The sustainable built environment maintained by the Betawian traditional house’s faithfulness in local wisdom

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Abstract. The uniqueness of construction and building process influences the purpose of form, generally recognized by local wisdom. Occasionally climate will not influence the building it follows, custom-tradition and environment condition that determine the differences of characteristics in responding to the climate. There are three elements to consider in architectural discipline: Nature as a place that influences the building; Building as a product to fulfill human necessity to stay in nature, and human as user, occupant, designer or builder. Those elements are inseparable, as they link to each other. Consequently it is important to take into account the environmental conditions when establish building and dwelling. Beside that it is necessary for house residents to obey and follow the stipulation regulated by local custom or tradition. The Betawian house is traditional house that maintains the built environment sustainability it is faithfulness in the local wisdom. For instance the house has veranda as a respond to the climate. For that reasons the author conducted this research with the following hypothesis “the fidelity to local wisdom in supporting the traditional house’s response to the climate” with descriptive-qualitative methodology. The discussion included the theory of traditional architecture in Indonesia, the Betawian ethnic house; the tropical architecture-building theory and the sustainable architecture theory. Findings showed the decrease a number of housing and dwelling that use of local wisdom as a response to the climate changes. One of the research goals was to preserve the local wisdom by maintaining the traditional house and teaching the house resident to preserve. Publishing a journal article is a way to raise the awareness of the built environment sustainability.

Keywords: built environment, betawian traditional house, local wisdom, sustainability,

1. Introduction.
The Betawian traditional house will be discuss is the betawian in the South Tangerang City, which is located in between 06°17’40”South Latitude - 06°22’10” SL and 106°40’25”East Longitude - 106°47’25”EL. The native are from betawian outskirts tribe (“betawi udik / pinggir”), refer to Ridwan [1]: In the beginning they came from descendant of Salakanagara empire (130-363), occurred as an effect of the acculturation with sundanese since Pajajaran empire subjegation, followed by Mataram Demak empire subjegation the acculturation with Javanese happened.

The Betawian in this locus is mix betawian descendant that called” The Betawi Ora” tribe impact of the acculturation with Chinese called “Betawi Kota”, which is inherit some character from some tribe, happened around 18th -19th century after some people came from china as trader. accordance with Harun,IB [2]. It is very regrettably if the extinction happens, because from the architectural point view the custom and tradition is one of the local wisdom which is characterized the inhabitant.

Pondok Benda-Pamulang is one of the area with high population density of ”betawian ora” tribe.
Nowadays total of the “Betawian ora” tribe still exist, even people density condition getting increase with many type tribe, but the “betawi ora traditional house” decrease, therefore emerged the question: “Why the betawian ora traditional house was decrease?” whereas it has a unique respond to the climate by put the veranda in front of the house). From the author point of view if the “Betawi ora” traditional house preserved, then the built environment sustainability will be maintained, It is the background of the study.

1.1 Traditional House.
Traditional house is an architecture form produced by local people for respecting to local ways of life and culture, applying simple technology as well as stabilizing local environmental resources by using local materials, the vernacular architecture products use the local characteristics refer to Rudolfsky [3]. However according to Barry Dawson and John Gillow [4] traditional architecture is a different environment product whose diversity is obtainable from same custom and tradition without alterations, and it becomes front gate from generation to generation. It further and utilizes building materials by considering and responding to the local climate and vegetation. From the Indonesian architectural expert’s point of view Siswono. YH [5] explain that the traditional house is the expression of manmade creation that constitutes local cultural element and expands in the local community, tribe or nation,

1.2 Betawian Traditional House
According to Ridwan,S. [1] in the past time Salakanagara empire changed into Sunda Kalapa, and that was changed to Batavia, and then to Jayakarta, etc. The last name is Jakarta, with the local inhabitant called betawian ethnic. Now Jakarta is a founder of Betawian village. Referring to Yasmin Z. S. [6] Betawian culture extinction is caused by identity crisis in the Betawian community when Jakarta change from small into metropolitan city, in which Jakarta is Betawian community home-town. Therefore, Ali Sadikin (1966-1977) as Jakarta leader formed the betawian cultural service (Dinas Kebudayaan Betawi) to revivet betawi culture and art. Nowadays the Betawi architecture and culture are recognize as the products of cultural services-Jakarta city government.

