Traditional Concept Toward The Sustainable Built Design in Bali

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Abstract. The spatial patterns of traditional Balinese houses in both Bali Apanaga for the urban area and Bali Apanaga for the traditional village in Bali, have concepts which both always adapt to nature. The composition of buildings, the concept of structure and construction, and outdoor spaces with traditional landscapes have the goal of being environmentally friendly while maintaining comfort for its residents, regulating the flow of air entering the room, and adjusting lighting according to its function, and acoustic function that can be found in outdoor of the housing. The research aims to explore the traditional concept that uses in both urban and traditional areas in Bali to maintain the quality of life toward sustainable built design and environment. The method of this research conducted qualitative research with a case study through observation in two different areas as a comparison to the sustainability of the traditional concept of built design, especially for housing. The depth literature review was used to gain an understanding of the quality of the environment, to deepen the understanding of Balinese traditional concept of housing and understanding of the differentiation between Bali Apanaga and Bali Aga and its characteristics. The research result shows that there is a similarity between traditional concepts in two different areas that adaptable for future sustainable built design.

1. Introduction
Bali is known for its beautiful landscape, culture, tradition, and architecture. Topographically, the Balinese landscape comprises of the mountain, mainland, and seashore. The Balinese traditional architecture has a unique characteristic that soul by Hindu Religion into its implementation. The Tri Hita Karana Concept adopts in Balinese life as the relationship between people to God, to a human being, and to nature. They live in balance and harmonious belief. The traditional concept implements into the design of the houses whether in both urban and rural areas or Bali Apanaga and Bali Aga.

The Balinese houses comprise of buildings in one unit area that each has own function for daily activities and ritual. The research focuses on the traditional concept of Balinese houses that bring people into security and safe to live in their houses. The study case in both Bali Apanaga and Bali Aga found that the traditional concept well implemented and inherited from generation to generation. The Balinese houses consist of small unit buildings that resistant to the disaster risk and also environmentally friendly to nature. The house has a simple form with traditional structure and construction that sustain the built design of architecture. This shows how the Balinese keep the quality of environment of the housing.

This research investigates traditional concepts implemented in Bali Aga and Bali Apanaga villages in order to answer the sustainable built design that affects people’s quality of life. The urgency of the research to maintain the local values that tend to be challenged by the influence of global technology development. The research on the traditional concepts found that both houses in Bali...
Apanaga and Bali Aga have their uniqueness in the implementation of Balinese traditional concepts that depend on their condition including tradition, topography, and architecture for sustainable built design.

2. Literature Review

2.1. The Quality of Environment

The quality of environment is depend on the quality of life of the people that has relation to the factors of economic, social, culture, psychological and environment [1]. Keles (2012) states there are three features of the concept of quality of life that are cited from Shucksmith, Cameron, Merridew, and Pichler (2009). The characteristics are firstly, the conditions of individuality and their perceptions; second, the concept of multidimensional including education, the condition of housing, employment, work-life balance, access to public services and the interaction; third, the people’s living conditions and their attitudes in the society. These three aspect of quality life characteristic have significant impact to the people’s act into the environmental development quality. Further, Keles (2012) describes many factors contribute to whether the quality life becoming good or worst as following, the access to infrastructures and services. Firstly, the water and sanitation, transportation, solid waste management, and drainage. Secondly, the pollution from the activities of the city. Third, the degradation of resource through city development construction. Fourth, the environmental hazards from natural and human sources. Fifth, the global nature environmental problems. From those above of all, the culture factor contributes to the living of the people in their environment such as settlement and it surroundings.

2.2. Balinese Traditional Concept for Housing

The Balinese housing is based on traditional concept called Tri Hita Karana. The concept of Tri Hita Karana refers to the “three causes of goodness” [2]. This concept has understanding the relationship between people to their Creation, to the human being, and to the environment [3]. These three causes of goodness implement from macrocosm (bhuana agung) into microcosm (bhuana alit) which consists of parahyangan, palemahān, and pawongan [3]. The parahyangan refers to the holy area (sakral) in the village as well as in the housing. The embodiment of this holy area is called pura for the village or regional scale, and it called merajan for the housing scale. The palemahān appoints for settlement and its facilities. The pawongan appoints for the impure area that mostly located the cemeteries in the village and the housing gate and back yard for the housing.

