

Original Article

# Exploring Local Wisdom for Contemporary Housing and Settlement Design: Empirical Study of Sundanese Vernacular Settlements in West Java, Indonesia

Purnama Salura<sup>1</sup>, Bambang Sugiharto<sup>1</sup>, Reginaldo Christophori Lake<sup>2</sup>, Stephanie Clarissa<sup>1</sup>

<sup>1</sup>Department of Architecture, Universitas Katolik Parahyangan, Indonesia.

<sup>2</sup>Department of Architecture, Universitas Katolik Widya Mandira, Indonesia.

<sup>2</sup>Corresponding Author : [reginaldolake@unwira.ac.id](mailto:reginaldolake@unwira.ac.id)

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**Abstract** - The motivation of this study is due to the Sundanese vernacular settlements' growing needs in terms of reconstruction and relocation in West Java, Indonesia, as affected by architectural design failures and natural disasters. The approaches implemented recently are not thoroughly supportive, as they either involve the conventional methods that are vulnerable or the foreign approach, which is less culturally acceptable. This study concerns the initial stages in generating an architectural design for the Sundanese houses as a manifestation of local identity. Kampung Dukuh Luar is the focus of the case study. This research conducts an architectural ethnosemantic approach incorporated with empirical observation on the architects' and cultural experts' focused group discussion. The design foundation of the contemporary Sundanese architecture is observed in this study, particularly in maintaining the mythical values for rational aims. Moreover, the innovations in construction materials and techniques are additionally discussed. The research finding contributes to the improvement of the community life for resilient and traditionally suitable housing-related issues, and at the same time, enriches the vernacular architecture insights. Thus, the study contributes to the realization of Sustainable Development Goals (SDGs) on sustainable cities and communities.

**Keywords** - Architecture, Contemporary, Settlement, Sundanese, Vernacular.

## 1. Introduction

The contemporary discourse on sustainable housing and settlements is increasingly confronted with the tension between universal modernity and the continuity of local traditions. As Paul Ricoeur once emphasized, the paradox of modernization lies in the necessity to “become modern while also returning to the sources; to revive an old, dormant civilization and at the same time take part in universal civilization.” [1] This paradox is particularly significant in the field of architecture, where the global drive toward technological efficiency and uniformity often neglects the cultural values embedded in vernacular architectural forms [2, 3].

The discourse on the gap between the local and the global becomes particularly relevant in the context of post-disaster housing and settlement reconstruction. Drastic climate change and environmental conditions have resulted in many vernacular settlements, especially in Indonesia, being severely affected by disasters. In addition to natural causes, the government has also highlighted the high incidence of disasters attributable to architectural design failures in houses and villages. In this regard, West Java—home to the

Sundanese people of Indonesia is classified as a highly vulnerable region [4]. While disasters caused by nature are inevitable, those arising from design failures should, in fact, be preventable.

To reconstruct Sundanese settlements, it is essential to develop architectural designs for houses and settlements that can reduce disaster risks and minimize the impacts of future hazards. Thus far, two common approaches have been applied in settlement reconstruction. The first is the introduction of entirely new architectural forms that are not rooted in local culture. For instance, the construction of dome houses after the earthquake in Yogyakarta, Central Java, was considered incompatible with the habitus of Javanese society, leading to widespread modifications and the eventual loss of their intended function [5, 6]. The second approach is to rebuild houses and villages in exactly the same form as before, even when such forms remain vulnerable to disasters. A case in point is Dukuh Traditional Village, which experienced fires at least twice, in 2006 and 2011. After both incidents, the houses and the village were reconstructed in their original form. However, one of the main reasons for the rapid spread of fire was the use of combustible materials such as wood, bamboo,



and palm fibers [7]. While this approach may be applicable in traditional villages where architectural forms are strictly preserved, other settlements also require reconstruction. In these cases, rebuilding houses and villages in their exact pre-disaster form is not desirable, since non-natural disasters may be caused by the architectural failures themselves. In other words, both approaches are considered suboptimal, as they neglect cultural dynamics and the need to adapt to changing times and environmental conditions [8].

This study concerns the initial stages in generating an architectural design for the Sundanese houses as a manifestation of local identity. The term contemporary is believed to refer to the age spirit that is *zeitgeist*; meanwhile, the change of the environment refers to the term simultaneous. Besides, values, worldview, and insights are transferred through generations [9]. The so-called “appropriate architecture” is understood to be achieved by implementing these two sides in combining cultural values and environmental change resilience.

The novelty of this study lies in becoming the connection between two different time spans in the goodness of architectural designs, past local wisdom, and the sustainability of the present day. This research concerns examining and identifying ecological, spatial, and social values toward the principles of architectural design of contemporary villages and houses. Hence, the research contributes not only to the implementation of the modern sustainable architectural theory and innovation but also to the preservation of traditional values.

The Sundanese vernacular settlements and architecture-related issues provide not only a form of religious point of view but also a global problem-solving approach, and as a bridge in applying the modern design incorporated with the local identity. The major aim is to maintain and re-examine the cultural values in the architecture as an effort to instill in contemporary architecture the challenge of sustainability challenges while preserving the traditional values. Therefore, the study strives to meet the expectation of utilizing modern advanced methods by the civilization in enhancing the quality of life in terms of the architectural design without avoiding the cultural traditions and cultural principles.

Regarding the ideas above, the study contributes to three different advantages. It firstly provides a theoretical framework on combining Sundanese traditional identity with contemporary necessity, particularly in settlement sustainability and disaster mitigation. Hence, the architecture field is not merely a theoretical knowledge development but also an applicable social life problem-solving. Secondly, the study offers a model of architectural design that maintains local wisdom while attaching modern innovation, along with the technology integration relevant to Indonesian suburban areas. The vernacular architecture discourse is, thirdly,

expanded by the study in proposing contexts in the reconstruction method on post-disaster, as well as the adoption of a foreign approach.

