



## The Interpretation of Tropical Architecture in Designing Nature School in Balige

Marsellyna Br Marpaung<sup>1\*</sup>, Morida Siagian<sup>2</sup>

<sup>1,2</sup> Universitas Sumatera Utara, Indonesia

Corresponding Author: [\\*](mailto:marsellynamrpg07@gmail.com)

**Abstract,** Conservation of natural resources and the environment is a global issue that needs serious attention and handling because there are many environmental problems. This is due to the lack of awareness of the younger generation about the environment. Balige is the capital of Toba Regency which is an area that has considerable natural wealth and potential. However, the natural wealth owned has not been utilized optimally. Therefore, there is a need for follow-up in the form of establishing a Nature School which is capable of educating today's young generation to increase their awareness of the environment and make the most of it. This Nature School is planned to be located in the Sopoturung area with consideration of a suitable [marsellynamrpg07@gmail.com](mailto:marsellynamrpg07@gmail.com) location for developing an educational zone. This building applies sustainable architecture that makes the most of the potential of the surrounding environment.

**Keywords:** Environment, Nature School, Balige

### 1. INTRODUCTION

Education contributes greatly to the progress of a region. Therefore, a region urgently needs the development of infrastructure and facilities that can support the welfare of the community, as stated in the Law of the Republic of Indonesia No. 20 of 2003, Chapter I Article 1 paragraph 1 concerning the Indonesian education system written "Education is a conscious and planned effort to create a learning atmosphere and learning process so that student actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state". One of the ways the government realizes the law is by building and education system, namely schools.

The role of education in human life is vital in preparing for the development of a better nation. Improving human resource impact progress in various fields, be it social, economic, political, and cultural fields. If a country has a good education, it will have quality human resources. This eventually results is a workforce rich in theoretical and practical knowledge, mastering technology, and having specialized skills. The changing times force humans to adapt well to the changes. The ever-evolving times create new problems that make education a necessary and important thing in human life.

Nature is an environment where there are no human activities but nature is a natural place, so it is very protected for the lives of animals and other living things. Nature also has a function,

namely as a material living things to survive in this world. Therefore, humans are obliged to preserve the surrounding nature from damage. Nature school is a school built for educational development efforts carried out in nature with learning from all living things in nature directly. In nature schools, students are freed up to interact with nature, thus forming direct learning on material and experiential learning.

## **2. LITERATURE REVIEW**

### **Nature School**

According to experts, one of them is the Nature School Community (2005), which defines a nature school as a school with the concept of nature-based education that uses natural resources in the environment around the school.

Nature school is a school built for educational development efforts carried out in nature to know the learning of all living things in nature directly. Unlike schools in general that use a room system in the form of classes, students in nature schools are freed up to interact more in nature so that direct learning is formed on material and experiential learning.

The concept applied in nature schools includes the use of nature as a place to learn, the use of nature as media and materials for teaching, and nature used for learning objects. Nature school has basic principles that are educative, participatory, and sustainable. Nature School is established to build the character of the school community to love the environment, both at school, at home, and in the wider community. The involvement of the entire school community must be shown to the environment around the school from the committee to the local government. All these activities must be carried out in a planned and continuous manner in a comprehensive/sustainable manner starting from the government and the community.

### **Nature School Activity Program**

There are two primary action groups in the program:

1. Learning activities: students and teachers carry out learning activities
2. Extracurricular: students and teachers carry out extracurricular activities both within and outside of school hours, example: outdoor/indoor activities, fun games, gardening & animal husbandry, and life skill.

### **Actors in Convention Hotel Activities**

There are three primary actors groups in the program:

1. Main Activity Group: Primary School Students: learners aged 6-12 years old and Junior High School students: learners aged 12-16.
2. Manager Activity Group: principal, vice principal, teacher, guidance counseling

teacher, secretary, treasurer, staff

3. Service Activity Group: technician, cleaning service, and security.

### Principles of Design



This building applies the principles of tropical architecture. The design concept of this building leads to solving problems with humid tropical climate conditions. Some principles that can be applied are paying attention to building orientation, building materials, radiation, lighting, rainfall, and airflow.


