



ENSHRINEMENT SPATIAL PATTERN IN BUMIAYU TEMPLES (DESCRIPTION OF ENVIRONMENTAL ADAPTATION IN WET LAND)

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Abstract

The Bumiayu temple is located in wetlands, but the temples are protected from puddles. The problem that arises are a) how is the location of Bumiayu temples, b) how is the network in Bumiayu temples area and c) how is the distribution of the Bumiayu temples. The purpose of this study was to analyze the spatial pattern of the Bumiayu enshrinement which shows that the people-built temples had adapted to nature. The specific aims are to analyze the morphography, morphometry, landform of the Bumiayu temples, b) to analyze water activity in Bumiayu temples c) to analyze the distribution and orientation of the Bumiayu temples. The qualitative method is used with descriptive and expansive reasoning, precisely the order using the Widyamanti classification (2016). The distribution/orientation of the temples uses data proximity analysis. The results showed that the Bumiayu temple area was lowland with an elevation of 11 masl - 20 masl and was on a rather sloping (8 % - 13 %). The landform consists of the river terrace, natural embankment, swamp. The enshrinement area consists of 4 rooms bordered by rivers and lakes. Location is in a group position and surrounded by canals that tributaries of the Lematang River. In the past, the community had managed the environment. They made canals to regulate water and transportation facilities in Bumiayu temple area. In addition, the canal also serves to fulfil practical and ritual needed.

Keywords: pattern, wet land, temple Bumiayu

1. Introduction

Pattern are images used for model, systems, permanent configuration, combination of characteristic tendencies, information on the form organizing the drafting technique, guidelines, frameworks, methods and efforts [1]. Pattern, in anthropological term, is a set of standard elements with regard to symptom, and can be used as an example in depicture or describing symptom (Fujiastusi, 2010). Spatial pattern in this context is a description of a location that shows



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characteristic tendency, particularly related to wetland locations, known as swamp lands, that are often inundated both seasonally and annually due to rainfall or tides [2]

Wetlands found in South Sumatera, typically in watersheds. In that kind of zone were found the distribution of archaeological sites which contain Hindu-Buddhist temples. Temple is a means of worshipping the Gods. It must be established by meeting the criteria of religious books. One of the criteria is being close to a water source, or being in high area [3]. The existence of the enshrinement near the water source is caused by Hindu/Buddhist mindset that the area is sacred since it is the abode of the Gods. In addition, water sources can meet the needs of ritual activities and practical needs. Still, watersheds have important role in past trade activities. Those trading activities helped to encourage the spread of Hindu-Buddhist religion [4]

In South Sumatera, a Hindu-Buddhist temple area found in Lematang River basin where Bumiayu Temple Complex located. This area has a chronology from the 8th to 13th centuries AD. It is based on the results of the relative dating analysis of the temple art style, statues and ceramics. This area is in the quaternary period, especially from Holocene era/Recent which is the present in which the rock formation process has stabilized. Geological processes from the past until now are not expected to experience much change since it will take millions of years. Therefore, the landscape from the development of Hindu-Buddhist religion in the archipelago, including in the Bumiayu Temple area, has not undergone major changes, and is relatively constant [5]. Thus, the Bumiayu Temple Complex Site can now be a picture of the landscape at that time it was founded.

Bumiayu Temple Complex Site is chosen as the research area for the reason that it contains a cluster of temples that have been restored, and its features can still be seen (temples environment). In Bumiayu Temple Complex Site, a cluster of temples is found With a clustered pattern on Lematang River and its tributaries. The problems that arise are: a) how is the location of Bumiayu temple complex? b) How is the water network in the Bumiayu temple area? C) What is the distribution and orientation of the Bumiayu temple complex. The problems that are expected to be answered in the research objectives are: a) to analyze the position of the temples such as morphography, morphometry, and landforms b) to analyze the water network in the Bumiayu temple area? c) To analyze the distribution/orientation of Bumiayu Temple complex. This research is expected to provide benefits as a reference for future research in the wetland enshrinement landscape, as a reference for research on the history of Indonesian culture, and as an input in the management of the enshrinement space in wetlands, especially in Lematang sub-watershed. The novelty in this research is the knowledge in the framing of residential spaces in wetlands which can prove that Bumiayu temple complex site is still a sustainable residential location. Another novelty is knowing the description of temple management in wetlands.