According to Ismet B.Harun.et.al. [2] : Betawian ethnic consists of
- Coastal Betawi who use a stilt house (“rumah panggung”) and inhabit in north of Jakarta such as Teluknaga, Cengkareng, Tanjungpriok, Marunda, Cilincing etc.
- Mainland Betawi who use a landed house (“rumah depok”), and the people consist of: 1.Mid Betawi (“betawi tengah”): Jakarta Kotulama, Gldok, Tanah abang, Senen,Rawamangun. etc. 2. Outskirt Betawian (“betawipinggir”): Tomang, Slipi, Senayan, Setiabudi, Manggarai, Tebet, Jatinagara, Mampang Prapatan. 3. Countrified Betawi (“betawi udik”): Kebon Jeruk, Cileduk, Ciputat, Sawangan, Depok, Cimanggis.

The houses of those two ethnic communities have the same room order, which is divided into public area in front of the house, private area in the middle and service area in the back. The bathroom and lavatory are separated from the house. They usually use a river or well for water resources and use a pond (“empang”) for lavatory. The spread Betawi people is as follows other things use a landed house (“rumah depok”) such as:
- “Betawian Ora” ethnic spread in Pondok Aren, Serpong, Serua, Pamulang, Rawa Kalong, Parung Beunying;
- According to Tjandra Kania (2000) Ethnic “Betawan Keturunan” (descendant Betawan) can be found in Gunung Sindur, Kampoong Cikoleang, Pabuaran, Pungasi, Cikarang and Jeletreng.
- Mixed Betawi (“betawi campuran”) who is blend of ethnic Outskirt Betawian and Countrified Betawian can be found in Kebon Jeruk, Kebayoran Baru, Pasarrebo, etc.

Sometime there is an acculturation between Outskirt Betawi with Chinese, Javanese, Minangkabau, or Batak.

The pattern of the Betawi ethnic spread in Jakarta it’s surroundings is illustrated in the following figure 1.
2. Methods

This research started with a question “Why did the Betawian traditional houses that have the veranda as unique response to the climate, decrease? And why would the local wisdom of Betawian traditional houses be defended from the climate?” This study sought to find the answer simultaneously by collecting the facts and needs in data compilation stage. The causal factors were found and used to express problem statement in the review stage. In the analysis stage the theory was selected and tested for the concept of problem solving, and then the problem solving was stated in synthesis stage. Then the conclusion stated as the result (see figure 2).

3. Discussion

3.1 Coastal Betawian House.

In the past most of the site was swamplands or seashores, thus to avoid the tidal wave, the Coastal Betawian ethnic house is a stilt house, Generally the inhabitant work as fishermen or merchants. The specification of the stilt house is as follows:

- It is stands with wood pillars and implanted on the ground, and uses “batang kalapa” (coconut pole) as its main structure to support the platform,

The building frame usually uses materials from “nangka” wood (actocarpus heterophyllus lamk) or “kecapi” wood (sandoricum koetjape). “bamboo tali” (giganto chloaapus) is use as a roof rafter.

![Figure 1. The pattern of the betawian ethnic spread [6]](image)

![Figure 2. Methodology](image)
It has two platforms: the ground floor to store the fish and sail equipments, and the second floor for living, completed with stairs in front facade with "balak suji" ("balak suji" means a tiny pool to clean up leg when entering the house).

3.2 Mainland Betawian House
In the past time Mainland Betawi inhabitant lived in a group of family. The site was communal and the people cultivated the fertile soil. Therefore Betawi Mainland house is a landed house ("ngedepok" means grounded or without floor covering). It is devided into four types, Where the differences are in the roof top models:

- Gudang House ("rumah Gudang"), or ware house
- Bapang / Kabaya House ("rumah Bapang or Kebaya"),
- Joglo House ("rumah Joglo"),
- Descendant House ("Rumah Keturunan"

3.3 “Gudang house”
Large scale merchants commonly owned in the past time. Usually the occupants are Mid Betawi ethnic, the form of the house is rectangular with width as the frontage and roof top styles are saddle or shield models to protect the inside or backside from sunshine glare and radiation. The building materials usually use "nangka wood" (actocarpus heterophyllus lamk) or "gowok wood" (Syzygium polychepalum) as the main structures and "kecapi wood" (sandoricum koetjape) for timbering part and "bamboo tali" (giganto chloa apus) as a roof rafter. The roof for public area is in the front side and the service area in the backside is called “sorondoy” it meaning hanging down into the main house roof. The main house structure is very strong and forceful to bear the burden, so the roof of the front and backside can hangs onto the main structure (Figure 3 & 4).

