

Defining the characteristics of local architecture in Indonesian based on geopolitical and geographical parameters

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Abstract

This study aims to disentangle the term "local" in the phrase "local architecture" and focus on the pivotal role of geopolitics and geography in regrounding and redefining the concept of "local architecture" in Indonesia. Based on literature studies, we develop an analytical framework specific to Indonesian local architecture to formulate the subject of "local architecture." The theories referred to are the selected theories about Southeast Asian and Indonesian ecology and history collections of historical texts. We took cases from published research works about vernacular architecture in Indonesia to substantiate the concept. The framework includes two parameters: 1) geopolitical areas and 2) elevation geography. Based on some parameters, we choose the cases purposively, focusing on the scope of premodern architecture in Indonesia.

Further analysis evaluates intelligence, resilience to changes, adaptability, and the traditions, transmissions, and sustenance that constitute local architecture in Indonesia. By closely associating local architecture with geopolitics and geography contexts, we distinguish it from other concepts, like ethnic, traditional, and vernacular architecture. The research aims to formulate "local architecture" in Indonesia as a framework for redefining and preserving the vernacular architecture in Indonesia and beyond.

Keywords: Local Architecture, Highland, Moderate Plain, Lowland, Premodern Architecture

1. Introduction

The word "local" is a term that refers to anything related to a particular area, one's neighborhood, or a location. In the discussion about vernacular architecture, the term is mentioned to conceptualize the characteristics of the architectural tradition of a specific culture of a particular region, covering aspects of ethnicity, culture, tectonic ingenuity, and local wisdom. Although the concept of "local" is so close to the idea of vernacular architecture, it has often lost its function in locating or discussing the "localness" of vernacular architecture.

The discussion about vernacular architecture does not automatically discuss location. Nevertheless, it is a crucial aspect. The term regional may have a geographical dimension, but ideological interests shroud it. Oliver did a geographical mapping of vernacular architecture in "The Encyclopedia of Vernacular Architecture of the World (EVAW)". He categorized the vernacular architecture of Indonesia and Southeast Asia not under a single and solid geographical body but environmental-based and cultural commonality (Oliver et al. 1997). He discussed the vernacular architecture in Indonesia as part of Australasia and Oceania, wherein the sub-categories are Malaysia and Borneo or Kalimantan, West Indonesia, Indonesia East, and New Guinea. Other categories outside Indonesia are Melanesia Micronesia, the Philippines, Taiwan/ Formosa, Australia, and New Guinea (Figure 1). EVAW provides a concise introduction and information on vernacular architecture, with accompanying geographical information such as latitude, environmental characters, architectural characters, historical highlights, and a list of architectural examples of the particular locations. However, the study is inevitably general and functions more as an introductory purpose. We would not intend to challenge this category but enhance it with more elaboration on vernacular architecture in Indonesia. Therefore, this paper explored the appropriate use of "local" as a geographical concept to understand and enhance vernacular architecture and conceptualize "local architecture" in Indonesia.

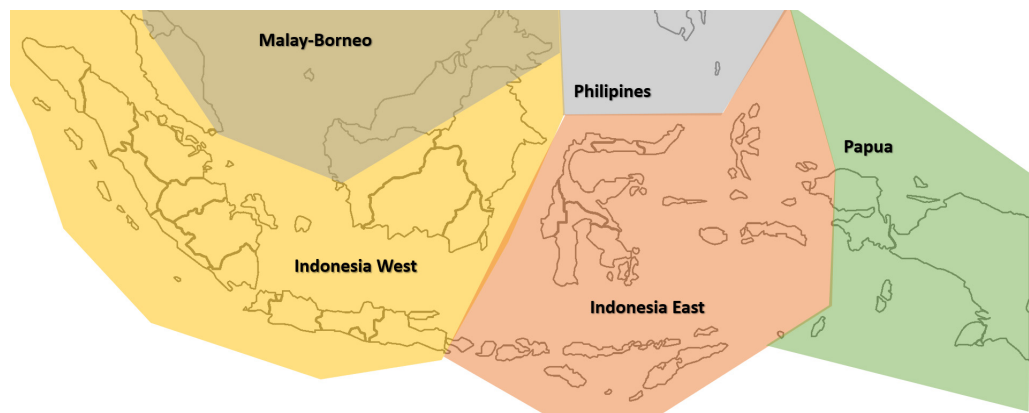


Figure 1: Geographical category of Vernacular Architecture in Indonesia according to EVAW
Source: Oliver, 1992

2. Methodology

The literature review is developed to establish a research framework described in Diagram 1. There are two stages of the literature survey. The first stage is the accumulation of theories and concepts to formulate the idea of "locality." We referred to several primary literature, such as *The Ecology of the Malay Archipelago* by Alfred Russel Wallace (2008), the geographical category of vernacular architecture according to Paul Oliver (1997), and the *Historical Atlas of Indonesia* as written by Robert Cribbs (2000). Historical sources depicting the dynamic of Indonesia and Southeast Asia started with the elaboration of the prehistoric migration of Africa-Pacific, Austronesian, and Dongson civilizations, such as Peter Bellwood (2000) and Wilhelm H Solheim (1978, in Reyes, 2010); also a historical reference about the dynamic of premodern cosmopolitanisms in Asia (300AD- 1500AD), referring to Andrea Acri (2016), Heather Sutherland (2021), O.C. Wolters (2017), and Anthony Reid (2004). Based on these literature reviews, we establish geographical parameters to examine the natural characteristics of the environment, culture, and history of vernacular architecture in various locations in Indonesia. Using geographical parameters, we discussed various aspects: 1) geotectonic dynamic and ecology, 2) historical dynamic, 3) ethnic distribution, 4) and dwelling culture. The examination of the literature lends a base to generating relevant geographical categories.

The second stage is literature surveys of scientific works of scholars researching vernacular architecture in Indonesia. This stage is independent and parallel with the first stages. Both would be superimposed to gain a plausible explanation of the distribution of certain architectural characters. We compiled the data from scientific journals discussing vernacular architecture in Indonesia.

The third stage analyzes how specific environmental conditions led to architectural uniqueness, difference and convergence, transformation, and transmission. More than biogeographic characters, examinations are also done on the dynamic of geopolitical characters that impacted diversity and multiplicity in every location category. In the end, we produce a map of the characteristics of local architecture within the Indonesian territory.

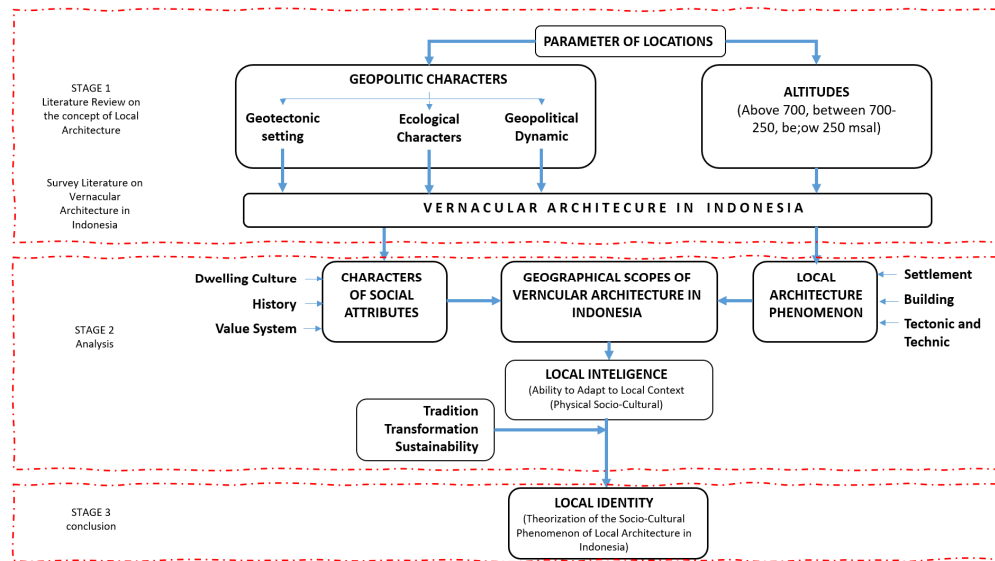


Diagram 2: Research Framework

Indonesia is a diverse, dynamic, and complex socio-cultural field developed in various localities. A comprehensive mapping of the concept of "locals" is therefore needed. The objective is to understand how geography could help understand vernacular architecture and explore a possible map of architectural characteristics of vernacular architecture in Indonesia using the framework of "local architecture."