2. Materials and Methods

2.1. Morphographic and Morphometry

Analysis of the shape of the earth's surface consists of morphography, morphometry, and landform. Morphography is a description of the morphology of an area such as plains, hills, and

mountains. Morphometry is a description of the slope of the land. Both morphography and morphometry are aspects that are related to each other.

There are five relief classes and six slope classes on the earth's surface [6]. An overlay of supporting maps such as elevation maps, morphology, slope maps, flow pattern maps, and geological maps are then carried out. Morphological elevation map shows the level of elevation in forming morphological unit. The slope map shows the level of the slope associated with morphological unit formed.

Table 1. Morphography and morphometry in the research area (Widyatmanti et al., 2016)

Elevation (m)	Relief Class	Percentage	Slope Class
<50 m	Lowlands	0 – 2%	Flat
50 – 200 m	Low Hills	3 – 7 %	Very Sloping
200 – 500 m	Hills	8 – 13 %	Sloping
500 – 1000 m	High Hills	14 – 20 %	Slightly Steep
>1000 m	Mountains	21 – 55 %	Steep
		56 – 140 %	Very Steep

2.2. Land Form

The flow pattern map shows the influential geological pattern that forms the current pattern. For aspects of slope and morphology, the naming of landform unit uses the combined modified classification of Widyamanti [6], and Hugget [7] for aspects of influential morphological and geomorphic aspects

2.3. Distribution and Orientation of the Temple

At first, aerial photos were taken using drones to find out the distribution of the temples in the Bumiayu enshrinement. Then, an observation survey was conducted to record the facing direction towards/orientation of each temple whether it was facing the cardinal directions or facing the direction at a certain location such as the direction of a river or a mountain. Next, an overlay map of the distribution of the temples was made with the orientation of each temple. Hereinafter, observations were made on the spread of the temples whether they were clustered, parallel, how far and close between temples to temples and between temples to rivers/lakes (Hodder and Clive Orton, 1976: 38-51; Bintarto nad Suratopo Hadisumarno, 1979: 74-80)

3. Result and Discussion

3.1 Morphographic, Morphometry and Landscape

Bumiayu temple complex site is at an elevation of 0 - 40 masl. Bumiayu temple is located at an elevation of 11 masl - 20 masl. On the west side is a high area of 16 masl - 40 masl. Based on the morphography, it is known that the area classified as a lowland morphological elevation. The temples in South Sumatera are generally located in lowlands and in watersheds. Hindu-Buddhist temples found in the watershed of Musi River and its tributaries. Those are Binginjungut (Musirawas Utara regency) and Telukkijing (Musibanyuasin regency) located in Musi River basin. There are also Lesungbatu and Tingkip temple in Rawas sub-watershed (North Musirawas

regency), Nikan temple in Nikan sub-watershed (Ogan Komering Ulu Selatan regency)[8][5](Taim, 2013) (Siregar, 2003). The temples located in the watershed developed due to trading activities in the waters of the Musi River (Sholeh, 2019). At that time, trading activities were accompanied by the entry and development of Hindu-Buddhist civilization. This is evidenced by the spread of Hindu-Buddhist temples in the Musi River basin and its tributaries from the 7th century AD to the 13th century AD (Siregar, 2016) (Indradjaja, 2014).