Thus, the research provides development not only theoretically on the architectural academic discourse but also practically in terms of the architectural design concepts suitable for local policymakers, designers, and local citizens in designing Sundanese settlements and villages in a modern way without abandoning the local identity. Correlated with architectural discourse, the research finding contributes to providing solutions in recent debates on neo-vernacular and regionalism approaches, corroborated by empirical Indonesian case studies.

## 2. Literature Review

### 2.1. Local Wisdom and Appropriate Architecture

The human adaptation in cultural, natural, and social environments where they settle remains a local identity concept in architecture across generations. Rapoport asserts that human techniques affected by the natural world relationships manifested in value systems, the community’s worldview, and the natural world, influence the form of vernacular settlements [10]. It is in accordance with the statement of Oliver (1997), emphasizing that local identity combining cultural-symbolic, ecological, and economic dimensions is the variable forming vernacular architecture [11].

In acquiring the sustainability of the local wisdom concept strategy, the contemporary architecture context plays a pivotal role by involving the related regionalist theories and Critical Regionalism in refining it. This concept emphasizes that architecture requires preserving and applying the local wisdom into the architectural design without avoiding the development of modernity and advancement of design technologies due to inevitable human era development.

As human life develops, architecture is not to be stagnant; it is expected to meet the development of the era, nonetheless. Therefore, architectural local wisdom theory is necessitated as a fundamental concept in incorporating innovation and tradition, particularly in encountering current challenges encompassing globalization, climate change, and disaster mitigation.

An appropriate technology theory by Schumacher (1973) stands as the major source on the development of the appropriate architecture concept, affected by the concept above. While the utilization of construction methods, technology, and materials represents the appropriate technology incorporating simple, affordable, and contextually aligned with community needs, appropriate architecture refers to an architectural approach that is rooted in local knowledge while simultaneously capable of responding to environmental changes and the demands of modernity.

The connection between appropriate architecture and local wisdom is proven in the method of cultural identity, which is instilled in the principles of contextual design. For instance, the selection of sustainable customary or local materials and construction systems is utilized as an effort to mitigate disaster and climate risks. It means that transformative potential exists as the orientation and value sources of local wisdom, while the integration of technological innovation and material is manifested by the realization of transformative potential by the appropriate architecture. Together, they converge in the effort to create sustainable architecture that concretely contributes to improving the quality of life of local communities.

## **2.2. Brief Overview of Sunda and the Sundanese People**

The term Sunda was initially used to designate the northwestern lowlands of the East Indies, while the southeastern lowlands were referred to as Sahul. The Sunda Shelf is surrounded by the circum-Sunda mountain system, which extends for approximately 7,000 kilometers. In geography texts, "Greater Sunda" refers to the group of larger islands (Sumatra, Java, Madura, and Kalimantan), while "Lesser Sunda" designates the smaller islands (Bali, Nusa Tenggara, and Timor). The Sundanese are people or communities who identify themselves, and are recognized, as *urang Sunda* inhabiting the western region of Java Island. The Sundanese ethnic group is one of the largest among the approximately 300 ethnic groups in Indonesia [13]. Administratively, the Sundanese today inhabit the provinces of Banten and West Java.

The term Sunda used to name the region and people in the western part of Java Island is linked to Hindu culture. Initially, the Sanskrit word *Suddha*, meaning "white shining, visible from afar," was used to designate Mount Sunda (1,850 meters). Subsequently, the name was applied to the surrounding region. In the Kabantenan inscription and several Old Sundanese manuscripts (*Carita Parahyangan*, *Sanghyang Siksakandang Karesian*, *Bujangga Manik*), as well as in the account of Tomé Pires, the term Sunda was used to refer to both the region and the kingdom [14].

The majority of the Sundanese people are adherents of Islam who faithfully observe religious obligations such as fasting during the month of Ramadan, performing the five daily prayers, and undertaking the pilgrimage to Mecca. Nevertheless, Sundanese communities living in rural areas generally continue to believe in supernatural forces thought to bring fortune, such as large trees, springs, untouched stones, or sacred ancient graves [15].

The Sundanese customary community believes that they are descendants of the rice goddess (*Nyi Pohaci Sanghyang Sri*) [16]. Accordingly, their life revolves around rituals related to rice cultivation, including planting, farming, and harvesting. Wet rice fields and dry fields thus represent key

features of Sundanese traditional villages. Residential areas are usually located close to agricultural fields. A settlement unit, known as a *kampung*, typically consists of dozens of houses, open spaces, places of worship, rice barns, animal pens, gardens, rice fields, water sources, and ponds, as well as other physical facilities closely linked to the settlement [17].

## **2.3. The Worldview of the Sundanese People as Reflected in Old Sundanese Literature**

Sundanese culture has long attracted anthropological attention, yet architecture has generally remained a marginal aspect within these studies. Prior to the 20th century, literature specifically addressing local knowledge of Sundanese architecture was extremely scarce, and the few available works were often speculative. As early as 1874, the Dutch scholar Grashuis observed the scarcity of written records on Sundanese culture, attributing it to the decline of the Pajajaran kingdom, which deprived the Sundanese of a royal court that could have functioned as a cultural center and patron of the arts. Since the 20th century, publications on Sundanese architecture have become more numerous; however, they tend to be case-specific rather than providing comprehensive theoretical foundations.

