Identification of Application of Biological Architecture in the North Nias’s Traditional House “Omo Hada” in Indonesia

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Abstract. The Indonesian archipelago has a wealth of traditional house with the uniqueness, each of them is corresponding with geographical location, which one of them is the traditional house of North Nias, located to the west of the island of Sumatera, Indonesia. This traditional house is a stage house with a sloping roof, which has a circular plan. The house has a wood frame construction which all materials of building were made from biological materials obtained from the natural surroundings. The building was strongly influenced by the environment and its inhabitants, where it is in harmony with the principles of biological architecture. Biological architecture is architecture according to its residents and local climate. Particularly in the traditional house of North Nias, was found some aspects that reflection of applications of biological architecture identified in this research. This research uses qualitative content analyze, which is a research method with deeply conceptual integration [2]. Environmental (climate, site, vegetation, soil, and water) and human/occupant (basic human needs, culture, belief/religion, and livelihood) are important indicators and as well as cause factors are born traditional house of North Nias. These factors will be analysed to determine the impacts (architectural design, material, construction) on the building, that contain genius locus of North Nias’s ancestor.

1. Introduction

Indonesia, as an archipelago, has several features, both geographically and culturally. The number of tribes in Indonesia gave birth to many cultures, which influenced the architecture of the traditional house. In addition to the influence of them, which are no less important, are the effects of the environmental aspects in which they were located. A Geographical location with its environmental privileges is a challenge, answered wisely by our ancestors in designing their traditional homes and managing their environment [6].

Traditional buildings have specific characteristics, depending on the availability of building materials, mastery of technology and structure, and are carried out in cooperation. This traditional buildings are not finished products but are strongly influenced by the role of users, society, and planners [7].

The local wisdom of our ancestors until now can still be founded in a traditional house in Indonesia, especially in the Omo Hada house in North Nias. The attitude of our ancestors, who appreciate nature, gave birth to the realization that every human activity, for the sake of their survival can affect their environment. Without realizing it, our predecessors have applied biological architecture to their traditional houses. Awareness to maintain it becomes very important in the present time, considering environmental durability, which is increasingly decreasing due to development activities.
As for the formulation of the problem in this study are any biological architectural factors that are identified by the application in the traditional Omo Hada house in North Nias. Thus this study aims to identify it, with case studies of the North Nias traditional house.

The term biological architecture was introduced by several building experts, including Prof. Mag. Arch, Peter Schmid, Rudolf Doernach and Ir. Heinz Frick. This theory means the science of connecting between humans and their environment as a whole. It also studies knowledge about the integral relationship between humans and the environment. According to Heinz Frick, It is also an architecture that fits the occupants and local climate [3]. In biological architecture, planning no longer departs from plans to construction and finally to building materials, but building materials determine optimal construction and construction influences building form [4]. This is as seen in figure 1.

Biological architecture has several characteristics, including the following [6]:

- Generally applied to traditional buildings, such as houses and other traditional buildings.
- Generally a simple building.
- Using local building materials.
- Generally a genius locus of the local community, especially in terms of technology and design
- Has three important indicators that are very influential, namely: environment, people/residents and the building itself

From the above characteristics there is a characteristic, namely that biological architecture is generally the result of local genius of the local communities which using building materials obtained from the surrounding area the environment can create suitable construction to design traditional houses or buildings.

For understanding biological architecture, must understand it from several indicators contained in biological architecture. The indicators are [6]:

1. Environment, which has the following variables:
   a. Climate and temperature
   b. Site
   c. Vegetation
   d. Soil
   e. Water

2. Building with the following variables:
   a. Floor plan
   b. Building material/materials
   c. Building construction

3. Humans/occupants with the following variables:
   a. Basic human/occupant needs
   b. Belief and Habit of resident /culture/customs
   c. Livelihood

By understanding the indicators, and the variables above, it will facilitate the systematic identification of biological architecture. Every environmental indicator, building indicators and indicators of human have mutual relations in biological architecture, such as the scheme seen in Figure 2 [6]. It explains simply that the building where it’s location automatically influenced by its environment. Otherwise, the environment will be affected by buildings contained in it. In addition to environmental influences, there are also influences from the culture/customs and livelihoods of the inhabitants.
The island of Nias lies west of Sumatra, in the Indian Ocean, at about a hundred kilometres north of the Equator. It is part of a string of islands marking the western limit of the Indonesian archipelago. Gunungsitoli, on the northern part of the east coast, is the main town of the island, Teluk Dalam being the southern harbor. Geographically, Nias traditional architecture was divided into three parts, namely: North Nias, Central Nias, and South Nias. In this discussion, it focused on North Nias architecture, namely Omo Hada.

