

The Architecture of *Batak Toba*: An Expression of Living Harmoniously

Himasari Hanan / Surjamanto Wonorahardjo

School of Architecture, Planning and Policy Development

Institut Teknologi Bandung

hanan@ar.itb.ac.id, titus@ar.itb.ac.id

ABSTRACT

Batak *Toba* people have a figurative imagination through which they orientate themselves to nature and the surrounding landscape. The architecture of the house is created to create a beautiful figure in the natural landscape as well as to act in moderating warm-humid climate. Dramatic roof forms have been developed as an expression of this culturally determined sensitivity towards natural forces and practical wisdom towards thermal comfort. Building a house deals with human needs within a structure of static and living components from the environment. Aesthetic qualities emerge genuinely out of the adaptive process within the corresponding multidimensional aspects of a living environment.

Keywords: *Batak Toba, harmonious living, thermal comfort, house on stilts.*

1. INTRODUCTION



Figure 1:
Map of Lake Toba in North Sumatra

Lake Toba in North Sumatra, the largest volcanic lake in the world, is about 100 km. long, 30 km. wide and 505 meters at the deepest point. It emerged after a volcanic eruption estimated to have occurred around 74,000 years ago. Samosir Island in the middle of the lake can be accessed via the port of Tomok by ferry from the city of Parapat in mainland Sumatra or via Pangururan, where the mainland meets the island, by car. On Samosir Island, *Batak Toba* people built up settlements that reflect and materialize ideas and images of the ideal life. Most settlements are situated 1000 m above sea level, where the temperature ranges from 28-33 degrees Celcius in the middle of the day and drops to 10 degrees Celcius during the night. The settlements are built to represent a comprehensive world, whereas a house is built to respect a harmonious relation to its surrounding. Houses and settlements are conceived to grow naturally as part of the socio-cultural life and physical context of the environment.

A Batak Toba settlement is originally set up by a group of people belong to a family clan in proximity to agriculture land as their food resources. A settlement grows up as an economically independent entity and becomes a basic living unit for the social and economic life of a family clan. Since Batak Toba people had no opportunity to expand their territorial outside the island to accommodate population growth, they intensified agricultural production by irrigated paddy-fields and protected the family clan by managing their settlement's coverage. The chief of the settlement is someone who comes from the family which had founded the settlement and owned the agriculture land. He has the authority to manage inhabitants and incoming people residing in his land for legal disputes and to represent the inhabitants to the outside world. He is supposed to have charisma based upon his knowledge of local customs, as well as, his persuasive powers of oratory.

The layout and architecture of houses in the settlement involves a conceptual relationship with the natural environment as well as the social relationship of a kinship system. The patrilineal kinship group of Batak Toba people is called *marga*. The kinship strictly determines interpersonal relationship in everyday life, in which people defer to ancestor and social status. Ideas and hopes for one's life shape one's everyday existence and social relationship in the community. Spatial organization and physical appearance of houses in a settlement articulate the existence of a human being in the world and being oneself, and in responding to the natural reality. The architecture of the house is then created to relate and mediate those ideas and meanings of the comprehensive world.

Batak Toba people built up settlements and houses with whatever circumstances and materials are at hand. Batak Toba people build a house as a practice of adaptability to the serious challenges in the local living environment: climate, materials, geographical conditions and social life. They respond and adjust themselves to whatever is made available by nature, and the architecture becomes the accepted procedure of structuring adjustments to local issues and social customs.

The paper elucidates knowledge and wisdom of people in interrelating physical conditions and socio-cultural aspects to architecture that reflects a balanced and harmonious living in a tropical climate. The research is undertaken to learn from empirical studies of the facts, design sensibility and

ecological principles in precedents of traditional building knowledge. The practice of ecological architecture in Batak Toba persuades us to take a broader view of sustainable design that goes beyond rational technicalities. Sustainable design challenges architects to think more comprehensively and to work as a generalist designer. Sustainable design requires architects who are able to assimilate a wide variety of issues and convert them into design solutions that encompass tradition, history, ecology, sociology and ethics in built environment.

2. METHODOLOGY

The discussion in this paper is preceded by field surveys, in late 2010 and early 2011, to Batak Toba settlements in Samosir Island, North Sumatra. Samples of houses were singled out from settlements in the *Tomok* neighbourhood in three different settlement categories that are differentiated by physical settings: 1) near the lake (*Janji Martahan*), 2) next to a hill (*Lumban Simarmata*) and 3) middle terrain between hill and lake (*Huta Siallagan*). The first category is *Huta Siallagan* (figure 2), an original settlement which was founded by the clan *Siallagan*, who owned the surrounding agriculture land. The inhabitants of the *Huta* are exclusively descendants of the family clan *Siallagan*. At the moment, the settlement is being developed as a touristic attraction and all inhabitants are involved in activities related to tourism. The second category is *Lumban Simarmata* (figure 3), a new settlement for descendants of the *Simarmata* family clan, founded outside the original settlement but within their territorial land. All inhabitants are descendants of from the same the family clan, and agricultural productions are their most important living resource. The third category is *Janji Martahan* (figure 4), a new settlement which is occupied by descendants of several family clans within the territorial land of *Martahan* clan. Whereas in the other two settlements, all inhabitants are related in the same kinship, inhabitants of *Janji Martahan* are descendants from various clans who are authorized to reside there by the chief of *Huta Martahan*. *Janji Martahan*, at the moment, is a rather abandoned settlement because most of the inhabitants moved out for work in the city.

