



Ancient Liyangan: Settlements Friend Mountain

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Abstract. Since its discovery by sand miners in 2008, the Liyangan site in Purbosari Village and Tegalrejo Village, Ngadirejo District, Temanggung Regency, has become a priority in the research program of the Yogyakarta Archaeological Center. Several archaeological objects were discovered during a series of studies that began in 2009, providing important data for understanding the people and culture of ancient Liyangan. 1) structures and buildings, 2) features, 3) ceramic, pottery, stone, and metal artifacts, 4) organic data, and 5) ecofacts are among the data. The data distribution is quite broad, and each has a correlation or association with one another. In theory, this is the basis for including the Liyangan site in an archaeological-space study that considers archaeological objects as a distribution rather than a collection. This research led to the creation of this article, which describes the type of settlement that existed during the Hindu-Buddhist period, including how it interacted with the environment, using archaeological data discovered at the Liyangan site in the form of artifacts, temple buildings, and other structures, features, and ecofacts. Prior to being destroyed by volcanic material brought on by Mount Sindoro's eruption, the old Liyangan settlement expanded steadily chronologically, at least from the second century until the time of the Ancient Mataram dynasty.

Keywords: Liyangan · Ancient Matarām · ancient settlement · volcanic

1 Introduction

Local communities' settlements are impacted by volcanic eruptions. The community of Oibura, Tambora, was significantly impacted by Mount Tambora's 1815 eruption. The 1883 eruption of Mount Krakatau affected a number of villages in Lampung Bay [1]. Many times, the Central Java volcano Mount Sundoro erupted, burying the Liyangan culture. In the form of an initial survey, 2009 marked the beginning of a series of archaeological investigations at the Liyangan site. The survey was based on a report by residents of Liangan Hamlet on the results of different archaeological data. The Yogyakarta Archaeological Center has since conducted numerous studies in a methodical manner with goals and tier-based stages [2]. Several significant pieces of information, some of which were considered rare or even absent from other sites from the 19th century, were discovered in the initial round of examinations. The amazing discoveries included

information on food and agricultural products including grain, kluwak, and seeds, as well as wood and bamboo fragments from building materials. Organic stuff was found in the form of leftover cloth in the form of sheets and rope bags, food, and food-related items. There are also found ecofact discoveries containing faunal bone fragments [3]. The organic data is typically in a burned state because the majority of these discoveries are in the volcanic matrix.

These charcoals are one of the crucial pieces of information used in the carbon-14 research to establish the chronology of the site. The date range of the Liyangan site, at least from the second century to the eleventh century, was determined from multiple charcoal samples that were examined. Pre-Hindu times up until the Ancient Matarām empire are included in the historical context. The Ancient Matarām Kingdom was one of the kingdoms in Central Java that existed at least from the 8th century or 717 AD, i.e., from the time of King Sajay a with his title Rakai Matarām until the time of King Dharmawangsa Tguh, whose position had been shifted to eastern Java [4].

What the Liyangan site reveals through the different previous studies is highly intriguing. Because of this, research is required to learn more about the assortment of data that was discovered and used as the foundation for describing the geometry of the Liyangan site. The Liyangan site can therefore be characterized in terms of its formal, geographical, and temporal characteristics.

2 Rationale

Spatial-archaeological investigations are strongly tied to the collection, distribution, relationships, and intercorrelations of archaeological data at the Liyangan site. Theoretically, in addition to being placed as entities, archaeological items including structures, buildings, other features, artifacts, and ecofacts also need to be placed as distributions. It describes the interaction between objects and other objects, between objects and places, or between sites and the resources found in their physical surroundings [5]. It follows that there is a fundamental correlation between the distribution of archaeological artifacts at the Liyangan site and its relationship to the locational element of the findings at the Liyangan site in the form of artifacts, ecofacts, and features. In this instance, it includes temples and other places of worship as part of the distribution of archaeological artifacts.

Indicators of the presence of settlements throughout the Hindu-Buddhist era include archaeological material such as temple structures, fences, post-hole features, ditches, agricultural land, and waste [6]. This information was discovered at the Liyangan site in a number of research that had been carried out. The explanation that can be found using the spatial-archaeological approach is the type of settlement at the Liyangan site, together with human activities and community culture at that time.