### Overview of the Theme

Tropical architecture has been selected as the nature school motif in Medan. An architectural concept called "tropical architecture" considers how a building is adapted to a tropical environment. Countries with tropical climates have considerable differences in air temperature due to long periods of rainfall and drought. Therefore, the design concept of tropical architecture is very important to ensure that the space has thermal comfort through predefined design parameters.

### Comparative Study Results

**Table 1 Comparative Study Summary**

Building	Study Case Summary
<p data-bbox="220 1211 539 1245">Tabata Junior High School</p> 	<ul style="list-style-type: none"> <li data-bbox="671 1205 986 1238">• Site plan arrangement</li> <li data-bbox="671 1256 1366 1290">• Placement and orientation of the mass as a focal point</li> <li data-bbox="671 1308 1374 1391">• Arrangement of interior space patterns that are functional, neat and organized</li> <li data-bbox="671 1408 1230 1442">• Dynamic and quite spacious outdoor space</li> <li data-bbox="671 1460 1066 1494">• Room programming concept</li> </ul>
<p data-bbox="220 1675 603 1709">Maharishi Vidya Mandir School</p> 	<ul style="list-style-type: none"> <li data-bbox="671 1675 1374 1758">• Design exploration of the philosophy, function and theme of the building.</li> <li data-bbox="671 1776 986 1809">• Using local materials.</li> <li data-bbox="671 1827 1374 1910">• The building form is integrated with the circulation in the building and is interconnected</li> </ul>

<p>National University Of Singapore</p> 	<ul style="list-style-type: none"><li>• The facade design is adapted to the surrounding environment based on the function of the building.</li><li>• - Thermal, Visual and Acoustic ComfortSpace programming concepts</li><li>• The building form is integrated with the circulation in the building and is interconnected</li></ul>
---	--

### 3. METHODOLOGY

#### Location Selection Method

The location selection method used in designing a Nature School with a Tropical Architectural Approach in Balige District, Toba, North Sumatra is a descriptive method, namely describing and explaining, primary data and secondary data based on existing facts and then analyzed to produce conclusions.

#### Problem-solving Method/Design Stages

##### a. Method of Reference Concept & Ideation

- i. There are various stages to the study's exploration of the idea for a Nature School in Balige
- ii. Idea/Concept Search Stage: Started by ideas for locations that might host a variety of community-important events but lack school facilities.
- iii. Design Concept Refinement Stage: To strengthen design concepts for comparison in problem-solving, examine both architectural and non-architectural data from studies, books, and media.
- iv. Idea Development: A design will arise from the idea development stage and then be subjected to analysis and synthesis.

##### b. Method of Data Collection

When gathering data, the descriptive technique is employed, which includes presenting, dissecting, and elucidating both primary and secondary data. Among the data sources are:

- i. Primary Data: Directly gathered to support and improve the design through field surveys, observations, interviews, and documentation.
- ii. Secondary Data: Information gathered from literature reviews, such as books, periodicals, journals, maps, and project-related laws and regulations, that helps with data interpretation and analysis.

c. Method of Analysis

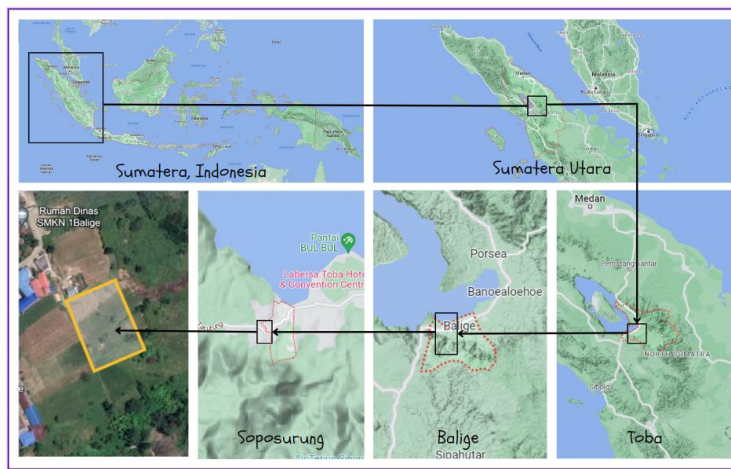
Prior to doing quantitative analysis, qualitative analysis is used to examine data about the environment, scope, and limits.