Within this context of limited written sources, Karel Frederik Holle (1829-1896) and Cornelis Marinus Pleyte (1863-1917) occupy an important place in the early study of Sundanese manuscripts. Holle, a Dutch official in the Priangan region, is recognized as a pioneer who collected and documented Old Sundanese manuscripts as well as the local script tradition, thereby underscoring the significance of Sundanese philological heritage in the late nineteenth century. Pleyte continued this effort with more systematic philological contributions, including critical editions and translations of the *Carita Parahyangan* and studies of the *Batutulis* inscription along with other Sundanese texts. Their contributions not only provided scholarly access to rare Sundanese written sources but also laid the groundwork for the development of philology and Sundanese cultural studies in subsequent generations.

Based on the translations and philological work of Holle and Pleyte, several historians and scholars of Sundanese culture began to trace the worldview of the Old Sundanese society. Among the manuscripts that have been discovered, one of the most important texts addressing the Sundanese worldview is the *Sanghyang Siksakandang Karesian* [18]. Scholars of Sundanese history and culture have interpreted this text as outlining the fundamental principles of Sundanese philosophy of life, which include [19-21]: (1) The concept of *Tri Tangtu di Bumi*, a traditional philosophical and governance system rooted in three interrelated elements that regulate human life and the natural world, namely *Rama* (the representative of God, providing moral aspiration), *Resi* (the sage, making wise judgments and decisions), and *Ratu* (the ruler or leader), who work together to create balance in earthly life; (2) The concept of *Rawayan Jati*, which describes the

existential journey of humanity and the cosmos as a whole; (3) These principles implementation in life are conveyed in triadic principles of Silih Asah (cultivating spiritual and intellectual freedom), Silih Asuh (comprehending individual's place responsibly and proportionally), and Silih Asih (performing social pure social relationship); (4) Finally, the indicators of a person who has acquired Rawayan Jati are demonstrated in five personal and moral qualities: (a) Bener (righteous), (b) Pinter (knowledgeable), (c) Bageur (virtuous), (d) Singer (self-aware), and (e) Cageur (healthy).

These principles represent Sundanese society's cultural-philosophical fundamentals in comprehending spatial orientation and worldview. Nevertheless, most conducted studies focus on the case-specific or descriptive analysis, creating a gap in methodological approach that is able to manifest these principles into practical architectural design. Thus, the recent study strives to fulfill this gap by examining the empirical concepts in Sundanese vernacular houses to interpret, extract, and reform local identity into practical ideas for contemporary settlement design.

### 3. Materials and Methods

#### 3.1. Architecture and Settlement of the Sundanese People in Kampung Dukuh, West Java, Indonesia

The vernacular settlement that serves as the focus of this study is Dukuh Vernacular Settlement, or Kampung Dukuh, one of the oldest settlements in West Java. Kampung Dukuh is located in Cijambe Village, Cikelet Subdistrict, Garut Regency, West Java, on the slopes of Mount Dukuh, at an elevation of approximately 390 meters above sea level. The total area is around 10 hectares: 5 hectares allocated for settlement and the rest for forest and sacred burial grounds (Tanah Karomah). Its hillside location and surrounding forest separate the vernacular settlement from nearby settlements. To the north lies the Karomah forest, which marks the boundary with the nearest cluster of houses about 500 meters away.

Kampung Dukuh is divided into two areas: Kampung Dukuh Dalam, located in the inner part, and Kampung Dukuh Luar in the outer settlement. The outside settlement of the main traditional area refers to Kampung Dukuh Luar. Meanwhile, Kampung Dukuh Dalam refers to a local customary rule that should be forty houses inside at maximum. As a result, the settlements for the descendants are located in the outer area, that is, in Dukuh Luar. The boundary between the two areas is marked with one-meter bamboo, as well as a customary border. The study selected this vernacular settlement due to three backgrounds: (1) It preserves cultural and genealogical connections to the traditional village of Kampung Dukuh Dalam; (2) It illustrates social dynamics; and (3) It signifies traditional values regarding the tradition and modernity transition context.



Fig. 1 Location of Dukuh Vernacular settlement (Kampung Dukuh)

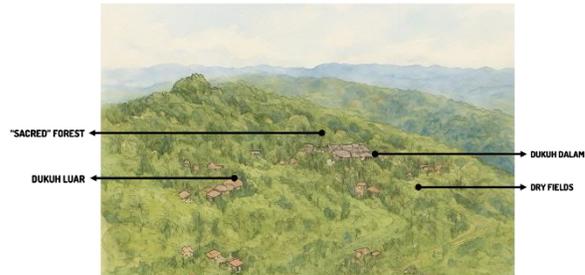


Fig. 2 Kampung Dukuh Dalam and Kampung Dukuh Luar geographical relationship

#### 3.2. Research Methods

A qualitative approach is implemented, particularly by applying the Architectural Ethnosemantic method [22, 23]. Critical evaluation framework on vernacular architecture is provided by architectural ethnosemantics: whether it results in the need of existence or is concerned by ideology, tradition, and social class transferred through generations that are not probably correlated with contemporary situations. The analytical method for archiving and examining transformation potential is produced by this evaluation.

In this research, the formulation of Architectural Ethnosemantics method is elaborated into several stages. It firstly conducts Kampung Dukuh preliminary study. The concerns of this step are identifying the general settlement and architecture for the main principles, and formulating the Sundanese architectural design and research for its highlighted concepts. Then, the semi-structured interviews and empirical observation of local citizens were conducted to collect field data.

The local wisdom values occurred in the settlement of fundamental elements at the levels of three interconnections,

which were interpreted. The settlement orientation on natural elements, such as water sources, mountains, and forests, representing ecological adaptation and cosmological beliefs, was provided in the environmental level analysis. In unveiling how the customary law and social order are articulated spatially, at the site level analysis, the circulation networks, the hierarchical relationship between Dukuh Luar and Dukuh Dalam, and the organization of communal spaces are examined. Meanwhile, in the level of building analysis, concerns on the components of architecture and their capability in encouraging the ritual and daily activities. These three stages are able to formulate an understanding framework on the symbolic values and existential necessities manifested in Kampung Dukuh's material and spatial configuration.

