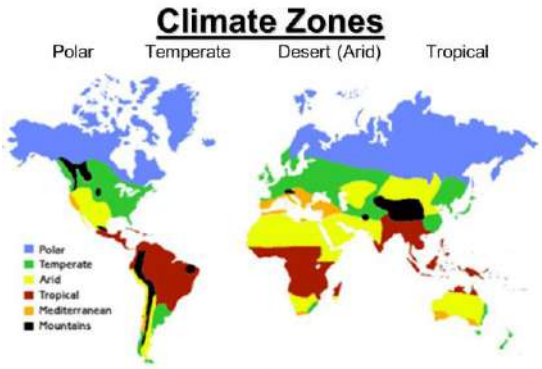

Image 1. World Climate Zone
Source: https://slideplayer.com/slide/10107949/, 2018

Indonesia is a tropical country which located between latitude 8° of north and 13° of south. It is part of Southeast Asia and passed by the equator line. Indonesia broadly has two seasons, ie: Dry season during April until October and rainy season occurs during November until March.

Temperature

The average daily temperature in Indonesia is varies according to the region topography, but roughly said 30°C along the year. The different of maximum and minimum temperature is approximately 9°C. In particular areas, the temperature can reach 36°C in dry season eg. two provincial capitals in Java island, Semarang (the capital of central Java province) has temperature between 23 - 33°C and humidity between 30% - 95%, and Surabaya (the capital of East Java province) has temperature between 24 - 35°C and humidity between 40% - 98%.

Humidity and Rainfall

The humidity in Indonesia are varies between 30% - 98%. According to Maaruf, 2014; the ideal relative humidity is between 50 – 60%. Indonesia is a country that has a high rainfall with uneven distribution. The rainfall in average reaches 700 mm / year (it is measured by pluviometer in the rainy season). The highest rainfall in Indonesia found in Central Java, Baturaden. In this area the rainfall reached 7.069 mm / year. The minimal rainfall is in Palu Central Sulawesi, is the most arid region with rainfall of about 547 mm / year.

Air movement

The air movement in Indonesia is under the influence of Asia and Australia continents, and Pacific and Hindi Ocean. In dry season (April - October), the hot wind blows from Asia to Australia. Vice versa, wind that blows in November – March carries water vapor and causes rainy season in Indonesia. The air movement varies in every region. Java Island which is located in latitude 6°, southern part of equator line, in the dry season the wind blows from Northeast direction to Southwest in dry season and during the rainy season blows from Southeast to Northwest.

Sun radiation

Basically, the position of the sun is always above all area along the years, with sun radiation intensity about 11.5 hours per day. Take Surabaya as an example, the radiation intensity is about 900 - 1000 W/hm². In Indonesia, October is meant to be the hottest month in all area

To create comfort in buildings in Indonesia, the humidity in the office should be approximately 50% with a wind speed of 0.1 m / s.

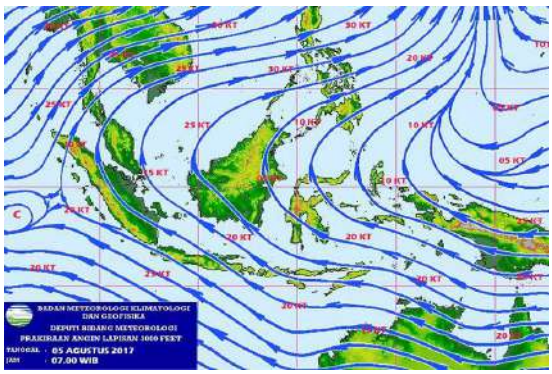

Image 2. In Indonesia the wind direction broadly changed according to the season
Source: BMKG, 2017

Buildings in tropical climates, get great solar radiation during the day and cooling at night occurred in the building. Therefore, at night usually heat removed from the wall. Buildings in tropical climates naturally have thermal control in its design to improve the quality of life and environmental contemporary architecture.