d. Final Ideation

Following analysis, a theoretical framework is developed as a concept—a way to solve the issues—that would eventually lead to several design approaches.

**4. RESULT AND ANALYSIS**

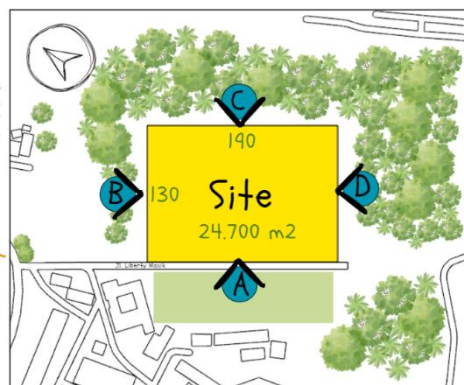
The site location was carried out in Balige, precisely on Jl. Liberty Manik, Balige District, North Sumatera, Indonesia.



Jalan Liberty Manik, Balige, Sumatera Utara

**Figure 1 Site Location**


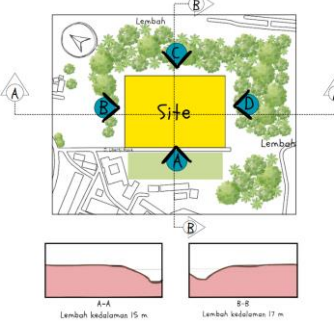

The design of the Nature School in Balige with a Tropical Architectural Approach has a total area of around 24,700 m<sup>2</sup>. The existing condition of the design site itself is empty land.



**Figure 2 Site Borderline**

**Site Analysis**

Analysis Aspects	Figure	Result

<p>Accessibility</p>		<p>There are 3 sides that have the potential to provide access to the site.</p>
<p>Contour</p>		<p>From the front to the back of the site it has a higher contour with a distance of around 19 meters, on the left side of the site to the right it has a more sloping contour after a distance of around 39 meters.</p> <p>The part that has a flat contour has the potential for buildings to be built, used as a sports field and also a ceremonial field. Meanwhile, the contoured part can be used as an outbound area, barebones, or a place for raising livestock.</p>
<p>View</p>		<p>The best view of this site is the valley, so the building will be designed to face the valley</p>