This research is focused in discovering local knowledge and wisdom in human-nature relationship in architecture and settlement through literature review and field survey. The discussion will illustrate

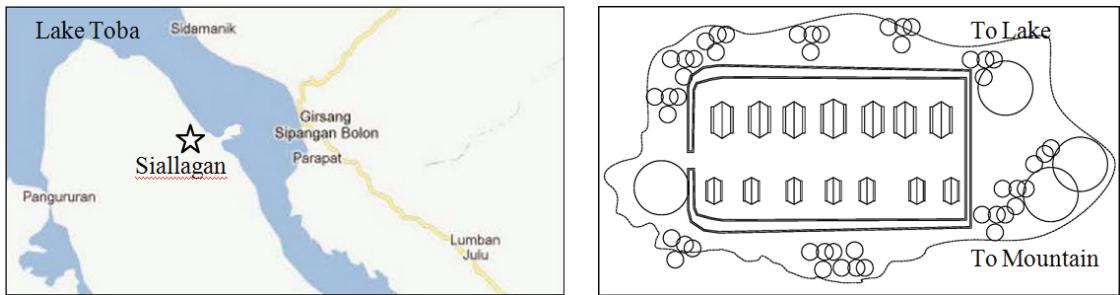


Figure 2:
Map of Huta Siallagan

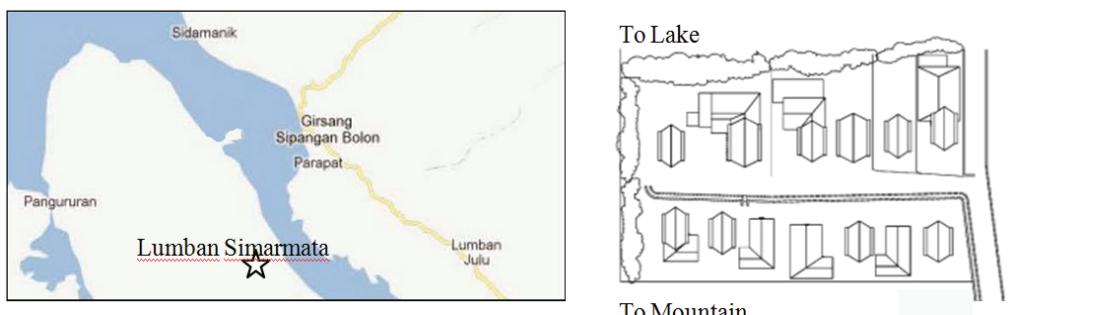


Figure 3:
Map of Lumban Simarmata

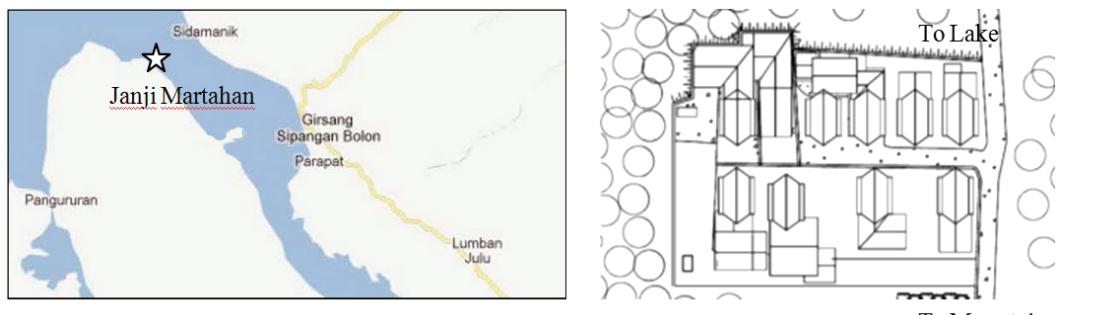


Figure 4:
Map of Janji Martahan

the underlying socio-cultural and environmental framework behind the spatial layout, building design and roof form in articulating climatic issues and people's dependency on nature. The thermal environment of space inside and outside the house was measured, the uses of indoor space were observed, and inhabitants interviewed about their respect to tradition. The result of the measurement was then correlated to the ordering system of the building mass, roof form and spatial layout that may be identified as climatically and culturally effective over time.