Thirdly, it is performed locally based finalization and formulation of contemporary Sundanese settlements and houses design principles. The architectural design formulation for contemporary Sundanese settlements and houses was generated from the local wisdom identified values.

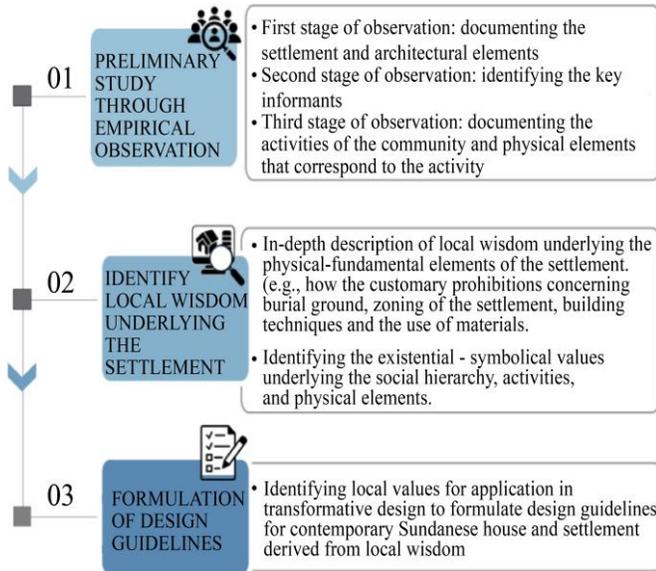


Fig. 3 Research methods

## 4. Result and Discussion

### 4.1. Kampung Dukuh Overview: Tradition and Transformation

In accordance with the oral tradition, Syekh Abdul Jalil, Sumedang Islamic preacher, discovered Kampung Dukuh. At first, based on the local belief, he had a problem with the local ruler where he lived before. Then, he moved to a place lived by a couple known as Candradiwangsa. This settlement is then understood as Kampung Dukuh. As he had been staying for a long time, he is well-known as the place founder.

Kampung Dukuh, geographically, is located in a hilly area surrounded by forests, which produces an isolated tone from surrounding places. This geographical position plays a

pivotal role in maintaining the traditional practices of the village, while avoiding rapid modern influence exposure.

Ladang or rice fields are known as the main place for Kampung Dukuh livelihood, as farmers. It is mostly situated one kilometer to the east of the village. Ownership of Likewise, none of the residents works as a civil servant. The local community believes in a myth that Sheikh Abdul Jalil once resigned from his position in government, in protest against violations of Islamic teachings committed by the authorities at that time. A rice field ownership in the neighboring villages is also possessed by several residents at Ciroyom, Kampung Nangela, and Citundun. Raising animals like goats, chickens, buffalo, and sheep, including farming fish in balong (ponds). Uniquely, businesses preceding profit financially, like commercial trading, are understood as taboo. It is considered a practice of dishonesty. Therefore, for the residents owning farm field when they harvest the agricultural products like cloves, palawija (secondary crops), and rice, are allowed to sell them limitedly merely based on the amount of they need in fulfilling the daily need.

Cultural and religious values are central to the identity of Kampung Dukuh. However, the local wisdom values in Kampung Dukuh Dalam and Kampung Dukuh Luar exhibit fundamental differences. These differences lie in the application of prevailing customary traditions. Dukuh Dalam tends to adhere to stricter rules and taboos, known as pamali, concerning the place in which they reside, as well as the daily ways of life related to their livelihoods. The rules related to nature include the principle of moderation, which the community applies in their efforts to utilize available resources to meet as many life needs as possible by maximizing natural resources. With this principle of simple living, as long as their needs can be fulfilled by the surrounding environment, they do not seek anything beyond it, as it is believed that doing so would affect the heart and mindset toward pursuing worldly pleasures of no real benefit.

Leadership in Kampung Dukuh also illustrates the coexistence of modern bureaucracy and customary authority. Formally, the highest administrative leader is the neighborhood head (ketua RT), who is accountable to the village head (kepala desa). However, in reality, authority rests with the kuncen, the customary leader of Kampung Dukuh. The leader of the tradition leads almost all aspects of the community life, like religious practices, prohibitions, agricultural activities, moral guidelines, and trade. The role of this traditional authority puts it in a great position in the middle of the state's governing system. Hence. The true guide for Kampung Dukuh people remains the customary leader. Additionally, there are areas in Kampung Dukuh where the founder's direct descendants possess a stronger influence over the whole population. It is collectively believed that those areas provide more about the Kampung Dukuh historical development and origin.

There are various responsibilities the customary leader (kuncen) has to fulfill encompassing: (1) leading every-Saturday pilgrimage (jaroh); (2) offering prayers for visitors; (3) conducting and leading annual religious event of Kampung Dukuh that is 14<sup>th</sup> of Maulid; (4) safeguarding objects and manuscripts; (5) performing munjungan (food offering) to a sacred house (Bumi Alit); (6) leading musyawarah (deliberations); and (7) leading (imam) the prayer of Islam in mosque. Moreover, kuncen is demanded to ensure the community lives side by side with nature in undertaking their life in harmony. It is the reason why kuncen dresses in customary attire as an authority symbol.

It is interesting to note that the munjungan, jaroh, Maulid, and pilgrimage rituals are typically attended by members of both Dukuh Dalam and Dukuh Luar communities. In fact, Dukuh Luar is essentially an extension of the original settlement of Dukuh Dalam. While Dukuh Luar has developed greater demographic diversity in terms of livelihood and lifestyle, the community continues to rely on Dukuh Dalam for the regulation of ritual life. This hierarchical relationship underscores the centrality of Dukuh Dalam as the cultural and spiritual core of the settlement, whereas Dukuh Luar functions as a spatial and social expansion whose legitimacy is still rooted in the customary authority of Dukuh Dalam.

