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The Disproportional Arrangement of the House: The Biodiversity Spaces and the Transformation of the Traditional Balinese House in Tourism Economy

I Dewa Gede Agung Diasana Putra

Abstract

The traditional Balinese house that is manifested and translated in this agricultural context is a complete house in which domestic and religious activities are interrelated with the environment including the biodiversity. Since these iconic practices subsequently became a resource of tourism economy, the house has been transformed not only for tourist facilities but also for accommodating the novel demands of occupants. The transformation presents a conflict between economic gain and the preservation of Balinese traditions. Using architectural examination, interviews about the cultural and domestic activities, and biodiversity checklist to record the historic process of types of vegetation and animals in the house, the chapter shows that the tourism has blurred the house's configuration. The house becomes incomplete in which the preservation of biodiversity spaces is now oriented toward the purpose of tourism rather than protecting the traditions and environment as a part of an agricultural tradition. The house has lost some essential elements that affect the way that accommodates Balinese traditions.

Keywords: the traditional Balinese house, biodiversity, transformation, traditions, tourism economy

1. Introduction

The traditional Balinese house, which is manifested and translated in an agricultural context, is organized within the framework of ritual arrangement in which its configuration is harmonious within its worldview to support the cultural functions of the house. The spaces in the house are not only to accommodate ritual and domestic activities, but also to provide materials for offerings and daily food for the occupants including many kinds of vegetation and animals. This configuration shows that the house is a complete house in which the biological diversity called biodiversity in the house provides the demands of the daily needs of the occupants. Biodiversity consists of species variation and their habitats across the earth's surface [1]. In a traditional Balinese house, biodiversity is the variety of vegetation and

animals in the house. Their functions not only create comfortable conditions but also provide raw materials for daily basic needs, offerings, and buildings [2].

Open spaces were not only a place for domestic and religious activities but also for vegetation and “domestic” animals. Small plants such as flowers and foliage were planted near the pavilions, while big trees such as coconut, banana, and palm were planted in the backyard. Pigs and ducks could run everywhere, while chickens freely played and looked for food in the courtyard (*natah*) [3]. The house was presented as a harmonious site where people, animals, and vegetation were able to live peacefully in a traditional house. This scene was a common situation in an agricultural society in which religious and domestic practices were interrelated with the environment. The Balinese felt comfortable to share spaces with animals since all elements of the house were in their particular ordered system.

However, since the tourism industry in the early twentieth century, the Balinese house has been transformed not only for tourist facilities but also to accommodate the new demands of occupants. On the other hand, since cultural tourism conception is applied in Bali, people try to maintain their culture as a resource of tourism attractions. This is a paradoxical phenomenon in which the transformation as the impact of tourism presents a conflict between economic gain and the preservation of Balinese traditions including the biodiversity in the house as a part of domestic and cultural activities.

In order to present the abovementioned conflict, this paper uses architectural examination and spatial stories of people’s activities as a method of investigation. This method involved architectural documentation, graphic analysis, and narratives of people’s cultural activities and traditions. Through this method, this paper investigates and explores how the biodiversity spaces in the house have been reconfigured as a response to address the challenges of the tourist economy. Initially, however, some theoretical considerations of how traditions in general are transmitted and the traditions of Balinese in the agricultural economy era are discussed. This is followed by a detailed description of the elements of the traditional Balinese house. In subsequent sections, the paper explores how the traditions and biodiversity have been transformed by the new arrangements within the house. Some conclusions are presented in the final section.

2. The traditional house: the harmonious spaces for biodiversity

The traditional Balinese house is a cosmological space in which its compound configuration is translated from a spiritual orientation. In this configuration, the world is built upon opposite poles as a cosmic antagonism concept including the sacred and profane, sunset and sunrise, high and low, mountain/highland, and sea/lowland. This is the concept of the balance of opposite poles, called *rwa bhineda*. It influences the spatial orientation and the shapes of the physical configuration of Bali, such as the configuration of villages, temples, and houses [4]. Based on this concept, the intermediate sphere called *madyapada/mertyapada* is then located in between the upper and nether worlds [5]. This intermediate sphere, that is a space for human dwelling, has an important role to maintain the balance of the upper and nether worlds [4]. In this context, people have religious roles to maintain the harmonious relationship with God (upper world), and to protect the environment as a representation of the power of God.

This relationship is the personification of the Hindu religion philosophy called *tri hita karana* [6, 7]. The spirit is a harmonious relationship between God, human beings, and the environment [8]. The *tri hita karana* philosophy then inspires other concepts related to the landscape of Bali from the universe physical division to the

human physical division including the *tri angga* concept. Based on this concept, the traditional Balinese house is divided into three traditional values namely *utama*, *madia*, and *nista* or the head, the body, and the legs. *Utama* or the head means high, lofty, or most sacred value, *madia* or the body means middle or neutral and *nista* or the legs means below or most profane value [4, 9, 10].

Based on this concept, the house is metaphorically likened to a human body divided into three parts: the head, body, and legs (**Figure 1**). The head is the most sacred area, called *merajan*/the family temple (a). The family temple located in the *kaja-kangin* corner of the house. Physically, it is surrounded by walls and organized around at least three shrines and a supported pavilion called *piyasan*. The family temple is a site where the Balinese perform many activities, such as praying, singing, and dancing that are devoted to God and ancestors. It is a place where the Balinese show their devotion by working together with their related family. They dedicate offerings and decorate the pavilions and shrines in the family temple with special clothes.