The measuring of the thermal environment in houses is undertaken in one original house with thatched roof and four houses with zinc roofs in the three settlements. The indoor and outdoor temperature was measured at 7:00 AM, 9:00 AM, 1:00 PM, 3:00 PM and 6:00 PM at predetermined locations. Measurement of air temperature is done with wet and dry bulb thermometer, while radiation temperature is with a globe thermometer. The dry bulb temperature is to indicate air temperature, whereas combination value of dry & wet bulb temperature and air velocity will show the Effective Temperature (ET). This

effective temperature is normally sensed by people as warm or hot air. The radiation temperature or globe temperature (GT) presents the temperature of electromagnetic wave radiation from the sun or other sources. The GT value corrects the ET value, so that the measured value is the CET (Corrected Effective Temperature). In general, thermal properties of building material are indicated by the values of heat capacity: the capacity of material to accept thermal energy, and thermal conductivity, which is represented by R-value and U-Value. The R-value (resistance value) is the ability of a material to inhibit the rate of heat flow, whereas the U-Value is the ability of a material to transfer or convey heat energy. The higher R-value and the lower U-value of a material, the better it restrains heat transfer. Building material with high R-value and low U-value is usually applied as a thermal insulator. On the other hand, the higher value of heat capacity means higher thermal energy being accepted or released. Heavy-weight material usually has a higher value of heat capacity than lightweight material.

3. SPATIAL PLANNING AND LAYOUT IN THE SETTLEMENT

To Batak Toba people, a settlement is perceived as the center of the world (Sibeth, Achim, 1991, p 46), in which all members of the family clan lives in a well-protected enclosed space next to the cultivation land. Only members of the family clan and designated people are permitted to live in the settlement, and its size is limited to no more than ten houses. The one who owns the cultivated land and sets up the settlement becomes the person in charge, and he is responsible for the wellbeing of all the inhabitants. He has the authority to control the existence of the original settlement and of setting up a new settlement once it is over-occupied. The settlement, hence, becomes the organizing framework of community living values. The authority of the founder can only be inherited by his descendants, although the decision making process in everyday practice is undertaken democratically among the inhabitants.

For the Batak Toba people, the *marga* kinship system determines the right and duty of an individual to the family and society. Relationships of kinship between various families are established by marriage and strictly proscribed by the unwritten laws of Batak kinship system. Marriages within the same family clan are not allowed. A Batak man must respect

and care about the opinion of the family of the wife and the family of the son-in-law. The social relationship with two other families besides his own family creates a man's role both as a superior and a subordinate to his families. This reciprocal relationship of dependence influences daily activities of an individual and in particular during ceremonial activities, towards his relatives and other inhabitants of the settlement. Ownership of agricultural land, the power to allocate ownership, and the right of use for houses are among others the great significance of maintaining kinship relationships and close networks of relationship between inhabitants. Each settlement is then identified and named according to the social organization that has been arranged to its establishment. Huta is an original settlement that is established by the founder who cultivated open land for his family clan, whereas Lumban is a new settlement founded by the chief of Huta for descendants of the clan living in Huta. Each Huta and Lumban will subsequently be named after the clan who initiated its establishment. The network of social relationships and kinship system is consistently applied to the practice of spatial planning in order to control the population growth of a settlement.

A Batak Toba settlement has the outward appearance of a linear settlement. The house of the chief is set up in the middle and is larger compared to other houses. All houses have a similar stilt-structure and architectural style, but a variety of façades. In front of each house stands a rice granary that belongs to the house with similar structure but in a smaller scale. The open space between the house and granary is utilized as a multi-purpose area for ritual performances and work. Houses are put side by side in a row following a strict concept of building orientation to the highly visible landmarks of the local environment, namely the mountain and lake. A house is set up on the axis of Mountain-Lake direction with the front gable directed toward the mountain and the open space. The mountain for the Batak people is a representative of the almighty cosmic power and, therefore, is highly esteemed as the respected direction (Sibeth, Achim, 1991, p 64-66). The fertile agriculture lands are normally on slopes of the mountain, and at the opposite is the lake which represents the negative power of the natural world. The lake is always treated as the back of the house, which supported the earlier situation when none of the Batak house had individual toilets and bathrooms.