3 Materials and Methods

As was already indicated, the Liyangan site has been studied since 2009, and significant information has been gathered through surveys and excavations. The findings of these investigations have consistently been disseminated through a variety of media and initiatives, including books, articles, films, seminars, and outreach. The primary research

source used to create this article was these publications. This study's methodology is an example of a desk study. Desk research is the process of gathering facts and information by tracking down, looking over, and interpreting secondary data. Hence, secondary research is sometimes known as desk research.

The research data referred to in this study are the major data, which are publications and research reports from the Liyangan site. Of course, not all of the information in the publication serves as the primary source for this study; rather, it is arranged in accordance with the article's theme, which is ancient settlements. The justification for this is as previously stated. In relation to it, the descriptive-analytical with inductive framework of the methodology adopted in this study. The goal of the descriptive-analytical notion is to accurately and methodically characterize a specific factual situation [7].

In this strategy, information about the findings of the Liyangan site inquiry is gathered from library materials. Data separation and analysis utilizing an archaeological-spatial framework were used to explain the settlement patterns at the Liyangan site in light of the analysis's findings. Based on this fundamental framework, information gathered from secondary sources is classified and organized into different types or categories. In this manner, the data can be methodically described for additional qualitative examination in accordance with the description. The outcomes of this qualitative investigation at the very least give a general overview of the structure and personality of the prehistoric Liyangan town.

4 Data and Discussion

4.1 Data Exposure

The outcomes of data collecting using secondary materials are categorized as follows based on shape, material, and type.

Temple and Basement (Batur). In general, the andesite stone temple and basement structures on the Liyangan site include Temple 1, Temple 2, Basement 1, Basement 2a, Basement 2b, Basement 2c, Basement 2d, Basement 3, Basement 4, and the thunderclap-shaped temple structure. The order in which each piece of information was discovered is used to determine the temple and basement numbers. Each of these facts are briefly described below [3] (Table 1).

The location where the buildings are situated creates a terrace or courtyard in the spatial structure. Four terraces, numbered I, II, III, and IV, can be found if they are arranged starting with Temple 1 as the major structure. Terrace I includes the buildings of Temple 1, Basement (batur) 2a, 2b, 2c, 2d, and Basement 3. Basement 1 and Basement



Fig. 1. Temple 1. (Doc: Yogyakarta Archaeological Center)



Fig. 2. Temple 2. (Doc: Yogyakarta Archaeological Center)



Fig. 3. Basement (*Batur*) 1. (Doc: Yogyakarta Archaeological Center)



Fig. 4. Sequenced from above is the row of Temple 1, Basement numbered 2a, 2b, 2c, and 2d. (Doc: Yogyakarta Archaeological Center)



Fig. 5. Basement 3. (Doc: Yogyakarta Archaeological Center)



Fig. 6. Basement 4 in the 2014 excavation. (Doc: Yogyakarta Archaeological Center)



Fig. 7. The sacred bathing place building (*pertirtaan*). (Doc: Yogyakarta Archaeological Center)

Table 1. The temple and basement buildings at the Liyangan site

NO	DATA	INFORMATION	PHOTO
1	Temple 1	The floor plan is rectilinear with a size of 5.53 x. 5.53 M.	See Fig. 1
2	Temple 2	The upper structure shows the presence of chambers, although not complete to the roof. The plan is a square measuring 7.2 x 7.2 M, 1.7 M high.	See Fig. 2
3	Basement (<i>Batur</i>) 1	The building has a square plan with a size of 8.40 x 8.45 M.	See Fig. 3
4	Basement 2a, Basement 2b, Basement 2c, Basement 2d	The four basements are located on the right side of the Temple 1 building, presumably as companion buildings.	See Fig. 4
5	Basement 3	This damage is thought to be due to the flow of Kali Langit. Basement 3 measuring 21.24 x 21.24 assuming a rectilinear layout, on one side of which has been damaged, namely on the northwest side.	See Fig. 5
6	Basement 4	The condition of the building is very damaged. The damage covered most of its parts so the shape and size of the plan cannot be known. Based on the recognizable length of one side, Basement 4 is more than 10 m.	See Fig. 6
7	The sacred bathing place building (<i>Petirtaan</i>)	The results of the reconstruction and restoration that will be completed in 2021 show that there is a tower in the center. The northeast and southeast sides are equipped with <i>jaladwara</i> or showers.	See Fig. 7

4 make up Terrace II. Temple 2 is located on terrace III, and the pilgrim building is located on terrace IV.