3. Literature Review

History, geology, and ecology are three critical aspects of studying vernacular architecture in Indonesia. History helps trace geographic change and cultural diversity, supporting natural and cultural heritage preservation. Geology helps us understand natural phenomena and natural resource management. Meanwhile, livelihoods and primary food reflect human relationships with ecosystems and culture, influencing Indonesia's ecology and cultural diversity. In the following three sections, we describe these aspects to build a dynamic map of Indonesian locations as a basis for studying vernacular architecture.

3.1. Geo-tectonic foundation of Indonesia

To locate the geography of Indonesia, we started by referring to the geotectonic formation and early human migration in Indonesia from the Middle Pleistocene as early as 125,000 years ago. At that time, the geotectonic of the Southeast Asian archipelago had concentrated on two continental shelves, namely the Sunda Shelf (Sundaland) and the Sahul Shelf (Sahuland) (see Figure 2). The Sunda Shelf unites Kalimantan Java, Sumatra and the Malay Peninsula with the entire continent of Asia. On the east side is the Sahuland, which links Papua and Australia. Between them are the ocean trenches that connected the Banda volcanic arc to the Lesser Sunda Islands and Maluku archipelago. Tectonic depressions along the southern coast of Sumatra, the Lesser Sunda Islands, and the present-day Banda arc formation coincide with a series of volcanoes that are still active today. Additionally, Jeffrey

Cook (in Oliver,1992) suggests nine entries also recognize climatic diversity based on architectural impact, and Indonesia is considered tropical with stable year-round warmth and humidity.

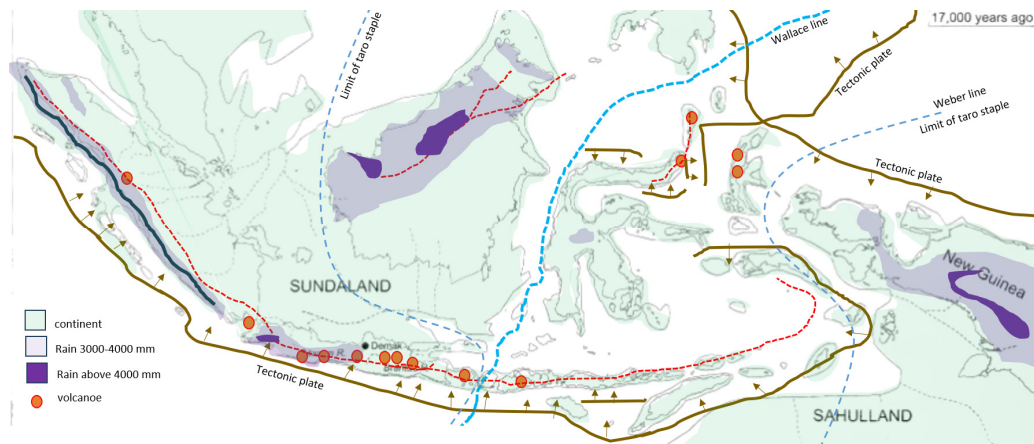


Figure 2: The Geological Map of the Indonesian Archipelago

Evidence of prehistoric humans dating from 1 million years was discovered on Java, Flores, and Sulawesi (Belwood, 2000). Horticulture developed as the ecology became more stable and plant species became more regulated for domestication. After the stable geological structure of the Southeast Asian archipelago was formed approximately 6,000-5,000 years ago, the indigenous Australo-Melanesians started to settle in fixed locations and cultivate. They are the ancestors of the Kubu and Sakai people in Sumatra and Toala in South Sulawesi. The vernacular architecture of Tulang Mamak in Riau (Faisal and Wihardyanto, 2020) is one example. Apart from the three Austro-Melanesian races, there was an Austro-Mongoloid race or Southern Mongoloid (Belwood, 2000) from the northern hemisphere who migrated in search of warmer habitats at the equator. The wet Sundaland was filled with rainforest and shaped agriculturist livelihood.

The Austro Melanesian, inhabiting the Sahuland, mixed with the Mongolid race from the Southeast Asian continent, was the earlier population to the Lesser Sunda Islands, the Maluku, and Papua islands approximately 4000 years ago. The east-west archipelagic stretch of islands marked a volcanic chain that lends a base to the fertile, warm, and self-sufficient places. The Banda trench gave birth to an ecology suitable for spices and trained skillful sailors. Along with the finding of early traces of prehistoric humans, the later evolution of humans and their domesticity confirmed that Java, Lesser Sunda Islands, and Sulawesi had been locations of earlier habitation. As a result, Figure3. illustrates the geotectonic profile of the Indonesian archipelago superimposed with two human migration routes.

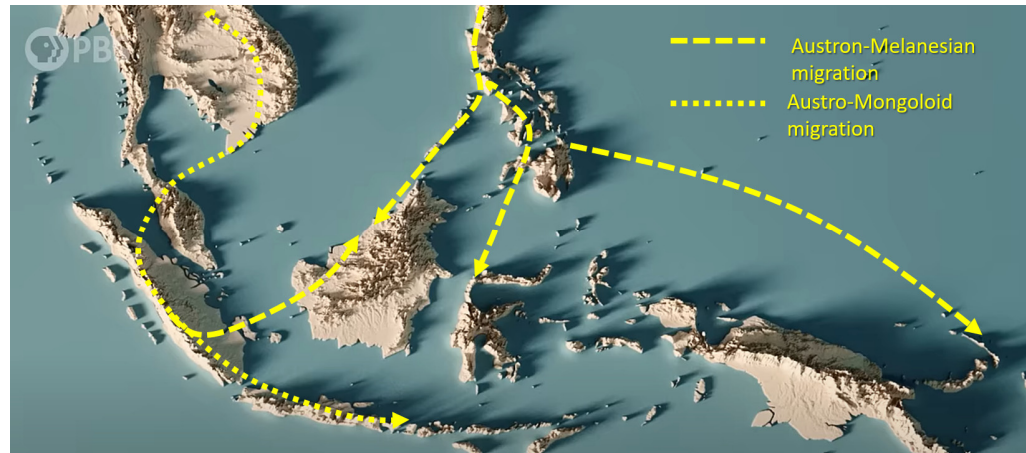


Figure 3: Illustration of Indonesia's Terrain Profile and Human Migration
Source: (Bellwood superimposed on PBS Eons, 2023)

3.2 Impact of Ecohistory on early settlement and architecture

Horticulture developed as the ecology became more stable, regulated, and available for domestication. Humans started locating and characterizing the respective locations. The Austro Melanesian races and Austro- Mongoloid. They were predecessors of the Austronesian- speaking community. The Austronesian immigrants from the continent lived in large domestic units or clans (Heine Geldern, Vroklage, Waterson, 1990), suitable for managing agricultural life. They pushed the native Austro-Melanesian inhabitants eastward. It explained how the native population in the Lesser Sunda Islands has been distinct from those of Maluku and Papua islands since approximately 4,000 years ago. In his book "Malay Archipelago," Alfred Russel Wallace categorized the geographical expanse of the Malay Archipelago into five distinct regions according to local flora and fauna, human settlements, and incorporating insights from geography, anthropology, and biology. These regions are the following, as illustrated in Figure 4): 1) the Indo-Malay Islands: comprising the Malay Peninsula and Singapore, Kalimantan, Java and Sumatera; 2) the Timor group, comprising the islands of Timor, Flores, Sumbawa, Lombok with several smaller islands, 3) Sulawesi: also comprising Sula islands and Buton; 4) the Maluku group: comprising Buru, Seram, Bacan, Halmahera, Morotai; with smaller islands, Tidore, Ternate, Makian Kayoan, Banda, Ambon, Banda, Watubelu, and Gorong; and 5) The Papuan group: comprising the great island of New Guinea, with the Aru Islands. The Indo-Malay and Sulawesi Groups were the domain of paddy planters. The Timor and Maluku group was the domain of horticulture and spices. The Lesser Sunda Islands, including Bali, also adopted rice cultivation and, much later on, developed the traditional Subak irrigation system.