Another concept for the Balinese house is the Tri Angga Concept that refers to the concept of division of the human physic. The Tri Angga consists of three hierarchies such as utama angga (primary value), madya angga (middle value), and nista angga (profane value) [2]. The Tri Angga Concept gives direction to value vertically, meanwhile the horizontal value is called the Tri Mandala. The hulu-teben value system (upstream - downstream) as a guideline for values in achieving the goal of alignment between macrocosm (bhuana agung) and microcosm (bhuana alit). The hulu-teben has the following orientations, the earth’s axis namely kaja-kelod direction (North - South / mountain and sea); high-low direction (tegeh and beten); the axis of the sun namely kangel-kauh (East - West / sunrise and sunset) [4, 5]. The spatial concept of Sanga Mandala is also born from the nine manifestations of God in maintaining the balance of nature towards harmonious life called Dewata Nawa Sanga [6, 5]. The spatial concept of Sanga Mandala becomes a consideration in zoning activities and building layout in the house yard, where activities that are considered primary, require calm placed in the main area - utamaning utama (kaja kangin), activities that are considered dirty / busy are placed in the nistaning nista area (klod kauh), while the people activities are placed in the middle area (madya) [4]. In its derivation, this concept becomes the natah pattern [7, 5].

Balinese traditional housing comprises of several building in the one housing unit (pekarangan). The housing pattern in the most mainland area consist of merajan, bale dangin, bale daja, bale dauh, bale delod, jineng (granary) livestock, traditional main entrance (pemesuan) (Figure 1). The composition pattern of the buildings creates a plaza in the center called natah that has function for orientation,
circulation, emergency point if there is an earthquake, the flow of air circulation, as well as the natural lighting for the buildings.

Figure 1. Balinese traditional housing pattern (Davidson, 2003) [8].

2.3. Bali Aga and Bali Apanaga and Its Characteristics

The word of Bali Aga is derived from the word arga (the Javanese language) means mountain [9]. Reuter (2002) reveals the original Balinese people as ‘the mountain Balinese’, or called Bali Mula or Bali Kuna [10]. Meanwhile according to Covarrubias (1974), the Bali Aga means ‘Bali highland’. He states that Bali Mula means ‘the original’ and Bali Kuna means ‘ancient Balinese’ [11]. The understanding of the Bali Aga for this study means the original or Indigenous villages that still adopts and practices the original traditions. The Indigenous villages are located in the highland, mountain area, valleys and hilly area, and also surrounding of the Lake of Batur in Kintamani Sub-district. The Bali Aga villages still conserve original traditions that did not get influences during the Majapahit era. Meanwhile the Bali Apanaga refers to the South people that have influence from the Mapajahit period.

The characteristics of the Bali Aga and Bali Apanaga have been described by Dwijendra (2009) as follows. The Bali Aga houses have twelve pillars called tampul roras or sakaroras with linear pattern of the settlements [12]. This pattern composes an orientation in the center called plaza or natah. The plaza or natah is also as a circulation within the neighborhoods in the settlements. Mostly Bali Aga village’s traditional governance adopt ulu apad system which means ‘push to the top’. The cremation (ngaben) is conducted through buried the corpses, or called biye tanem. The community apply mass cremation in certain time for every four or five years. The Bali Aga villages adopt nyineb wangsa that they do not apply caste system as it applies in mostly villages in South of Bali. The agriculture and fishermen are as the main occupation of the people in Bali Aga villages. In some of Bali Aga village apply mass wedding as the second marriage called bakti jauman or pekandelan ceremony. Example to this that can be found in the village of Pengotan, Landih, Abangbatudinding and Suter are the most villages adopt the mass marriage every four years. The village annual festivals called ngusaba desa commemorate aims as a thankfulness of the prosperity and fertility.