**Table 2 Site Analysis**

## Design Concept

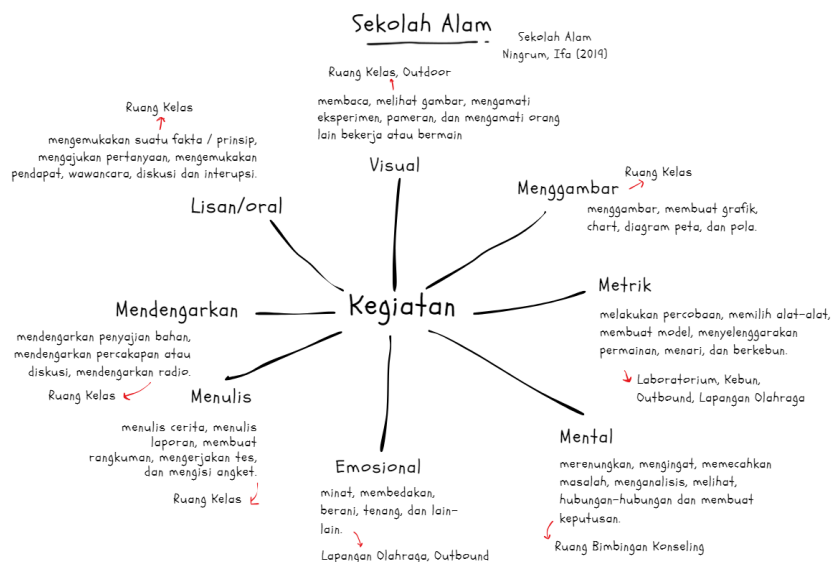
### A. Basic Concept

The basic concept of this design is to design a school by applying a tropical architectural theme. The application of tropical architecture basically aims to respond to the tropical climate which has high rainfall, high humidity, lots of sunlight and high temperatures. In order to achieve user comfort, tropical architecture was implemented. Because the location of this site

is located in Balige (mountainous area), this tropical architecture focuses on how to utilize natural ventilation in mountainous areas and minimize the entry of heat into the building during the day. These things can be achieved in various ways, such as the use of sun shading, cross ventilation systems, as well as material selection. In this regard, this school building was designed by applying the concept of tropical architecture.

## B. Programming Concept

Programming concept is calculated based on the activity design of the building considering type of users activities. The users are categorized as students, teachers, and visitors. The users and activities defined the certain room needs and special requirement to facilitate each of activities, and it is important to design the room interaction so the activities all are supported flowy and well integrated. The room and special needs are categorized as Elementary School Area, Junior High School Area, Farming Area, and Animal husbandry areas.

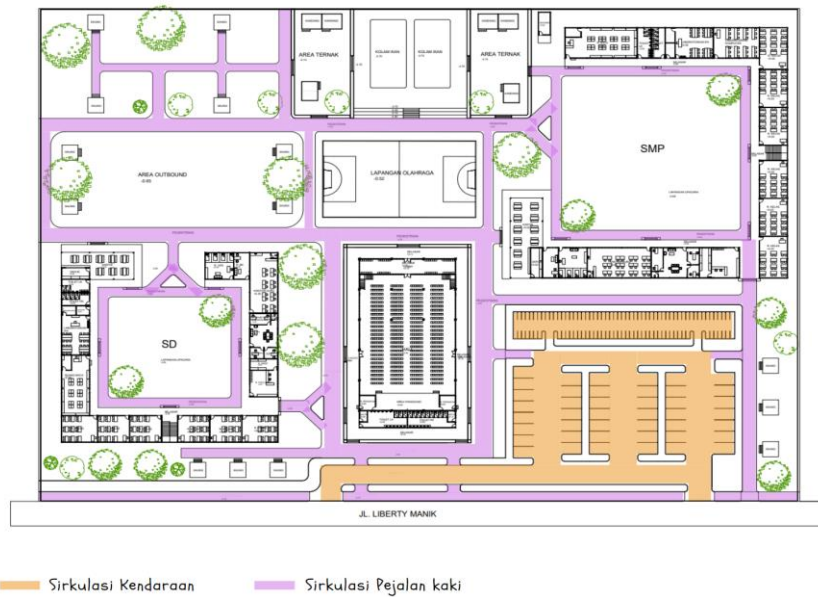


**Diagram 1 Programming**

## C. Site Circulation Concept

The main access to the site is via Jl. Liberty Manik. Access and pedestrian circulation for elementary and middle school students are differentiated, but remain connected. This is because there are differences in attitudes and behavior of elementary and middle school students. Meanwhile, vehicle access and circulation can only be achieved in the drop-off area and parking area, where vehicles are not allowed to enter the school building area to maintain its natural concept.