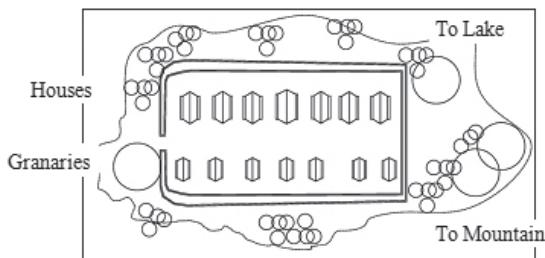


Figure 5:
Spatial layout and building's direction

The settlements are normally located as close as possible to the fields and watercourses, whereas houses are built close together to keep the settlement area minimum and the cultivated land as large as possible. Perimeter walls or bamboo fences are built around the settlement to protect inhabitants from enemies and uncontrolled spiritual forces. The entrance way is put in a certain height in that people enter the settlement at a position signifying appreciation to the inhabitants. An image of a guardian spirit is usually set at the entrance gate to send spirits out of the place. Physical boundaries are established to attain social and environmental sustainability for the settlement. The spatial layout of houses tends to be persistent hence it reflects the deep rooted socio-cultural values of community planning and building. Batak Toba people follow obediently conventions that have been accepted by the community although they are passed down orally. Individual expressions are not common and expected, on the other hand, overall similarity is pursued to identify oneself to the community within the settlement.

4. THE HOUSE AS A BEAUTIFUL FIGURE ON THE NATURAL LANDSCAPE

Batak Toba people have a figurative imagination in relating themselves to the nature and the surrounding landscape. Nature is seen as having meaningful reference points, whereby the relationship and direction of mountain-lake becomes the generative force for the layout and design of a house. Batak Toba people believe that their ancestors are from Sianjur Mulamula at the foot of Pusuk Buhit mountain on the western shore of Lake Toba (Sibeth, Achim, 1991, p 11). They believe souls of the ancestors may influence the lives of their

descendants long after their death, therefore, the mountain is highly esteemed as the best orientation for a sustainable living. A higher place in nature, such as a mountain, is valued as the preferable place, as it gives the sense of being closer to heaven or sky. The lake that reflects the sky, reveals the sense of place that comprises the height of the sky and the depth of the earth. The sky and the earth are categories commonly used to make people see the basic order of things in nature (Norberg-Schulz, 1985, p18). The design of a Batak Toba house, hence, involves the concept of location and orientation in expressing the relationship of people with nature.

Batak Toba people respect and take care of a given place by interpreting and transforming the site into a human place. Building a house and setting up a settlement means to shape the natural environment for a sustainable living. The settlement and the house signify people's presence by which wilderness is transformed and notified as a human place. Batak Toba people see a house as part of nature that blends in its environment like a rock or a tree. A house is a beautiful figure on the natural landscape and an act of altering the natural into the human-made world. The house brings the earth as an inhabited place for people and enables the experience of the totality of sky-earth relationship. A Batak Toba house is by then erected as a single entity and a highly visible artifact which rises from the ground towards the sky. The building mass of a house forms an artificial solid center of the earth or a point of arrest on earth or an establishment of a relationship between earth and sky. The roof forms of the house give emphasis to a peak or ridge of mountains, by which they reveal and emphasize natural qualities that are already present at a place. The architecture of the house is developed as a process of visualization of the dominant interrelationships of the mountain and lake, and of the sky and earth.

A Batak Toba house is an object of human identification. It embodies the existential meanings of its inhabitants and staying between the earth and the sky. To Batak Toba people, the world is created in three manifestations: the first one is the upper world (God's place), the second one is the middle world (place for the human being) and the third one is the underworld (the place of demon and spirit). In that order, a house is divided into three sections. The lower part, which symbolizes the foot, is used for storage of wood and animals. The middle part, which symbolizes the body, is designated as the house for a human being. The attic, being the biggest part of the house, symbolizes the head, and is



Figure 6:
The house rises from the ground to the sky

respected as the upper world for god or ancestors. The ordering system of three sections is parallel to the three societal values of 1) respect to the family of the mother, 2) friendly to the family of the sister and 3) tolerant to the family clan, and three different parties to be respected in kinship system.

The house unfolds the human position in nature and the distribution of power among people. Just as a human has a soul, so does a house. The three aspects of human life are manifested also in other elements of design. Decorations on the façade of the house consist of three-dimensional carvings of figural representations in three natural colors: white from lime, red from earth, and black from the

charcoal. The architecture of the house is, therefore, to embody tangible and intangible ideas. The house is a human-made artifact altering nature through a process of smoothing the rough and brighten the dull. Architecture herewith stands for the action of transforming human characteristics into aesthetic expression.