Some basic principles in the planning of buildings in tropical climates are free to prevent heat into the building. There are also others principles such as:

1. Maximize heat release (ventilation and windows, colors, building envelope)
2. Energy used (for cooling the room that cannot use passive ventilation)
3. Overhang for Blocking sunlight and rainwater
4. The knock down structural system.

Beside those basic climate principles, there are considerations in designing buildings in Indonesia. According to the geographical position, Indonesia located between the Australian and the Asian earth plates. Those plates are frequently looking for their balance positions. The tension of those are oftenly released and create an earthquake. According to geoscientists, it occurs all year with a big earthquake occurs in a particular period of time, roughly every 75-100 year. Indonesia indeed has several active volcanoes which also cause earthquakes and other natural disaster.

Basic Characteristic of Vernacular Architecture in Indonesia

Image 3. Indonesia's Archipelago
Source: Google Eart, 2018

Indonesia consist of thousands island and thousands ethnic group. Each ethnic in Indonesia has their own culture and tradition. This also affect each place vernacular architecture development. Vernacular architecture in Indonesia is mostly generated through experiences, thoughts, and cosmology of the ancestor. Broadly there are two physical factors that make Indonesian vernacular architecture said sustainable. Those are its material and physical design.

Material

Tropical countries are famous for their natural resources. Thus, make local people always consider about using natural material. This has been happening since long time ago.

The most used material in vernacular architectures in Indonesia are:

1. Wood

Since Indonesia is considered as tropical country, they have so many types of woods in from the forests, especially in Kalimantan. Thus, most of the traditional houses in Indonesia made of wood. Eg. Javanese and Dayak traditional houses (see below image for reference).

Image 4. Front Facad of Dayak Traditional Long House
Source: tripadvisor, 2018

Image 5. Javanese traditional house
Source: Nusantara TV, 2018

2. Bamboo

People in Indonesia commonly used bamboo to build their houses. There are two kinds of bamboo that commonly used for buildings due to its strength and elasticity. People called them raw black bamboo (bambu mentah hitam) and yellow bamboo (bambu kuning). Both types of

bamboo used for the traditional house roof structure and columns.

Image 6. Traditional Lombok house roof structure
Source: Personal documentation, 2015

3. Stone

Mostly used for the house foundation. Stone foundation material in traditional houses is mostly taken from the nearby river.

Image 7. Stone Path in Baduy Village
Source: Khatulistiwa info, 2013

4. Thatched roof

This kind of roof material can oftenly be found in the eastern part of Indonesia, from Nusa Tenggara Timur (NTT) part to Irian Jaya (Papua) island.

Image 8. Traditional Sasak house, Lombok island
Source: Personal documentation, 2015

Image 9. Honai, Traditional Papua House, Irian Jaya
Source: Gilar Setiadin Nugroho, 2018

Physical Design

1. Stilt Houses

The stilt house designed to catch the wind of higher velocity. Some people think, stilt house is good for contemporary architecture since the flooring material do not cover the soil. When it is raining heavily, the soil can absorb the water maximally.

Image 10. Dayak traditional house
Source: Noberta Mebang, 2004

Image 11. Batak traditional house
Source: Puchy Nisa, 2018

2. Building pole is not directly attached to the ground

In many cases we can see that in traditional houses the pole is not directly being attached to the ground. It is done to avoid the water precipitation into the pole material which normally using wood or bamboo. Thus cause the material to be rotted.

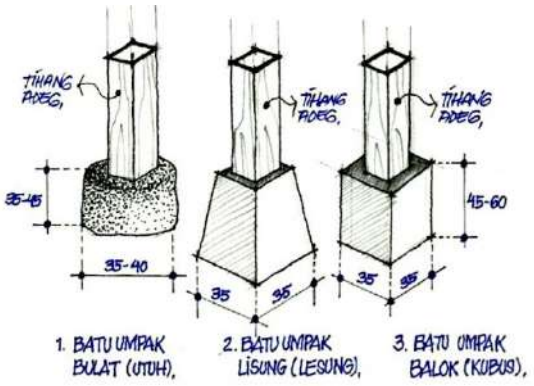

Image 12. Sample of building poles in traditional houses
Source: Dearchitect blog, 2016

3. Sun Shading and Solar Protector

The main function of the sun shading and solar protector in tropical building is to block the direct sun radiation into the building. There are two kind of precautionary principles, ie: shadowing and filtering.

