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NATURE'S CHRONICLE: GEO-HISTORY AND ARTEFACTS DISTRIBUTION IN THE ECONOMIC PATTERNS OF JAYAWARSA'S SOVEREIGNTY (1186-1204 CE)

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Abstract

Every culture develops based on geographical conditions where deepening with historical geography is needed to see the pattern of social life of the community. The social life of the ancient Javanese community formed a structured pattern based on economic, social, political, and religious aspects, one of which was in the Jayawarsa territory. Previous research was only limited to textual contexts such as inscriptions and kakawin so that it has not explored other factors such as geographical conditions and cultural heritage itself in the form of artifacts. This research examines the economic pattern and social life of the community in the reign of Sri Jayawarsa through Geohistorical approach with variables of History and Geography. Based on geographical, archaeological, and inscription interpretation data, this research reconstructs the community structure formed around Sirah Keteng site and Mruwak Village. The historical geography approach highlights human interaction with their environment in building spatial systems, economic patterns and cosmological orientation. The results also show the existence of a community pattern involving people's settlements, the territory of the clergy, and royal land grants. This study can enrich the understanding of the interrelation of spatial and cultural aspects in the development of the social and economic structure of the Jayawarsa period.

Keywords: Jayawarsa; Geohistory; Artifactual variety; Economic patterns.

INTRODUCTION

Every culture develops based on the geographical aspects of its region so that the deepening of historical geography is needed to see the pattern of social life of the community (Daldjoni, 1982). The social life of the ancient Javanese community during the Hindu-Buddhist period itself formed a structured pattern based on economic, social, political and religious characteristics (Rahardjo, 2010). The pattern of social life certainly also forms a spatial pattern in the community structure. The social structure did not only revolve around the kingdom and the people but developed into the kingdom, the people and religion (Wijaya & Wirasanti, 2024).

A culture can certainly shape the pattern of society and spatial layout, one of which is the Culture in Sri Jayawarsa's Area of Power. Cultural traces in Sri Jayawarsa's territory can be marked by the findings of inscriptions that refer to his name, namely in the Ponorogo Regency Area, precisely at the *Sirah Keteng* Site and *Mruwak* Village Area, Madiun Regency (Nasoichah, 2017). In previous research, Jayawarsa's territory in the Sirah Keteng Site area formed a pattern of community structure observed based on geographical aspects, archaeological distribution and interpretation based on the contents of the inscriptions (Sucahyo, Zameilani, Andhifani, & Wiretno, 2024). The resulting interpretation based on these aspects can produce a narrative about the culture in the Sri Jayawarsa area more broadly even with limited textual data.

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The geographic perspective has a role to sharpen the analysis of spatio-temporal. This is because geography has three approaches, namely the spatial approach, the ecological approach, and the regional approach, which are suitable for this research (Sejati, Sugiarto, Anasi, Utaya, & Bachri, 2022). In addition, geography has six objects of study, including the lithosphere and hydrosphere, which are related to the crucial elements of supporting human life, namely the existence of water and a place to live (Lee et al., 2023; Huggett, 2024). Geography also has a branch of Geographic Information System (GIS) that is useful for visualizing various spatial data, including artifactual distribution.

Similar studies in Historical Geography on geographical, archaeological and inscriptional aspects are also needed in looking at the structure of society in another area, namely Mruwak village, where previous research only focused on examining the context of inscriptional content that requires further interpretation (Nasoichah, 2017). During observations, researchers found a similar pattern in the Mruwak area with several artifactual findings in certain topographical patterns. This certainly supports the interpretation of Historical Geography, as well as considering that the area around Madiun still requires further study of historical geography aspects (Riyanto, 2018).

RESEARCH METHOD

This research uses a Geohistory approach with a variable focus on History and Geography. Geohistory refers to studies that focus on the reconstruction of past landscapes and the evolution of man-made landscapes over time (Christopher, 1977). The Historical variable in this research focuses on the aspects of artifactual variety and textual context in the form of inscriptions of Sri Jayawarsa's heritage. In this case, the data analysis used for the Historical Variable can be classified as Philoarchaeology. This analysis is similar to that used by experts to understand the Religious Education Center of the Majapahit Period by combining artifactual analysis methods with textual data (Wahyudi, Jati, Munandar, & Soesanti, 2014) and archaeological heritage research in Lasem (Wijaya & Wirasanti, 2024). This analysis is used as a critique of textual data to reveal broader aspects of culture that can be interpreted as the result of culture itself (Nuarca, 2017). The stages in Philoarchaeology are problem identification, heuristics, data verification, analysis, synthesis, explanation and conclusion (Agusta, 2019; Dwiyanto in Arrazaq et al., 2021).