5. THE HOUSE AS A RESPONSE TO NATURAL FORCES

Batak Toba people realize that it is dangerous and unhealthy to live on the ground level. A house is built on stilts to protect inhabitants from termites, animals

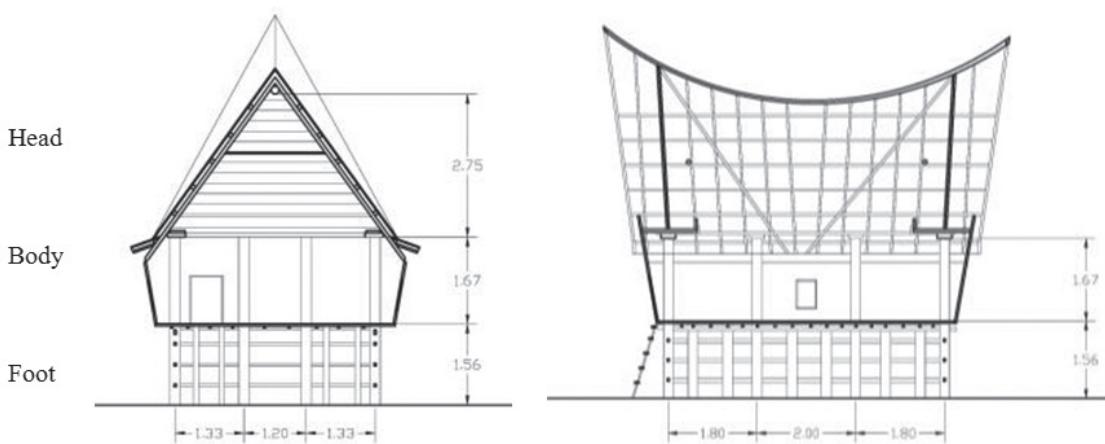


Figure 7:
Section of the house

and enemies. Living above the ground secures inhabitants from the effects of flooding, poor drainage and splashing rainwater hitting the floor in the rainy season. The inhabitants acquire the maximum benefit from cooling breezes at an elevated position, and cross ventilation under the floor structure is most effective for cooling and reducing humidity. Stilts rest upon a flat stone foundation to allow the house to move flexibly during an earthquake. However, the substructure is stabilized by a system of beams into the piles by which it provides a secured place for livestock during the night. The house itself has a post and lintel wooden structure, which instead of nails use wedges, pegs and lashing techniques for the joints. Wood and bamboo are the main source of building materials used for construction. The tropical climate, in which temperatures are uniformly warm, encourages the use of easily available light materials

and negates construction of a tightly fixed building. A Batak Toba house that is raised up on stilts is finely attuned to its environmental conditions.

The most remarkable feature of a Batak Toba house is the roof. It represents the most complex arrangement of technical solutions in the building and dominates the external appearance of the house. The roof is incredibly significant in that it obtains a symbolic meaning as the upper world or a place for ancestors. The roof protects inhabitants from the sun and rain, shelters the walls and holds the building together. The roof is designed with a dramatic inclination that makes the vast amounts of tropical rainwater run away swiftly and safely. The overhanging eaves shade the windows and protect the wall from driving rain. The roof serves also to collect necessary supplies of household water.



*Figure 8:
A system of beams into piles
on flat stone*



*Figure 9:
The dramatic roof forms for
comfortable living*

The roof of a Batak Toba house is thatched with leaves of sugar or coconut palms which are highly resistance to tropical weather and temperature. Although thatch roofs are light and not leaking from rains, they deteriorate rapidly and need to be replaced often. In the last decade, thatch has been replaced by zinc sheets which are cheaper, easier to handle and require less maintenance. The growing popularity of zinc is in large part related to the reduction of labor required in construction. Thatching may require days of work because of the skill required, while sheets of thin zinc can be put up quickly and easily. The major impact of this material change to the living condition inside the house is less heat insulation during the day and from cold at night.

The large steeply pitched roof has a front gable that extends further than the rear gable, while its longitudinal profile simulates the ridge of a mountain. This symbolizes the cultural values of blessing the younger generation to get better than the predecessor in harmony with the surrounding landscape. The prominent gable roof projects forward and upward and is the highest and most visible part of the house. Accordingly, the front gable wall is finely carved and painted in geometric motifs while the rear gable is not decorated. The gable roof with its dramatic height and intricate symbolic decoration combines artistic form with the practical function of bringing living comfort in the house. On the gable wall, an airy framing structure of boards is installed to allow winds going through the house from both mountain and lake directions. The huge attic

space underneath turns into a passage of cooling air and drives away hot air inside the house through the airy structure of boards.

The cross ventilation between gables occurs high above the ground in which no air current at people's height might cause thermal discomfort for the inhabitants. The breeze simultaneously dries out the humidity of the space and freshens the stifling conditions inside the house. Furthermore, it protects roof and walls materials from moisture and dampness caused by the humid climate. The steep roof and height of the ceiling works as a temperature-regulating apparatus, whereby hot air is made to rise until collected near the roof, and then driven away through the gable.