The selection of the villages is always on higher ground than the surrounding environment. The reason was based on cosmology, the people of Nias set three worlds the world over as the upper world (ancestor’s world), the middle word (human’s world) and the underworld (departed spirit’s world), see figure 4.

The pattern of North Nias’s settlement always form of straight-line axis, see figure 5, 6. The end of settlement (East and West) is a gateway and the ways to their workspaces such as fields and gardens, while another end is a door leading to the back of them as a public facility or cemetery. This pattern makes a new visitor of their settlement will see a very long hallway with the houses on either side. The Omo Hada have orientation at North and South, and elongated side of Omo Hada face to street or hallway. There is a distance between the Omo Hada, and they are stand-alone, see figure 5, 6. At the front of the Omo Hada, usually, there is one or more megalithic statue, as a symbolize of relationship with the dead and social status, see figure 6.
The traditional North Nias house "Omon Hada" is a traditional North Nias house, built by its ancestors, considering by the geographical conditions of its territory, which is prone to earthquakes and floods. This building is frame construction, which is lightweight and earthquake resistant [5]. As a binder or connection, use a wooden peg system so that this building is knocked down or unloaded [5]. The roof is bell-shaped, with a roof covering made of woven sago palm leaves, as shown in figure 7.

This building is a platform house, where the underneath of stage was used as a place for raising livestock or gardening. The foundation is a single-footing foundation, made from river's stone, called Gehomo stone. For the columns, it was made from hardy wood, named Berua or Menawa Dano, which is still intact/rounded, which has been skinned and dried beforehand, so it does not fade when paired, see figure 7.

There are no plank walls on two sides of the house that carry the roof of a house but four main pillars that bear the entire roof. The names of the four poles are silalųyaŵa (which leads to the meaning). Above two silalųyaŵa on the left in the house and so on the right in the house across one beam called alisi (shoulder). Noble homes are usually larger and more decorated [1].

In the interior of the house, in public spaces are generally deliberately elevated along the walls, such as a stage and a chest/storage box, which also functions as a bench, placed against the wall. All valuables and some furniture were placed in the chest. Right above the chest/seat, there is a lattice, which faces the outside of the house [9]. In some Omo Hada, there is an expansion of the room, on its elongated side, which is used for the kitchen, see figure 7. After the war accompanied by conditions, which was secure, then at the other end of the house, a porch is built, for the placement of stairs, as well as the entrance to the house, see figure 14. In larger Omo Hada there may be two entrances, one large door to the public room, and one simple to go to a private residence on the other end [9].

**Figure 5.** The Pattern of settlement at North Nias.

**Figure 6.** Typical Settlement at North Nias.
There are several characteristics in the traditional North Nias house “Omo Hada,” consist of:

- The Sloping roof, shaped like a bell, with a roof covering made of sago palm thatched woven. On the roof, there are some attic windows (zara – zara). The roof is the dominant part of this traditional house, see figure 7.
- House is stand alone with distance with others. Constitue a platform house, which consists of an underneath platform (for cattle and gardening), main floor and roof floor, see figure 7.
- Floor plans are oval, with entrances through stairs under the building. Building walls sloping upward, see figure 7.
- Constitute a building with earthquake-resistant wooden light frame construction and knock-down system. There are diagonal round-shaped beams (Ndriwa), which make the building earthquake resistant, see figure 7, 8.
- Omo Hada is a traditional house in North Nias, which is a genius locus from North Nias’s ancestors considering with environment and occupants.
- The traditional architecture of North Nias reflects the cosmological beliefs of its people, see figure 4, 7.

The birth of the Omo Hada traditional house architecture can be said to be the impact of conditions with the environment and its inhabitants. A wise response, born from the ancestors of the North Nias tribe in addressing the region and residents who inhabited it.

