Traditional Acehnese House: Constructing Architecture by Responding to the Power of Nature in Relation to the Local Wisdom Values

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Abstract – The existence of traditional houses in Banda Aceh has been extinguished in modern times. With globalization’s impact, the traditional house connotes as ‘old house style,’ and thus, the house style is not up to date. A large number of house owners demolish them and reconstruct them with new modern houses. Despite that, it is approved that the traditional houses of Aceh were survived the earthquake that frequently hit the region. As Banda Aceh is one of the regions resided on Sumatran's segment, the region has a large number of earthquakes. This paper, which is part of the previous study on the thermal comfort of traditional and modern houses in Aceh, explores a historical architectural example that reveals local experiences that involve local wisdom and expertise. This paper focuses on a traditional house located in a modern housing neighborhood in Banda Aceh city. In doing this, the paper identifies how Acehnese ancestors, through their local knowledge, have constructed a traditional Acehnese house. The article also shows how its architectural form's construction techniques respond to the region's geographical condition. In constructing this study, interview and observation toward the building as primary data collections are conducted. Also, several written sources, as secondary data, related to an Acehnese traditional house, are reviewed. This paper shows that constructing a conventional house is a responsive architecture toward hot climate and earthquake. Therefore, this architectural building type with the local wisdom value's involvement is worthy of being applied and adapted in modern life.

Keywords: local wisdom, Acehnese traditional house, geographical condition, disaster reduction

Introduction

Banda Aceh, one of the cities in Indonesia, is the capital city of Aceh province. It is a coastal city located in the northern tip of Sumatra Island and is one of the regions resided on Sumatran's segment. As a result, the city of Banda Aceh has a large number of earthquakes. Banda Aceh is situated at 5°33′0″N 95°19′0″E, and is about 8 meters above the sea level. This town is mostly surrounded by the coast and sea. The 2018 data recorded by BMKG – Badan Meteorologi Klimatologi dan Geofisika (Meteorology Climatology and Geophysical Agency) indicates as followed; the city climate is a warm tropical climate and has plenty of rain. The amount of rainfall is 100.6 mm, which mostly falls in December and January. The average temperature is 33°C with a relative humidity of 78%. The amount of rain is 100.6 mm, which mostly falls in December and January. The wind speed is 2 m/s, and the dominant wind orientation faces southeast (BMKG, 2018). Having these conditions, the Aceh ancestors have constructed their houses by paying great attention to the local geographical conditions (See Dall, 1982; Lombard, 2006).

In terms of architecture, the local wisdom concept is applied in constructing the traditional house of Aceh. In view of this, human-made, such as a living structure, is built by paying great attention to the local geographical
conditions (Lombard, 2006). The ancestors believed that the relation between the macro cosmos and microcosmos has to be considered. In this regard, a later study conducted by Widosari (2010) describes that the ancestors have tried to create living spaces based on their local knowledge, which is on how to deal with local geographical conditions to connect themselves toward their environment. Being friendly to the environment means maintaining “the high quality of all sources,” which will be experienced for a long time in the future (UNCSD, 2007). In terms of the traditional house, the local wisdom values become sustainable characteristics that describe the adaptive integration factor in relation to culture and local climate (Sari et al., 2017). The earliest writings on the traditional house of Aceh were conducted by Dall (1982) and Leigh (1989). According to local customs, their works identify the traditional Acehnese house in relation to its structure, material, and function. In supporting Dall’s and Leigh’s works, Hasan explores Acehnese people’s cultural history and examines the relationship between the local culture and the representation of its architecture.

Meanwhile, Meutia (2011) researched how Acehnese house’s structure could save the dweller from the earthquake. In doing the research, a laboratory test using SAP2000 was conducted. Similar studies with Meutia’s work, Nursaniah et al. (2016) examine the Acehnese house’s building structure and argue that the Acehnese house’s stilted structure fits to be built water shade area.