In Indonesia the best shading device is the one which located on the building facade. There are several kinds of external shading device which works well in tropical climate, such as:

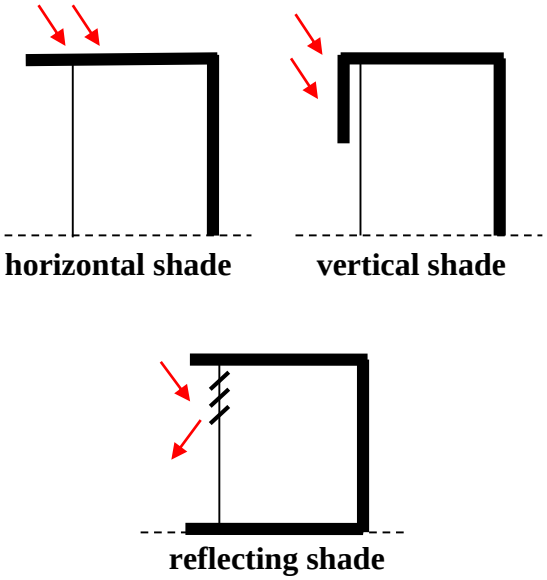

Image 13. Various type of shading device commonly used in Indonesia

These kinds of shading device also serve to overcome the problem during the rain.

4. Passive cooling devices

In order to achieve the thermal comfort inside the house, tropical houses usually designed to have ventilation devices. There are two ways in maximizing the wind inlet, first is by creating openings either on the building facade or its roof.

Image 14. Traditional Nias house, Sumatra
Source: Zegachandra, 2014

Image 15. Traditional Betawi house, Jakarta
Source: Cinta Indonesia, 2018

The second possibility is to let the wind flow into the building through the roof gap or joint. These kind of methods can be used for cooling the interior space of the house. The used of passive cooling method in tropical building is expected to be a key to solve energy consumption issue.

The wind goes inside the building through the roof gap

Image 16. Javanese house (known as Joglo)
Source: Oyin Ayashi, 2015

5. Roof shape configuration

As can be seen from images above, as a tropical-humid country, Indonesian buildings are mostly using the oblique roofing system. This kind of roof shape allows the reducing of wind velocity in the building. Indeed, in the interior space the air velocity is conformed.

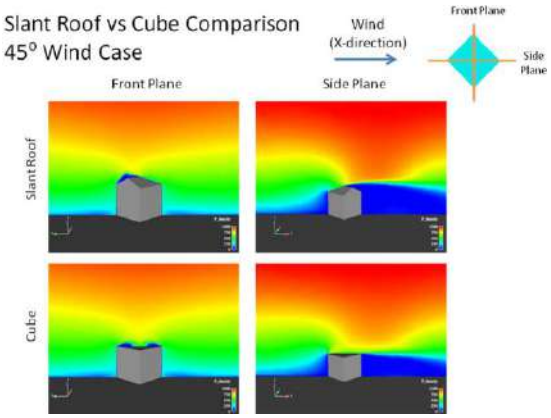

Image 17. Comparison of the wind velocity in flat roof building and oblique roof building
Source: Sue Ellen Haupt, 2011

C. RESEARCH METHODOLOGY

The methodology used in this study is descriptive qualitative method. Assumption will be proved by literature studies from precedent and observation on case studies. Preceden used as an interactive and easier ways to conclude and understand the literature of vernacular architecture. While several case studies choosed based on its compatibility with the whole research purpose.