Other than a staple, Koji Sato (2020) pointed out that the ecohistory of a location is associated with specific species of plants used to construct vernacular architecture. Bamboo and wood, including coconut trees, are mostly found in Indonesia. Palmwood is typical in eastern islands. Teak and other hardwood products were available in the rainforest ecology of the western part of Indonesia and enabled them to construct big structures.

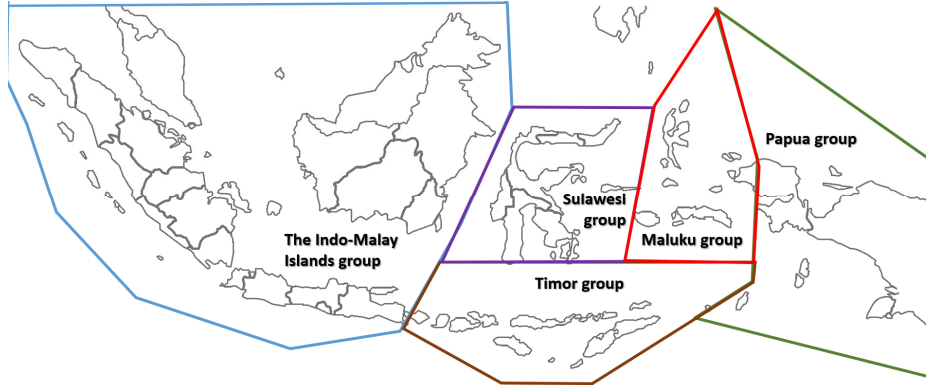


Figure 4: Biogeographical map of Indo-Malay Archipelago according to Alfred Russel Wallace
Source: Oliver, 1992.

3.3 Geopolitical characteristic of the premodern Indonesian archipelago

Geopolitics is the study of geography's influence on power distribution in geographic areas. It explains how human activities are framed in power distribution and circulation, on sea and land, and how it determines cultural production. In understanding vernacular architecture, geopolitics is important to contextualize the interactions among traditional political forces in various fields such as trade, the influence of power translation, religion, and migration.

There is a coincidence of premodern geographical power characteristics in the Indonesian archipelago. The western part of Indonesia has a dynamic history of global politics of oceanic exploration and trade since the 3rd century AD, supported by strong Hindu- Buddhist Kingdoms, concentrated on the north coast of Java, the eastern coast of Sumatera, and the southern peninsula of Sulawesi (see Figure 6). The Eastern Indonesia, encompassing clusters of islands rich of spices produces. The deep ocean that separated Sunda land from Sulawesi seems to be the natural border of Indian direct influence. While the western part of Indonesia absorbed Indian culture between the 6th and 10th centuries AD, the eastern islands remained untouched by Indianized power, except for Bali, which formed the Hindu Kingdom due to its interactions with Java during the arrival of Indians was also recorded by the people in eastern Indonesia. Still, no Indian power exists in Eastern Indonesia. They maintain the old Austronesian traces. The Maluku Islands had a rich tradition of trade and seafaring centered on spices. As premodern global trade flourished, trade competitions emerged on islands. The Sultanates of Ternate and Tidore controlled it. In South Sulawesi, the Bugis and Makassar played pivotal roles in consolidating maritime trade and engaging with forces in the Malacca Strait.

Major kingdoms such as Tarumanegara, Srivijaya, Majapahit (4th to 14th centuries), and the Medang Kingdom (8th to 10th centuries) were established in Java and Sumatra. Majapahit, for example, was a maritime empire based in Fulcrum but controlling much of Sumatra and the Malay Peninsula, renowned for controlling important naval trade routes. The development of power in Java, such as Majapahit power, was pivotal in connecting the two geopolitical forces. The importance of Java in both regions is confirmed by the circulation of Javanese terms around Indonesia (see Figure 5).

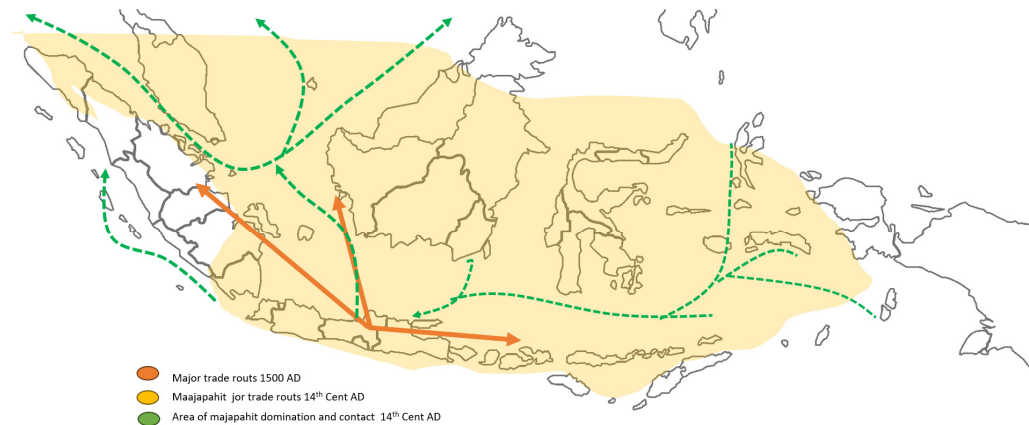


Figure 5: Area of Majapahit's power and influence up to 14th-18th century AD
Source: redrwan from Cribb, 2000

The traditional native Indonesians were remnants of horticultural, paddy farmers, communities, and cultivators of spices. The indigenous people, like the Dayak, Nias, and Mentawai communities, are in inner West Java. Although facing limited autonomy, the geopolitical of the time made them maintain a decentralized political structure with various powers. The oceanic native established their life on boats and gradually shifted to the mainland. They were concentrated along the coastline. The more consolidated power took place in the following three milestones:

- 1) At the turn of the century AD, the Malacca Islands were active in trade, shipping, and maritime culture. In present-day Indonesia, it culminates in the reign of Srivijaya in the 4th century AD. Migrants from other islands and foreign countries, including Europeans, mingled with the oceanic and inland natives, triggering a multicultural life.
- 2) The next milestone is the power of Muslim powers that stood on the earlier Buddhist power since the 12th Century AD. Chinese kingdoms started to participate actively. It helps clarify that certain ethnic groups in the Lesser Sunda Islands have origins in regions such as Malacca, Minangkabau, and China. Robert Cribb (2000) acknowledges Bugis and the Chinese as ethnics that had been distributed in many places in Indonesia (see Figure 6). We can further question the accuracy of terms like Chinese, Bugis, or Java, but here is what is important it demonstrates phenomena of diversity and cultural redistribution, including house styles.
- 3) The third milestone was in the 16th century when the Chinese and Portuguese. This era also witnessed the contestation of Western countries that came under the Christian missionary movement, which would face resistance against the existing Muslim domination, resulting in a map of resistance towards foreign Western actions (see the grey area in Fig 7). Islands like Lombok and Sumbawa had their sultanates with varying political organizations. Portuguese is perhaps the foreign Western power that manages to mingle with the locals and contribute to the eclectic nature of the architecture along the lowland and offshore. Later, the Dutch sought direct engagement with the Eastern Archipelago for spices, bypassing Malay-Muslim intermediaries.