Having dealt with the local environment, most Acehnese houses found in Aceh, including the house examined in this paper, were survived by the earthquake measuring 8,9 on the Richer scale that occurred on 26 December 2004. Such a tremendous earthquake, followed by tsunami waves, was concentrated in the Aceh region’s coastal zones. It is reported that the disaster took about 220,000 lives and ruined most housing structures in the coastal city of Banda Aceh (Steinberg and Smidt, 2010). Most of those units were modern housing structures. Moreover, the Aceh house is adaptive to the local climate within which it gives comfort to the dwellers. Most studies claim that the Acehnese house, like other vernacular houses throughout the archipelago, is friendly to its local environment. Such a local thought can be seen clearly in the house’s representation, especially its structure and form. Despite that, having claimed as an environmentally friendly architecture, the existence of the Aceh House, however, is increasingly fading away. The Aceh houses are rarely found in Aceh, especially in Banda Aceh. Therefore, the study explores a historical architectural example that reveals local experiences that involve local wisdom and expertise in dealing with the geographical condition, primarily in relation to local climate and earthquake shakes. The house orientation that deals with the local climate and the house structure with regard to earthquake disturbance are the main consideration in this research. Regarding the description above, the study shows how the Acehnese ancestors, with their local wisdom system, can present an architecture that can protect the inhabitants from the power of nature, such as earthquakes and hot climate. The benefit of this study is to give an alternative idea toward preservation effort on how Acehnese houses are sustained and can be represented as an adaptive housing model for contemporary needs.

**Research Method**

The study examines the building construction and materials used in the traditional house belongs to Bapak late Ibrahim Hasna (see Figure 1). The house is located in the modern housing neighborhood, Jalan Sudirman, Geuecu Iniem Banda Aceh. As most Acehnese, especially young generations, have been ignoring to use Acehnese house and lack knowledge on the Acehnese traditional house, the house owner would like to provide the house as a place for people who has the interest to learn Acehnese traditional culture. The house has been utilized by a number of students who learn about traditional architecture and some researchers who conduct research related to Acehnese culture and architecture. Right after the massive earthquake, this house became the temporary evacuation building where many people who were running away from the tsunami and earthquake affected areas in Banda Aceh have stayed in this house. Interestingly, the two modern houses in the same slot of the Acehnese house were empty because around a hundred refugees felt safe staying at Acehnese House.

In doing this study, primary sources were mostly used. The data was collected through a field survey. In terms of the earthquake disturbance, the study observed the existing and damaged house structure damage. Corning climate-responsive, the study measures the air temperature in the Acehnese house and the modern house by using thermal data logger- Expect RS 12 thermorecoder. Compared with the Aceh house, the modern house
located next to the Acehnese house was also measured. The logger was placed in the rooms of both traditional and modern houses. While each room's air temperature was measured, all kinds of mechanical, thermal comfort devices were not allowed in the room. The study also interviewed the house dwellers, an Acehnese Historian, and ex refugees who have ever stayed in the Acehnese house after the earthquake and tsunami hit Banda Aceh in 2004. To support primary data, some secondary sources related to traditional Acehnese architecture are collected and reviewed. Such sources provide detailed and illustrated explanations of the traditional Acehnese house in relation to its structure, material, and function according to local custom.

Result

Acehnese Traditional House Structure and its Function

The Acehnese house is an enclosed wooden structure (Figure 1). The house type is a stilted construction type. It has vertical and horizontal sections. Horizontally, the house plan comprised three verandahs; they are a public space called male verandah (seuramo agam), a semi-private space called female verandah (seuramo inong), and a private space called seuramo dalam. These three divisions were distinctively separated by walls—the access from one to the other divisions located in the center. In traditional life, with Islamic teaching, these three divisions of space are strictly applied (Hasan, 2010). Hasan stresses that, in modern times, such a strict division has been faded away as the house owner has dismantled some wall division.