Figure 1. The Elevation of Bumiayu Temples Area

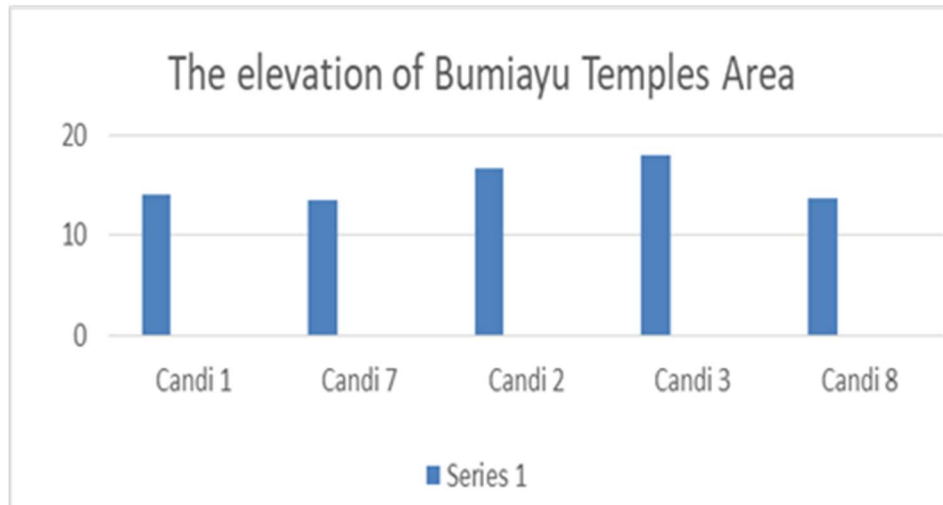


Figure 2. Morfography Map on Bumiayu Enshrinement is on low land (>50 m)

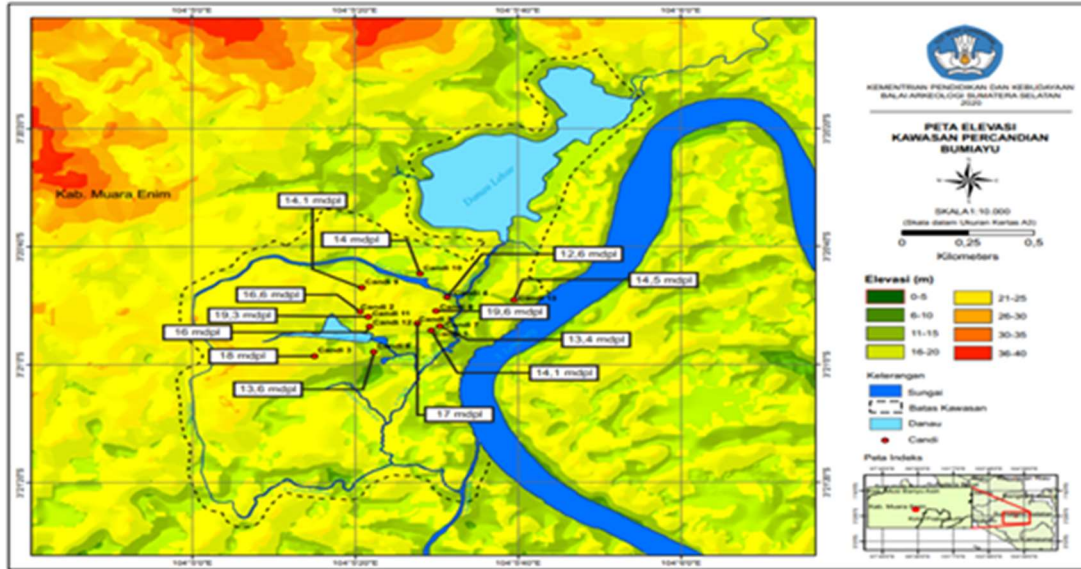


Figure 3. Morphometric Map on Bumiayu Enshrinement; flat (old green collar 0 - 2%), very sloping (green collar: 3 % - 7 %), sloping (yellow collar : 8 % - 13 %), slightly steep (orange collar : 14 % - 20 %)

Morphometric observations were carried out by analyzing the slope class of Bumiayu temples which is composed of flat (0 - 2%) to steep (21% - 55%). The location of the temples is generally on a rather slow slope (8 % - 13 %) which is depicted in yellow on the map. This enshrinement is

located on a rather steep slope which makes it slightly higher than its surroundings in order to avoid puddles. After all, based on Manasarasilpasastra Book, the temple's location which is rather elevated than its surroundings is considered a sacred place (Acharya, 1934).