The result of the geography of power evolving up to the 18th century is that Indonesia is divided into two politics of geo-environment, the dominant agriculture life of Western Indonesia and the maritime life of Eastern Indonesia. Both trade, from seafaring peddlers up to maritime kingdoms. The main and powerful land kingdoms have been concentrated in Java, the Malay Peninsula, and Sumatera since the 4th century AD (see Figure7)

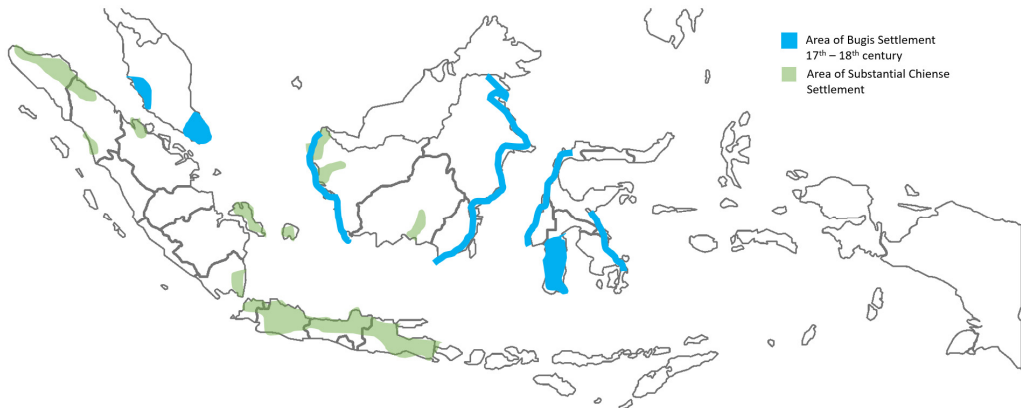


Figure 6: Chinese, Bugis, and Portuguese distribution up to the 20th century AD
Source: redrwan from Cribb, 2000

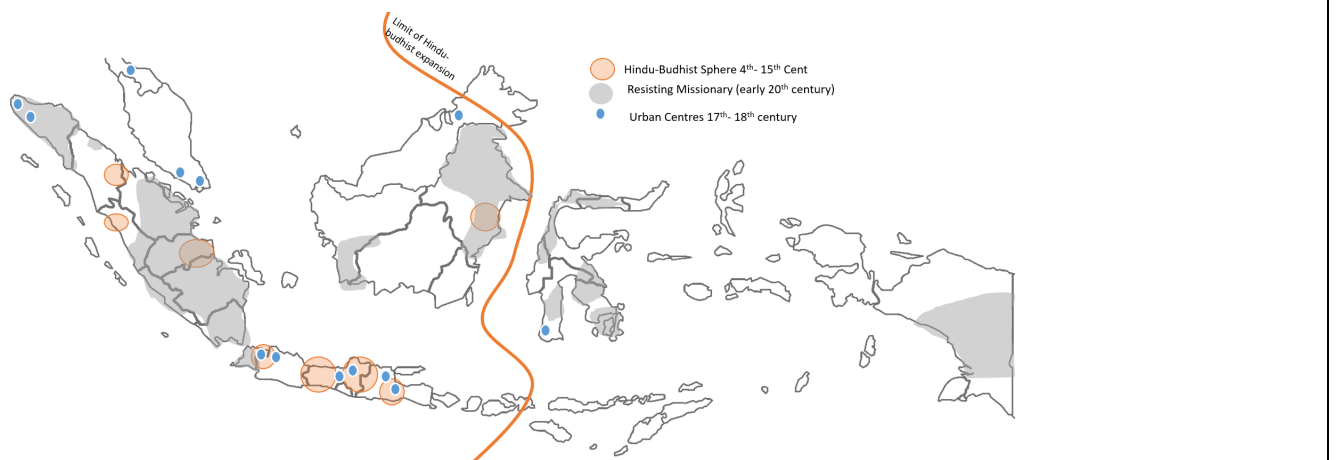


Figure 7: Premodeen History up to 18th Century AD
Source: redrwan from Cribb, 2000

3.4 Examining Dwelling Culture across Altitude Zones

Humans spread to varying altitudes where species thrived, faced with diverse natural challenges and potentials. Many traditional legends in Indonesia narrated ancestors who descended to earth from mountain peaks or emerged from the ocean. Gusti Asnan (2016) offers a critical reading that this story may reflect the emergence of horticultural life in the highlands, where water sources were abundant. When large-scale farming became popular, people moved to warmer, lower places with climates and soils suitable for growing crops, especially rice. The highland, moderate land, and lowland flows must have been through rivers. Altitude, therefore, contributed to characterize vernacular settlements. Vertically, we examined dwelling cultures, covering vernacular architecture representing three different contexts: lowland plain in altitude of less than 250 meters above sea level (masl), moderate plain in altitudes between 250 and 700 masl, and highland plain in altitudes above 700 masl.

4. Analysis of characters for Vernacular Architecture in Indonesia

Geography and geopolitics provide the basis for framing "location" and "locality" in "local architecture" in a horizontal and vertical context. The following is an analysis of architectural characteristics based on the superimposing geographic, geotectonic, and geo-history facts of the premodern cultures of Indonesia in two stages- the horizontal and vertical geographical characteristics. Table 1 is a collection of ethnicities in Indonesia gathered from various studies mapped according to the vertical and horizontal altitudes.

Table 1: Locality Mapping of the Ethnic Architectures in Indonesia

Locations Grouping	1. Sumatera Kalimantan Group			2. Sulawesi-Maluku Group		3. Southern-Ocean Belt Group			4. Papua Group
Altitudes	1.1 The sphere of Southern China Sea	1.2. Sea passage of Malaka and Java Straits	1.3 Interior land	2.1 Sulawesi Islands	2.2 Maluku group of islands	3.1 Western coast of Sumatera Island	3.2 Southern Coast of Java	3.2 Lesser Sunda Islands	4 Papua
Lowland area of moderate height above 700masl		1) Batak Karo 2) Batak Toba 3) Aceh Gayo 4) Aceh Alas	Dayak Ngaju	1) Tana Toraja 2) Toraja Utara 3) Tambi-Poso 4) Mamasa		1) Sunfai penuh, Kerinci 2) Rao-Rao Nagari 3) Nias Utara-gunung sitoli 4) Pekon Kenali	1) Tengger-Bromo 2) Ciptagelar	1) Bunaq 2) Wai rebo 3) Ngadha	1) Igkojei 2) Puncak Jaya-Honai
Moderate area, average height between 250-699 masl		1) Rumah Betang 2) Brebes	area around Mahakam ulu	1) Karampuang 2) Minahasa 3) Sinjai 4) Konawe, Southeast Sulawesi	1) Banda Island 2) Pulau Seram	1) Mandailing Nata-Bagas godang 2) Nagari Sungayang 3) Batipuh 4) Mentawai 5) Tanah Datar 6) Agam	1) Ponorogo 2) Yogyakarta 3) Sembalun 4) Kampung Naga	1) Sumba-Uma Mbatangu 2) Tetun 3) Kefamenanu-Dawan 4) Kampung Tarung 5) Kei besar	1) wosilimo
Highland area of height average height < 250 masl	1) Bidayuh, Kuching 2) Natuna 3) Batam 4) Kepulauan Riau 5) Kapuas (bansir Laut) 6) Mempawah 7) Sambas 8) Bengkayang-Bidayuh 9) Radakng	1) Lubuk Sukon 2) Lahat-Ghumah Baghi 3) Ruma Kudus 4) Bangka Belitung 5) Palembang 6) Dayak Ketapang 7) Dayak Jangkang 8) Madura 9) Kampar 10) Lumansari-Kalang 11) Bangkalan 12) Gresik	1) Iban 2) Kemyah 3) Pulaulaut	1) lobo ngata toro-Sulawesi Tengah 2) Luwu, Sulawesi selatan	1) Tobelo-Halmahera 2) Bajo (Halmahera) 3) Tidore 4) Maluku 5) Leihitu	1) Kajang Padati, Padang	1) Banyuwangi-Osing 2) Solo 3) Tenganan 4) Banjar 5) Sade	1) Ratenggaro 2) Alor 3) Sikka-NGGELA 4) Kei kecil 5) Tanimbar	1) Korowai