As brief, there is research steps used below, consists of:

1. Understanding the literature study in the direction of defining several main points in local climate and vernacular architecture characteristics.
2. Identifying Indonesia's local climate particular character.
3. Identifying basic understanding of vernacular architecture in Indonesia.
4. Through case studies of relevant project in several areas in Indonesia, this research is trying to find the transformation of Indonesia ancient vernacular architecture into its current contemporary architecture.

The steps above could be seen in research methodology diagram below.

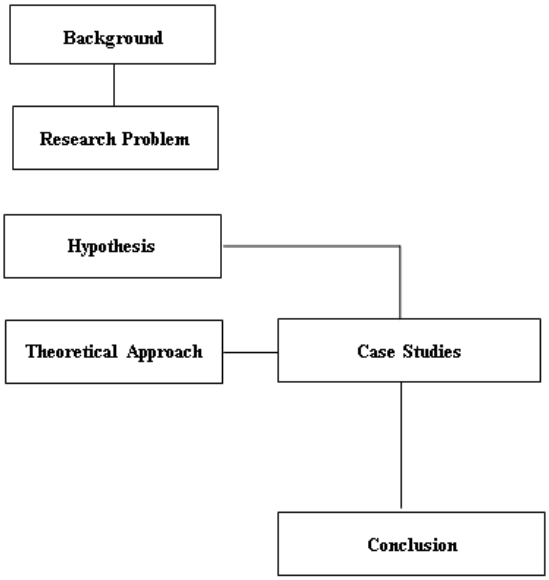

Image 18. Research Methodology Diagram

D. CASE STUDIES

Ngibikan Village

In May 27th, 2006 at 5.55 am local time, when people usually prepare to start their routine, Yogyakarta was devastated by the earthquake. This 5,9 Richter scale (6,2 Richter scale according to the United States Geological Survey) earthquake that occurred for 57 seconds was destroyed most of the building structure in Ngibikan Village, except for their wooden doors and windows. This earthquake was initially also caused by mount Merapi, located in the north part of Yogyakarta which often creates tremor. Hence caused any casualties about 7000 people. In this village there were 5 people died.

a. 

b. 

c. 

Image 19. Ngibikan village condition just after the earthquake
Source: Zahra Nasution, 2011

Later, the wooden construction was proposed to use in the reconstruction of the village dwellings. This reconstruction process led by a famous architect based on Yogyakarta called Eko Prawoto. He visited Ngibikan village just a day after the earthquake occurred. Was approaching Mr. Maryono at first, this reconstruction program was also carried out with respect by the participation of the existing social structure of the village community. Thus was not only encourage the existing villagers to reconstruct their houses, but also about rebuilding their community resilience. Instead of building a post-disaster temporary houses, they tried to build normal houses.

Eko Prawoto said, this reconstruction purpose is not to destroy the village social structure. Outsider can say that after the disaster everything has been destroyed, but we believe that many things are remained. The village culture, their values, their skills and knowledge are still there. In this case this village has

something in the reconstruction to begin with.[1]

Javanese people apprehend their house not only as a physical private domain, but more than that they perceive it as a social structure. The balance of their life and the nature is one of the prominent point of this community. It also related with their belief of the Devine Power. Building a house for them is an important moment, so that to remark it they held ceremonies (slametan [2]). The main structures (wooden frames) had been constructed for 3 houses when they held the ceremony on June 12th, 2006.

Image 20. Slametan[3] after structural topping off
Source: www.akdn.org, 2016

At first they planned to build 65 houses in this village with estimate cost 10 million rupiahs for each house. At the end, they 67 houses can be built. The fund to this village reconstruction was given by Kompas newspaper. They got in total 650 million rupiahs, but at the end they still had 150 million rupiahs. The rest of the money then used to help the village nearby. The key to success in this development's cost savings are the reuse of material from the previous houses. There were approximately 50 volunteer from the villagers which have various skill and abilities in which about 10 of them were the real building workers. This reconstruction process was started on June 5th, 2006 and was completed in around 3 months, exactly on September 22nd, 2006.