Nias Island, especially North Nias, is very rich in vegetation, such as coconut, corn, rice, sago palm, coffee, rubber, etc., see figure 9. In ancient times there were berua trees, which grew in the forests, and were one of the Nia’s epidemic woods, and are now difficult to meet. This wood was used as the principal building material, in making traditional Omo Hada houses. The natural conditions of the island of Nias, which forms hills with dense forests accompanied by lowlands, enrich the type of vegetation, which is on Nias island. Overall the structure of the land on the island of Nias is referred to as soft soil and volcanic soil, so that this area is fertile for planting various crops, see figure 10.

North Nias is abundant with water sources, which consist of lakes, rivers and beaches. In the past, it became one of considerations of the selection of sites, because the water needs for daily activities, such as cooking, bathing, raising livestock, farming, etc., see figure 11,12,13. Lake Megoto is the only lake...
on Nias island. Besides that there is a Luaha Ndroi waterfall, which is still surrounded by forest, which is thick, see figure Gawu Soyo Beach, which is surrounded by hills and dense forests, see figure 10,13.

![Figure 9](image9.png)  
**Figure 9.** Coconut trees, which are vegetation, are most commonly found on Nias island.

![Figure 10](image10.png)  
**Figure 10.** Lahewa sub-district, North Nias.

![Figure 11](image11.png)  
**Figure 11.** Megoto lake at North Nias.

![Figure 12](image12.png)  
**Figure 12.** LuahaNdroi water fall at Alasa, North Nias.

![Figure 13](image13.png)  
**Figure 13.** GawuSoyo beach surrounded by dense forests and hills.
Compared to southern Nias, there are fewer, cultural heritage sites in northern Nias, which are left over, due to modernization through Christianity, which first occurred in North Nias. In 1865 the first missionary from Germany, named E.L. Denninger arrived in Nias, as the beginning of the entry of Christianity into Nias, which began in the region. Mass conversion or Fangesa Sebua took place on Nias Island in 1916, which was driven by local residents. Some customary culture or activities, which are
prohibited, such as Mengayau (the beheading of humans), worship of ancestral statues (Fonanba Adu Zauta), slavery, making megalithic statues, etc. [8], see figure 16,17,18.

The people of Nias (Ono Niha) derive from archaic Malay or Proto-Malay races. Their language is of the Austronesian or Malayo-Polynesian language family. The word “Niha” means humans, and “TanôNiha” the island of humans. They claim to be Ono Niha (child of humans), and place their ancestors in the Gomo area, in the center of the island, which is said to be their place of origin [8].

Residents on Nias Island, referred to as North Nias, are known for their culture of fighting, so they are often referred to as warriors, who struggle to defend the territory, and also the dignity of their clans, villages, and groups, see figure 19. At that time, war often occurred, accompanied by slavery, where in particular the nobility carried out slavery, by exchanging prisoners of war or lower class people as slaves with gold or other valuable objects. Many of Nias’s youths, especially from low castes, were kidnapped and sold into slaves to other islands [8].

The Nias community believes that in every traditional ceremony or activity, such as case and peace, legal party [Fondrakô], construction of their house, personal events in a family, birth of child, death ceremonies, religious ceremonies / worship, hunting, Mengayau, must be done by slaughtering pigs [8]. Those activities make pigs as an compulsory animal for these indigenous people (see figure 20).
At first, the traditional clothing of North Nias people, made of tree bark, by weaving fibers from bark or grass, see figure 21. Men use vests, and loincloths, while women use cloak. Along with the times, they began to recognize textiles, so they could weave traditional fabrics became their custom clothing. In these clothes, there are three main colors of Nias, consist of red, yellow, and black. These colors are also found on the Nia’s traditional clothing see figure 22, which means [8]:

- Yellow (gold), symbolizes wealth, glory, and success.
- Red (blood), symbolizes the courage and ferocity of the warriors of Nias, as well as their clan and family.
- Black (land), symbolizing their homeland, fertile land in Nias, and fortitude from ordinary people.

They also provided him with expertise in building and metalworking, for manufactured weapons, jewellery, and ornaments [8], see figure 23.
There are several traditional North Nias dances, which generally have meaning, which is related to their lives, such as one of the Moyo dances, whose movements mimic the eagle [8], see figure 24.