The house consists of one enclosed space with no partition wall. Entry to the house is by means of a wooden staircase and a small door. The interior is dark because light enters into the house through small windows on each side in a diffused manner. The house is designed to protect inhabitants securely from sight as well as from evil spirits. Therefore, small openings are advantageous as a defense mechanism against the enemy in times of clan wars. The house becomes inaccessible when the door and windows are closed, and the staircase is pulled up. On the one hand, door and windows are features of symbolic acceptance and reception to the outside world, and, on the other hand, they are small to keep them in a manageable weight when it has to be swung, pushed or pivoted.



Figure 10:
Thatched and zinc roof

Walls are made of wooden planks forming a box frame, and lean outwards to provide additional stability to the structure. Their height is insignificant compared to the roof, and they do not directly support the roof. The roof is a critical part of the building in that not only provides shelter but also ensures the integrity of the building. Once the roof is ruptured or penetrated by rainwater, the entire building begins to deteriorate, and the wooden structure eventually cracks. The symbolic idea of the architecture might then be interpreted as to bring a house into existence by fitting walls and roofs together, so that spirit of the house comes to life. Consistent flow of air and coolness is, therefore, identified as a flow of life in the house. Rainfalls and winds influence the spatial layout of the house form. Houses are erected in the direction of the mountain-lake allowing the winds to flow freely to every house, and to ensure none of them is blocking the winds to the others. Protection against cold due to a significant drop of temperature at night has also been a consideration for the roof covering and that thatch roof is applied for better insulation.

6. THE HOUSE AS A SHELTER FOR THERMAL CONTROL

Arreola in Noble (2009) described that the variety of traditional building forms is heavily and predetermined by traditions and symbolic needs. Many other scholars in vernacular architecture agree that the socio-cultural values of the inhabitants is the primary influence, rather than simply climate and availability of construction materials, in the creation of building forms. The building of a Batak Toba house will involve not only the owner but also the entire local community. The repetitiveness of house form in Batak Toba indicates that a house is a creative work of the people based on knowledge informally passed on generation to generation. The unwritten rules have been enforced to and in a time accepted by the community as the regulator of building processes. A Batak Toba house is built and guided by experiences and traditions of the community in responding to local conditions and available building materials. Its architecture reflects the understanding of a tropical climate and the availability of vegetative materials.

The warm-humid temperature of the area induces a building system that effectively drives away heat and humidity caused by constant rainfall. In such weather, wood construction will deteriorate quickly, and termites and woodworms present a

constant threat to buildings. A house, therefore, needs to be adequately ventilated for cooling and reduction of humidity, whereby its architecture must ensure that less heat is transmitted into the house as well as air flow increases. Temperature was measured to investigate the performance of a Batak Toba house in its adaptation to climatic conditions, in which roof forms and materials play an essential role in moderating the warm-humid climate. The investigation would like to confirm that the architecture had been developed by a culturally determined sensitivity towards environment, yet, its tradition is predominated by practical wisdom to thermal comfort.

The measurement results reveal that outdoor air temperature during the day is between 26.75 and 30.8 °C, while indoor air temperature is between 26.7 and 28 °C. Under this condition, people need ample air movement in order to feel comfortable. Outdoor air velocity is between 0.3 up to 1.2 m/s, while indoor air velocity is almost zero. Under this condition, people feel warm and humid inside the house during the day. The thermal environment inside the house is mostly influenced by solar radiation that is converted into thermal energy, which causes the rise of air temperature inside the house. Results of measurement in outdoor, indoor and attic temperature indicate that:

- A Batak house with thatched roof has a significant temperature decrease inside the house. The indoor temperature of living room is 2°C lower than the attic room, and the outdoor temperature is less than 1°C higher than the attic room.
- Houses with zinc roof in several locations have a trivial difference of temperature between outside and inside. The indoor temperature in the living room is exactly the same as in the attic room, and temperature discrepancy between outside and attic room is less than 1°C.
- In houses with zinc roof, no matter of higher or lower outside temperature, the living and attic room has equal indoor temperature.

Globe temperature is in line with air temperature, and indoor temperature is higher than outdoor. The globe temperature of the outdoor is relatively high, between 28.25 °C to 35.2 °C, and, therefore, creates a potential for a rise of indoor air temperature. In a house with a thatched roof, attic room temperature is much higher than the living room and outside. In houses with a zinc roof, living and attic room have

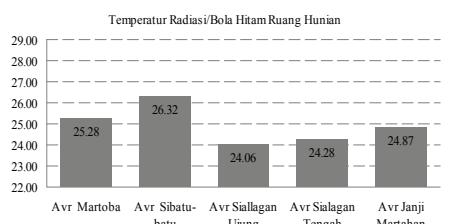
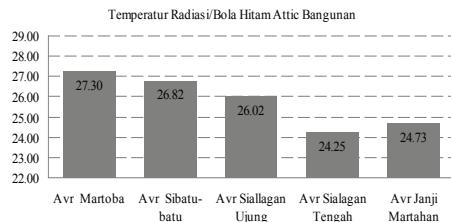
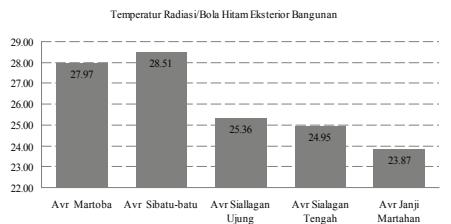