The body is the intermediate sphere where domestic and ceremonial activities related to the human life cycle, birth-life-death-rebirth. Within the body as the zone of the domestic domain, the inhabitations are preoccupied with daily work. Women mobile across spaces: to the kitchen (f), to the backyard (k), to the pigsty, to the granary, and sometimes to the rice field and to the market. In their spare time, women sit in the pavilions such as the *bale daja*: the sleeping pavilions (b), the *bale dangin*: the ceremonial pavilion (d) and the *bale dauh*: the sleeping pavilions (c) or in the *natah* (g). On the other hand, men travel across spaces to help women prepare their daily needs or they go to the field.

The *bale meten/bale daja* (b) is a pavilion for the oldest family members, children, and unmarried daughters that consists of one or two bedrooms and a veranda. This is located on *kaja* direction near the family temple. The *bale* is a building related to some religious activities such as proposal rituals in a wedding ceremony and a seclusion ritual before a tooth-filing ceremony (*mesangih*). The participants stay in this pavilion before attending the main rituals in the *bale dangin*. The building is also a space for supporting activities during ceremonies, including a place for

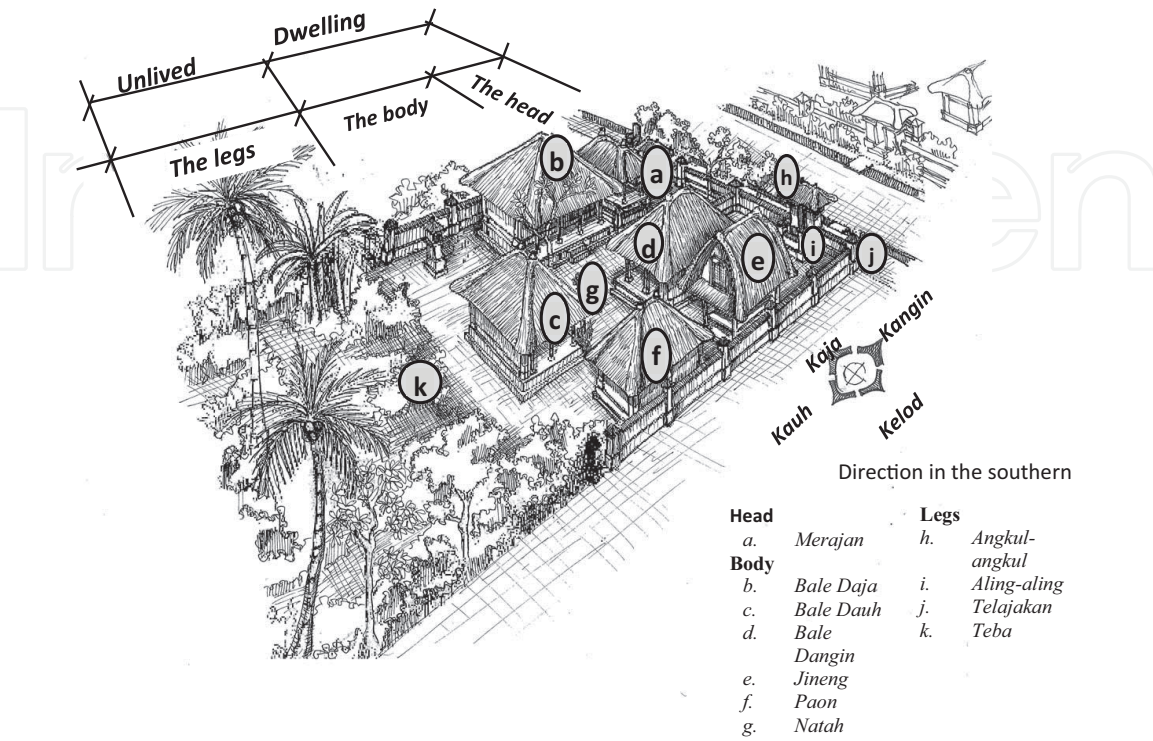


Figure 1.
The typical configuration of the traditional Balinese house.

pesantian (the traditional singing group for rituals) and special guests such as the head of the village, royal, and high priest families.

The *bale dangin* (d) is an open pavilion where the walls are just on two sides. It is located in *kangin* direction, in front of the *bale daja* and near the family temple. The pavilion consists of one wooden bed for *manusa* and *pitra yadnya* rituals, such as *ngaben* (a cremation ceremony), *nyekah* (a purification of the soul), *mesakapan* (a wedding ceremony), *mesangih* (a tooth-filing ceremony), *otonan* (a birthday ceremony), and many ceremonies for a baby.

The *bale dauh* (c) is a building for all family members located on the west side of the house. It consists of one or more bedrooms and one veranda. The veranda is used for guests who are involved in ceremonial activities. In some conditions, it is also the location of the *wayang lemah*, the puppet shadow, which is performed as a part of the ceremonies.

The *natah*, the courtyard (g), is an empty space in the middle of the compound space formed by the setting of the pavilions in the house. It is a central orientation for human circulation. It means emptiness, the harmony between microcosm and macrocosm where the people perform many rituals such as *ngaben*, *nyekah*, *mesakapan*, *mesangih*, and ceremonies for a baby. As an open space, the *natah* is a place for planting vegetation especially the small trees including many kinds of flowers. This space is able to accommodate domestic activities, including drying rice, drying clothes, or for children to play. The activities change over time, which depends on the procession of the rituals and activities. These make it impossible for the particular pattern to represent the functions of the space. The space is empty and has no definition as a place of activities until the people perform them and use many types of equipment.