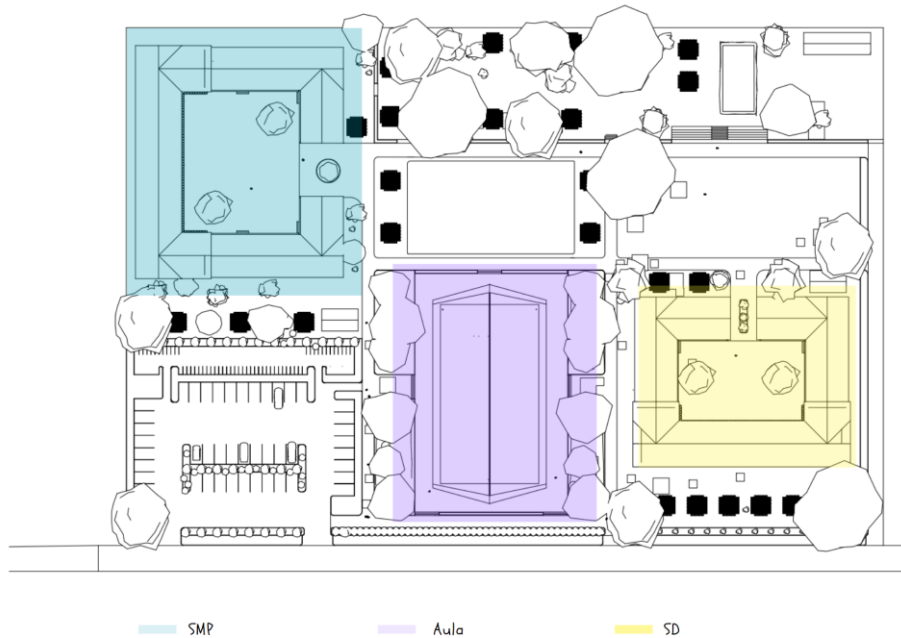




**Figure 3 Site Circulation Concept**

#### **D. Mass Composition Concept**

The mass of the building applies a tropical architectural theme. This building uses a multi-mass concept and is divided into 3 masses. The basic shape of the school building is a modification of the basic square shape to suit the needs of the building activities and utilize the potential of the site conditions and the surrounding environment.

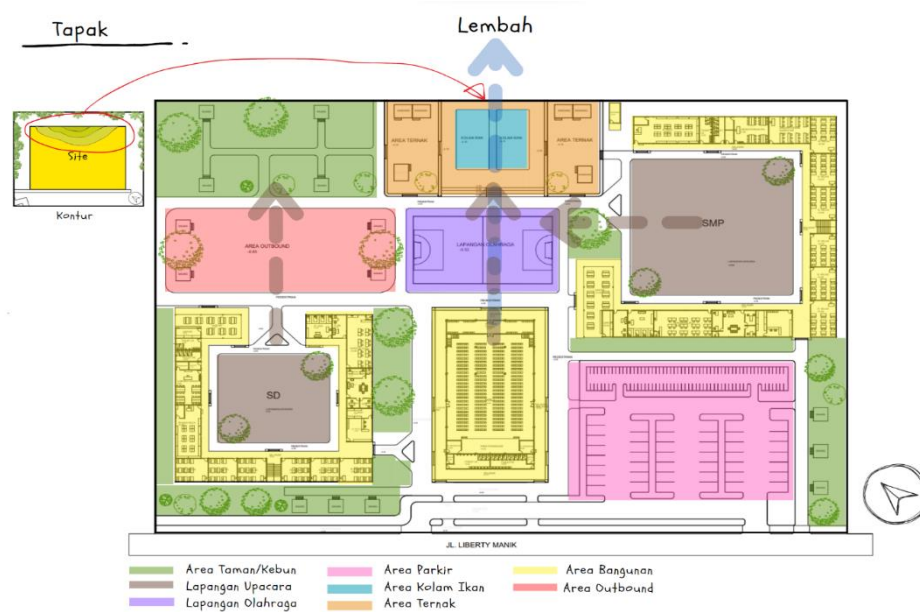


**Figure 4 Mass Composition Concept**



## E. Zoning Concept

The concept of a natural school is that school and nature must be integrated. So this school building was designed to maintain and utilize nature. The surrounding nature can be used as a view, gardening area, livestock area, and also outbound area. Based on activities, the school's outdoor space consists of a park/garden area, ceremonial field, sports, parking area, fish pond, livestock area and outbound area. The outer space of this building has a central point, namely the sports field.