Figure 11:

- (a) *Outdoor Globe Temperature*,
- (b) *Attic Globe Temperature*,
- (c) *Indoor Globe Temperature*.

similar temperature, and the inside temperature is 2°C higher than the outside. The house with thatched roof has a better performance in keeping the indoor temperature more comfortable, in that indoor air temperature is 2.75 °C lower than outdoor air temperature during the day. The thatched roof has reduced globe temperature more significantly (7.97 °C) than zinc roof (1.62 °C) during daytime. The differences of globe temperature between outdoor and indoor indicate that the building envelope with

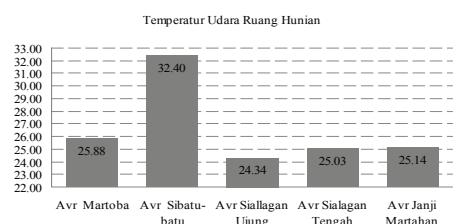
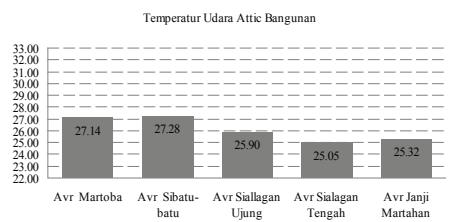
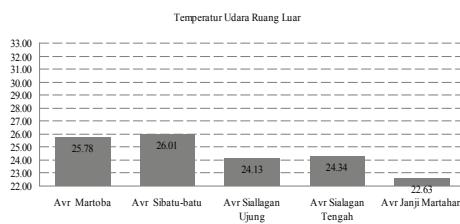


Figure 12:

- (a) *Outdoor Air Temperature*,
- (b) *Attic Air Temperature*,
- (c) *Indoor Air Temperature*.

a zinc roof does not reduce the solar radiation. Therefore, replacement of thatch with zinc sheets affected indoor thermal environment significantly, because the zinc roof does not perform as a system of thermal modifier.

Roof material influences indoor thermal environment by causing warm sensation during daytime and cool sensation during the night. Zinc sheets perform as a thin skin for the building, in which indoor temperature

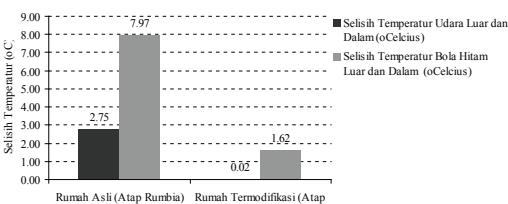


Figure 13:

The difference of outdoor and indoor temperature (AT and GT)

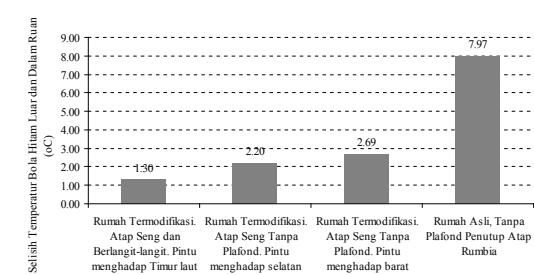


Figure 14:

Temperature reduction in relation to Roof Materials, Ceiling and Orientation to Sun.

fluctuates following outdoor condition of the house. Thatched roof performs as a thick skin for the building, which causes indoor temperature to remain constant during the day and at night.

The absent of a ceiling causes the thermal environment inside the house to be highly vulnerable to solar radiation. The influence of solar radiation to indoor temperature depends on the orientation of the building. The long side of the building wall facing east receives more sunlight than the wall facing the north. The longer side of the roof cover facing east-west direction causes higher indoor air temperature than the one facing north-south direction. Some houses, besides changing roof materials from thatch to zinc, have applied a new layer of ceiling under the roof with manufactured wooden panel (multiplex). The new added ceiling has caused incoherency in the thermal environment inside the house as a result of air volume reduction in the living room. Hence, the indoor temperature between living and attic room becomes quite different. Warm temperature and high humidity have led to the necessity of roof forms that accommodate sufficient air volume inside the house and cross ventilation for cooling the air.

7. CONCLUSION: The architecture of the house as an expression of living harmoniously

House building for Batak Toba people is a living activity that concerns not only people's needs and uses of natural resources, but also with the way a building's elements are abstracted, assembled, used and finally become perceptible in nature. The house design is seen culturally as a form of organizing natural energy and materials with the goal of minimizing all undesirable impacts and achieving a steady-state relationship with nature. The architecture of the house does not simply deal with spatial uses and organization of building elements, yet, with a structure consisting of living and static components. People assemble all those components to provide themselves with certain functions that operate together as a whole system in nature.