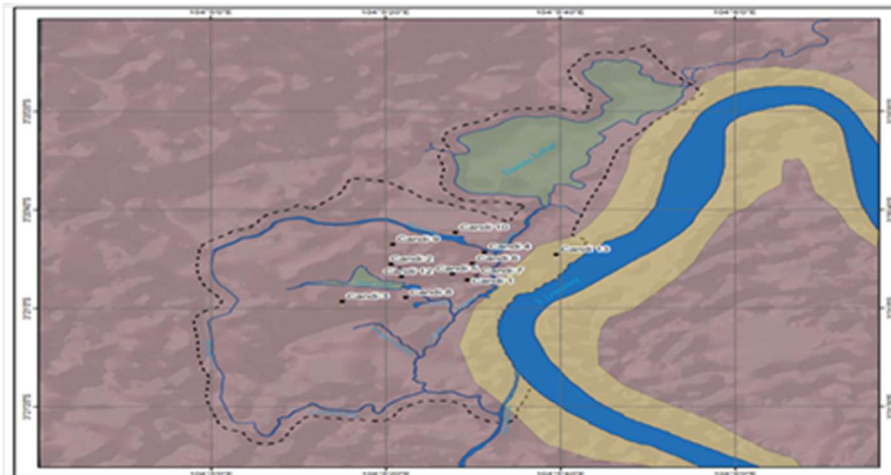


Figure 4. The Landform on Bumiayu Temple Area: terrace river (brown collar), yellow (natural lagoon), green (swamp)

The landform of Bumiayu temples area consists of river terrace, natural embankment and swamps. River terrace are flat area areas which is the remnant of the land formed as a result of river subsidence. The enshrinement itself stands on a terrace river. This location is a wide plain located on the left and right of the river which is formed from the Kasai rock formation and consisted of greenish claystones, sandstones, coal seams and volcanic deposits at the top. The people in the past had wisdom by choosing the location of the Bumiayu temple on the ground which was slightly higher than the surrounding area. The temple was established on a river terrace which is weathered rock, not on sedimentary soil, so the temple looks stable and not easily shaken.

The natural embankments are on the left and on the right of the Lematang River with a height of 20 masl - 30 masl. It stands on a meander of the Lematang River which flows from south to north. In South Sumatera, some building temples on the natural embankment was risks. Unlike The Telukkijing Temple, Lubuk Pauh Temple and Binginjungut Temple, which is on natural embankment Musi River, has components that have been wrecked and lost due to flooding. The land was also eroded by the Musi River, so many temple components were lost or sunk into the river.

The natural embankment area on the right side of the Lematang River becomes the location for Bumiayu community's plantation while the natural embankment on the left has been a residential location from past until now. This is evidenced by research in 2000 by conducting city excavations on the banks of Musi River. Fragments of old ceramic and pottery were found there which the remains of kitchen utensils were. Likewise, wooden pillars that have a chronology from the 10th century AD were also found. In the past, it was indicated that the community chose the riverbank area as a place to live, apart from the location of the temple which was on the west side of the Piyabung River.

The swamp of Bumiayu enshrinement is on the north side, which is a swamp, known by local community as Danau Lebar (Lake Lebar). This swamp always contains water both during the dry and rainy seasons. It also drains the water regularly to the south where Bumiayu enshrinement is located. The Muarajambi temple area also has a swamp on the north side. The swamps in the Bumiayu and Muarajambi enshrinement areas have the same function: being a water reserve and a location for people's rice fields.