Geography variables in this study are divided into two, namely general description of geography and geoprocessing using GIS (Geographic Information System) software. The general description variable focuses on the description of the physical conditions of the area around the study, such as hydrology and geomorphology (Gregory, Gurnell, & Petts, 2002). Meanwhile, the geoprocessing variables are divided into two studies, namely hydrology and geomorphology. The "r.watershed" feature of the GRASS plugin version 2.12. is useful for analyzing stream ordering using DEM (Digital Elevation Model) (Amatulli, 2020). The "r.water.outlet" feature of the GRASS plugin version 2.12. is useful for analyzing watershed delineation based on river outflow (Hofierka, Mitášová, & Neteler, 2009). Strahler, (1957) and Shreve (1966) methods were used to classify the river order. The "r.geomorphon" feature is useful for analyzing ten universal landform patterns (Atkinson et al., 2020). The features in the GRASS plugin version 2.12 were run on QGIS 3.34 "Prizren" software as used in previous studies (Scala, Manno, & Ciraolo, 2024). Data acquisition for the majority of variables was secondary data, except for artifact distribution data which was primary.

Table 1 Data and Data Sources Geography Variables

Data Name	Data Source
Artifact Distribution	Primary (observation)
DEM *(Digital Elevation Model)*	Geospatial Information Agency
River	Geospatial Information Agency
Administrative Region	Geospatial Information Agency

RESULT AND DISCUSSION

Reign of Sri Jayawarsa

Sri Jayawarsa was one of the rulers of the Kadiri era whose name is recorded in several historical sources. In the Sirah Keteng inscription dated 1126 Śaka or 1204 AD, it mentions him as Sri Jayawarsa Digwijaya Sastraprabhu (Nasoichah, 2017). His name appears at least four or five more times in this inscription, although in slightly different forms, namely Sri Sastraprabhu, Sri Jayadhrtaprabu, and Jayaprabu (Zoetmulder, 1974). This name also appears in the Mrwak inscription dated 1108 Śaka or 1186 AD as Śrī Jaya Prabhu. Besides the inscription, there is also a mention of King Sri Jayawarsa in the Sumanasantaka and Krsnayana kakawin. In Kakawin Sumanasantaka Jayawarsa's name is mentioned in the epilogue which reads "None other than Sri Warsajaya, the famous teacher of the art of poetry, who was pleased to appoint him as a student" which can be interpreted that Mpu Monagona presented Kakawin Sumanasantaka as a gift to his king as Sri Warsajaya (Worsley, Supomo, Fletchert, & Kakawin, 2014).

Sri Jayawarsa's territory included Ponorogo area by referring to the location of Sirah Keteng inscription and Madiun area by referring to the location of Mrwak inscription with orientation on Mount Wilis (Sucahyo et al., 2024). According to Nasoichah, Sri Jayawarsa's power was separated from Kadiri's power which had an autonomous and even sovereign kingdom (power), which was located in Madiun and Ponorogo areas although its power was not as big as Kadiri's kingdom (Nasoichah, 2017). Srī Jayawarsa Digwijaya Śastraprabhu in the Sirah Keteng inscription is mentioned as claiming to be the grandson of Sang Apanji Wijayamṛtawarddhana whose abhiseka title is Sri Isana Dharmawangsa Tguh Anantawikramatunggadewa. Sri Jayawarsa received the throne from his great-grandfather who was the only son of Dharmmawangsa Tguh and that was the reason why his kingdom was separated from the Kadiri kingdom. Another opinion was also put forward by Robson who said that Jayawarsa's palace was somewhere in the Ponorogo region and not in Kadiri because Sirah Keteng which is the place of origin of the inscription is located west of Mount Wilis not far south of Ponorogo while Kadiri is located far east of Mount Wilis (Robson, 2013).

Artifactual Traces of the Jayawarsa Region

Sirah Keteng Site

The Sirah Keteng site is the place where the *Sirah Keteng* Inscription was found (1204 AD) which mentions the name Sri Jayawarsa Digwijaya Sastraprabhu along with his genealogy by explaining Dharmmawangsa Tguh as his ancestor (Nasoichah, 2017). The naming of this site comes from the folklore about the battle between Ki Ageng Kutu against Bathoro Katong, Kyai Ageng Mirah, and Selo Aji. The battle was won by Bathoro Katong with the beheading of Ki Ageng Kutu by Selo Aji in a beji or pond which was eventually named Sirah Keteng (Purwowijoyo, 1985).