Image 21. Ngibikan village site plan before and after the earthquake
Source: www.slideshare.net, 2016

At the first two weeks, the non-building worker volunteer were watching the skilled workers since they do not have any clear job description. At the end, the chief of the village, Mr. Maryono decided to create a working system. The working system according to Eko Prawoto is just

[1] ChangFang, Luo. 2011. Yogyakarta, Indonesia: Reconstruction of Ngibikan Village. Accessed at http://www.architectureindevelopment.org/project.php?id= on June 29th, 2013.

[2] a ceremony to ask for blessing from God during their working process

[3] a ceremony to ask for blessing from God during their working process

like an assembling process in automotive industry [4].

The vernacular architecture by using wood as construction material has dominated Yogyakarta buildings since ancient time. It is such a lesson that passed from one generation to the next generation about light and elastic structural material.

In this project, Eko Prawoto decided to build a simple house, but has a resistance to the earthquake. The house design is similar to traditional Javanese house which called Limasan. The roof shape has a type of kampung roof which made a bit higher than the original size in order to facilitate the future development. This kind of roof also purposed to let the wind goes into the building.

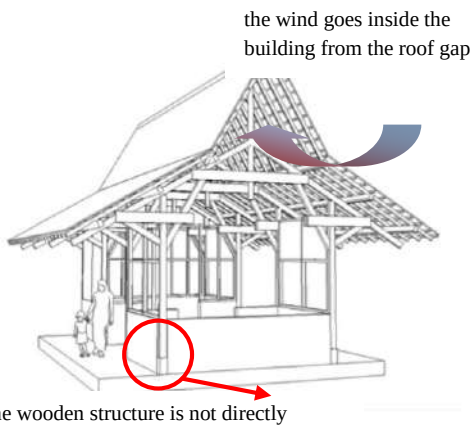

Image 22. Eko Prawoto drawing plan for the village reconstruction
Source: www.akdn.org, 2016

The house was designed very simple, but flexible in providing the spatial arrangement. The original design provides 3 rooms, each has 2,4meter long and 6 meters wide. In total each house has 7,2 meter by 6 m which area is more than 43 m^2. In this case people can actually divide their house according to their needs. This house designed to provide up to 4 bedrooms with an extra room designated for the living room.

Image 23. The inclined roof used in order to avoid leaks when it rains and the overhangs designed to protect the house from direct sunlight
Source: www.akdn.org, 2016

Traditional wooden construction was considered as the best structure for this reconstruction project. They use the 4 meters long wood to form the wooden truss and joined it with 12mm bolts. The woods were taken from the ruins of the previous buildings. This structure is actually not tested yet regarding its resistance to the earthquake. It is being used after looking at the local buildings. It was constructed in the same way before the earthquake happened. And this system seems to be the one that can survive during the earthquake. Thus, this structure system was considered as an earthquake-resistance structure and adopted in the Ngibikan village reconstruction project.

[4] ChangFang, Luo. 2011. Yogyakarta, Indonesia: Reconstruction of Ngibikan Village. Accessed at http://www.architectureindevelopment.org/project.php?id= on June 29th, 2013.

Image 24. Wooden truss joined with 12mm bolt. The ventilation for cooling down the building structure
Source: www.akdn.org, 2016

Maya Ubud Resort and Spa, Bali

Maya Ubud resort and spa was designed by Budiman Hendropurnomo from Denton Corker Marshall. It is located in between Petanu River valley and the verdant rice fields in Peliatan around an hour drive from the Ngurah Rai international airport. Maya Ubud resort and spa has 108 luxury rooms with villas. It also has quite diverse facilities, for example dining, swimming pool, tennis court, golf putting green, yoga pavilion and gym, spa, village trekking, nature excursions and mountain biking, etc. It also provides a shuttle bus to the Ubud township.