3.2 Water Activity

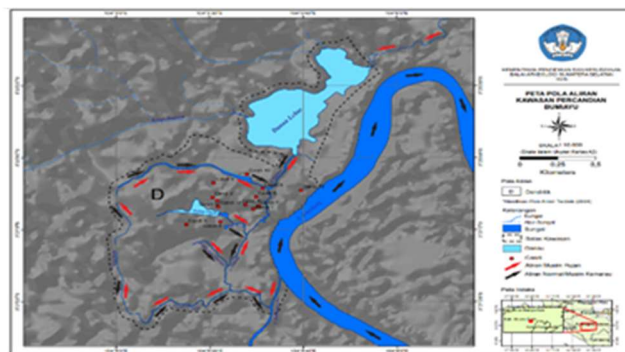


Figure 5. Water Activity on Bumiayu Temple Area

Water activity also affects the formation of the earth's surface (Twidale, 2004), including in the Bumiayu temple complex site. Water flows from a high place to a low point, where Lematang River discharges at Lahat, Dempo Mountain and down to Musi River (S.M. Siregar et al., 2021). The meander of Lematang River flows into Bumiayu temple complex site, eroding and leaving deposits on the riverbanks continuously. Thus, forming a land consisting of natural embankments, floodplains, and back swamps. On the left and right of Lematang River, the surface of the land continues to increase because it gets silt, so it forms a natural embankment. This area is flood-prone area if it rains heavily and if the Lematang River tides. This natural embankment area is a residential location from time to time. People live by constructing houses supported by wooden poles to avoid puddle. Based on archaeological research, it is known that the natural embankment of Lematang River is a location of old residence that supports the Bumiayu culture. This is evidenced by the results of excavations by finding many ceramics/potteries from the time the temple was founded. The results of dating the findings of old ceramics pillars of old houses from Lematang River show the oldest chronology of 8/9 AD and 10 AD when the Bumiayu temple complex site was founded.

The land form of Bumiayu Temple complex is on terrace river which is a plain behind the natural embankment. In the past, people made drainage channels so that the temple complex site was not flooded when it rained heavily. These drainage channels are man-made canals that drain water from Lake Candi to the temple complex area, and ends at the Lematang River. In Bumiayu Temple complex site, the majority of the soil is clay, and there is no layer of sand deposit that indicates the temples are protected from puddles (Siregar, 2021), as well as from resident information that the location of the temple is never floodier.

Based on the geological map, it is known that Bumiayu Temple complex site is located in the stratigraphy of kasai rock formation which mostly contains clay, and erected on the surface of weathered rock and not on sedimentary soil. Enshrinement was erected on insitu ground, so it is stable and not easy to shake (S.M. Siregar et al., 2021). The temple building was established from clay stone material so it not watertight. When it rains heavily, the water does not steep into the temple-bricks. That is why the temple building can last a long time because the bricks are not easily weathered and destroyed.

The swamp is a basin area that is always flooded with water. People call this area as Lake Lebar. It has a height of 16 masl - 20 masl. Bumiayu temple complex site always gets water from this swamp which is located on the north side. Lake Lebar flows south through the Lia River, Tebat Jambu River, Piyabung River and then flows down to Batanghari Leko and Lematang River. Besides that, the Piyabung River also flows into the Lake Candi which is in the middle area of the enshrinement site. This Lake Candi serves as a transportation channel to the temple location. Based on the results of excavations in 2000, on the shores of Lake Candi were found many pottery and ceramic shards which were indicated as ritual equipment during the establishment of the Bumiayu temple.