In terms of house function, traditionally, the public space of male verandah (seuramo agam) was used the house owner to receive and entertain their guests. In addition, this verandah is also used as a space to do five-time daily prayers. The guests who were not the family members were not allowed to pass beyond the male veranda. Meanwhile, a semi-public space of female verandah (seuramo inong) is considered a woman and their children's area who live in the house. This verandah is located on the backside of the house. For the lower-middle-class family house, the kitchen might take place in the corner of this female area.

Meanwhile, the upper-class family built an additional room (annex) for the kitchen. Its location is usually attached to and located behind a female verandah. A private space (seuramo dalam) resides between female and male verandas—this area comprises two private rooms. One room is used for the parents, and the other room is used for the daughter who has got married. The married couple will temporarily use this room until they build a new house for the daughter and her new family. Therefore, the Acehnese house is also known as a rumoh inong (female house) since the female’s family provided the house.

In terms of vertical sections, the house comprises three parts; upper, middle, and lower. Historically, these three sections, which are similar to most Southeast Asian traditional houses, represent the sacred, the human, and the nether worlds. Concerning this, Leigh (1989) gives further explanation and explains that the upper level, which is the roof area, is used to keep valuable items, especially the heirlooms (Leigh, 1989). Leigh adds that the middle level considers the area for profane activities. Meanwhile, the lower section, located underneath the house, was used to keep the house owner’s pet(s) and store ordinary items.
Architectural and the power of nature

The structure of the Acehnese traditional house is mainly comprised of posts and frames (figure 2). Both poles and frames are joined together by using pegs and wedges without using nails. Some joins are tied with a robe made of palm fiber. Such a construction technique has considerable flexibility. Meutia (2011) has examined the structure of the Acehnese house in relation to an earthquake. Given this, the house's miniature was provided, and the laboratory tested using the Structure Analysis Program (SAP) 2000. The result was that the house's miniature could withstand the big shocks (as in the earthquake simulation) because the main structure is sturdy and elastic.

![Figure 2. Construction detail of the traditional Acehnese house (Source: author's collection)](image)

In aligning with Meutia’s work, this study observes the Aceh house structure's condition after the most significant earthquake shocks that hit the Aceh region in 2004 with its richer scale 8,9. The damage caused by the earthquake to this traditional house is hardly seen. They are only the house columns that are slightly shifted – which are up to 1.5 cm – from the original location, placed in the center of the house base (figure 3). According to the witnesses who take care of this Aceh house, the house was in big shakes when the 10 minutes earthquake occurred. Within this situation, however, this Aceh house – like most traditional Aceh houses found in Aceh – was lightly affected by the earthquake. Such a structure made evident that the house was safe from the large-scale force of an earthquake.

Architecture and its climate-responsive

The traditional architecture of the Acehnese house, similar to other vernacular houses, is adaptive to the local climate. In this regard, the local wisdom values are applied in the representation of the house. In dealing with the local climate where the humidity percentage is high, the house provides ventilations on the floors and walls to allow the wind to come in and out of the house vertically and horizontally. As a result, the airflow that comes in to and out from the house pass through the house floors and walls. The stilted Acehnese house floor that provides a kind of ventilations is made of timber slats and placed at a specific interval (Figure 4). Thus, underneath the stilted house, the cool, moist air is drawn up through the slatted floor (see Dall, 1982, Hasan, 2010). The housing overhang is constructed to protect the house from direct sunlight to create shade and reduce the house's hit (Sari et al., 2017). In addition to that, the overhang protects the house against the rain that comes into the house through the windows. Most windows are placed on the long side of house walls that face north and south so that the room inside receives indirect sunlight.
Also, the ventilations found on the wall bring the wind into the house. Such an airflow will decrease the hot air coming from the roof space. Moreover, this traditional house's gables screens on the long side of the house also act as ventilation. The gable screen installed slightly outward was hollowed with carvings and thus allows the wind to cross in the roof space (Figure 5). As a result, the room's incoming breeze cools under the roof (Hasan, 2010).