**4.2. Local Wisdom Underlying the Fundamental Physical Elements of the Settlement**

The existing literature on traditional Sundanese settlements generally divides the settlement area into five zones [24]: (1) Land in which prohibitions are enforced based on customary law, such as sacred burial grounds or graveyards that may not be entered by outsiders and are reserved exclusively for local residents. This area is known as the Forbidden Land (Tanah Larangan). (2) The area that is believed to be a legacy from influential figures in the formation of the settlement. This entrusted land, known as Tanah Titipan (awisan), includes sites such as Awisan Sumedang, a legacy of Sheikh Abdul Jalil, Awisan Sukapura, and Awisan Arab. As a form of respect to those who entrusted it, this land is preserved, and no buildings are allowed to be constructed upon it. (3) The area where residential houses and public buildings are constructed, known as Enclosed Land (Tanah Tutupan). (4) The area consisting of rice fields or dry fields used for cultivation, as well as for raising livestock and fish, known as Cultivated Land (Tanah Garapan); 5) The area consisting of natural resource-producing land that is preserved for the future, known as Reserved Land (Tanah Cadangan). Nevertheless, the people of Kampung Dukuh divide their territory into only three categories: Tanah Larangan, which contains the grave of Sheikh Abdul Jalil, the founder of Kampung Dukuh; Tanah Tutupan, where residential houses and public buildings such as the mosque are located; and Tanah Garapan, which consists of agricultural fields. Corresponding with the threefold land division, there are three fundamental elements in Kampung Dukuh: the burial ground,

the fields, and the dwelling area. Karuhan, known as the settlement's founder, is believed to be buried and venerated in a burial ground. This graveyard has become a place of pilgrimage, visited both by residents and outsiders seeking blessings. In Kampung Dukuh, pilgrimages may only be conducted at specific times, accompanied by the kuncen and marked by ritual ceremonies.



**Fig. 4 Physical elements of Kampung Dukuh**

Customary prohibitions (pamali) concerning the burial ground include: no houses or public buildings may be constructed in the forest or cemetery area; residential houses may not face north or have entrances oriented to the north, since that direction points toward the sacred graveyard; and stretching one's legs toward the sacred grave is also considered disrespectful to the ancestors. These prohibitions apply to both the residents of Kampung Dukuh Dalam and Kampung Dukuh Luar. Nevertheless, in Dukuh Luar, house orientation tends to follow the contours of the land rather than strict alignment with the north. Overall, however, the cemetery area as a sacred zone continues to be respected by all Kampung Dukuh residents.

Field observations indicate that the growth of the settlement area always begins with the house of the customary leader (imah-kuncen), followed by the houses of the kuncen's close relatives, water sources (cai), and the mushola (small prayer house). Over time, these mushola expanded into mosques, often accompanied by adjacent open fields (tegalan). In Kampung Dukuh, the main water source is located within the karomah forest and is used communally by the entire village. The settlement of Dukuh Dalam consists of forty-two houses, one mushola pameget (for men), one mushola istri (for women), one imah panggung (raised communal house), and communal latrines (jamban umum) located above ponds. The buildings are arranged on terraced land with contour differences of 1–2 meters sloping southward, and the terrace edges are reinforced with large stones naturally found in the area. At the center of the settlement stands a boulder approximately 3 meters in diameter and 2.5 meters in height, known as batu hideung (lit. "black stone"). This stone is regarded as one of the most important elements of the settlement, as indicated by the bamboo fence that encloses it.



Houses



Mosque



Latrines

Fig. 5 Typical buildings in Dukuh Dalam

All the houses share similar characteristics: raised structures with saddle roofs covered with *hateup* (thatched along-alang grass layered with palm fibers), differing only in size. The mosques differ slightly in design by including a roofed mihrab. The house of the customary leader does not differ in form from those of other villagers. The elements present in each house are relatively similar, with differences found only in variations and the size of the houses. As a location for resident deliberations, the house of the leader is bigger than the ordinary community.

The typical house in Kampung Dukuh consists of seven fundamental elements, namely: (1) *Tengah-imah*: the central area of the house, used jointly by men and women for daily routine activities. (2) *Tepas*: an area designated specifically for men to carry out their work and to receive guests. Women never use this area. (3) *Pawon*: an area used by women for their domestic activities and also for receiving guests. (4) *Goah*: a storage area for rice, generally integrated with the *pawon*. (5) *Hawu*: the cooking place, always located within the *pawon*. (6) *Pangkeng*: the sleeping area for the inhabitants. (7) *Golodog* or terrace: the area located at the front entrance, used by both men and women.