![Figure 24. The Moyo dance imitates the flight of an eagle. North Nias Regency, Nias Island, Indonesia.](image)

Besides traditional dances, there are also some traditional musical instruments which, usually played at traditional ceremonies or parties, that are beaten and picked, such as Aramba, Gondra, Fondahi, Lagia, and Nduri Mbawe, see figure 25.

![Figure 25. Traditional musical instruments of North Nias, Indonesia.](image)

In ancient times, when there was war in North Nias, to fulfill their daily needs, people hunted, raised livestock, farmed and traded, see figure 26, 27. Over time, people have started working on the fields, see figure 28, and make woven crafts.

![Figure 26. Hunting was the livelihood of the Nias tribe in ancient times.](image)  
[figure 27. Raising pigs and gardening.](image)  
[figure 28. Farming is the livelihood of the Nias tribe.](image)

2. Method
This study uses a method of qualitative content analysis (qualitative content analysis) is an analytical method with a deeper conceptual integration [2]. Data analysis is done with the data description stage, looking for trends based on data to find significance, and relevance. Furthermore, for all data obtained, identification of biological architectural indicators was then analyzed, the application of it in the traditional house of North Nias "Omo Hada" through the variables on each of these indicators.
In figure 29, a conceptual framework was described in this study where biological architecture can be identified through its indicators, namely: environment, occupants, and buildings [6]. The local area and occupants/humans are the causes of the impact on buildings in this case is the traditional North Nias house "Omo Hada," which can be described on the variables, as seen in Figure 26. Identification is carried out on the causes which are then followed analysis so that the impact is the application of the building, in this case the traditional house.

![Conceptual framework of Biological Architecture](image)

**Figure 29.** Conceptual framework of Biological Architecture.  
Source: Siahaan, Fanny, 2015

### 3. Results and Discussions

Environment and humans (occupants) are important indicators that will be identified and are causal factors. These causative factors then analyzed to find out the impacts on buildings in the form of biological architectural applications in traditional house OmoHada. So in table 1, it can be seen the identification of indicators (environment, human, and building) along with each variable.

#### Table 1. Identification of each indicators and Its variables.

| Indicators of Environment | Identification | Cause | Analysis | Impact |
|----------------------------|----------------|-------|----------|--------|
| **Temperature and Climate** | North Nias region has a humid tropical climate with relatively high rainfall because it located close to the equator. |   |   |   |
|   | Average air temperature in one year 26.3° C |   |   |   |
|   | Average wind speed in one year is 6 knots/hour. |   |   |   |
| **Site** | The geographical location of North Nias district is at 1° 003’00’ - 1° 033’00’ LU and 97° 000’00’ - 99° 000’00’ LS. |   |   |   |
|   | North Nias Regency has an area of ± 1,501.6 Km². |   |   |   |
|   | The topographic physical characteristics of the land of North Nias district, a large portion of narrow and steep hills, and mountains with a height above sea level between ± 0 - 478 m, consisting of lowland to bumpy, from undulating land to hilly and, to the mountains, see figure 10,13. |   |   |   |
| **Vegetation** | North Nias region is a fertile area, which is overgrown with various plants, such as agricultural and plantation crops are the types that are often found, such as: coconut, rubber, corn, sweet potatoes, patchouli, etc. The coconut tree is the plant, which is often found in this region, see figure 9,10. |   |   |   |
• Besides that, there are also forests - thick forests overgrown with trees, which in ancient times used for building materials see figure 10, 13.

4. Soil
• Generally, the soil structure on the island of Nias is soft soil, and for North Nias, it has a land surface, which is humped and forms a large number of rivers or springs.
• The character of the soil is volcanic soil, which be good for vegetation.

5. Water
• Natural conditions, most of which are hilly - mountainous and mountainous, consisting of lowland to undulating, resulting in the formation of waters flowing from the mountains towards the sea waters around the island, such as Gawu Soyo beach, Luaha Ndroi waterfall, etc., see figure 12, 13. Besides that, there is Megoto lake, which is the only lake, which is on Nias island, see figure 11
• Water as a primary need for the community was obtained from rivers, beaches, or lakes, which flow around their villages. The occupants has abundant access to get water for their daily needs, such as drinking, cooking, bathing, washing, planting, and raising livestock.

Indicators of Occupants

1. Basic Human Needs
• Basic needs/activities of residents such as eating, sleeping, resting, cooking, bathing, and special needs, such as socializing (visiting and holding traditional meetings), working, and worship.