The Lematang River in Bumiayu Temple complex site is a gathering spot for Lematang tributaries, such as the Piyabung River which flows from north to south through the Tebat Siku River to the Batanghari Siku River. The Lematang people, from the past until now, have used river transportation routes from the temple area to Lematang or vice versa. The location of Bumiayu Temple complex site is far from Lematang River due to avoiding river erosion. In fact, it is closer to Piyabung River (a tributary of Lematang River) which serves as a transportation route among locations in the Bumiayu Temple complex site. Based on the resident information, the Piyabung River is used as a means of transportation to the plantations on the riverside of Piyabung. The location of Bumiayu temple itself is far from the main river since it serves as a transportation route out of the enshrinement area. However, the location of the temple is closer to the tributaries due to a means of transportation between locations within area, especially in livelihood activities, but closer to a deep tributary that is parallel to Lematang River.



Figure 6. Lake Lebar on the north side of the Bumiayu Bathing Area



Figure 7. The temple lake is between Temple 2 and Temple 3 Bumiayu

Bumiayu Temple complex site has one canal which is linear with Piyabung River. It flows from north to south while the other canals are branches of Piyabung River in a position encircled the Bumiayu temple complex site. These canals are close to the enshrinement, and are supported by water from Piyabung River which ends in Lake Lebar (north side of the temple). Bumiayu Temple complex site generally faces east. Bumiayu Temple has adherence to religious books that the orientation of the temple faces east as a holy place. Lakes at Bumiayu Temple Complex site are located either far or near the enshrinement area. The lake which is far from the temple (north side of the temple) serves as a water reserve in this enshrinement area. This lake will be filled with water during the rainy season, and always drain water during dry season in that area. While the lake adjacent to the temple functions as a reserve of clean water, used for daily needs and ritual activities.

The canals in the Bumiayu temple area function as water regulators so that the temple location is not flooded, and during the dry season, it is not dry. In the dry season, the temple area depends on Candi Lake on the north side, which always flows water through canals to the temple area. During

the rainy season, the Bumiayu temple area gets water from the Lematang River on the south side. Lematang River water rises and flows into the temple area. There are canals in the Muarajambi temple area, but they tend to stop/or not flow. This is because the landscape tends to be sloping. During the rainy season, water flows from the south (the Batanghari River) to the north and west through the Jambi River canal.

Meanwhile, the Angkor wat temple area gets water from Phnom Kulen Hill, then the water flows into the Seam Reap River canal, enters the Angkorwat moat and exits from the southwest side and flows down to Tonle Seap Lake. The Nalanda temple in India depends on rainwater collected in the pools around the temple. In the rainy season, water will flow from the river to the Nalanda temple area.

3.3 Distribution and Orientation of Bumiayu Temples

In 1990, the National Archaeological Research Center carried out excavations in the Bumiayu temple complex site. They managed to find nine earthen mounds containing the temple's brick structure. The National Archaeological Research Center gave numbering: Temple 1, Temple 2, Temple 3, Temple 4, Temple 5, Temple 6, Temple 7, Temple 8, and Temple 9. The numbering is done according to the order of discovery, and is placed into the situation map of the Bumiayu temple complex site (Utomo, 2012). In 2018, the Bumiayu temple complex was delineated by Jambi Cultural Heritage Conservation Center in collaboration with South Sumatra Archaeological Center and PALI (Penukal Abab Lematang Ilir) Regency Culture and Tourism Office. The delineation results show the distribution of archaeological remains in the Bumiayu temple complex site which has an area of 203,710 hectare (Tarida, 2017).

In the Bumiayu temple complex site, there are temples which are divided into 3 rooms, namely Room I, II, III, bordered by river and lake. Room I border Tebat Jambu River on the north side, Tebat Soleh River on the west side, Piyabung River on the east side, the estuary of the Batanghari River on the southeast side, the Tebat Soleh on the south side, and the Lubuk Panjang River on the south side. In Room I there are 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12 Bumiayu Temples. In Room II, there is a distribution of features in the form of Temple Mound 10 which borders the Tebat Jambu River on the south side and residential areas on the north. Room III is bordered by the Piyabung River on the west side and Lematang River on the east. Until now, the temples that have been restored are temple 1, 2, 3, 7, 8, while the others have not been restored, and are still in the form of Menopo (mounds). The term "Mounds" is a ground level that is slightly higher than the surrounding area because it contains a temple brick structure. The naming of the temple is based on the order in which the temple was discovered (Tarida, 2017).