The architect of Maya Ubud resort and spa combined both new and traditional concepts in the buildings. Instead of putting Balinese paintings, masks, and statues Budiman tried to go deeper in the ancient concept for its landscape and architecture. Thus designed according to the traditional Balinese cosmology which usually oriented along north-south sacred axis (kaja-kelod), connecting to the mountains in the centre of the island, kaja [5] to the peripheral seas, kelod [6].

Image 25. Maya Ubud Resort and Spa Layout Plan
Source: Marie Bowden, 2016

A central ceremonial pedestrian along the central cam links the prominent public spaces and the porte-cochere. It goes from the lobby and down to the spa. The villas or dwellings are located on both sides creating a village with axis. It is designed to follows the contours of the land.

The walls are desegregated with modern functional space. If we look further the design of the restaurant and

[5] the realm of the gods

[6] the domain of demons

swimming pool seems like they are suspended between the sky and the river valley. The main design concept for this resort and spa is to conserve Balinese culture and heritage.

In both interior and exterior space of the buildings, we can find recycled materials. Thus purpose is to create the uniqueness of this resort and spa. There are old cart wheels have been turned into mirror frames, table tops were made from teak railway sleepers, and traditional fish traps baskets are formed into lamp shades. Maya Ubud Resort and Spa has got several awards as a green building for its using of recycled and local material.

Image 26. The Massing of Maya Ubud which Respond the Nature
Source: google images, 2018

Image 27. Natural and Local Material Used in River Café, Maya Ubud
Source: google images, 2018

The modern Balinese style can be seen from the used of thatched roof. It makes the buildings attached to the nature surround.

Image 28. Recycled and local materials are being used in Maya Ubud Resort and Spa
Source: Denton Corker Marshall accessed in 2013

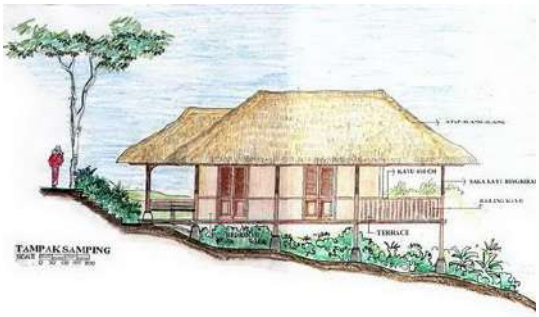

Image 29. Building elevation from the east
Source: Denton Corker Marshall accessed in 2013

Image 30. Interior space of the villa (the roof gap and windows provide natural ventilation)
Source: Denton Corker Marshall accessed in 2013

Another green strategy of this resort is that they recycle their waste water from the sewage treatment and use it for irrigation. Not only that, they also use the bio-degradable products and cleaning

supplies in laundry, stewarding, and housekeeping. Started from June 2010 they use energy efficient bulbs (including LED) in the hotel. For the garbage, they recycle the plastic containers with supplier and try to separate different types of garbage.

Not only environmental contemporary architecture, but they also care about the socio-culture contemporary architecture by prioritized the local worker and also try to promote the local culture by having art classes and cultural performances. These sustainable concept is not only to show their care about environment, but also to as a business promotion trick.

Image 31. Engage the local community to be employed

Rumah Sitok Srengenge

Rumah Sitok Srengenge was designed by Indonesian Architect, Eko Prawoto. Again, Eko Prawoto is an Indonesian architect and instructor who mixed contemporary design with local knowledge, reflecting his design views which thought buildings as social objects as much as physical objects. By using local resources and frequently recycled materials, his designs are not only environmentally delicate but also reducing the building costs.

While he get project to design a building in rural areas, he always researching about the local resources by doing an initative site visit to propose a suitable design, combined with local workers and craftmenship (spatialagency, 2018).

Image 32. Façade of Rumah Sitok Srengenge
Source: Google images, 2018

His concern towards locality, both material and contextual always represented on his architectural works. One of his famous works is Rumah Sitok Srengenge. Rumah Sitok Srengenge is a residential project for an Indonesian literature writer and artist, located in Yogyakarta. He is Sitok Srengenge, the house's owner. He wrote a poem for his wife, mentioned about the beauty of this house, called "Home for Maulida" (Powell, 2010).