The legs, also called *lebuh*, are the *nista* (below) area consisting of a backyard (k) called *teba* and a front part of the house consisting of *telajakan* (j), front wall, *angkul-angkul*: the traditional gate (h) and *aling-aling* (i). The *telajakan* is a profane space between the front wall and road. This place functions as a garden where people plant vegetation such as flowers, foliage, and trees. In addition, *aling-aling* (i) is a small wall behind the traditional gate. This wall is to protect their privacy since the Balinese people always welcome guests, and never close a gate. This small wall is a screen so that someone outside cannot see the people who are in the house. It is built in between the traditional gate (*angkul-angkul*) and the house yard. The traditional gate, *angkul-angkul*, is a pair of two brick blocks in a row, positioned with a wooden door in between. The *angkul-angkul* has a pyramid roof made from dry grass or brick and stone. The *angkul-angkul* is normally higher than the wall surrounding the house. This is usually used as the entrance to the central courtyard called *natah*.

Similar to *natah*, the backyard, *teba* (k), is also an empty space in the back. It is a place for planting vegetation and raising animals that are used for food and offering materials. It is also a place for garbage processing. It is a place to prepare offerings related to ceremonial activities, including many kinds of food and other ceremonial equipment. The backyard is a place that is no particular traditional order or is not regulated by traditional architectural requirement through which to arrange the configuration of vegetation and animals. Temporary structures are built for keeping animals such as pigsties, cowsheds, and henhouses.

The abovementioned functions of pavilions and open spaces show that the house has multifunctional purposes, both spiritual purposes represented by ceremonial activities and secular purposes represented by domestic activities. The spaces become meaningful through this interaction between architectural spaces, objects, and activities therein. Without occupants' activities, the spaces are abstract and without meaning.

The social-cultural activities are related to harmonious relationships between occupants and God, as well as community. This is represented by the ceremonial

activities that are regularly performed in the house. In ceremonial activities, the house is full of activities involving the members of the family and the community during the preparation and the day of the rituals. The house becomes a meeting place for members of a traditional neighborhood called *banjar* to do voluntarily work, chat, and discuss. Women make same offerings in the compound space, the spaces located in between the sacred and profane area. They arrange flowers, fruits, and coconut leaves. Men merge with other men in the backyard or other spaces in the house. Men usually make some offering of equipment to complete the offerings made by women. They prepare food for offerings and feast in the backyard, the profane space.

On the days of ceremony, Women assemble in the compound space and family temple, take and lay the offerings in the shrines, light incense, and perform the procession of the rituals. They perform these activities and rituals together guided by a priest called *pemangku* or a high priest called *pedanda*. Some of them sing religious songs and walk from space to space based on the particular rituals. The women, who are not involved, sit on the floor or ground in the family temple and witness the rituals. They are ready to take on the role in the ritual processions if necessary. Men, on the other hand, assemble in many areas of the house to witness the rituals. They are ready to help women during the rituals including bringing heavy ritual equipment and offerings.

3. The transformation of the compound spaces

The development of tourism has changed many aspects of Balinese culture. Tourism has produced negative impacts including the profanation of sacred performances [11] and the degradation of classical artworks [12]. However, the tourism impacts are various and it is difficult to generalize from a specific case [13, 14]. The impacts depend upon the interactions and their circumstances between local people and tourists. Variations are caused by the dynamics of tourism that is different, active, and changing.

The development of tourism has influenced many aspects of the village, including the pattern, as well as the family house compounds [15]. Many traditional Balinese houses have been transformed for tourist facilities such as home-stays, art shops, restaurants, cafes, moneychangers, and laundries. Along the main roads in the villages, traditional settlements were previously represented by the presence of traditional walls, gates, and the spaces between the wall and the road. Now many of these have been turned into tourist facilities. A baseline data investigation recorded 749 traditional Balinese houses in the four villages. This investigation found 54% of the houses have been transformed into tourist facilities (**Table 1**). These data show that tourism has substantially influenced the transformation. Kuta, which is a very popular coastal tourist destination, underwent the greatest transformation (69% of the 191 houses were transformed). This number is the highest percentage of the four villages. Kamasan, the less popular tourist destination, had the lowest percentage (13% of the 188 houses transformed) [16]. This phenomenon presents the extent to which tourists influenced the level of the house transformation.

In Kuta, tourist activities have spread both to beaches and in the village while, in Kamasan, tourist activities have been restricted to just a few parts of the village. The people in the former village, therefore, have had opportunities to interact intensively with tourists and employed their houses as an asset by transforming them for tourism. Similarly, tourist activities in Ubud have been in the center of the village, with 61% of the 213 traditional houses were transformed into tourist facilities [16]. On the other hand, the tourist activities in Sanur are on the outskirts of the village. In this village, the percentage of the transformed houses for tourism was much

Villages	The traditional Balinese house				
	Transformed for tourism		Not for tourism		Total
		%		%	
Kuta	132	69	59	31	191
Sanur	60	38	97	62	157
Ubud	129	61	84	39	213
Kamasan	24	13	164	87	188
Total	345	46	404	54	749

Table 1.
The number of the traditional Balinese houses transformed for tourism.

lower (38% of the 157 traditional houses) than the percentage in Kuta and Ubud (**Table 1**). Therefore, the location of the tourist activities has influenced the degree of transformation; the closer the tourist activities were to the traditional village, the greater the level of transformation.