Figure 8. Temple Distribution in Room 1, Bumiayu Enshrinement

Room I is divided into 2 sectors, namely sector A which consists of Temple 1, Temple 7, and Bumiayu Temple Mound 4, 5, 6, 7. Sector B is a feature adjacent to Danau Candi (Lake Candi) namely Temple 2, Temple 3, Temple 8 and Bumiayu Temple Mound 9, 11, 12. In Sector A, it can be seen that Temple 1 is adjacent to temple 7 and Temple Mound 5, which is located on the northeast and northwest sides, while the Temple Mounds of 4 and 6 are on the north. The distance from Temple 1 to Temple Mound 7 is 25 meters, and the distance from Temple 1 to Temple Mound 5 is 60 meters. Temple 1 to Temple Mound 6 is 97 meters. Temple 1 to Temple Mound 4 is 175 meters. Temple 1, Temple 7 and Temple Mound 5, 6, 4 look linear with Piyabung River on the east side, with the distance of Temple 1 to Piyabung River is 80 meters. The entrance of Temple 1 and Temple 7 faces east (Piyabung River). Thus, it was indicated that the entrance to the temple was through that river.



Figure 9. Temple 1, Room I in Bumiayu Enshrinement



Figure 10. Temple 7, Room I in Bumiayu Enshrinement

Temple 1 has a square plan, consisting of one main building with three perwara (ancillary) temples located on the east side. The foot of the Temple 1 was built directly on the ground made from a brick arrangement. On the east side of the foot of the temple there is a staircase which is the main entrance, and there are no decorations on the foot panels of the temple. Temple 7 is on the northeast side of Temple 1. It is in the form of a brick structure with a rectangular base with viewer on the west with a size of 9 m x 10.60 m. Viewer measures 5.53 m x 5.80 m. In the middle of the temple there is an arrangement of bricks in a circle form measuring 1.55 m x 1.75 m. Temple 1 and Temple 7 have a perimeter fence. Those temples have a direction facing east. It shows that Temple 1 and Temple 7 meet the criteria for establishing a Hindu temple based on the religious books since the east is the above of Hindu gods.



Figure 11. Temple 2, Room II, in Bumiayu Enshrinement



Figure 12. Temple 3 Room II, in Bumiayu Enshrinement



Figure 13. Temple 8, Room II, in Bumiayu Enshrinement

Bumiayu Temple 2 is in Sector B, Room II, Bumiayu temple complex site, which consists of 1 main temple and 1 perwara (ancillary) temple. Temple 2 is on the northwest side of Temple 1. It has a square plan with a size of 9.52 m x 9.91 m and has 3 viewers in front with a size of 0.52 m. the second viewer with a size of 2.70 m, and the third one with a 1.93 m. Temple 3 has a

quadrilateral floor plan with a size of 13.88 m. On its side is viewer with a size 6.78 m x 1.80 m. At the foot of the main building, there are four brick wall structures which are then sequentially called wall I, II, III, IV. The wall plan I and II are square, while wall III and IV are inequilaterally octagonal.



Figure 14. Temples Distribution in Room II, Sector A, Sector B in Bumiayu Enshrinement

The structure of the building body is an octagon which is located on the inside of the building plan. It is strongly suspected that the structure was made to form a room in the building which is also octagonal. In temple building, this room is commonly called garbhagrha. It is located inside the body of the temple. The roof structure can no longer be known, except for the decorations contained in the structure. Those decorations are simbar (antefixes) and decorative towers shaped like bells. There are also the pinnacle decorations found among the ruins of the building. Remains of the entrance staircase structure also found on the northeast side. Temple 3 consists of one main building and three perwara (ancillary) temples located on the west, east and north sides.