3.4 “Bapang / Kebaya House”
In the past, usually the occupants were mix Betawian ethnic, most of them were descendants of Sundanese ethnic. Workers or employees commonly own the Bapang/Kebaya house, the character is like “rumah gudang” that is a rectangular form house with the length as the frontage. The roof top styles are saddle or shield models but the “sorondoy” roof is joined with the main building roof. Building materials usually use “nangka wood” (actocarpus heterophyllus lamk) or & “gowok wood” (Syzygium polychepalum) as the main structure and “Cempaka wood” as a windows or doors frames because the occupants believe that cempaka wood will bring a happiness. Timbering part use “kecapi wood” (sandoricum koetjape) and the roof rafter use “bamboo tali” (giganto chloa apus). Occasionally
in the frontage there is an open building (without divider) used as a public room for chatting or trading, called “Belandongan” like “pendopo” in Javanese, “paseban” in Sundanese (Figure 5 & 6).

3.5 “Joglo house”.
The joglo traditional house is occupied by mixed Betawian ethnic, mostly descendant of Javanese. It is different from Javanese joglo house. According to Ridwan, S [1]: It started around 18th - 19th century during Mataram troop aggression. Usually the occupants of Joglo types house are Betawian Javanese descendants, where there is strong influence of the Javanese custom-tradition on the house. Workers (or employees in the rubber estate) commonly owned the Joglo type house. Referring to Nenek Intan (otjoh Tjoen Ien) one of the oldest Ora Betawian women whose ages is ± 95th year olds some of mix Betawian married with Betawian Chinese descendants, to procure the job in high level. The detail of building is close to “Javanese Joglo” type, it is a square form house with pyramid roof top model. The additional part in the frontage and backside put up flat slope roof allied with the main building roof. The Building use materials like “nangka wood” (actocarpus heterophyllus lamk),“gowokwood”(Syzygium polychepalum) etc (Figure 7 & 8).

3.6 “Descendant house type”
According to Nenek Intan (Otjoh Tjoen Ien). the inhabitants belonged to Betawian ethnic are a mix of countrified Betawian with Sundanese or with Chinese Tangerang Banten. The uniqueness of the house is The uniqueness of the house is “meja abu” in the front part after veranda (“serambi”), because Betawian descendants are faithful to their custom or traditions especially in taking care of ancestor ashes. It is a duty of the youngest male offspring in the family, therefore the house is always inherited
to the youngest offspring in family, the common occupation is farmer or breeder or large scale merchant. Therefore, a wide area of rice field, plantation, farm etc. always surrounds the house (Figure 9).

![Figure 9. “Descendant type house” owned by Grandma (Otjoh Tjoen Ien)](image)

3.7 “Betawian Ora House”

According to Nenek Intan (Otjoh Toen Ien), the inhabitants are from the acculturation of countrifieds Betawian with Sundanese, Javanese, or China descendants in Tangerang or Banten. The occupation is employee as supervisor of rubber estate, security foreman called “Jawara or Centeng” or as a farmer and breeder. A wide area as dry ricefield, embankment, fish pond, plantation or chicken coop surrounds the surrounded.

Nowadays the Betawi an Ora houses are rare, so they are very difficult to find. One of the existing “Betawian Ora” house is Surachmat’s at Salak street Pondok Benda; H Simin’s house at RW 5 Pondok Benda and H. Syahbani’s house in Benda Baru. In the past Surachmat’s house was an original “betawian ora” house in heritage from his father because he is the youngest male boy offspring in Engkong Romli family. Regarding the family tree, Engkong Romli was descendant of Betawian countified (Engkong Romli’s father) and Sundanese (Engkong Romli’s mother). Engkong Ramli’s grandfather was mix of betawian countified with betawian outskirt (Engkong Ramli’s grandmother). From the family tree we can trace that engkong Romli’s father belonged to “Betawian Ora” because he was descendant of Betawian Countified with Betawian Outskirt.