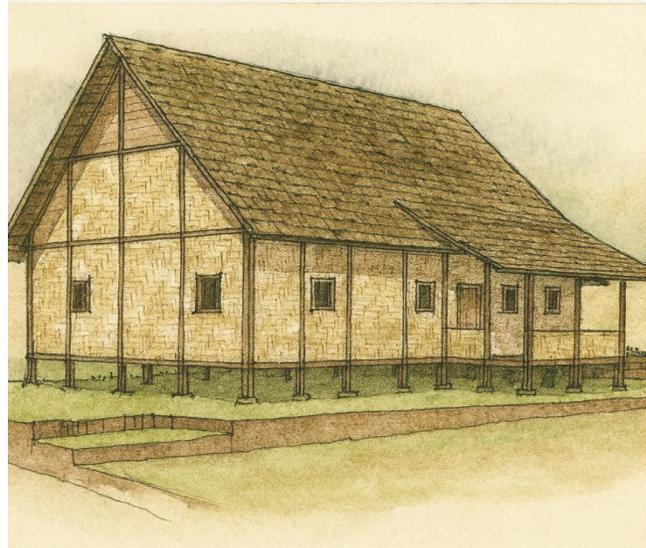
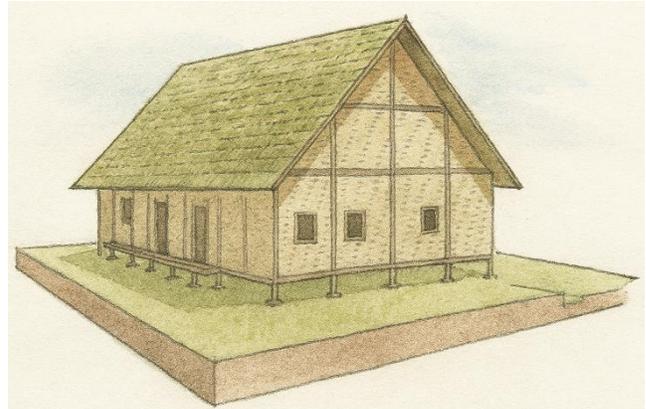
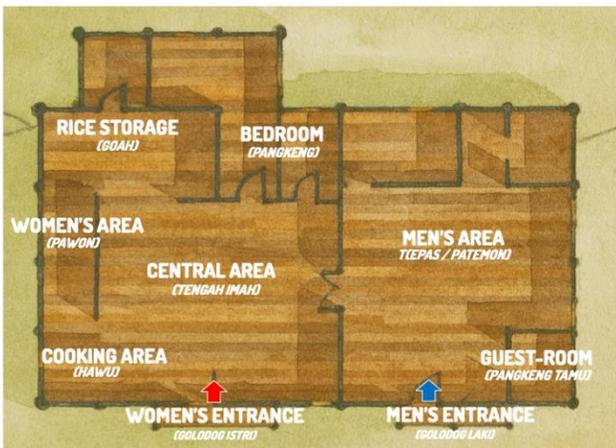


Fig. 6 Floor-plan and Elevation of Customary Leader's House

The whole house form and the spatial zoning are the similarities of *Dukuh Luar* and *Dukuh Dalam*. Both *Dukuh* also form stilt houses to let space for raising chickens or livestock beneath the house and prevent rainwater splashes from reaching the walls.

Although houses in *Dukuh Dalam* and *Dukuh Luar* tend to be similar in terms of form and spatial zoning, there are fundamental differences regarding the number of floors and building materials. In *Dukuh Luar*, there is no prohibition against residents constructing two-story houses. Even so, such houses are permitted because they are located on topographically lower ground than the mosque, the madrasa, and the *kuncen's* house, thereby maintaining *Dukuh Dalam* as the main point of orientation for *Dukuh Luar*.

With regard to materials, residents of *Dukuh Dalam* are required to use natural materials for their houses, from the foundation to the roof. It is restricted to utilizing industrial materials. The customary houses are mostly built using surrounding materials such as bamboo, palm fiber (*ijuk*), and wood. The use of electronic appliances and building more

luxurious houses compared to the neighbors is also forbidden due to customary prohibition (pamali). Meanwhile, in Dukuh Luar, it goes the other way around. The use of materials is freer, for instance, in using asbestos in the roofing method, as it is believed to be more fire-resistant than a roof made by *ijuk*. It is also not forbidden to use electrical devices in the house, like a lamp.



Fig. 7 Typical houses in Dukuh Luar

#### 4.3. Sundanese Local Values for Application in Transformative Design

Due to the traditional materials used as one of the reasons, Kampung Dukuh still encounters design problems like fire disasters, besides its popular image as the oldest village of Sunda in West Java. In 2006, a fire destroyed around 51 buildings along with several heirlooms, including ancient manuscripts with Arabic script. The exact cause of the fire remains unknown, though it is suspected to have resulted from negligence in extinguishing kitchen stoves, with flames spreading rapidly due to the highly combustible building materials. Another fire occurred in 2011, allegedly caused by residents clearing the fields by burning them. Strong winds carried sparks from the land-clearing activity into the settlement, igniting traditional houses made of bamboo walls and palm fiber roofs. The flames quickly intensified under the strong winds, and the close proximity of the houses made it impossible to prevent a major conflagration. This disaster left approximately 170 residents homeless.

In addition to fire disasters, data from 2023 indicate that the Cikelet area itself has experienced drought (or drought-related impacts), particularly food and water shortages during the dry season or periods of low rainfall. Although there is no specific record of Kampung Dukuh being directly affected by this drought, local authorities have highlighted the potential risks of clean water scarcity and the threat of crop failure across the Cikelet region as a whole.

In order to provide alternative solutions to these problems, based on empirical observations and analysis, a set of Sundanese local values can be transformed and integrated into the design of settlements and their architecture:

##### 4.3.1. Preserving the Myth while Serving Rational Purposes

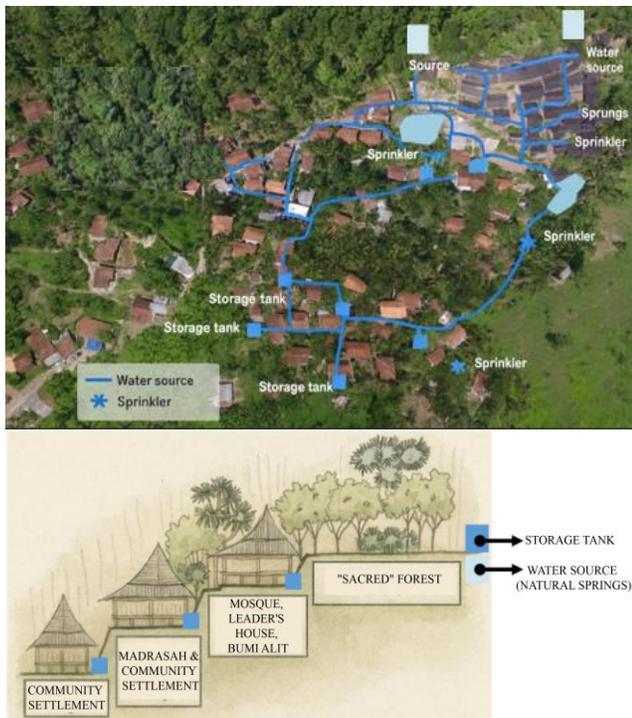
Myth can be understood as a cultural code that essentially regulates the relationship between humans, nature, and society. However, previous studies on the role of myth in vernacular architecture show that myths are not merely romanticized but are also applied for rational purposes. For instance, the style of praying-hands, like building in Japan, specifically in Shirakawa-gō, in the style of gassho-zukuri, is the harmony symbol of the divine, humans, and nature [25].

Another example of implementing both traditional value and practical use of the building structure is discovered in tangible-intangible (sekala-niskala) and mountain-sea (kaja-keled) in Aga villages, Bali, Indonesia. With the kaja-keled concept, the building is directed to the mountain and sea for maximizing ventilation from nature, while the sekala-niskala concept is used in locating the building upstream as an effort to avoid natural disasters like landslides and floods [26-29].

The examples illustrate that the customary buildings can be established not only by emphasizing the local value

perseverance but also concerning the practical benefit, especially in settlement protection and disaster mitigation.

The observation evidences that one of the most believed myths in Kampung Dukuh is associated with the sacred place known as forbidden land (tanah larangan) encompassing the surrounding forest and makam karomah (sacred burial land). As the forest is known as sacred, it is not allowed to build any type of building, including houses or settlements. This is unique as the community believes that cutting one tree will lose a huge water resource. It indicates that the myth existing in the community is robust in preserving nature and human existence. This is evidenced in their belief as understood as leungit sirah cai, di tuar cai, balangsak kahirupan (losing water is due to cutting trees, then the life difficulty will come). It means that traditional belief also supports ecological perseverance. In distributing the water, the system used is by utilizing pipes made of bamboo spray in networks encircling housing. Built through mutual cooperation (gotong royong), this system allows the application of a mitigation strategy with low cost as well as environmentally friendly, as it maximizes the use of natural materials thoroughly.



**Fig. 8** The distribution and spatial arrangement of reservoirs, water sources, and sprinkler systems in effectively connecting water in emergencies due to fire

#### 4.3.2. Maintaining House Zoning and Settlement

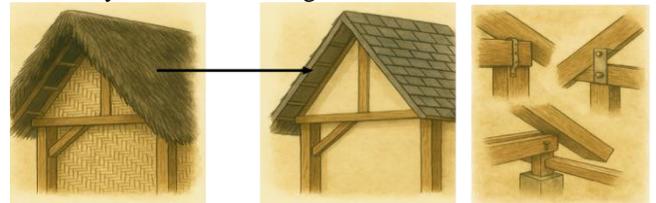
The settlement zoning is located around the central point, that is Kampung Dukuh Dalam. It is because all traditional community activities for both Kampung Dukuh Dalam and Luar are conducted in Kampung Dukuh Dalam. Thus, Dukuh Dalam remains the central focus of the entire housing.

The arrangement of the settlement is naturally built based on the contour of nature, which is also suitable for disaster mitigation. Dukuh Dalam is built at the top of the highland, while Dukuh Luar is under. It indicates that the upstream and downstream positions themselves naturally are like the spray networks, waterways, and evacuation access.

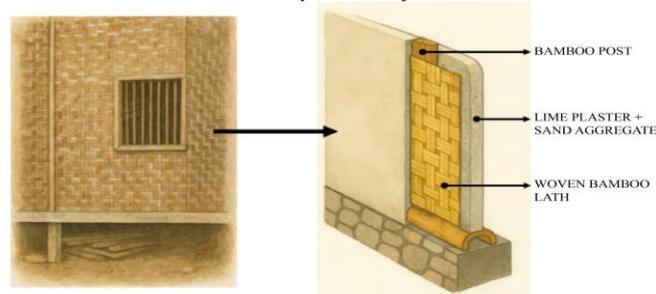
Despite the different materials used in building Dukuh Luar settlements compared to Dukuh Dalam, the spatial design utilizes the same concepts, the outer space is the terrace followed with central point, then kitchen that is connected to the bedroom without partitions. This traditional concept is still vulnerable to fire disasters due to the connection between the kitchen and the sleeping area. Thus, there has to be an innovation in terms of fire mitigation in building safety while upholding local identity perseverance. The kitchen may remain in its traditional position, but it should be equipped with fire-resistant walls made of brick or clay to prevent flames from spreading. In addition, cross-ventilation should be enhanced to improve air circulation in the kitchen, ensuring that heat and smoke do not become trapped inside the house. In this way, the risk of sparks igniting wooden or bamboo elements can be reduced.