This investigation also found that house gates were generally kept unlocked during the day, even when the occupants were absent. For the most part, the owners were willing to show off their houses, some of them were proud to do so. However, there were different reactions of people across the four villages. In Kuta and Sanur, there were more locked houses and the owners were more cautious about giving consent because of criminality, increasing tax surveys, wasting time to talk with unrecognized people and for no stated reasons. These observations indicate that tourism has influenced people’s behavior making them more selective in their contact with people, especially strangers.

In transformed houses, many parts of the houses have been changed. These changes have altered both the settings and forms of the house compound. The houses, which once had similarities, nowadays have many variations. To understand the variations, the houses were investigated by visual and checklist examination to assess the recent settings and forms compared to the traditional configuration of the Balinese house including *tembok penyengker*, *angkul-angkul*, *telajakan*, *natah*, pavilions, *teba*, and *sanggah/merajan*. The transformed houses that were investigated within the compound related to conditions of the family temple, pavilions, courtyard, and backyard are demonstrated in the following sections.

The level of the transformation differs amongst the villages. The concept of the destinations is significant. Most houses (96%) in Ubud, regarded as the cultural capital of Bali, still kept the traditional front wall while they are just 75% in Sanur and 73% in Kuta that are the coastal destination areas [17]. In the investigation of the *angkul-angkul* representing the identity of the traditional house (**Figure 2**), Kuta had the biggest (64%) loss of *angkul-angkul* while Ubud had the smallest (16%). Interestingly, Kamasan that is visited by few tourists had a relatively high loss (38%). This phenomenon indicates that the loss of *angkul-angkul* was not entirely caused by the number of tourists in the villages. This was related to the phenomenon that cultural tourists want stylistic representation of traditional Balinese architecture.

The traditional Balinese architecture including the elements of the traditional house was one of the cultural components used by the local people in Ubud to attract tourists. From the economic benefit of tourist activities, they were able to reconstruct and repair the old in the traditional style. On the other hand, the people in Kamasan were not able to rebuild the traditional *angkul-angkul* and applied non-natural materials to repair the old. As popular destinations in Bali, people in Kuta and Sanur are also able to use the economic benefits from tourism to build the *angkul-angkul*

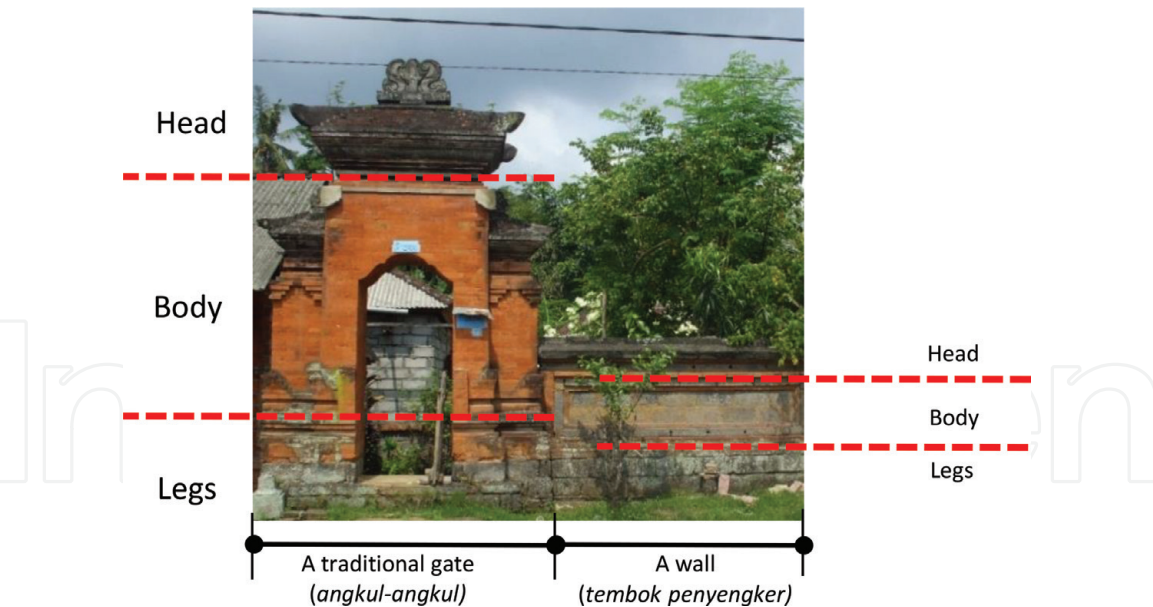


Figure 2.
A gate and a wall applying tri angga concept and using a number of natural materials.

in their houses. However, the complete traditional gates consisting of *angkul-angkul* and *aling-aling* were fewer in number where there are just 1% in Kuta and 2% in Sanur. In this case, one can see the different characters of tourism development. Ubud focused on cultural tourism, while Kuta and Sanur focused on beach tourism. While Ubud tried to maintain and preserve its culture, including the elements of the traditional house, Kuta and Sanur employed the beach to attract tourists.

The application of traditional architectural style indicates that tourism has evoked awareness in people to maintain their culture as a strategy to attract tourists. The figure shows that the transformation in cultural tourism destination contrasts with the tourist destinations that rely on the beach as capital for tourism developments in which the houses have undergone substantial transformation. The constructions of many new structures have utilized parts of the *natah* so that its size, form, and setting have been transformed.