Further, the characteristic of Bali Apanaga as follows. In term of socio culture and community, the villages are influenced from Indian culture and Hindu-Javanese religion. The use of the Tri Mandala concept to define the holy temple zone into three zones (jeroan/primary, jaba tengah/middle, jaba sisi/impure) relates to the concept of Tri Bhuana (three worlds), i.e. Bhur/God, Bwah/human being, and Swah/spirit. It is believed that the Tri Hita Karana philosophy arrived in Bali via a Kuturan priest who introduced the Kahyangan Tiga temple and other temples in the village. A village contains of a small community including hamlet and a family. A village has individual land village and common village land (karang desa), temple land or customary communal land (tanah jaba pura/pelaba pura). The livelihood and equipment system; where most people as farmers that adopt the traditional irrigation system (subak). Other people are also as fisherman, and as traders. Equipment is made of iron and an iron worker is called empu and pande family. The housing pattern uses Balinese traditional architecture,
including temples, palaces, etc. The Bali Apanaga adopt the kinship system known as Catur Wangsa (four types of society based on obligation). There are Brahmana (priest), Kesatria (leadership/King), Wesia (trade), and Jaba (common people). For the governance, they have organization system that led by Bendesa Adat or kelihan Adat. The marriage system mostly a common marriage based on the teachings of Manawa Dharma Sastra that link to the religion. The Bali Apanaga use differentiation of language level, for polite and structures (sor-singgih).

3. Method
This research is focused upon the traditional concepts of the Balinese traditional architecture. Accordingly, the methodology of this research significant sensitive to the concepts and values of Balinese traditional architecture. This research is based on a qualitative research method that has emphasized to case study in two different areas. Denpasar City as urban area that mostly living people in heterogeneous aspects however the Balinese people still adopt the concept, norms, and value of traditional architecture for their settlement and it is influenced by the Majapahit culture, so it called Bali Apanaga. Another case study area is the Indigenous villages called Bali Aga that remain adopt the original traditional in their whole life and architecture which without influencing from the Majapahit culture. The selected village is Pinggan Village, that located in Kintamani area. This Bali Aga village is selected for the village pattern, culture and architectural implementation in the settlement.

The research quality has significant influenced from the research instruments and data collection [13]. The quality of research instrument affects the validity, reliability, and quality of data collection. The data was gathered from primary data through observation and interviews. Meanwhile the secondary data by depth literature review regarding the understanding of the Bali Aga and Bali Apanaga. Statistical data was used for secondary data to provide validity of the data such as the total area of the villages, inhabitant, and land use function of the villages. On site observation according to Babbie (1998) and Sugiyono (2008) it is not only communicating the behaviour of the people, its also observe deeply of the events, the objects and the process of community activities [14]. The interviews was used to the village elders and the householders to get better information regarding the history of the village and the housing condition specifically for the traditional architecture. Data analysis is a significant stages to bring result and answer the hypothesis. Data analysis through qualitative descriptive was used to analyse the qualitative data from the observations and interviews to categorize and identify the traditional concepts in both Bali Aga and Bali Apanaga. Data collected from secondary and statistical were used to explain and understand the existing condition of the villages. The sketches and photographs were used to investigate the traditional concepts that have been implemented in the traditional houses of the villages.

4. Findings and Discussion

4.1. Bali Aga Housing
Pinggan Village as a case study is one of the villages located in the valley of Batur Mountain, Sub-district of Kintamani, Bangli Regency. Pinggan Village has an area of 16.51 km² that consists of 130 km² of the plantation, 342 km² of dry farming, 23 km² of settlement, 1 km² of the graveyard, and others function of 248 km² [15]. Pinggan Village as Bali Aga, implement the original tradition that inheritance from generation to generation. The landscape of Pinggan Village comprises of mountain and hill [16]. The pattern of Bali Aga villages is a linear pattern (Figure 2 and Figure 3) that found in the villages of Pinggan. One-unit housing pattern consists of 5 to 10 houses. The traditional houses are called tampul roras or saka roras. A traditional house consists of 4 functions, including kitchen, bedroom, shrine (pelangkiran) and terrace or ampik or terampe. The traditional house of sakaroras has a simple function as a residence where the villagers do their daily activities in the house. Meanwhile, the villagers go outside only for work in their plantation located surrounding the village. The kitchen is a place for cooking food for the family. Further, the bedroom is a place for rest or sleep at night, the sacred area as a place to worship the ancestors. The terrace or ampik or terampe has the function to welcoming guests,
to socialize with neighbor, as a place to prepare the offerings (*banten*). In several places, the terrace is also functioned to put the clean water tanks to distribute the water that they collected from the rainwater.