The Betawian Ora house owned by bapak Surachmat looks like the joglo type. The appearance of the house has changed included the building materials and the facade color. In fact even the veranda (“sorondoy” in front side), but the “tempayan or kendi” still exist in front of the house (near the “belandongan”) because it has a deep meaning even though the ground plan of the main building part is no longer there.

Many elements of the house have a philosophy of life, such as “pangkeng”, pendaringan, langkan, listplank for eaves, etc. Thus they still maintained by the Betawian Ora people. In the past, the Betawian Ora people occasionally built a hall (big building without divider) as an element, called “belandongan” in front of the house. It was use as a chatting space or as a storage of farming and breeding tools or protection against the sun glare or radiation of the sunlight that entered the frontage of the main house. Betawian Ora people used the service area to maintain the indoor temperature from the back side. Unfortunately although the belandongan was a part of Betawian house, it is now difficult to find (Figure 10 - 12).
Figure 10. Belandongan in front of Betawian Ora house owned by Kong Sanan

Figure 11. New Style of Belandongan in front of Pak Surachmat’s Betawian Ora house

Figure 12. Ground plan of Belandongan in “Betawian Ora house” owned by Bapak Surachmat

The pole rest on pedestal, use landed floor with the top soil compacted surface and no devider. Between the pole placed there is “Bale” that look like a low platform used as a place for sitting crossleged. The activities there include trade, chat with neighbor, recite Quran verses, enjoy relaxation and also store farming equipment or place the crop temporarily. The building materials usually use “nangka wood” (actocarpus heterophyllus lamk) and “gowok wood” (Syzygium polychepalum) as the main structure, “kecapi wood” (sandoricum koetjape) for timbering part and “bamboo tali” (giganto chloa apus) as a roof rafter (Figure 13 & 14).

Figure 13 & 14. The detail of “belandongan”

Belandongan has long lifespan,due to the building materials and the construction system selection For example in the connection of pole with timbering, the elbow is connected with peg in many directions, so that the load can distribute and spread throughout and then the construction responds as equal as strengthen of structure element, the elbow (Figure 15 & 16).
Nowadays unfortunately it is very difficult to find “belandongan”, since it is rare now, the following questions emerge what is the causal factor? Why is “belandongan” going to extinct?

3.8 Characteristic of the Site

South Tangerang City topography is in a hilly landscape from south side (top hill) to the north side (valley), Many slopes with slightly high-level land are found in the West side facing with “Cisadane River”. The East faces with “Angke River” and in the middle is named “Pesanggrahan”. The house orientation is to the North or South, depending on the site form. The characteristics are: three wide rooms in front, middle and the back area; many entrances to the private area from the public area in front, in the back to the kitchen part and in the side to the store house called “pendaringan” (Table 1-5).

Table 1. The Course of the site

| Settlement/Background | Environmental Impact | Problem Solving | The Government Prudence | Year | The Housing Name |
|-----------------------|-----------------------|-----------------|-------------------------|------|------------------|
| The rubber plantation and the citrus plantation | The change of physical landscape profile | Reforestation | Published & distribute the AMDAL and some Environment prudence | 1977 | “Wira Haja” Country Housing |
| Citizenry plantation | The change of physical landscape profile | Reforestation | Published & distribute the AMDAL and some Environment prudence | 1987 | “Pamulang I” |
| Lake hill | Water absorption decrease | Land Conservation | Published & distribute the AMDAL and some Environment prudence | 2005 | “Benda Residence” |
| Dry ricefield changed into new housing estate | Water absorption decrease | Reforestation and land conservation | Published & distribute the AMDAL and some Environment prudence | 1995 | “New Villa Pamulang” |
| Dry swamp land and Citizenry plantation | Water absorption decrease | Land Conservation | Published & distribute the AMDAL and some Environment prudence | 2005 | “New Villa Pamulang” |
| Orchid plantation and Chicken coop | Water absorption decrease | Reforestation | Published & distribute the AMDAL and some Environment prudence | 2007 | “The 3rd Al Failah” |
| Private plantation changes into housing estate | The changes of physical landscape profile | Reforestation | Published & distribute the AMDAL and some Environment prudence | 2010 | “Belaious Cluster” |
| The Cileduk Lake | The constriction and filling up the lake caused by trash and rubbish | The management of trash and rubbish | Published & distribute the AMDAL and some Environment prudence | 2003 | “Bendahara residence” |
| | | | The management of trash and rubbish learning by trash bank supported by office of city and regional planning | 2003 | “Cluster Excara” |
Table 2. Characteristic of Betawian house