Ubud, the cultural tourism area, had the biggest percentage (84%) of the presence of courtyard (*natah*). In such transformation, *natah* has been maintained and employed as an asset and a part of the tourist facilities (**Figure 3**). On the other hand, the *natah* underwent a substantial transformation, in which 89, 88, and 63% courtyards (*natahs*), respectively, in Kuta, Kamasan, and Sanur have been transformed (**Figure 4**). The transformation of courtyard is related the transformation of the pavilions and the increase of new structures in the houses. 99% house in Kuta, 98% in Sanur, 83% in Kamasan, and 51% in Ubud had the increase of structures representing the body of the house through the demolition of old traditional pavilion and the building of new structures in the open spaces such as courtyard and backyard representing the legs of the house [16]. This figure shows every part of the house, which is likened to a human body, has undergone different levels of transformation. Based on the perspective of a cosmological framework, the body is getting bigger while the backyard is getting smaller and in many cases has even disappeared so that the house becomes disproportional arrangement.

In all processes and categories, the original pattern of the house is still maintained in which a *natah* is still the central orientation of pavilions and a family temple (**Figure 5A**). In this process, the *natah* is a frame limiting the multiplicity of many structures. The configuration of the *natah*, pavilions and family temple is never transformed into a new pattern, but it still continues to develop and becomes



Figure 3.
Courtyards (*natah*) that still exists in transformed houses.



Figure 4.
Courtyards (*natah*) that have been changed.

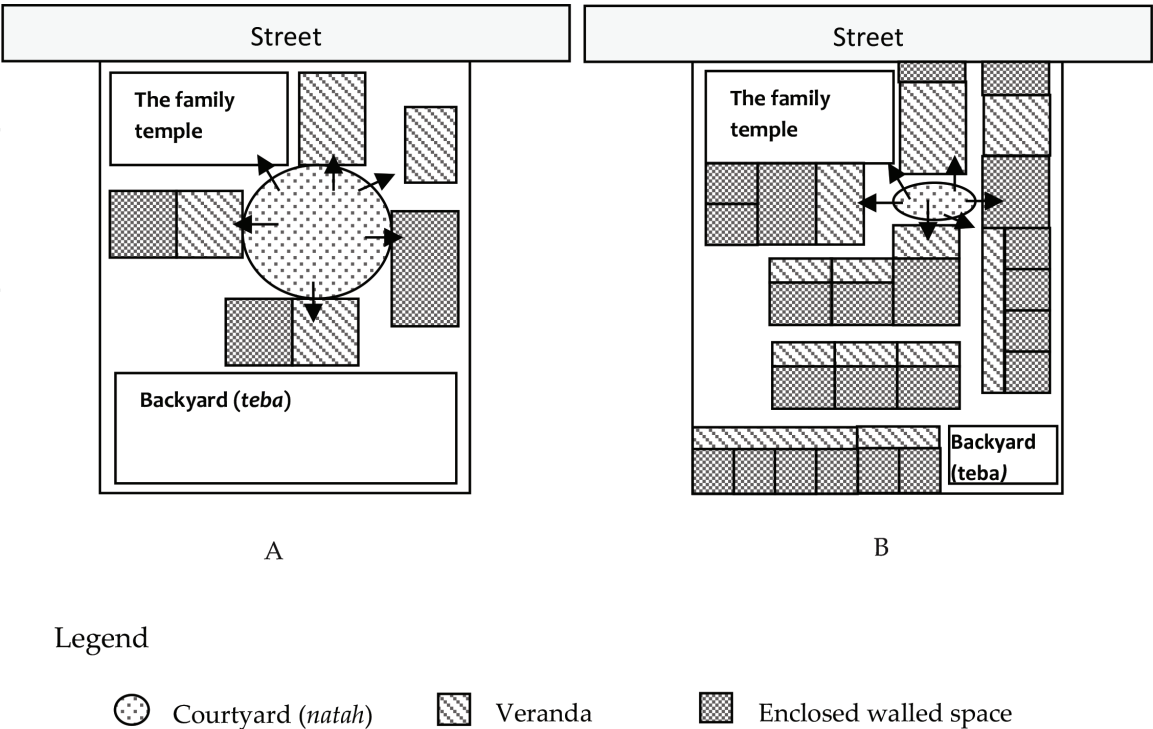


Figure 5.
The pattern of the house before and after transformation. (A) The pattern before transformation and (B) the pattern model after transformation.

internally more complicated and complex (**Figure 5B**). This pattern is a part of building practices in Balinese traditions. Such traditions, as suggested by Shils [18], are an attachment object of the past into the new tradition. However, in this process, physically, the size of the *natah* and *teba* reduces because of the multiplicity or enlargement process of new structures.

The enlargement and multiplicity process of new structures causes a decrease of open space in the house. This process not only occurs in the compound spaces as the body of the house, but also spreads into the backyard or the legs of the house. The backyard, which used to be a small forest without pavilions, now becomes an additional space to accommodate the occupants' domestic activities. The compound space as the body of the house is getting bigger while the backyard as the legs of the house is getting smaller and in some houses there are even not enough spaces for planting vegetation. From the perspective of the cosmological framework, the house is likely to become incomplete. The house has disproportional arrangement and becomes like a "human" who still has a head (the family temple) with an enlarged body but without legs or very small legs. The traditional house pattern no longer presents its cosmological order. Therefore, the following section will examine whether or not this change will influence the functions of the house in relation to its physical configuration as a residential area and the representation of the family formation of the paternal kinship.