4.1 Geographical scopes of vernacular architectural characters

Indonesian locality refers to the cartographic and geotectonic scope in which the Republic of Indonesia is located. Based on an analysis that summarizes the case of vernacular architecture on geotectonic, geopolitical, and eco- historical parameters, a conceptual categorization is obtained to refine the concept of local architecture horizontally and vertically. Horizontally, there are eight geographical scopes upon which vernacular architectural characters evolved. They are clustered into four major groups: the Sumatra-Kalimantan Group, Sulawesi-Maluku Group, Southern Ocean belt islands, and Papua Group. See the clustering of geographical scopes in Figure 8

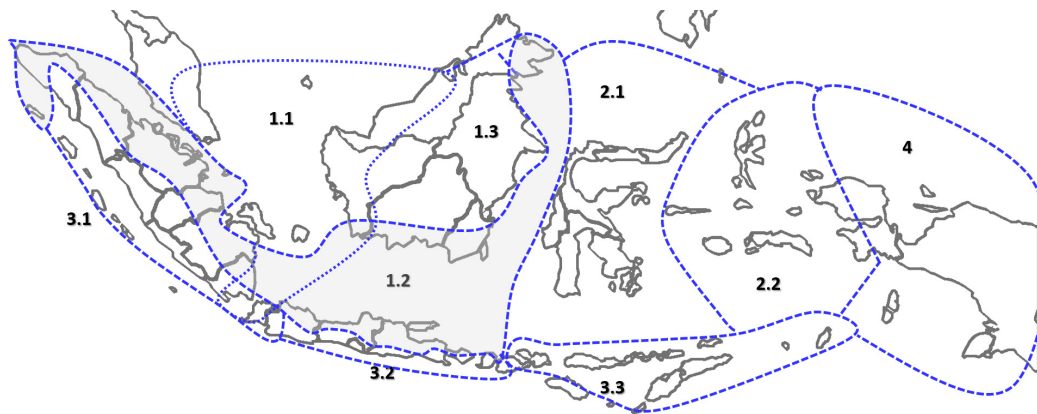


Figure 8: Map of Geographical Scopes for Vernacular Architecture in Indonesia
Source: Author

1. Sumatra-Kalimantan-Group. The Malay group occupies the area of Indonesia toward the western parts. The Encyclopedia of Vernacular Architecture of the World also labels this area under the same name. Geologically, they evolved from the geotectonic of Sundaland on the Eurasia Plate. There are distinct sub-characters, which would be elaborated as First is *the oceanic Southern China Sea*, which intersects with the second one, *along Sea routes of Malaka and Java Strait*. Multicultural culture developed with the strong amalgamation with Sino-Indic culture, preceded by the arrival of as early as Austronesian over the land of the Austromelanosoid from which the Malay world evolved. The third one is the interior Kalimantan, whose ecological characteristics share some points with the Southeast Asian continent. EVAW (1992) described the environment as dense virgin equatorial forests and wildlife. Inheriting from Austronesian and Austroasiatic migrants, they mostly managed unilineal kinship.

2. Sulawesi-Maluku Group. The Sulawesi-Maluku group occupies the area of Indonesia toward the eastern parts of descendants of Austronesian Sailors. They have a maritime culture, which is rooted date back to prehistoric times. Geologically, their culture is shaped by deep ocean volcanoes and the geotectonic of the Banda oceanic trench between Sundaland and Sahulland. The ecological characteristics are shared with the Philippine archipelago. The area can be distinguished by two distinct contrasting sub-characters of archepilagical lives of Sahul

land: 1) The *Sulawesi Island*, home of agricultural and remnant of horticultural culture, and 2) the *Maluku Islets* as spice producers.

3. Southern-ocean-belt islands. The Southern Ocean Belt islands stand along the "ring of fire" volcanic belt facing the Indian Ocean, at the direct meeting of the Indo-Australian and Eurasian Plate. It is bounded by a mountain range that divides the island of Sumatra into west and east, and south-north for Java Island and the Lesser Sunda Islands. Along this belt, culture and architecture have evolved less rapidly than those facing the Java Sea and the Strait of Malacca. We considered this place the offshore of ancient migration since the late Pleistocene before Malaka Street was accessible in the early Christmas era (Meulen, 1974). However, large rivers connect them well to the Java Sea and the Malacca Strait. Matrilineal societies are found in many of these locus. Most of them retain the dominating pyramidal roof architecture. Three sub-characters are discussed here: first, the *Southern Coast of Sumatera* interior, where bent-roof, as described by Reimar Schefold (2005). Second, the *Lesser Sunda Islands*, which are full of architecture with pyramidal tower roof. Third, the *Southern Coast of Java* evolved as an interior land, a more urbanized place than *the oceanic Southern China Sea*, and *along the sea routes of Malaka and Java Strait*. They developed into a major indic concentric kingdom.

4. Papua Group. The Papua group occupies the area of Indonesia toward the eastern parts, covering mainly the Papua islands. Geologically, they evolved from the geotectonic of the Sahul Shelf. They are the last frontier of cultures of the Austro Melanosoid in Indonesia. Papua New Guinea is not a single culture but is a collection of diverse cultures, some overlapping and interrelated, some far apart. Cultural diversity is reflected in the diversity of architectural forms and designs across the country.

4.2. Geographic Variation of Vernacular Architecture

Location for vernacular architecture can be defined as a physical or geographical place encompassing important aspects of a society's history, environment, and culture. It includes the physical geography, climate, natural resources, and historical patterns that shape the culture's unique identity and characteristics. In a location, the portrait of society and culture is no longer single, and time does not stand still. Thus, "Local Architecture" can be conceptualized as an important framework for understanding architecture as the fruit of the relationship between humans, the environment, and culture that develops in a location. The architectural characters are examined by highlighting the advent of the location where the architecture is identified and examined by the following parameters: 1) local intelligence manifested in architectural products and concepts, and 2) traditions, transmission, and sustainability.

4.2.1 Sumatra-Kalimantan group islands.

Vernacular architecture in Sumatra-Kalimantan group islands generally demonstrates 1) a steeply pitched saddle roof over an enclosed living hall for accommodating extended family, 2) bent or prow roof style, and 3) raised structures on piles. They have ancient traditions resembling Proto-Malay building techniques, using timber frame construction, simple bamboo frames, and thatch-leaf roofs or leaf-covered shelters.

4.2.2 The sphere of the Southern China Sea

This region has a lowland and moderate land plain facing the South China Sea, stretching from Natuna Island north to the West Kalimantan Coast, the Bangka-Belitung Islands, and the Riau Islands south. Indigenous people build dwellings on the sea and land. At coastlines, they live on boats or rafts, floating on rivers or sea. Trade introduced the typology of dockyards, which initially functioned as a means of communication and circulation but later became a place for docking houseboats. These structures are known as *pelantar* in the Riau River and *gertak* in the Kapuas River. Later, they triggered vernacular settlements of houses on stilts connected by dockyards along riverbanks.

On land, stilt houses have wooden structures with construction made of wooden planks. They generally constituted a living hall with a front and back porch (*serambi*). The kitchen is important and sacred, whether alone or integrated into the porch. Rooms are built from wooden wall planks, indicating the innovation of cutting tools. The architecture underscores the importance of columns and makes columns a representation of philosophical meaning. In reference to European aesthetics, this structure was refined and became a typology of the Malay palaces on Kalimantan's west coast.