Temple 8 has a rectangular floor plan with a size of 6 m x 15 m without viewer. This temple has no stairs. The decoration on the edge of the temple building is in the form of a panel arrangement that has a ruler frame decoration, flowers, plain frames, bells, and rulers. The shape of the temple is rectangular, plain and has a kind of terrace for seating in performing ritual activities. In some panels, the decoration appears upside down. It was estimated that there was an error in the placement of the decorative panels on the building.

Based on the floor plan, it is known that temple 2 has a main temple in the center and 4 perwara (ancillary) temples in front of the main temple. Temple 3 has a main temple in the center and 2 perwara (ancillary) temples on the west, east, and north sides. Temple 8 has no perwara (ancillary) temple. Temple 2 and Temple 3 have perimeter fence, but Temple 8 does not. Temple 2, 3, 8 are toward the east. It shows that Bumiayu temple meets the criteria for the establishment of temple according to religious books. The orientation of Bumiayu temple is generally towards the east, such as temple 1, 2, 3, 7 and Temple 8 (restored temples).

In the Bumiayu temple complex site, concentric enshrinement groups are surrounded by Lematang tributaries. However, in particular there are 2 groups of temples. One of which is the temple group adjacent to the Piyabung River, and the other is the group adjacent to Lake Candi. The former has

a rectangular plan with facing east direction, indicated as the entrance to the temple via Piyabung River in the east. The later located on the east and west sides of the Lake Candi, indicated as activity center in the past. Lake Candi once served as a fulfillment of water for daily needs and ritual needs. It is also used as a means of transportation into and out of the Bumiayu temple complex.

The cluster patterned temples are surrounded by canals, in contrast to the Muarajambi Temple site which is in linear position facing the river. Bumiayu Temple complex site is close to Piyabung River, a river parallel to the main river (Lematang). Its position has similarities with Muarajambi Temple close to the Jambi River, a river that is parallel to the main river (Batanghari). Both areas contain a cluster of temples, and these temples still survive today. Ancient civilization in the world also appeared and thrived in watersheds, such as in the Indus River valley where the Mohenjodaro and Harapa site was found. On the banks of Nile River found ancient civilization as well. Likewise, in the Mekhong River, the ancient civilization of China was found. The Angkorwat Temple in Cambodia gets its water from the hills on the northeast side. Every day, water flows from the hills to the Seam Reap River and enters the Angkorwat Temple complex site. The water fills the pools around the Angkorwat. Then the water flows downhill and ends up in the lake Tonle Seap. When the lake water is abundant, the water will flow from the southwest to the northeast towards the location of the Angkorwat Temple. The people of Angkorwat have been managing water for a long time by making ponds as water reserves, and also functioning as drainage channels (Fletcher et al., 2008). Likewise, the Mohenjodaro civilization in India has managed water by making a large pool measuring 55 meters long, 33 meters wide, with an outer wall thickness of 2 meters, and being fenced around the area. The water is then channeled through large pipes (Alam, Sahota and Jeffrey, 2007).

4. Conclusions

Bumiayu Enshrinement is located in the lowlands with an elevation of 11 – 20 masl with a slightly steep slope of 14 – 20%. This temple area has natural embankments, floodplains and swamps. The temples are grouped in pattern and are located in floodplains. However, the temple is protected from puddles because it is surrounded by Lematang tributaries which function as drainage channels. The residential area is separate from the ritual area (enshrinement) since the former is located on a natural embankment. The community used to have managed the environment well. The community in an area higher than its surroundings and make canals around the temple. So that even though the temple is in the floodplain, permanently protected from the puddle. The back swamp such as Candi Lake and Lebar Lake serve as water reserves so that the people of Bumiayu do not experience water shortages during the dry season.

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