2. Belief and Culture
• The North Nias tribe of ancient times had animist beliefs and dynamism, besides that polytheism beliefs.
• They also adhere to Megalithic culture, by making statues as a liaison with their ancestors, who are gone and social status symbols, see fig 17.
• The beliefs of the Nias people, emphasizing the worship of ancestors (Fonanba Adu Zatua), see figure 17.
• But after the entry of Christianity into the island of Nias in 1865, and mass repentance (Fengesa Sebua) in 1916, many people embraced Christianity, and some traditional practices were not allowed, such as Mengayu, Fonanba Adu Zatua, Making megalithic statues, slavery, etc., see figure 16,17,18.
• In the order of life of the people, known as social status, namely: Kings, nobles, commoners, and slaves.
• The life of the people of North Nias in ancient times were surrounded by war, so they were known as warriors, see figure 19.
• Hold firm and preserve its culture/customs
• Respect their ancestors with their rituals or religious ceremonies
• Many principles or attitudes were expressed in the design of the traditional house
• In ancient times the Nias tribe made clothes from tree bark, or by weaving fibers from bark or grass because they were not familiar with textiles. Men wear vests and loincloths, while women use robes, see figure 21. After getting to know textiles, they make traditional clothes with three principal colors, namely: yellow, red, black, which also symbolizes the character of the community, see figure 22.
• North Nias people are familiar with other body jewelry and accessories, from ancient times, as war equipment. Besides that it also shows social status, especially for nobles and warriors, see figure 19, 22, 23. Their jewelry was made from copper, gold, coconut shells, and shells, in the form of necklaces, earrings, and head ornaments.
• Traditional dances, one of which is famous for the Moyo dance, see figure 24.
• Each party holds a traditional ceremony (Owasa), see figure 20, Nias people always slaughter pig animals. These ceremonies include:
  ✓ Birth ceremony
  ✓ Death Ceremony
  ✓ Wedding ceremony
  ✓ Nobility ceremony

3. Livelihood
• The life of the people of North Nias in ancient times was surrounded by war so that to fulfill their daily needs they were hunting, farming and raising livestock, see figure 26, 27, 28. They are also experts in making metal/iron equipment, such as: weapons, jewelry, etc.
• They were also active in slave trading activities, where slaves were sold by exchanging it for gold, but this activity was removed in line with the entry of Christianity into the island of Nias.
Indicators of Building (Omo Hada traditional house of North Nias)

1. Building Designs
   - During the war, the site was placed on a plateau, with dense forests, making it difficult for the enemy to reach.
   - The village pattern consists of several Omo Hada, which stand alone and face each other, and are separated by a yard/road in the middle. The long side of the house faces the street. Residential/rural orientation facing North-South, where the gate location was on the East, and West side. Settlements were lined with trees, which are thick, such as bamboo trees.
   - In the front yard of this house, there are generally megalithic statues.
   - This is a building with earthquake-resistant wooden frame construction, with a lightweight structure.
   - This house was built without using nails, but using wooden pegs. It is also knocked down.
   - This is a house on stilts, which consist of ponds (cattle sheds or gardening places), first floor (shelter) and roof floor
   - The sloping roof, shaped like a bell, with a roof covering made of woven sago palm leaves or palm. On the roof there is an attic window (Lawa-Lawa), as natural lighting. The roof is the dominant part of this traditional house.
   - Floor plans are oval, with entrances through stairs under the building. During times of war, stairs could be raised, to make it difficult for enemies to enter the house.
   - Upward sloping walls, like a boat, and on the upper wall, there are lattices for ventilation.
   - Floor layout consists of public space, homeowner's room, and occupant's room. The kitchen was located in an extension building.

2. Building Materials
   Building material was a biological material (see figure 14), and obtained from the surrounding environment, which consists of [1]:
   - Foundation
     Made from river stones, which are formed in boxes and obtained from rivers in the surrounding locations.
   - Column
     Made from hardwood material which was left in a round shape which is cleaned by bark. Columns was made from Nia’s epidemic wood, namely Berua or Manawa Dano wood
   - Beam
     Ndriwa Beams and all beams made from Berua or Manawa Dano wood
   - Floor
     The floor plate was made from wooden boards from Berua or Manawa Dano wood, which was arranged on the floor beams
   - Walls
     The walls were made of Berua or Manawa Dano wooden panels, arranged horizontally on the frame of the wall
   - Roof Truss
     The main roof frame was made of Berua or Manawa Dano wood and bamboo as additional material
   - Roof cover
     The roof cover was made of dried palm sago leaves.
   - Connections
     Connections do not use nails, but use pegs, which was made of palm wood.