Multicultural life evolved, especially dependent on large rivers. Cultural exchanges resulted in eclectic architecture that combines European, Javanese, Chinese, and Bugis influences in its architectural character. Interaction with Bugis sailors from Eastern Indonesia and European sailors influenced this architecture, with distinctive features such as the Bugis *timpa laja* gable lattice barge board and European bungalow style. This architecture characterizes the architecture of the Malay royal palaces, such as the Riau Community. Local Chinese architecture also manifested an eclectic nature, especially combining masonry and wooden walls.

4.2.3 Kalimantan Interior.

Apart from the coast, older communities have built vernacular architecture, such as the Dayak in the interior of Kalimantan and the Lum people in Bangka Belitung island. They used large logs, rattan, and bamboo to build houses with various plans, including square and elongated apartments, as well as circular or curved shapes. Dayak houses are generally communal houses that stand on a height and are connected by wooden platforms like dockyard platforms as *pelantar* did in the offshore house. It seems typical that either over the soil or water, the architecture creates a distance between the dwelling and the surface of the land or water. The development of life on the coast is made possible by productive inland life- producing commodities that will be transported through major rivers and marketed on seaports or river estuaries. Jarzombek and Prakash (2013) underlines the Dayak people as the first society, who lived in the interior of Kalimantan and developed many distinctive cultural characteristics and left lasting traces of the architecture of the proto-Austronesian horticultural society. Many of the most discussed ones stood near the western coast of Kalimantan facing the South China Sea – the architecture of House of Dayak Radahkh, *rumah betang*, the eastern coast facing Java Sea, and developed interactions with Javanese kingdoms and Dayak Pasugian at Ketapang, and the easter coast facing Sulawesi Strait. Like most houses off the coast, with their betang houses, they make piers that are raised high off

the ground, and attached to them are long houses called various names - *rumah betang*, *lamin*, etc.

4.2.3 Sea passage of Malaka and Java Straits.

The waterway along the Strait of Malacca to the Java Sea results from transformations of ancient rivers on the Sunda shelf. Since the reign of the Srivijaya Kingdom in the 3rd century AD, this region has turned into a sea passage for maritime trade activities. The architecture along the north coast of Java and east Sumatra is closely linked to the dynamic of busy trade along these sea passages. The ancient kingdoms grew and developed from the 3rd century AD to the 16th century AD, consolidating agriculture and maritime trade. This region reflects some architectural characteristics that use large logs, dominating roofs, and large dimensions. The architecture in this place reflects the influence of various cultures along this corridor, including the inland vernacular architecture of Karo Batak, Toba Batak, Malay Peninsula, Riau, and Kampar.

During the 6th to 10th centuries AD, or the period of development of Asian trade networks (Lombard, 2000) and Esoteric Buddhism (Acri, 2016), Sumatra and the Malay Peninsula were the centers of what Ptolemy called "*Golden Chersonesos*" (Meulen, 1974) with major ports on Java and the coast of Kalimantan. It triggered the emergence of kingdoms and Buddhist temples on the islands of Sumatra and Java, such as Terumanagara in West Java, Vangka, and Pajajaran, which rely on spices.

During the period of domination of Islamic maritime trade (12th to 15th centuries), the Fulcrum of Sumatra was redistributed to Java and Sulawesi, thus triggering the invention of urban structures in Java. Increased trade competition among polities or sovereigns occurred among the Sultanates of Riau, Sunda Kelapa-Banten, Demak, and Riau. It encouraged the development of eclectic vernacular architecture on the north coast of Java, the south coast of Kalimantan, and South Sulawesi. The combination of Malay, Bugis, and Javanese architecture was reflected in architecture with pyramidal roof styles in locations such as Palembang, Banjarmasin, Langkat, and many more. The interaction of the coast of South Kalimantan does not change the architecture. Still, it makes the architecture - Rumah Betang in Dayak Ketapang, Dayak Jangkang, and Dayak Tomun - absorb foreign techniques and mixtures.

The Java Sea became busier, and transoceanic transformations and urbanization took place more intensively. Foreign factors such as Islam, China, and Portuguese had a big role in this development. The Majapahit temples recorded the presence of buildings with conical or pyramidal roof styles in their relief panels, which later coincided with the characteristic of *joglo* or *pencu*. The Joglo typology itself is thought to have emerged after the arrival of Islam, and in Java, Kudus, Demak, Brebes, Cirebon, Madura, Gresik, and Bangkalan house architecture emerged.

Java evolved so rapidly that it progressed into urbanized life. At the same time, building technology developed more industrial and well-codified, triggering the emergence of advanced artisans. Architectural formulations were identified, such as "Kawruh Kalang" in Java and "Iontarak" among the Bugis and "Asta Kosala Asta kosali" in Bali. Likewise, the

knock-down method was advanced to codify components, professions, and knowledge developed. The nuclearization of the domestic life of the earlier extended families living in big or long houses seemed to trigger demand for small structures, as found in Malay, Bugis, and Javanese architectures.

4.2.2 Sulawesi-Maluku Group.

In this area, there are three types of dwellings, as stated in EVAW (Oliver, 1997), namely nomadic camps, houseboats, and temporary dwellings. Boats are important structural representations and architectural models, reflecting the technological importance of active structure structures. The simplest type of house is generally a single multi-purpose room with a fireplace and grain storage in the attic.

Sulawesi Island

Sulawesi is the largest island in a geological setting, separated by the Sulawesi Strait from the Sunda shelf. Since prehistoric times, the Sulawesi Strait has been an important migration hub. It then kept the trace of Austronesian architectural remains or earlier - the Proto-Austronesian- in the interior highland. They are home to the *tongkonan* architecture of the Toraja, *lobo ngata toro* architecture from Central Sulawesi, and Mamuju and Mamasa. In the southern highlands, architecture is characterized by elongated halls with long saddle-gabled roofs. One example is the architecture of the Bugis community in Kajang, Karampuang, and Kendari. Stilt houses, typically found in the South China Ocean, are found in lowlands and coasts with slightly different characters, such as in Konawe, Gorontalo, Soppeng, and Sinjai. Among the Bugis in south Sulawesi, they are called *bola*.

The further development of architecture in Sulawesi is also closely related to the development of Islamic rule, which produced royal architecture such as Luwu, Gowa, Makassar, Soppeng, and Sinjai. Sulawesi society is the result of the development of Austronesian society, which has maritime and agricultural traditions which then received various cultural influences from Europe, especially the Portuguese and the Dutch. Architectural transformation is reflected in changes from time to time, including from conical to square architectural shapes.

Maluku Groups of Island

While Sulawesi is significantly associated with agricultural life, the Maluku Islands are more associated with oceanic life, coastal activities, and the traditional life of sea paddlers. This region was hypothesized by anthropologists (Solheim 1978, in Reyes) as the origin of the Austronesian language-speaking people. They had interacted with various places since olden times, during the Asian Networks of the 3rd to 14th, and European powers such as the Portuguese and Dutch in the 15th to 16th centuries AD. The development of Islam played an important role in maritime trade, especially after the collapse of Majapahit in the 14th century AD.

The strong Dutch influence in Tidore, Ternate, Banda Island, and Seram Island also contributes to the eclectic architecture of the mosque with striking overlapping roofs, as seen in Ternate and Ambon. Coastal architectures triggered simple box houses attached to the dockyard, like *pelantar*, but here is addressed as *damage*, such as in Aru, Seram, and Bajo in

Halmahera. In the lowlands, there is typical Bugis roof stilt architecture, with gable lattice ornaments of *timpalaja*, such as the Tobelo community in Halmahera, Maluku, and Leihitu.

4.2.3 Southern Ocean Belt Islands

The west coast of Sumatra and the south of Java form a series of locations between mountain ranges, with their volcanic points, and the Indian Ocean trench where the Indo-Australian and Asian tectonic plates meet. In contrast to the cosmopolitan beaches on the other side, this series of locations along the geological side are well preserved. Rice is their staple food. We identify the concentration of matrilineal society in the western part of Sumatra and the Savu cluster of islands. Its fertile environment, dominated by high and wet plains, made it develop into agricultural settlements and the establishment of concentric kingdoms in Java. Old kingdoms were established, such as Barus and Pagaruyung Kingdoms, in Sumatra. Meulen (1974) hypothesized this southern coast as an ancient crossroad that predated the 3rd century AD when the Strait of Malaka was still an unconsolidated waterway.