Fences, Gaps, and Roads. The temple fence was discovered for the first time in a study in 2011, but only the end of the fence was visible at the time. Further excavations until 2014 revealed that the temple fence was only on one side, rather than around the entire structure. The talud (slope stone) structure is located southeast of the temple fence and shares the same orientation, stretching northeast to southwest. This talud is made of tuff stone and has slab-like dimensions of 42–83 cm long, 26–28 cm wide, 96–110 cm long, 26–28 cm wide, and 12–13 cm thick.

The road was discovered during the excavation in 2012. The road is approximately 4.5 m wide, and it is strengthened in the middle with a stone arrangement approximately 3.5 m wide, while the road's edges are not filled with stone arrangements. The section parallel to the temple building, beginning from the terrace and running for 30 m, is not entirely covered in stone structures [8] (Fig. 8).

Platform and Stairs. A 2012 study discovered this platform or elongated structure with a relatively flat surface. Terrace I and Terrace II are linked by this platform. This passage has two stone steps about 25 m apart. Aside from the two staircases that connect the hall, four other staircase structures were discovered through a series of studies up until 2014. The four steps are as follows:

- 1) bolder staircase at the end of the dirt road,
- 2) stairs that connect the temple area with the area outside the temple
- 3) stairs that merge with the talud at the edge of the stone road, and
- 4) stairs connecting terrace III with terrace II (Fig. 9)

Artifact. Based on the category and type, the metal artifacts at the Liyangan site are as follows.

Stone was discovered to be used not only as a building material, but also to make household tools and utensils. Many different types of artifacts serve a variety of purposes, including household items (technofacts) and religious objects (ideofacts).

Ceramic artifacts come in a variety of shapes and are used for a variety of purposes. This variety demonstrates that there were numerous activities going on at the time. Bottles, teapots, bowls, urns, jars, and jars are examples of ceramic containers. All of



Fig. 8. Findings of stone roads in excavations in 2012 (a); And a photo of a stone road in 2022 (b) flanked by a temple fence (right) and talud (left). (Doc: Yogyakarta Archaeological Center, left and Sugeng Riyanto, right)



Fig. 9. The platform and stairs were found in excavations in 2011 connecting terrace II and terrace I (a); and stairs that connect the temple area to the area outside the temple (b). (Doc: Yogyakarta Archaeological Center)

Table 2. Metal Artifacts at Liyangan Site [9]

No.	Category	Objects
1.	Building Elements	Anchor
2.	Lighting Equipment	Chandelier
3.	Farm Equipment	Hoe, machetes, sickle
4.	Household Equipment	Pitcher, bowl, pot, knife
5.	Carpentry Equipment	Pickle, axe, hammer, chisel, pliers
6.	Rituals Equipment	<i>Giring-giring</i> , place for offerings, tray
7.	Jewelry	Mirror/ <i>darpana</i>
8.	Weapon	Swords, daggers, spears, machetes

these ceramic artifacts were made in China during the Tang Dynasty in the ninth century AD (Fig. 10).

Organic Material Building. The Liyangan site includes data in the form of building components made of organic materials, such as wood, bamboo, and palm fiber, all of which have turned into charcoal. Excavations in 2010, 2012, and 2018 revealed the remains of this structure.

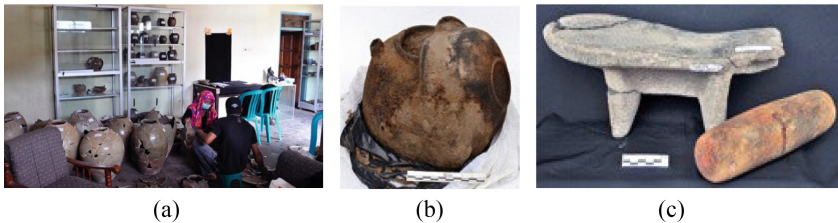


Fig. 10. Various ceramic vessels (a), earthenware jugs and bowls (b), and *pisan-gandik* pairs (c). (Doc: Yogyakarta Archaeological Center)

The following wood species have been identified through laboratory analysis as building components.

- 1) the rafters and battens use pairs of wood, the *Fagaceae* tribe, the *Quercus* clan, *Quercus spp* species,
- 2) wall components using puspa wood, *Theaceae* tribe, *Shcima* clan, *Wallichii* species,
- 3) other components that are not yet known from which part use *jamuju* wood, Pandak fir, *Podocarpaceae* tribe, *Podocarpus* clan, *Podocarpus imbicaturi* species [9].