The disproportional arrangement of the house has caused the gradual disappearance of many functional structures that presents the deterioration of its traditional functions and meanings. Although many socio-cultural practices are still performed in the transformed houses, the house needs other components outside the house such as village facilities to compensate for the lost spaces. The space limitation also influences its original configuration, rendering the structure less environmentally friendly including the reduction of biodiversity in the house.

4. The reduction of biodiversity spaces

The transformation of the traditional Balinese houses in tourist destinations has caused disproportional arrangement. The reduction of open spaces has influenced spaces for biodiversity. Spaces that were places for animals and vegetation are now places for accommodating the occupants' domestic activities and tourist activities.

In order to investigate the types of vegetation in every sample house, vegetation checklist was used to record it. In this investigation, the vegetation was divided into two categories: (i) commonly grown vegetation and (ii) non-commonly grown vegetation. Vegetation being traditionally used for ceremonial and domestic activities is categorized as the first. The second is vegetation that traditionally is unusually used as materials for ceremonial activities. The types of vegetation in every transformed house were then presented in star diagrams (**Figure 6**).

The amount of vegetation in a house is related to the availability of open spaces. This availability influenced the number of vegetation types in the house. Ubud that had the lowest (47%) BCR (Building Coverage Ratio: the ratio in percentage between ground building area and plot area) had the most types of vegetation (32 types). On the other side, Sanur and Kuta having the highest BCR (60%) had the fewest types of vegetation (respectively, 15 and 18 types) (**Figure 3**). The figure also presents that frangipani was the favorite vegetation in all villages. Almost 90% houses in Sanur and Ubud, more than 80% in Kamasan and almost 70% in Kuta have this flower.

Nine types of flower trees, 13 types of fruit trees, and 11 types of foliage trees have still been planted in the transformed houses. Frangipani called *jepun*, hibiscus

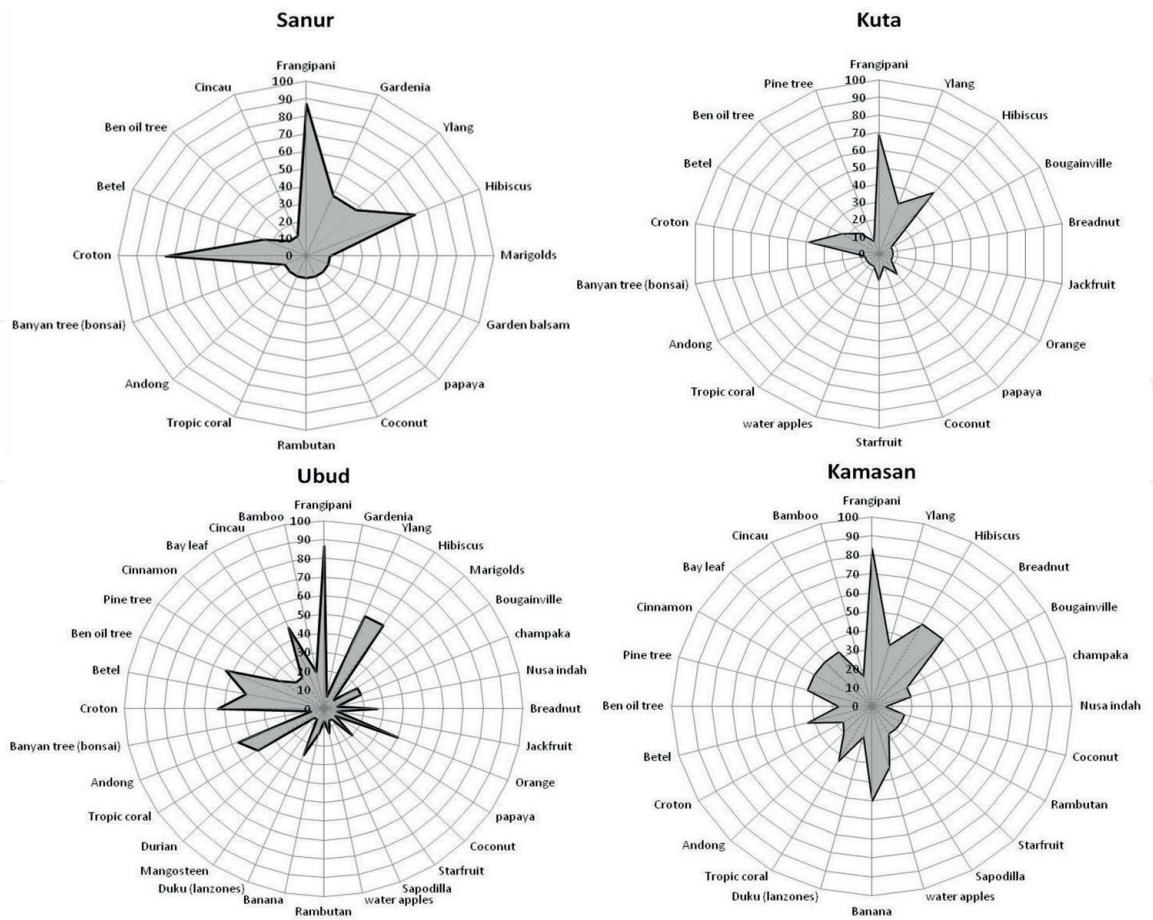


Figure 6.
Percentage of Balinese vegetation in each village.