Matrilineal kinship is often found, such as in the Minang, Enggano, Kerinci, Timor, and Flores communities. This bilateral pattern is common in Java and patrilineal in Batak and Lampung. Matrilineal with connubial characters dominate the islands in the Savu group. The architectural characteristic of this area is centered on a four-pillar structure, which in Javanese is called "soko guru," which is tied with wall plates in various types of knock-down construction, forming a central space gestalt that is often prioritized. This central layout with four main columns is also found in Timor and even Honai Papua. Wood and bamboo are the main materials.

At the top of these four pillars, there is usually an attic for storing food stock and a hanging rack. In most places, this tower is not utilized (Koji Sato). However, in Lombok and Wairebo, although not entirely, this place is to store food, ancestral relics, and even a place to hide children during times of conflict. The significance explains the sacred status attributed to this four-pillar hall.

The western coast of Sumatera Island

Locations on the South Coast of Sumatra is land covered with dense rainforest. This area is an enclave defined by the sea and a mountain range that stretches from the tip of Sumatra to Lampung. This area became a sanctuary for traditional, Austronesian-speaking communities, such as the Karo Batak and Toba Batak (Central-North Sumatra), Batin (East Sumatra), Niha (South Nias), Siberut (Mentawai). They are generally unilineal and rain-fed rice-growing communities.

The West Sumatra Sea was the main trade route to the South China Sea via the Sunda Strait before the 3rd century AD. Old kingdoms such as Pagaruyung, Bengkulu, and Java survived here. Records of sea voyages coincide with the rise of Boat tectonics, even in highland plains. We hypothesize that this side of the area and the interior of Kalimantan island are secluded enough to make the remnant of old Austronesian culture well preserved. In the highlands, there is a more ancient culture, namely the architecture of an ancient community that is suspected of carrying the tradition of houseboats at the foot of Mount Pasagi, the Pekon Kenali community.

In the lowland plains, we identify the *omo* architecture people in North and South Nias Island. In the moderate plains, there is large architecture of farming communities that have the character of large houses, such as the *bagas godang architecture rumah gadang* from Minangkabau Tanah Datar. The architectural remains of the long house were also found as another variant of the house in Kalimantan, namely in Pasaman Minangkabau, Batih community in Jambi Sumatera.

Southern Coast of Java

The southern coast of Java is a fairly steep expanse of highlands that extends into the lowlands towards the Indian Ocean. The general depth of the Indian Ocean makes it unfavorable for maritime trade. It makes the area inland from the development of settlements in the Java Sea. Therefore, many traditional cultures are well preserved here, such as the Sundanese community in Baduy village, Naga Village and Cipta Gelar Village (West Java), villages in South Bali, Ancient Java (Central Java and East Java, the Sasak community in Lombok, and Tengger on the coast of Mount Bromo. These locations are centers of rice farming traditions and were areas where ancient kingdoms developed on their feet of volcanoes.

The local population developed carpentry skills for building construction. Texts about carpentry and other basic construction formulas. Basic architectural concepts, such as the shape of roof-tower in Sumbawa, Sumba, and Java; The composition of the spatial unit - *rong* - formed by four columns and their binding beams; the tiered roof structure - *tumpang*, which is found in all these places is evidence that the exchange of traditions occurred, reaching the island of Timor and the Pacific region.

The tower roofs are acknowledged, and the use of modular woodworking for residences in Javanese architecture is similar to those in Sumbawa. But in Java, it has become more industrial and produces architectural types of *joglo* and *pencu* in Jawa and *rumah kampung* (an architectural house of a commoner in Java). This structure combines the tradition of tower roofs with a coastal house plan. In the lowlands, this architecture is found in the Osing and Madurese communities, while in the highlands, it is found in Lombok, Sembalun, and Tengger/Bromo.

Lesser Sunda Islands

The people of the Lesser Sunda islands have corn, sweet potatoes, and sago as their natural staple. Paddy farming was not their natural cultivation. House-Society characterizes their social and spatial organization as well as the common house concept. The inhabitants cover Timor, Sabu, Tanimbar, Wanukakan (Southwest Sumba), and Wewewa (West Sumba).

A house, for them, is a place of origin, ritual, storage of heirlooms, and a meeting place. The roof dominates most houses. The wall seems to be just a barrier construction to fill the space between the roof and the floor. Wooden plank is most intensive in the core rooms, which are usually female. The interior is usually dark, without sufficient windows, and is associated with fertility and food rituals. This core chamber is conceptually a structural unit formed by four pillars, with a hanging rack above. The arrangement of landscape and residential elements

represent the complementarity concepts of female and male gender, such as the main pillars of women and men, women's houses, and men's houses. A meeting place is a sacred spatial setting, in the form of a stone installation under a tree, to a meeting hall called *bruga/ baruga/ beruga*.

In the lowland plain, we can see pyramid-shaped architecture, as seen in the architecture of Alor, Sikka, and Kei's people. In some areas, more ancient architecture, such as Longhouses with curved roofs, can still be found, as seen in Taninbar.

Meanwhile, the moderate plains are becoming the center of development of megalithic community architecture; the house plan tends to be square, slightly oval, or circular. This type of architecture can be found in various locations, such as *uma mbatangu* on Sumba, the villages of Tarung, Ume Bubu, and Atoni among the Dawan community, and *uma* and *deu* of the Tetun and Bunaq communities on Timor Island and Kei. This architecture has been noted by Stephen Lansing (2016) as a representation of original matrilineal societies, such as Bunaq, Wai Rebo, and Ngadha.

4.2.4 Papua Group.

Papua's ecology is a Sahul ecology that is rich in tropical forests and marshland areas. Indigenous people have inhabited Papua for tens of thousands of years. The most famous Papuan architecture is highland architecture. In coastal areas, villages are often located near the shoreline, and houses may be built on poles or stilts above the water. These homes were designed to take advantage of cool ocean breezes and provide easy access to the water for fishing and transportation. Over time, Austronesian and Melanesian-speaking peoples migrated, adding to their ethnic diversity.

So far, architecture in Papua has experienced a leap in development from the old to the modern architectural period. The development of modern culture was relatively sudden. When in the 16th century, Europeans arrived in Papua during World War II, until 1963, the UN transferred the administration of Papua to Indonesia. Therefore, the architecture demonstrates abrupt transitions to the more modern style.

The architecture developed from the coast to the mountains. On the coast, the architecture stretches along the coast, jutting into the waters of Maluku. On the coast, Korowai community architecture stands on trees, the Kariwari house on Youtefa Lake, traditionally cone-shaped, and the Panjang house. In the interior of the Jayawijaya mountains, the Honai architectural treasure trove of round floor plans and square floor architecture is known and is called Igojei's "thousand-legged house." Their houses resemble those in Nagaland, with cross beams at the feet. As in Kalimantan island, Igojei architecture is raised far from the ground, up to the height of the tree tops. However, the Papuan is not a secluded society. They built half of the societies on adjacent islands, including Timor Island and the Pacific islands.

4. Conclusion and Discussion

The discussion about vernacular nevertheless implies the concept of "local," but it does not specifically discuss "location" and "locality." The finding of this research would substantiate "location" as the main parameter for examining vernacular architecture. The conceptualization of "Local Architecture" consequentially refers to a geographical ecological framework. The conceptualization of the local architecture of Indonesia is defined horizontally by examining the parameters of geotectonics, ecohistory, and geopolitics. First, the geotectonic parameters are determined by tectonic and volcanic characters and stories about migration and the origin of population. It signifies the earth's formation and evolution of humans and earth as context. Second, the eco-historic parameter, which is determined by species, climate evolution, and biodiversity and diet system of the people. It portrays the evolution, materiality, and dwelling life. Third, geopolitics parameters yield history, political traditions, ethnicity or race, and technology. It relates more to the origin and history of human control over the environment. Ecological characteristics and geopolitical dynamic, and vertically, altitude.