Batak Toba people depend on cooperative interaction with the living environment because the nature itself is too hard to overcome. People are forced to be innovative, not by individual expression, but through identification with a community. They have integrated available building materials, climatic constraints, and socio-cultural values into architectural forms that

meet the needs of individuals and groups. A house is built with a holistic approach that puts into practice the proper understanding of interdependencies and relationships within the environmental and a societal system. The building of a house is not meant to change nature but to relate human activities into the natural environment in the least destructive way. The architecture of the house encourages people to realize the comprehensive world of nature and the sense of being oneself in nature. It concerns existential questions, in which imaginative building forms express nature as an inspiration for creative works and not as something to be replaced. The house becomes a work of art that enables people to understand their existence in the world and recognize the reality of natural forces.

The way Batak Toba people manipulate forms and space in house design indicates the way people think about tangible and intangible aspects of life, and human needs that are both physical and spiritual. The physical elements of a house do not exist as static components, yet, they interact as part of the overall ecosystem processes between the earth and the sky. Expression in architecture, therefore, addresses the appreciation of the establishment and unfolding of life. Architecture becomes an imaginative experience to see the world and people's contribution to the aesthetic apprehension of everyday life. The architecture of the house, consequently, is created out of living purposes and demands of living in harmony with life-threatening nature. Its aesthetic qualities emerge genuinely out of the adaptive process in corresponding multidimensional aspects of a living environment.

REFERENCES

Asquith, Lindsay, Vellinga, Marcel (ed). (2006). *Vernacular Architecture in the Twenty-First Century*. New York: Taylor & Francis

Bonatz, D., Miksic, J., Neidel, J. D., & Tjoa-Bonatz, M. L. (2009). *From Distant Tales Archeology and Ethnohistory in the Highland of Sumatra*. Cambridge: Scholars Publishing.

Building Research Institute (1973). *Tradisional Buildings of Indonesia Vol. I Batak Toba*. Ministry of Public Work and Electrical Power

Building Research Institute (1973). *Tradisional Buildings of Indonesia Vol. II Batak Karo*. Ministry of Public Work and Electrical Power

Building Research Institute (1973). *Tradisional Buildings of Indonesia Vol. III Batak Simalungun and Batak Mandailing*. Ministry of Public Work and Electrical Power

Crouch, Dora P. & Johnson June G. (2001). *Traditions in Architecture. Africa, America, Asia and Oceania*. Oxford: Oxford University Press.

Dawson, Barry. (1994). *The Traditional Architecture of Indonesia*. London: Thames and Hudson Ltd

Departemen Pendidikan dan Kebudayaan. (1997). *Arsitektur Tradisional Daerah Sumatra Utara*. Jakarta:Departemen Pendidikan dan Kebudayaan Republik Indonesia

Domenig, Gaudenz. (2004). *Indonesian Houses Vol. I*. Singapore: Singapore University Press

Hanan, Himasari, *A House is a Figure between The Earth and The Sky*, International Seminar on Environment and Architecture Senvar 12, Department of Architecture, Technical Faculty, University of Brawijaya, Malang, 4-5 November 2011

Hanan, Himasari, Wonorahardjo, Surjamanto, *The Impact of Modern Roof Material to The Traditional House of Batak Toba*, International Seminar on Environment and Architecture Senvar 12, Department of Architecture, Technical Faculty, University of Brawijaya, Malang, 4-5 November 2011

Noble, Allen G. (2009). *Traditional Buildings*. New York: IB Tauris & Co. Ltd.

Norberg-Schulz, Christian. (1985). *The Concept of Dwelling. On The Way to Figurative Architecture*. New York: Rizzoli International Publications, Inc.

Papanek, Victor. (1995). *The Green Imperative. Ecology and Ethics in Design and Architecture*. Singapore: Thames and Hudson.

Pusat Penelitian dan Pengembangan Permukiman. (2010). *Laporan Kegiatan Pengkajian Rumah Tradisional Etnis Batak di Propinsi Sumatera Utara*. Binjai: Loka Teknologi Permukiman Medan

Schefold, Reimar, Nas, Peter JM, Domenig, Gaudenz, Wessing, Robert (eds). (2008). *Indonesian Houses*. Leiden: KITLV Press

Sibeth, Achim. (1991). *The Batak, People of the Island of Sumatra*. London: Thames and Hudson Ltd.

Wonorahardjo, et. al. (2008), *Thermal Environment Assessment on Residential Districts, Case Study: The City of Bandung, Indonesia*, International Seminar on Climate Change, Bali