The main idea of this house was not to designed a compact house which are typicall house always looking for. The big site area was the main reason why the architects proposing a moving from place to place, building to building. It would provide space experiences for user as well as accommodating the needs within its multiple massing.

Rumah Sitok Srengenge located in Bangunwijoyo, Yogyakarta. The total site are of Rumah Sitok Srengenge is 1.3 ha. The distribution of multiple massings could be seen in the block plan image below. The distribution of building masing is adapted to the traditional Javanese concept which allow user to moving around the house.

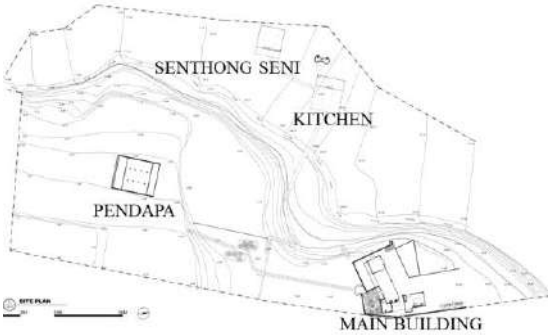

Image 33. Block Plan of Rumah Sitok Srengenge Which Adapted to the Surrounding Landscape
Source: Eko Prawoto, 2013

As the architect has aim to providing user experience despite its function as a home, there are several additional features added. The first feature is series of landscape designed providing user an uxepected spaces experience.

Image 34. Natural Stone Used for Pedestrian Way Along the Site
Source: Eko Prawoto, 2013

By its natural topography, the house is situated at the end of undone pathway. Responding to this potential, the architect create a path of stepping stone covered with trees, passing over a rattan bridge that extents a water preservation pool. After that, user could walking down by stone steps to a small amphiteather that heads the dwelling building. The experience continue, which user cancross a blue wooden bridge over a koi pond to an ever-open door. All these routes is offering a curiously walking through excavated ruin.

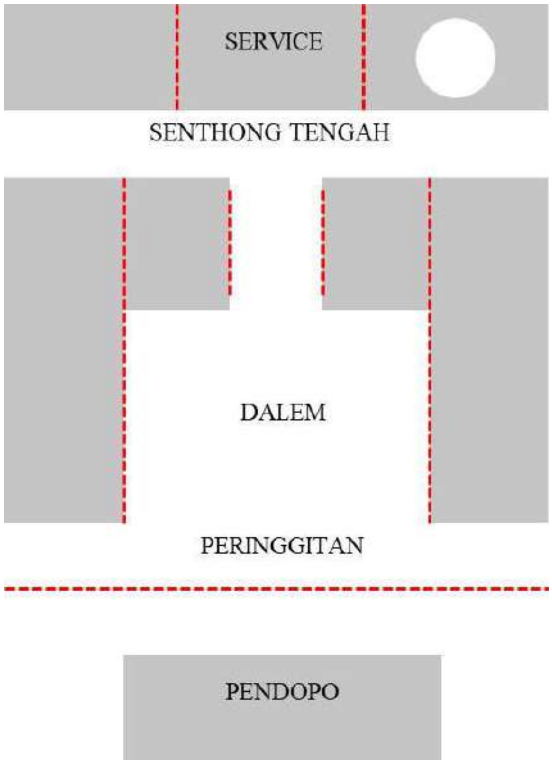

Image 35. Massing Layout of Java Traditional House

For the building distribution, the first building which user could find is the pendapa where guests are accepted. Soon after the bridges experience, there is main building where the dwellings are. The kitchen and dining room of the house is actually situated 40 metres from the main house in a deep valley. At the end of the site, there is Senthong Seni where the house owner works.