Horizontally, the architectural characters of the Indonesian archipelago could be located in 4 major groups, namely: 1) Sumatra-Kalimantan-Group (the Southern China Sea, along Sea routes of Malaka and Java Strait, and the interior Kalimantan island), 2) the Sulawesi-Maluku Group (the Sulawesi Island and, the Maluku Groups of Island), 3) Southern Ocean belt islands (Southern Coast of Sumatera, Southern Coast of Java, and Lesser Sunda Islands), and 4) Papua Group. The architecture west of the Wallacean line is dominated by a typology of big houses with curved ridge roofs. In contrast, the east is dominated by the typology of small houses with converging roofs. The horizontal categories reveal two sub-categories, referring to Wallace lines: the western part, characterized by rice-growing communities with grand-scale architecture inhabited by unilineal societies, and the eastern part, characterized by yam, sago, and corn-growing communities, bilateral kinship, small-residential structures, and the connected house-society network.

Vertically, considering the characteristics of agriculture, staple, and cultural characteristics, the Indonesian archipelago would be defined in three major altitudes: 1) above 250 masl or lowland plain, 2) between 250- 700 masl or moderate plain, and three above 700 masl or highland plain). Vertically, archaic architecture generally accumulates in the highland plain. Trades, oceanic enterprises, and dynamic and eclectic architecture dominate the living culture of the lowlands and coastline. Rice farming and the highland, forest source, and horticulture dominate the moderate plain. The character of these buildings has also proven to be flexible and able to adapt to different traditions, knowledge, and skills according to developments within and between cultures in various geographic regions.

Geographical analysis shows that in Indonesia, patterns of natural change, history, and intercultural transmission influence how buildings are made. Vernacular architecture could be examined by projecting it to the length of time where vernacular architecture is sustained and modified—transmitted, transformed, mutated, or extinct. Some modern houses could evolve from the earlier traditional ones (Artiningrum et al., 2019; Kurnia et al., 2020). These dynamic aspects would be poorly elaborated if we limit the concept of location to only certain ethnic groups. Efforts to turn local architecture into a theorization of "location" are offered

as a starting point for understanding dynamic vernacular architecture. This research still needs more refinement. We know that other sub-parameters can still be generated in future research.

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References

Books

- Acri, Andre (ed). (2016). Esoteric Buddhism in Medieval Maritime Asia – Networks of Masters, Texts, Icons. Singapore: ISEAS Yusof Ishak Institute.
- Asnan, Gusti. (2016). Sungai dan Sejarah Sumatra. Yogyakarta: Penerbit Ombak.
- Bellwood, Peter (2000). Pra-Sejarah Kepulauan Indo-Malaysia - Edisi Revisi. Jakarta: Gramedia.
- Cook, Jeffrey. (1992). "Climate," in Oliver, Paul (ed). Encyclopedia of Vernacular Architecture of The World, volume 1. England: Oxford University Press.
- Cribb, Robert. (2000). Historical Atlas of Indonesia. Honolulu: University of Hawaii Press.
- Lombard, Denys. (2000). Nusa Jawa: Silang Budaya – Batas-Batas Pembaratan. Jakarta: Gramedia, 1-39.
- Munoz, Paul Michel. (2006). Early Kingdoms of the Indonesian Archipelago and The Malay Peninsula. Singapore: Editions Didier Millet.
- Jarzombek, M. & Prakash, Vikramaditya (2013) Architecture of First Society: A Global Perspective. Canada: John Wiley & Sons, Inc.
- Oliver, Paul. (1997). Encyclopedia of Vernacular Architecture of the World. Cambridge University Press.
- Reid, Anthony. (2004). Sejarah Modern Awal Asia Tenggara. (translation from "Charting the shape of modern Southeast Asia, 1999.) Pustaka LP3ES Indonesia.
- Schefold, R., Nas, P. J., & Domenig, G. (2005). Indonesian Houses: Tradition and Transformation in Vernacular Architecture, Volume 1. Singapore: NUS Press.
- Sutherland, Heather. (2021). Sewayas and Gatekeepers: Trade and State in the Eastern Archipelagos of Southeast Asia, c.1600-c.1900. Singapore: NUS Press.
- Wallace, Alfred Russel. (2008). The Malay Archipelago. Hong Kong: Singapore: Periplus Editions (HK) Ltd.
- Waterson, Roxana. (1990). The Living House: An Anthropology of Architecture in Southeast Asia. Singapore: Oxford University Press.
- Wolters, O.W. (2017). Kebangkitan dan Kejayaan Sriwijaya Abad III-VII (translation of Early Indonesian Commerce: A Study of the Origin of Srivijaya,1967). Yogyakarta: Komunitas Bambu.
- Wouden, F. A. E. Van. (1968). Types of Social Structure in Eastern Indonesia, Koninklijk Instituut voor Taal-, Land- en Volkenkunde book series (KITLV).

Journals

- Artiningrum, P, Sudiko, A, & Kamal, A. (2019). "Adaptation Patterns of Bugis Diaspora Village Architecture: Sulapa Eppa'Philosophy and Function-Form-Meaning-Context Theory" ISVS e-Journal, Vol. 6, No. 2 Available from: isvshome.com/pdf/ISVS_6-4/ISVS-6.4.4-Primi-Final.pdf [accessed Sep 25 2023].
- Kurnia, K R Suhanto, G K A, and Angelia, D Puti. (2020). "From Boluf to Kampung: Spatial Changes in The Korowai Traditional Settlements." ISVS e-Journal, Vol. 7, no.1, Available from: isvshome.com/pdf/ISVS_7-1/ISVSej-7.1.2-Kemas-Final.pdf# [accessed Sep 25 2023].
- Faisal, Gun & Wihardyanto, Dimas. (2021). "Negotiations of Vernacular Shapes and Materials of Talang Mamak Tribal Houses, East Sumatra." ISVS e-journal, Vol. 7, no.3. July 2020. Available from: https://www.isvshome.com/pdf/ISVS_7-3/ISVS_ej_7.3.2_Gun_Faisal_Final.pdf, (isvshome.com) [accessed Sep 24, 2023].
- Reyes, Mariano Raphael B. (2010). "The Austronesians, the Nusantao and the Lapita Cultural Complex: A Review of Neolithic migration in SEA and Oceania." [Online] Available at (26) (PDF) The Austronesians, the Nusantao and the Lapita Cultural Complex A Review of Neolithic migration in SEA and Oceania (researchgate.net) [Accessed [Sep 24, 2023]].
- Van der Meulen, W.J. (1974). "SUVARṆADVĪPA AND THE CHRYSĒ CHERSONĒSOS." Indonesia, No. 18 (Oct 1974), pp. 1-40. Southeast Asia Program Publications at Cornell University. [Online] Available at: <http://www.jstore.org/stable/3350691> (Accessed [Sep 24, 2023]).

Youtube

- Lansing, Stephen. (2005). "Complexities of Time - J. Stephen Lansing," Para Limes. Conference: Complexities of Time - J. Stephen Lansing. Available at [Conference: Complexities of Time - J. Stephen Lansing - YouTube] (Accessed [Sep 24, 2023]).
- PBS Eons. (2023). The Invisible Barrier Keeping Two Worlds Apart. [Online] Available at: (5) The Invisible Barrier Keeping Two Worlds Apart - YouTube (Accessed [Sep 24, 2023]).
- Sato, Koji (2020). "Characteristics of Traditional Wooden Houses in Indonesia and the Problems They Face – Koji Sato. Available at: [(5) CHARACTERISTICS OF TRADITIONAL WOODEN HOUSES IN INDONESIA AND THE PROBLEMS THEY FACE - KOJI SATO - YouTube] (Accessed [Sep 24 2023]).