3. Building Constructions
   Construction of buildings is a stilt house with a wooden structure, which is lightweight, with the following components [1], see figure 8, 14, 15:
   - Foundation
     It is a single-footing foundation, which was made of river stone in the shape of a box (Gehomo stone).
   - Column
     The substructure column (Ehomo), derived from intact wood, is placed on a stone foundation so the column does not touch the ground The number of columns depends on the area of the house. While the column/pole on top (upper structure), consists of four main pillars (Silalo Yawa), which function as the main structure in the building.
   - Beam
Ndriwa Beams is a diagonal beam, which is below the building block and was placed on a rock (Ndriwa stone), which provides resistance to earthquakes. Beams were also located on the floor and roof construction.

- **Floor**
The floor is wooden boards, which were mounted on a floor frame with a system pen.

- **Walls**
The wall panels were made of timber panels, slotted into the big side beams (Siholi) of the house using tongue-and-groove joins.

- **Roof Truss**
The roof frame, consisting of two main pillars, and supporting poles, which are bound by the beam surrounding it.

- **Roof cover**
The roof cover was woven with sago palm leaves, which was tied to bamboo ribs.

- **Connections**
All connections in this building use wooden pegs so building is knock-down. As a binder, coconut fiber was used.

source: Siahaan, Fanny, 2019

After identifying environmental and occupant indicators, along with their respective variables, see table 1, then an analysis of the impacts on the building is carried out, which in this case is a traditional North Nias house, as shown in table 2.

**Table 2. Impact on Building (Traditional House in North Nias “Omo Hada”)**

| Indicators/Variables | Impact on Building (Traditional House in North Nias North Nias”) |
|----------------------|---------------------------------------------------------------|
| **Indicators of Environment** |                                                                 |
| **Temperature and Climate** | With a humid tropical climate, the roof of the building implements a sloping roof, see figure 7.  |
| | The shape of an oval-shaped building wall can direct wind speed, which is quite high, see figure 7.  |
| | Wood material as the dominant building material capable of adapting to the existing temperature and humidity, see figure 7.  |
| | Matting of thatch leaves as a roof covering can protect the building from the sun's heat, see figure 14.  |
| | High rainfall, which causes moisture, the humidity was anticipated by laying the column above the stone foundation and not touching the soil directly, so that it avoids decay/weathering, see figure 14.  |
| | The interior of the building, protected from moisture, with the roof window (Lawa-Lawa) and lattices on the walls of the building, which become a way of sunlight into the building, as well as lighting and natural airing, inside the building. The roof space, which is high, helps air circulation take place optimally in the building, see figure 7, 14.  |
| **Site** | In the pattern of Omo Hada settlement, in North Nias, all houses face North-South, with the position of the length of the house facing the road. This orientation gives natural lighting and airing, which is optimal for every home, see figure 5, 6.  |
| | The foundation of the building is a single-footing foundation because it was located on a contoured soil surface, see figure 14.  |
| | Houses are raised from the surface of the land (house on stilts), to avoid flooding and moisture, which can damage building materials see figure 7, 14.  |
| | Located in mountainous and forested areas, the form of a stilt house can avoid occupants from wild animal attacks, see figure 7.  |
| | Geographically located in earthquake-prone areas, buildings are made of wooden structures, which are lightweight, with columns, which were located above the stone shelf, so that when an earthquake occurs, flexible buildings follow earthquake movements without damaging the main structure of the building, see figure 14.  |
Vegetation
- Beams that are x-shaped, and located on a rock (Ndriwa beam), as a structure, which forms bracing, so that it can withstand earthquake vibrations, see figure 14.
- Buildings were built with biological materials, namely: Berua wood, thatch leaves, bamboo, Palm wood, river stones, which were local materials, which are obtained from surrounding areas, such as forests and rivers.