called *pucuk*, and *ylang* called *sandat* were the favorite vegetation in the transformed houses where their percentage were, respectively, 82, 53, and 39%. This vegetation is traditionally used for ceremonial activities, daily rituals, and praying. Similarly, croton called *plawa* and betel called *base* were also favorite. The Balinese picked the leaves for many kinds of offerings. Croton and betel were planted in 46 and 30% houses, respectively. However, some vegetation that is usually used for ceremonial activities decrease in number such as banana called *biu* and coconut tree called *nyuh*. The reduction is related to the reduction of open space in the house. They were just, respectively, 16 and 14% in the house because the vegetation is big while the houses have no enough open space to plan them (Table 2).

The size of the trees was a reason why flowers that were usually still planted in the house were more popular than other kinds of vegetation. Because of the limitation of undeveloped spaces, people were compelled to cut down big trees in order to build new structures to accommodate tourists and domestic activities. The flowers, on the other hand, were still in the houses because such vegetation does not need a lot of space. People are able to plant them in limited spaces or pots.

In the transformed houses, the owners planted particular trees not only because of their need for domestic and socio-cultural activities, but also because they like to see the appearance of the trees. They planted particular vegetation to express their hobby. People also have even planted banyan trees in the houses. This tree is a big tree that is usually planted in village facilities. Traditionally, it was never planted in the houses because the people believed that by planting this tree in the house, there would be a negative impact on the residents. However, in the transformed houses, this belief has changed so that this tree has been planted in the houses, especially those in popular tourist destinations, without being afraid of its negative effect. The

		Various type of commonly grown vegetation in transformed houses in every village (%)				
		Sanur	Kuta	Ubud	Kamasan	Average
Flower plants	Frangipani	88	69	87	83	82
	Gardenia	38	0	7	0	11
	Ylang	38	31	53	33	39
	Hibiscus	63	46	53	50	53
	Marigolds	13	0	7	0	5
	Garden balsam	13	0	0	0	3
	Bougainville	0	8	20	20	12
	Champaka	0	0	20	20	10
	Nusa indah	0	0	7	7	3
Fruit plants	Breadnut	0	8	27	50	21
	Jackfruit	0	8	7	0	4
	Orange	0	8	40	0	12
	Papaya	13	15	7	0	9
	Coconut	13	8	20	17	14
	Starfruit	0	15	7	17	10
	Sapodilla	0	0	7	17	6
	Water apples	0	8	13	33	14
	Rambutan	13	0	7	17	9
	Banana	0	0	13	50	16
	Duku (lanzones)	0	0	27	17	11
	Mangosteen	0	0	7	0	2
	Durian	0	0	7	0	2
Foliage plants	Tropic coral	13	8	40	33	23
	Andong	13	8	47	20	22
	Banyan tree (bonsai)	13	8	7	0	7
	Croton	75	38	53	17	46
	Betel	25	23	40	33	30
	Ben oil tree	13	15	53	17	25
	Pine tree	0	8	27	33	17
	Cinnamon	0	0	20	33	13
	Bay leaf	0	0	20	33	13
	Cincau	13	0	47	33	23
	Bamboo	0	0	20	17	7

Table 2.
Types of commonly grown vegetation in the surveyed houses.

tree has been planted in pots as a bonsai tree. A few houses (13, 8, and 7%) in Kuta, Sanur, and Ubud, respectively, utilized the bonsai as part of the garden. On the other hand, no houses in Kamasan, the least-popular tourist village, had this tree.

Compared to commonly grown vegetation (33 types), as mentioned above, the types of non-commonly grown vegetation (six types) were fewer. *Adenium* was the most popular non-commonly grown vegetation in the transformed houses in Kamasan, Sanur, Kuta, and Ubud, where this plant was grown in, respectively, 83, 50, 40, and 20% of all houses. The other species planted in significant numbers were *Euphorbia*, where the percentage was 67% in Kamasan, 20% in Ubud and Kuta, and 13% in Sanur. Interestingly, Kamasan, the least-popular tourist village, had the highest percentage of non-commonly grown plants (83% *Adenium* and 67% *Euphorbia*) while Ubud was the lowest (Table 3). These figures indicate that the people in the more popular villages, especially in Ubud, prefer to plant commonly grown vegetation to present their traditional identity. This practice is likely to be a strategy of the people to attract tourists.

Animals are other kind of biodiversity in the house. Chickens, ducks, dogs, pigs, cows, and water buffalos were traditionally raised by the Balinese in the houses [2]. A pigsty was usually built near a kitchen, while a cowshed was built in the *teba*. Roosters called *siap muani* were usually kept in cages that could easily be moved. They put the cages in the front of the house in the day and in the back of the house in the evening. Dogs and hens were never caged so they easily moved around the house and even go into the pavilions. At the night, hens will go to the *rompok*, the temporary structure located in the *teba*.