Feature

Pole Hole Features

Thirty-six holes were discovered in two parallel rows in the 2014 and 2015 studies. This feature was discovered on land above the burial building. The majority of the holes, 33 in total, are round, with the remaining three being square. The round hole has a diameter of 8–10 cm, while the square hole has a side length of 10–12 cm. Another hole feature with the same character was discovered in the 2017 study. Because of its location on the edge of a stone road, the fence by the road may serve a different purpose [10] (Fig. 12).

Agricultural Land Features

A characteristic in the form of two elongated mounds forming a longitudinal position in a parallel position was discovered in a study from 2015. People who helped with the excavation procedure identified it as a “larikan,” or land that had been prepared for use as agricultural land, right away. Signs of agricultural land, apart from being based on comments from inhabitants, are also reinforced by finds in the form of plant stem prints generated by volcanic ash on top of and between mounds [11].

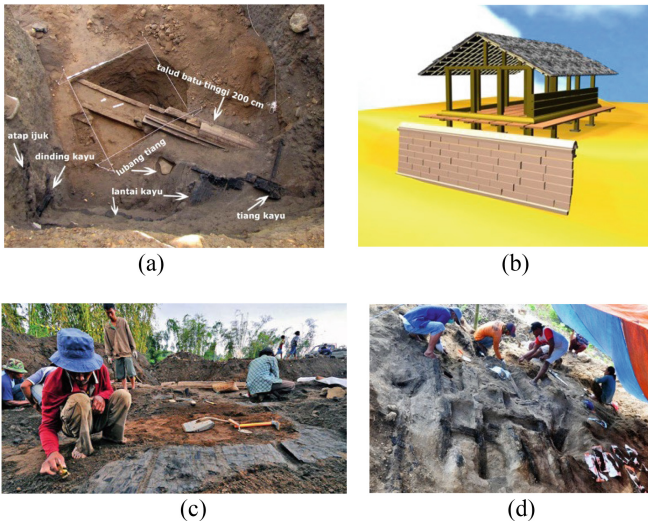


Fig. 11. Some of the remains of buildings made of organic materials from excavations in 2010 (a) along with the reconstruction of the shape of the building (b); excavation 2012 (c), and excavation 2018 (d). (Doc: Yogyakarta Archaeological Center)

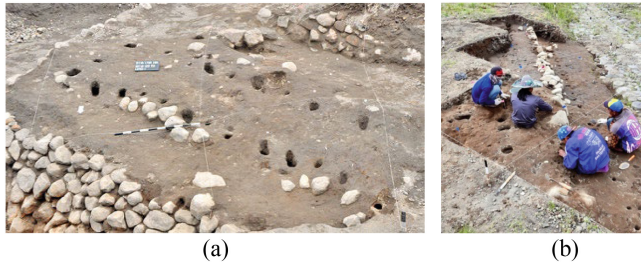


Fig. 12. Hole features near the ledge (a) and the curbstone (b). (Doc: Yogyakarta Archaeological Center)



Fig. 13. Farmland feature. (Doc: Yogyakarta Archaeological Center)

Irrigation Channel Features

During excavations in 2016, a larger structure thought to be an ancient aqueduct was discovered. There are five rows of boulder structures, one on the far right and slightly below, and two double structures above it. Structure 1, structure 2a and 2b, and structure 3a and 3b will be sorted from left to right (Fig. 14). The aqueduct appears to be located between structures 2b and 3a, as the two double structures (2a–2b and 3a–3b) each form an elongated mound through which water can flow for agricultural purposes.

Sewer Features

The feature discovered in 2019 is located on the side of a stone road on terrace IV of the worship area. The channel's width is between 25 and 30 cm, and the top is covered with stone structures. This feature is thought to be related to the ranch of the building,



Fig. 14. Irrigation feature. (Doc: Yogyakarta Archaeological Center)



Fig. 15. Ditch feature at the edge of the cobblestone road. (Doc: Sugeng Riyanto)

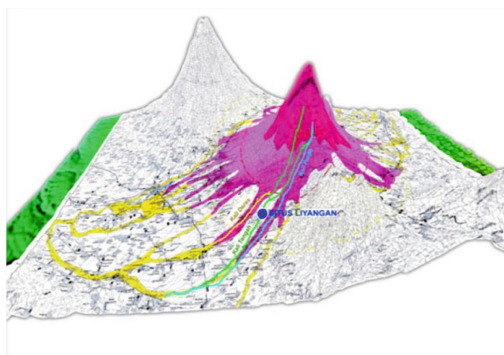


Fig. 16. The location of the Liyangan site is at the foot of Mount Sindoro, now on the pyroclastic path [13]

acting as a drain or gutter. The author obtained this information during a visit to the Liyangan site in 2022 (Fig. 15).