Soil
- Soil conditions that tend to be soft and the soil surface is bumpy - lumps were anticipated by making single-footing foundations, which are made of stone and laid on the ground surface, by making a runway under the foundation of the stone pair, see fig 7, 14.

Water
- The source of water is one of the considerations in choosing a site location. The North Nias region has many water sources, which come from rivers, beaches, waterfalls, and lakes, see figure 11, 12, 13. The source of water for the community for daily needs, such as cooking, washing, bathing, raising livestock, farming, which the ancients set the site near water sources.

Occupants
- Vertically, the building consists of three parts. Kolong (underneath of the house) is a place to raise livestock, and gardening areas. The middle floor as shelter (sleeping, cooking, resting, visiting) and the roof as a storage area, see fig 14.
- Floor plan (see figure 15c), which consists of:
  ✓ Public space (Talu Zalo), as the front room, which functions to receive guests and hold traditional events.
  ✓ Stage area (Sinata), generally used by the owner to sit back while looking out of the house through a wall grille, while socializing with the neighbors.
  ✓ Private room/bedroom (Bate'e), used for resting or sleeping.
  ✓ The family chief room (Bate'e Sebua), is used to rest or sleep for the head of the family.
- Some activities are carried out in outdoor, namely:
  ✓ Traditional ceremonies on the street and home page.
  ✓ Farming and farming in the fields and fields
  ✓ Hunting in the forest
  ✓ Wash and bathe in rivers or lakes

Belief and Culture
- The application of cosmological philosophy, applied in elections, site, where the higher the footprint, the more prosperous the inhabitants, because it is close to the upper world, see figure 4.
- Vertically, the building consists of three parts, namely: Kolong, as a place to raise livestock and gardening areas, the middle floor as a residence (sleeping, cooking, resting, visiting) and the roof floor as a storage area. This division reflects the cosmology of the people of Nias, which divides the world into three parts (the underworld, the middle world, the upper world), see figure 4.
- The walls of the building tilted upward like a boat because the people of Nias thought their ancestors had come to Nias island by boat.
- Placement of megalithic stones in front of the house, as a symbol of relations with the dead and social status, see figure 6, 17, 18.
- In ancient times, Nias people lived in, warfare so almost all aspects of their lives were defensive, include in their traditional homes. Site selection on the highlands, which was difficult for the enemy to reach The entrance from under the building using stairs, which could be moved. Placement of attic windows (Zara-Zara) with a high roof space, which serves to lurk enemies.
- Traditional ceremonies or parties, as part of people's beliefs and culture, such as Mengayu, Owasa, etc., are carried out on the village road as a public area, see figure 20.
- In the past, the livelihood of Nias people was hunting, for their food and re-bread. Raising pigs is one of the livelihoods of the people of Nias. This was supported by the importance of pig as part of the requirements, which must be present at each of their traditional ceremonies/parties. Generally they use under-houses to raise pigs.
- Farming and gardening were community activities to fulfill their daily needs, and are usually carried out on land close to their village while managing garden produce is done in the yard or around the village road.
Iron or metal carpentry, is also one of the expertise, which is a livelihood, the people of Nias at that time, and carried out in open spaces in residential areas.

source: Siahaan, Fanny, 2019

From table 1 and table 2 can be related that occupants and the environment are indicators - indicators that have an impact on the building of traditional North Nias house “Omo hada” so that it can give an idea of the application of biological architecture itself in the building.

4. Conclusions
From the previous discussions, several things can be concluded, as follows:
1. Biological architecture is an architecture (building) that is suitable with its environment and occupants. It can be identified by some indicators, as follows:
   • Environmental indicators, which have the following variables:
     ✓ Climate and temperature
     ✓ Site
     ✓ Vegetation
     ✓ Land
     ✓ Water
   • Building indicators with the following variables:
     ✓ Floor plans
     ✓ Building materials
     ✓ Construction of buildings
   • Human/occupant indicators with the following variables:
     ✓ Basic human/occupant needs
     ✓ Belief and Habit of residents (culture /customs)
     ✓ Livelihoods
2. The application of biological architecture can be seen clearly in Om0 Hada’s traditional house of North Nia’s, namely in floor plans/space’s organization, building materials, and building constructions.
3. The application of biological architecture of Omo Hada is a genius locus of their ancestors itself.

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