#### 4.3.3. Indigenous Materials and Structures Innovation

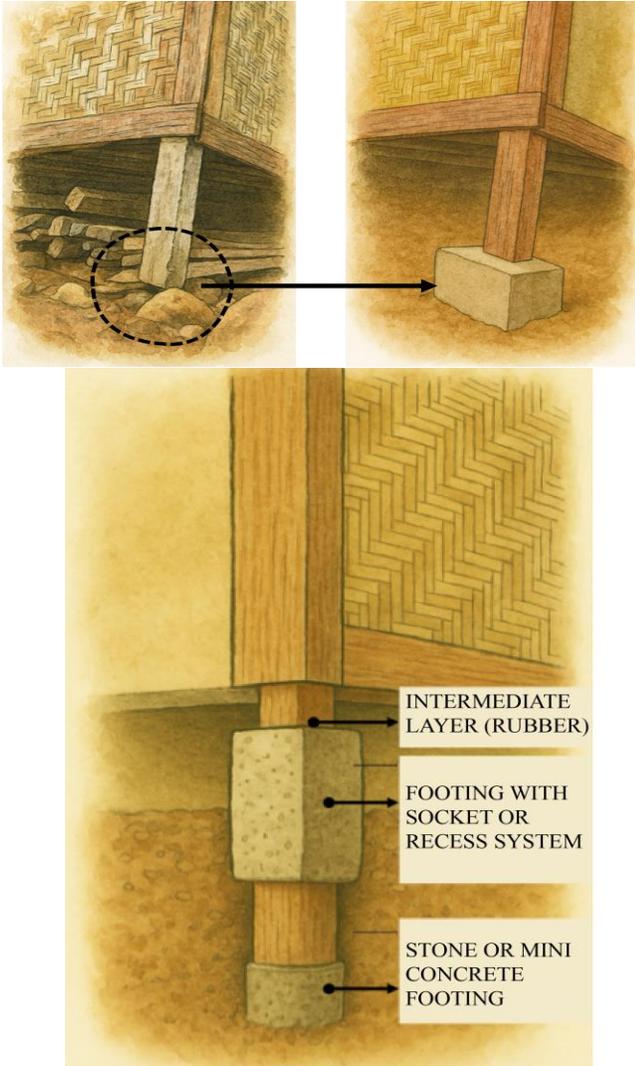
Regarding the flexible materials used in Dukuh Luar, it is not limited by the customary law, innovations on construction techniques in the building of the settlements can be implemented. Unlike the structurally vulnerable stilt systems in Dukuh Dalam, where posts are simply placed on flat stones, the renewed stilt construction can adopt jointed or bound structural systems, thereby enhancing overall stability and safety while maintaining the traditional elevated form.



The roof that was originally made from palm fiber (ijuk) can be replaced using fiber-cement shingles. Thin fiber-cement board panels are molded with the texture of ijuk fibers or coated with a matte black-brown paint to visually resemble ijuk



The walls made of woven bamboo can be transformed into walls with a sand-lime plaster layer. This construction appears like ordinary masonry walls, is durable (20–30 years), and relatively more fire-resistant compared to woven bamboo.



The building foundation, which was originally composed of wooden posts simply placed on stones, has been transformed into a pad foundation with a footing, constructed to a certain depth in accordance with the bearing capacity of the soil

**Fig. 9 Design innovations for roofing, wall, and foundation materials**

Furthermore, the use of new materials developed from local resources creates opportunities for establishing village-based building material industries. For example, local clay can be processed into fire-resistant bricks or traditional plaster mixed with rice husks, producing heat-resistant walls that remain environmentally compatible. Bamboo, traditionally used as the primary structural element, can be processed into laminated panels or woven wall coverings that are stronger and more fire-resistant, while still retaining traditional aesthetics. The innovation in materials not only fulfills the need of sustainability and safety but also produces a creative economy for Kampung Dukuh people. The participation of local people may produce small to medium industries in bamboo panels, fiber boards, and bricks. The younger generations are able to pursue livelihoods by having skill training in modern building. Moreover, marketing and

production of the distinctive building materials containing local identity provides income diversification for the community.

#### **4.4. Legibility and Imageability in the Architectural Expression of the Settlement**

The practical strategies are not merely elaborated upon by the alternative solutions in points 1 – 3, but also in the architectural expression of settlement legibility and imageability.

The visual strength of Kampung Dukuh represents the imageability of the settlement. It is due to the center of observation being centered in Dukuh Dalam, which serves as the primary cultural and ritual center. The distinctive characteristics, such as dark roofs, hillside contours, and hutan larangan (sacred forest), vividly represent the Kampung Dukuh settlement, easily recognized as a robust image of identity for both visitors and residents. On the other hand, the spatial arrangement of Dukuh Luar and Dukuh Dalam refers to the legibility. In which the arrangement of the hillsides is arranged consistently with the same spatial arrangement, starting with the terrace, sleeping areas, followed by kitchens in the main room.

## **5. Conclusion**

The conclusions below are formulated based on the observation.

The Sundanese local wisdom, firstly, observed in this study, in myths, customary rules, and settlement zoning in particular, can be examined rationally as methods in environmental sustainability and disaster mitigation. A belief in the sacred forest also functions as natural perseverance in preserving natural existence, particularly on a water reservoir and fire-sprinkler emergency systems. Dukuh Dalam, in its position as the central activity area, is observed as the spatial and spiritual landmark. The arrangement of the settlement not only provides spatial hierarchy for Dukuh Luar and Dukuh Dalam but also offers planning of disaster mitigation in performing natural contours for evacuation routes, water distribution, and management of risks.

Secondly, despite the different spatial materials, Dukuh Dalam and Dukuh Luar preserve the fundamental structure of the customary space. These local wisdom materials allow for providing innovations encompassing cross-ventilation, protective kitchen walls, and fire-resistant materials. This method puts local identity preservation and safety side by side.

The economic empowerment, thirdly, can be created by realizing the material innovation. It is able to support alternative livelihood for community welfare, encourage younger generations to make a living without leaving the local settlement, and preserve the local wisdom. Fourthly, this study

proposes a design model that preserves cultural identity while allowing for material innovation and the integration of simple technologies, making it relevant to rural contexts in Indonesia. However, it is acknowledged that the implementation of such design guidelines at the scale of actual construction still requires further research.

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