| No | Aspect over view | Gading house | Bajang house / Qra house | Joglo house | Descendant House |
|----|-----------------|--------------|--------------------------|-------------|-----------------|
| 1  | Topography      | 9° - 17° slope slightly to land | 9° - 17° slope slightly to land | 9° - 17° slope slightly to land | 9° - 17° slope slightly to land |
| 2  | Surround situation | "Cicadas" river flows through the middle and "Anggik River" in the East, smaller than "Cicadas" river, flow from south to north part | "Pamunukam" river in the middle and "Anggik River" in the East, river flows from south to north part | "Cicadas" river flows from north to south part | "Cicadas" river flows through the middle and "Anggik River" in the East, smaller than "Cicadas" river, flow from south to north part |
| 3  | Type of the house | The roof made of corrugated tile | The roof made of corrugated tile | The roof made of corrugated tile | The roof made of corrugated tile |

Table 3. Climate and Weather

| No | Aspect over view | South Tangerang City |
|----|-----------------|----------------------|
| 1  | Climate         | Tropical humidity    |
| 2  | Seasons         | Dry and rainy        |
| 3  | Geographical Location | between 06° 17'40" South Latitude - 06° 22'10" S and 106° 40'25" East Longitude - 106° 47'25"E |
| 4  | Temperature degree | 25°C - 32°C (in the peak of dry seasons in May 25th 2019 - June 15th 2019) |
| 5  | Temperature     | 21°C - 28°C (in the peak of rainy seasons in October 15th 2019 - January 15th 2019) |
| 6  | Humidity        | 70% - 80%            |
| 7  | Topography      | Slightly slope       |
| 8  | Sun Light       | Clear and bright     |
| 9  | Day Light       | Bright temporary cloudy |
| 10 | Air movement velocity | Sometimes breeze in the morning, warm and hot in the afternoon, in the peak of dry seasons, Breeze and cool temporarily in the morning and night in the peak of rainy seasons |

Table 4. Humid Tropical Data Surrounding the Locus

| No | Data | Rainy season (Apr-Jun’18) | Dry Seasons (August-Okt’18) |
|----|------|--------------------------|-----------------------------|
| 1  | Max air temperature average | 29°C | 33°C |
| 2  | Min air temperature average | 23°C | 30°C |
| 3  | Humidity | 80% | 65% |
| 4  | Average Sun Light radiation | 12 hour (5.30.wib – 18.20.wib) | 13hour (5.50.wib – 17.50.wib) |
| 5  | Rainfall | 14.022.5 mm/second | 156.4 mm/second |
| 6  | Wind direction domination | South | North |
| 7  | Average wind speed | 1.0 – 4.3 m/second | 1.0 – 2.5 m/second |
Table 5. Average light level recommendation, renderation and colour temperature (SNI 03-6197-2000, energy conversion in lighting system)

| Fungsi Ruangan | Tingkat Pencahayaan (Lux) | Kelompok Rendearsi Warna | Warm White < 3300 K | Cool White 3300 K – 5300 K | Daylight > 5300 K |
|----------------|--------------------------|--------------------------|----------------------|-----------------------------|------------------|
| Teras          | 60                       | 1 atau 2                 | •                    | •                           | •                |
| Ruang Tuau    | 120 – 150                | 1 atau 2                 | •                    | •                           | •                |
| Ruang Makan    | 120 – 250                | 1 atau 2                 | •                    | •                           | •                |
| Ruang Kerja    | 120 – 250                | 1                       | •                    | •                           | •                |
| Kamar          | 120 – 250                | 1 atau 2                 | •                    | •                           | •                |
| Tidur          | 250                      | 1 atau 2                 | •                    | •                           | •                |
| Mandi          | 250                      | 1 atau 2                 | •                    | •                           | •                |
| Dapur          | 60                       | 3 atau 4                 | •                    | •                           | •                |