In the transformed houses, most traditional domestic animals were no longer in the houses. Cows and water buffalos that were used to help a farmer to plow the rice

Name	Various type of non-commonly grown vegetation in transformed houses (%)				
	Sanur	Kuta	Ubud	Kamasan	Average
Euphorbia	13	20	20	67	26
Grape	0	7	7	0	5
orchid	25	0	20	0	12
Adenium	50	40	20	83	43
Palm	13	13	13	0	12
Athurium	13	0	0	0	2

Table 3.
Types of non-commonly grown vegetation in the surveyed houses.

field are now replaced by a machine. People also no longer raise pigs in the house because of their bad smell. However, some traditional domestic animals including dogs and chickens are still kept in the houses. On average, they were the most popular traditional domestic animals kept in the transformed houses. Dogs were raised in 45% houses, while chickens were raised in 33% houses (**Table 4**). In Sanur and Ubud, dogs are the popular animal where the percentage was 38 and 53%, respectively. In Kuta, chickens and turtledoves (*kukur*) were popular traditional domestic animals in the houses where the percentage was 33%. These figures indicate that the animals in the house are no longer an important part of the houses to provide materials for offerings and daily life. From the owner’s point of view, raising animals in the house was part of their leisure time activities. In contrast, most houses in Kamasan (83%) use chickens as a source of offerings and food. In addition, many kinds of birds including turtledoves and pigeons that used to be free are now caged. A few houses, 13, 33, and 27%, respectively, in Sanur, Kuta, and Ubud, raised turtledoves and 50% of houses in Kamasan raised pigeons. People have caged these birds as leisure time activities. Therefore, raising animals in these houses is no longer for domestic and socio-cultural reasons.

Besides raising traditional domestic animals, some animals have been introduced in the transformed houses although in the small numbers. Raising many species of nontraditional domestic dogs has become a popular hobby in the houses. Two nontraditional domestic animals, *Pomerania* and *Poodle*, were the most popular dogs raised by the people (**Table 5**). In Kuta, Kamasan, and Ubud, the most popular was *Pekingese*. These figures indicate that the choice of raising animals that used to be based on the needs of the domestic and socio-cultural activities is now merely a hobby or pastime.

Name	Various type of traditional domestic animals in transformed houses (%)				
	Sanur	Kuta	Ubud	Kamasan	Average
Dog	38	27	53	67	45
Chicken	13	33	20	83	33
Turtledove	13	33	27	0	24
Pigeon	0	0	0	50	7
Cat	0	0	0	17	2
Duck	0	0	0	17	2

Table 4.
Various types of traditional “domestic” animals in the houses.

Name		Types of non-traditional domestic animals in surveyed houses (%)				
		Sanur	Kuta	Ubud	Kamasan	Average
Dog	Poodle	13	0	0	0	2
	Pekingese	0	7	7	17	7
	Pomerania	13	0	0	0	2
Rabbit		0	7	0	0	2

Table 5.
Types of nontraditional domestic animals in the surveyed houses.

5. Conclusions

The traditional Balinese house is an indigenous form accommodating domestic and religious activities in relation to maintain a harmonious relationship with God, other human beings, and the environment. Traditionally, the representation of the environment in the house was open spaces including a courtyard and a backyard. In these open spaces, occupants planted vegetation and raised animals. It was the biodiversity that supplied materials for rituals and domestic needs. In the house, rituals and mundane practices were mutually implicated. The Balinese conserved the environment to support their rituals, and at the same time, they conducted these rituals so that the God will provide them with a good harvest. As a site to perform these practices, the house and the practices have produced and contributed to the Balinese cultural identity.

However, these iconic practices subsequently became a resource to obtain economic benefits when the tourism industry discovered the island in the early twentieth century. Tourism has caused a paradoxical phenomenon in which the transformation presents a struggle between economic benefit and the preservation of Balinese culture including the biodiversity in the house. Nowadays, the old conditions contradict with the new desires of the occupants. In this transformation, new ideas have infiltrated the local traditions by collective participation and collaboration.

Every division of the house has undergone different levels of transformation. The head constituting the most sacred spaces, where God and occupants' ancestors reside, underwent fewer and more limited transformations. On the other hand, the expansion and multiplication of new structures occurred in the body of the house, causing a reduction of open spaces including in the courtyard and backyard. From the perspective of the cosmological framework, the body has been getting bigger while the legs, represented by backyard, have been getting smaller and, in many cases, have disappeared. The house has been likely to become disproportional and even incomplete. The traditional house pattern has undergone an ongoing process of the loss of some components, its cultural expression and traditional functions but economically, the house becomes more valuable than it was before the transformation.

The increase of building density has reduced open spaces in the houses that would appear to significantly influence biodiversity. The preservation of biodiversity is oriented toward the purpose of tourism rather than protecting the environment as a part of an agricultural tradition and as materials for offerings. The house has lost some essential elements that affect the way to accommodates Balinese traditions. Sanur and Kuta that had a high BCR had smaller numbers and types of vegetation

and animals than Ubud and Kamasan that had the lower BCR. The investigation found that some types of flowers, such as frangipanis, hibiscus, and *ylang*, were favorites in the houses. The flowers were used not only as offerings in ceremonial activities, but also as ways to beautify the houses. On the other hand, the most popular animals in the houses were dogs, turtledoves, pigeons, and chickens. The three first animals were favorites in the popular tourist destinations (Sanur, Kuta, and Ubud). These animals were raised not only for offerings but also for pleasure. In contrast, most people in Kamasan raised chickens as a stock for offerings and food. The biodiversity in the houses, especially in popular tourist destinations, has increasingly become a way just to beautify the house and to be merely a hobby or pastime.

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Author details

I Dewa Gede Agung Diasana Putra
Udayana University, Denpasar, Bali, Indonesia

*Address all correspondence to: diasanaputra@unud.ac.id

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