**Figure 5 Zoning Concept**

## F. Façade Concept

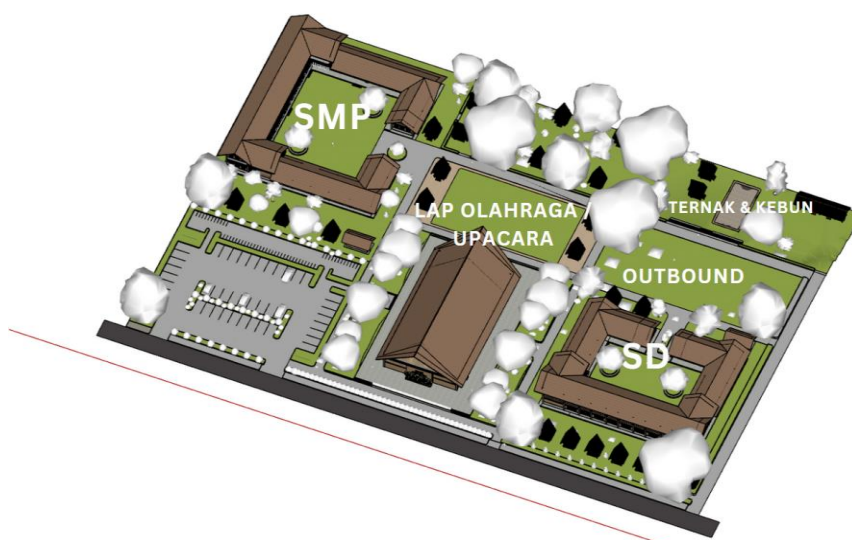
The mass of the building applies a tropical architectural theme. This building uses a multi-mass concept and is divided into 3 masses. The basic shape of the school building is a modification of the basic square shape to suit the needs of the building activities and utilize the potential of the site conditions and the surrounding environment. Matching the tropical architectural theme, this building uses a gable roof, in response to rainfall. This school building also implements cross ventilation in its openings as a response to solar heat.



**Figure 6 Facade Concept**

### Result

Based on analysis that have been done to all the aspects, the site plan concept offered can be seen in the figure below:



**Figure 7 Site Plan**



**Figure 8 Final Design**

## **5. CONCLUSION**

The design of this natural school was built as an effort to develop education carried out in nature by learning directly from all living creatures in nature. In nature schools, students are given free time to interact with nature, so that direct learning of the material and experiential learning is formed. Choosing Tropical Architecture by considering how a building is adapted to its surroundings, namely the tropical environment, is expected to produce a functional space that effectively supports the building's role as a natural school.

## **REFERENCE**

- Chiara, J. D., & Callender, J. (1973). *Time saver standard for building types* (2nd ed.). McGraw Hill Professional Publishing.
- Ching, F. D. K. (1996). *Arsitektur: Bentuk, ruang, dan susunannya*. Erlangga.
- DeBurn. (1990). *Psikologi untuk anak, remaja dan dewasa*.
- Kamus Besar Bahasa Indonesia. (n.d.).
- Karyono, T. H. (2016). *Arsitektur tropis: Bentuk, teknologi, kenyamanan, dan penggunaan energi*. Penerbit Erlangga.
- Kementerian Pendidikan dan Kebudayaan. (2020). *Panduan pengembangan bangunan sekolah*.
- Lippsmeier, G. (1980). *Bangunan tropis*. Penerbit Erlangga.
- Neufert, E. (2002). *Data arsitek* (Edisi 33, Jilid 1) [Terjemahan oleh S. Tjahjadi & F. Chaidir]. Jakarta.

Neufert, E. (2002). *Data arsitek* (Edisi 33, Jilid 2) [Terjemahan oleh S. Tjahjadi & F. Chaidir]. Jakarta.

Ningrum, I. (2018). *Sekolah alam*.