Image 36. Senthong Seni Which Used Joglo Traditional Roof.
Source: Eko Prawoto, 2013

Image 37. The Main House'Structure Adapted Traditional Thatched Roof Completed with Traditional Ornaments.
Source: Eko Prawoto, 2013

As for the architectural style, it used traditional Java resemble on its thatched and Joglo roof. The buildings used wood as main structure and terracotta as roof covering. The wall constructs with concrete and finished with wall painting, while the floor covered by natural local stones.

Not only how the architect responds the site topography's, the most distinctive features of his design is the used of local material, craftsmanship, and ornaments all over the buildings.

Image 38. Fascinating Material Details on the Main Bathroom
Source: Eko Prawoto, 2013

As showed in several images below, he used traditional decorated windows in Senthong Seni. He also used traditional architraaf on the door, and bamboos in some parts of the building.

The buildings were designed with open massing concept which allowed fresh natural air circulation passed over the whole part of the buildings. As sunshading, there are thatched roof in every massings. The joglo style of roof in some buildings also providing an internal thermal comfort by bringing the hot air up and distribute it to the outside.

The materials, structural system, and architectural design of Rumah Sitok Srengenge present an appropriate example of how contemporary architect adapted the exceptional values of vernacular architect. In addition to that, Eko Prawoto as an architect also has researched on earthquake resistant buildings made from local materials such as bamboo, straw and coconut wood. He never halts to learn and educated public.

Image 39. Bamboo Used as Wall Covering on Some Parts of the House (Indoor and Outdoor)
Source: Eko Prawoto, 2013

E. CONCLUSION

Indonesia as a tropical-humid country has several climate issues which directly nor indirectly affect the building design. Those factors are: temperature, humidity and rainfall, air movement, and sun radiation. Those specific climates resulted in several architecture design elements, both in vernacular and contemporarly architecture in Indonesia.

As mentioned by Ponni, M., Dr. R, Baskar, a building especially residential is a dynamic system which comfort temperature is a critical state for the indoor air quality. Along with that statement, these three architects likewise place that value as frontline on their project.

In general, the characters of vernacular architecture Indonesia basically have met the demand of the sustainable tropical architecture. The design of the traditional buildings has answered the climate challenge in which more focusing in the application of natural ventilation and sun shading devices. Regarding the abundant natural resources, vernacular architecture is mostly using natural material such as wood, bamboo, stones, and thatched roof.

As for the contemporarly architecture development in Indonesia, there are numerous architects which still manage to respond towards the climate appropriately within its design elements, though they might have done it in diverse ways.

As mentioned on three case studies, the current local architects seem already realize more about the prominent role of local context, local climate, and contemporary architecture. In the first case, which Eko Prawoto did reconstruction for Ngibikan Village, he emphasize more on how to maintain the village social structure which are important in Javanese culture. In order to accommodate the needs and the limited situation of local people, the new houses was built with reuse material from the damaged house with traditional limasan style and wood construction which proven to be earthquake resilient from long time ago.

In second case, Maya Ubud by Budiman applied Bali Cosmology onto the resort's master plan. The main goal of this project is to conserve Balinese culture and heritage by using the modern Balinese architecture style resemble on its thatched roof. In order to respond the environment sustainability, he reused local material both for interior and exterior, as well as the decorated furniture. In addition, there are also water treatment plan to recycle used water and rain water. He is not only design the building, but also bringing ideas on how to build the local community by using local workers and build the local culture by providing spaces for the development of local art, despite the class of this project.

In the third case, Eko Prawoto once again showed his concern towards locality, climate, nature, and people. In this case he is exploring a house as an art which is part of surrounding nature. As expected of his work, this project also maintained the local Javanese space organization, well respond towards topography, and how he used recycled bamboo as part of interior and exterior elements.

As conclusion, it is undeniable that there are various ways to express contemporary architecture. While many of architects interested more on exploring the form, industrial material, and its symbolism. There is no eventual reaction on how an architect should be like. But, resulted from precedent and case studies showed that the adaptation towards local context (in this paper, talked more on its climate) and the vernacular knowledge are appealing which not only offering building whole efficiency, but also providing additional values toward the architecture design itself and its surrounding environment.

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