Velocity (air movement) intake and outtake, in the flow of air movement (Figure 17-20)
4. Conclusion.
Many element of the house have a philosophy of life, like veranda, listplank for eaves, “pangkeng”, pendaringan”, “langkan” (fence). There is a veranda, roof of veranda (“sorondoy”) In front of the house (see figure 2 & 4), and a hall (big building without devider) as a part (an element) of “betawian ora house called “belandongan”, use to restrain the sun glair or radiation of the sunlight that enter to the main house in frontage, to preserve the indoor temperature from the back side use the service area. The house performance has change now, the building materials, the facade color, some of the owner house disclose the veranda and change the function of belandongan, more over it is difficult to find. Related to the built environment sustainability maintainance research start with anxious to find out why the betawian ora traditional house was decrease, cause the betawian ora house has a unique respond in order to be defended from the climate change. Because of that it is best if done by preserve the “Betawian ora” traditional house.

Table 6. Benefits of the study

| No | The Aspect Review                              | Fact                                      | Benefit                                                                 |
|----|------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------|
| 1  | South Tangerang City was located in hilly area | The landscape is surrounded by river, valley and hill | The area will cool of due to air movement among the two hills (between the valley and river) |
| 2  | The roof model is generally saddle or pyramid  | Ceiling is made of plaited bamboo and the space is triangular. | The hot air passes through the bamboo plaited ceiling, intercepted in the space. |
| 3  | The roof model generally saddle or “joglo” pyramid | The saddle or pyramid roof causes the rain falls quickly to the ground | The room beneath the roof will be cool off due to the flow of rainfall |
| 4  | Floor                                          | The floor usually uncover                 | The room temperature will cool of due to the soil surface.             |
| 5  | Doors, Orifice edges                           |                                           | Outlet and inlet air velocity will be passing by to cool off the room  |
| 6  | Roof cover                                     | The roof is made by corrugated tile       | The room temperature will cool off due to the top roof cover            |
| 7  | The body,walls, column, tree type (tectonagrandis, sptek wood / Jati.) | The body is made by wood tree type (tectonagrandis, sptek wood / Jati.) | The division wall is made by wooden plank or bamboo plaited material   |
Table 7. Conclusion of the study

| No | Aspect Review | Bapang house | Gadang house | Joglo / Betawi Ora house | Descendant house | Scoring & action as problem solving |
|----|---------------|--------------|--------------|--------------------------|------------------|-----------------------------------|
| 7a | Core of the site | Change | Change | Change | Staying | Staying | Give some positive suggestion & recommendation to the owner ± |
| 7a | House characteristic | Change | Change | Change | Staying | Staying | Give some positive suggestion & recommendation to the owner ± |
| 7a | Topography | Change | Change | Change | Staying | Staying | Give some positive suggestion & recommendation to the owner ± |
| 7a | Structural System | Change | Change | Change | Staying | Staying | Give some positive suggestion & recommendation to the owner ± |
| 7a | Climate and Weather | Appropriate | Appropriate | Appropriate | Appropriate | Appropriate | Give some positive suggestion & recommendation to maintain to the owner ± |
| 7a | Location | Appropriate | Appropriate | Appropriate | Appropriate | Appropriate | Give some positive suggestion & recommendation to maintain to the owner ± |
| 7a | Average light recurrence | Change if the house characteristic become different | Change if the house characteristic become different | Change if the house characteristic become different | Change if the house characteristic become different | Change if the house characteristic become different | Give some positive suggestion for maintenance to the owner ± |
| 7a | Ventilation | Change if the house characteristic become different | Change if the house characteristic become different | Change if the house characteristic become different | Change if the house characteristic become different | Change if the house characteristic become different | Give some positive suggestion for maintenance to the owner ± |

*The conclusion to the study:*  
These are thirteen (13) positive possibility value to maintained the betawi traditional house's by faithfulness of local wisdom. In order that the rurut and kin’s built environment reflected.
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