Visitors of the traditional Aceh house have their own experience and confirmed that the room temperature is cooler compared with the modern-brick house located right next to this Acehnese house. The study has approved the visitors' claims by comparing the thermal comfort between the traditional and the modern houses in the coastal city of Banda Aceh. The traditional Acehnese house that has been mentioned in this paper plus a modern house located next to the Acehnese house were two among numbers of samples examined in this research. It is found that the inside air temperature of the traditional house (RTD) is closer to the comfort air temperature, ranging from 26.6 to 29.7°C. Meanwhile, the modern brick house's temperature is
higher than the comfort criteria (Figure 6). Even though the inside air temperature in Acehnese traditional house is higher than the comfortable one in some hours during day time, it is not a matter due to the sufficient apertures across the house plan. The circulating air through the apertures reduces the RH (relative humidity), which creates a thermal comfort sensation inside the traditional house. Meanwhile, the modern house has a relative lack of aperture comparing to the traditional house. Such a condition results in limited airflow inside the house, and thus, the room temperature inside the modern house is relatively warmer.

![Figure 6. The air temperature inside the traditional and modern house (Source: Sari et al., 2017).](image)

As the primary material of the traditional Acehnese house, the timber has a lower embodied energy value compared to the concrete material in modern houses. The lower value of embodied energy is the characteristic of sustainable building materials (Karyono, 2015). Meanwhile, the substantial material of modern house absorbs the heat during the day and releases the heat at night time worsens the indoor thermal comfort at sleeping time. Such a condition becomes the reason for the need to have an air conditioner installed in a concrete house. Meanwhile, the material of the Acehnese house helps to keep the temperature down.

**Discussion**

Concerning house structure, the stilted construction was used by Acehnese ancestors to protect the dwellers from the flood and to secure them from wild animals attacked (Dall, 1982; Hasan, 2010). In his writing, Dall includes seventeenth-century traveler Peter Mundy and describes that the house's underneath space was used as a space to keep their pets and transportation equipment, such as a prahu (boat). During this time, however, coincided with the cultural development of Aceh, natural disasters such as floods no longer occur. The local government has been developed a drainage system to solve the flood problem. In addition, wild animals that molested human life have been disappeared in Banda Aceh. Therefore, the space underneath the house has been changed its function to become a convenient public space for sitting area. Like most Acehnese houses found in Banda Aceh, the space underneath this house has also been utilized as a resting area and as a space to entertain the guests.

In terms of material, wood is used as the primary house material. However, the wood material is flammable. To save the dweller from the fire, the roof construction was designed to minimize the damage. The join system for the roof construction is strongly tied with ijuk (palm fiber) rope. When there is fire, the rooftop construction can be relatively more comfortable to be pulled up by cutting off all rope joins. Thus, the fire from inside the house can be transferred out of the house through the roof. This prompt action can protect the house from a severely damaged fire attack.
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![Figure 3. House columns that are slightly shifted due to the earthquake (Source: author’s collection)](image)

![Figure 6. The air temperature inside the traditional and modern house (Source: Sari et al., 2017).](image)

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Conclusion

Having had this study, this paper shows that the local knowledge in presenting traditional architecture is still adaptable to modern culture. The traditional Acehnese house can offer an integrated solution toward human needs in relation to nature's power. During the earthquake, it was found out that local people felt safe being in a traditional house. In contrast, local people prefer to live in the modern house's permanent structure to the normal situation. The study has shown that the flexibility joins system in the stilt construction become a useful construction system in dealing with earthquake shocks.

Moreover, the architectural elements, such as the pitched roof and the gable screens create a breathing roof; the porous walls and raised floor bring the cool air into the house area. This concept of responsive architecture toward local condition obtains thermal comfort for the inhabitants. Given this, architecture becomes a medium for people’s survival since it reconciles nature’s power and human beings' desire. In responding to nature's power, the traditional concept in creating architecture that concerns local wisdom value is still appropriate for modern life. Combining traditional concepts into the modern structure of the Acehnese house may be considered for further study.

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