![Figure 2. Linear pattern of Pinggan Village](image)

**Figure 2. Linear pattern of Pinggan Village**

4.2. *Bali Apanaga Housing*

The compound housing pattern can usually be seen on the plains and particularly in the southern part of Bali called Bali Apanaga that having influencing from the Majapahit Kingdom era, especially Denpasar City. Denpasar City has a total area of 12.778 hectares or 2.27 percent of the total area of Bali Province, and it is inhabitant by 930.600 people in 2018 [17]. The housing pattern in Denpasar mostly building arrangements generates the *natah*, an open plaza in the middle of the house (Figure 4). The housing unit comprises of the family temple called *pamerajan*, *pengijeng natah* that located in the middle area of the housing; kitchen called *paon*, the *bale dauh* has to function as a bedroom (parent’s pavilion), the *umah meten* for bedroom (girls pavilion); the *bale dangin* for ceremony activities and for boys pavilion, granary as rice storage, and main gate called *pamesuan*. 

![Figure 3. One unit housing pattern in Pinggan Village](image)

**Figure 3. One unit housing pattern in Pinggan Village**
4.3. Sustainable Built Design and Environment

The implementation of the traditional structure and construction is one of principle in the Balinese traditional architecture to conserve the traditional building and as an identity of Balinese architecture. Balinese traditional architecture has a local structure and construction for the houses. The housing pattern in Bali Aga has a linear pattern (Figure 3) wherein one unit of the house consists of several householders (5 to 12 householders). Each household of the family is required to have two traditional building units, namely the Bale Sakaroras and Bale Meten. The function of the Bale Sakaroras is mainly for ritual purposes such as marriage and death ceremonies, while the Bale Meten is for beds, while other functions such as the kitchen and services. The Bale Sakaroras and Bale Meten use traditional construction that used wood or bamboo as the main structure. The construction is resistant to the earthquake (Figure 5). The pillar of the Bale as the main structure that connects a joint in the foundation (sendi) that can sway from earthquake vibrations.

The same as Bali Aga, the Bali Apanaga, as Denpasar City selected as a case study, the traditional buildings are also adopted the traditional structure and construction that resistant to the disaster such as earthquake risk (Figure 6). The traditional pillar called Saka (Figure 5), has a traditional joint where it can flexibly adopted the vibration of the earthquake. While the earthquake happened, the joint of the Saka can avoid the risk of collapse from the earthquake.
The buildings developed into small units that arrange with distance to each other for both Bali Aga and Bali Apanaga (Figure 3 and Figure 4). These distances give the flow of the air into the building. The buildings get enough sunrise to lightening the room in the building. The surroundings of the buildings planted by the vegetation that has the aesthetic function, as a barrier from ash and sunlight. The disaster risk management is also adopted to this pattern, if there is an earthquake, the people run out from the building to the center of building orientation or natah (Figure 4) as a central point meeting for security. The distance between the buildings is also bring security from the fire risk. If one building in fire risk, another building will avoid and be spared from the fire. The small building’s design of traditional housing is a unique design that answered the challenge from the risk of disaster.

The traditional houses bring quality life to the people to live in. The building composition of the compound and linear patterns give the air flows into the housing, thus the environment of the housing have no pollution as Keles (2012) states that the quality of life depends on the factors that contribute to making good or worst. These factors can be seen through the traditional values of housing in both Bali Aga and Bali Apanaga. The traditional structure and construction answered the global nature of environmental problems. It can conclude the design of traditional housing is a sustainable built design.

**Figure 5.** Balinese traditional pillar (*saka*) construction for earthquake resistance [18 ]

**Figure 6.** The traditional structure and construction of the *bale dauh* resistant to the earthquake
that can prevent the risk of disaster and suitable for the condition in order to maintain their quality of life and environment.

5. Conclusion

Both Bali Aga and Bali Apanaga houses use the traditional concept of architecture. These concepts have been adopted from generation to generation. Most Bali Aga still implements their original norms and values into their traditional building of sakaroras and bale meten. Bali Apanaga is a new culture that influenced by the Majapahit period, where the people still retain the Balinese traditional concept into their traditional buildings for their living. The traditional concepts implemented in traditional housing is sustainable built design. It is also suitable for future design in the globalization era that can make the quality of life better.

The values from this research that can be learned, it is very important to maintain our traditional concept to implement into the buildings to conserve the tradition and wealth of architecture norms. This is also a cultural identity, especially for traditional architecture.

6. References

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