Geological Data

The Liyangan geomorphology is located on moderately undulating hills on the 2nd slope bend at an elevation of 1127 m–1165 masl. This morphology is made up of pyroclastic fall deposits and “hot cloud” pyroclastic flow deposits that range in thickness from 4 to 7 m. The drainage pattern in this area is a radial drainage pattern, which means that the river’s drainage pattern originates from a single point. The geological research results show that the Liyangan site has two rock units: pyroclastic falls in the lower area and pyroclastic flows that mostly cover the buildings, features, and structures on the site [12] (Fig. 16).

4.2 Discussion

The Liyangan site’s complexity stems from the integration of data in the form of temple buildings and other stone buildings with features, organic data, artifacts, and the environment as potential settlement locations on the slopes of Mount Sindoro. The relationship between human activity and settlement location provides a cultural form of adaptation.



Fig. 18. The four terraces in the worship area indicate the strong elements of old beliefs and worship methods, before there was Hindu influence (Doc: Yogyakarta Archaeological Center).

as ceremonial tools, such as giring-giring, offering places, and trays, supported the existence of worship activities at the Liyangan site (Table 2).

The presence of pre-Hindu worship elements or the original beliefs of the Liyangan people before being influenced by cultural elements from India, particularly Hinduism, is indicated by the formation of the worship area in the form of terraced steps. As previously stated, the dating analysis of a number of charcoal samples reveals a chronological range from the 2nd to the 11th century, i.e. from pre-Hindu times to the time of the Ancient Matarām empire [15] (Fig. 18).

In addition, to worship activities, the data exposure yielded residential activities. The discovery of three buildings made of organic wood, bamboo, and palm fiber, which are hypothetically residential buildings, indicates residential activity at the Liyangan site (Fig. 11). The location of these three buildings tends to surround the worship area which indicates a different function, that is, they are not part of the cult (Fig. 17). A number of artifacts in the form of daily tools in various forms and materials support the existence of residential activities at the Liyangan site. Ceramics is one of them, and it all began in China during the Tang Dynasty in the 9th century AD [16].

The data presentation shows that, in addition to worship and residential activities, there are elements of agricultural culture at the Liyangan site. Agricultural land (arurkan), water or irrigation canals, and agricultural equipment were discovered at the Liyangan site as evidence of ancient agricultural activities (Figs. 13, 14; Table 2). The water channel appears to be connected to the agricultural land, both of which are located in the southeastern part of the worship area (Fig. 17). This description indicates that agricultural activities are spatially integrated with dwellings and worship, all of which are located in the same spatial unit. Agricultural life, at least in Central Java, was not novel during the ancient Matarām kingdom.

The Liyangan site's spatial distribution of archaeological data is relatively diverse, and each of these data also contains linkages and correlations within the same spatial unit (Fig. 17). According to the data distribution, the components of agriculture, dwelling, and worship together make up a settlement spatial unit.

5 Conclusion

The data's variety and distribution suggest that there are spatial relationships and associations between temples and other religious buildings, artifacts, and features at the Liyangan site. Based on this, the character of the Liyangan site is described as a settlement with various community activities related to worship, housing, and agriculture.

The ancient Liyangan settlement was gradually formed at least since the second century, before being influenced by Hindu culture until the time of the Ancient Matarām kingdom. The terraced worship area formation is one of the pre-Hindu elements that the ancient Liyangan inhabitants have preserved.

The volcanic material that sealed the Liyangan site naturally preserved the archaeological data. All of these archaeological objects are now part of the data that makes the Liyangan site a complete and complex settlement site.

Even though the Liyangan site is in the interior of a larger spatial unit, access to the outside area remains easy. Furthermore, the ancient Liyangan settlement played an important role in the Matarām Ancient kingdom's power constellation. This significant position is also supported by the ancient Liyangan community's economic capacity, which is supported by advanced agricultural technology and infrastructure, such as land management and water management. Within certain limits, the site's location on the slopes of Mount Sindoro provides agricultural land with volcanic elements required by plants, resulting in higher agricultural yields.

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