The *Sirah Keteng* site, located in Bedingin Village, Sambit District, Ponorogo Regency, has a long history. The inscription was first read in 1913 with documentation in Figure 2 (Albert, 1913). Long before that, in 1895 Hoepermans reported the abandonment of a stone carved on four sides and broken into two parts which was most likely the *Sirah Keteng* Inscription. The stone was eventually secured with the help of Resident Noordsiek. Other artifacts reportedly found in the temple ruins include Nandi statues, Ganesa statues, Kala heads and several andesite temple steps (Hoepermans, 1895).

Currently in the *Sirah Keteng* Site Area only a few remains remain but there are other remains that have not been discussed by colonial era experts. The remains are in the form of a brick-based underground trowogan. This underground tunnel can be associated with the irrigation function of the petirtaan for purification before performing rituals to the temple or padmasana. Based on the collective memory of the community, in 1985 people threw merang or rice husks into Dong Lesung and three days later the merang reached Sendang Sirah Keteng. Thus the community assumed that there was a tunnel connecting the two. This assumption may be true based on the

data that this tunnel forms a straight line with two other petirtaan or springs, namely Telaga Mantili Dirga and Dong Lesung (Sucahyo et al., 2024).

Mruwak Village

Mruwak village, Dagangan sub-district, Madiun district is the location where the Mrwak inscription was found. The village name mentioned in Mrwak inscription is still the same as the current toponym and Mrwak inscription also mentions the name Sri Jayawarsa, but there has been no further research. The reading of this inscription was conducted in 2007 by transliterating the script and language of the Mrwak inscription to analyze the contents of the inscription with geospatial conditions (Nasoichah, 2017). However, the research has not looked at the context of the distribution of artifactual remains of Mruwak's cultural heritage in the past.

Researchers received a report from the Madiun History Preservation Community (KOMPAS MADYA) that there are several artifactual scattered around the Mrwak inscription. The artifactual collection was found in 2020 based on reports from local residents. But until now there has been no further action either rescue or study. The results of the data collection of artifacts around the Mrwak stele can be accessed at https://bit.ly/DataArtefaktualMruwak and mapped into 5 sectors in Figure 1 can be accessed at https://bit.ly/4iA1my5.

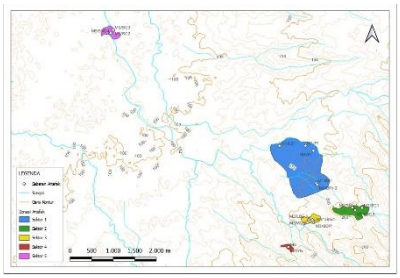


Figure 1 Map of Mruwak Artifactual Distribution Sector Division
Source: Mapping Using QGIS *software*

Geohistory of the Sri Jayawarsa Region

Parts of Madiun and Ponorogo Regencies were the area of Sri Jayawarsa's rule as previously described. According to (Hartono, 1980), the two regions are geographically isolated from other cultures so as to support the formation of a distinctive cultural pattern, such as the Panaragan Ethnicity in Ponorogo. This statement can be validated by looking at the geomorphological and hydrological aspects of Madiun and Ponorogo Regencies.

Geomorphologically, Madiun and Ponorogo Regencies are confined by landscapes in three cardinal directions, namely the Southern Mountain Range to the south, the Wilis volcanic mountains to the east, and Mount Lawu to the west. This forms a "natural fortress" that reduces the level of accessibility or movement of people living in the area. Land access can only be reached through the gaps between the hills in the area which is now the border between Ponorogo and Wonogiri Regencies. This statement is supported by analysis using the Terrain Positioning Index (TPI) in Figure 2 can be accessed at https://bit.ly/3Bzo2Oa.

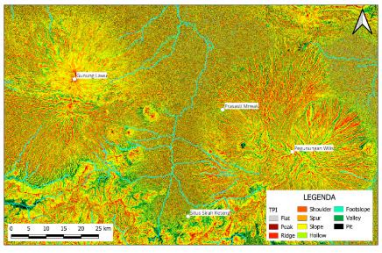


Figure 2 *Terrain Positioning Index* (TPI) Analysis
Source: Processing using "r.geomorphon" feature of GRASS 2.12 plugin in QGIS *software*.

Although the Madiun and Ponorogo Regencies are geomorphologically "locked" in three wind directions, hydrologically the region is traversed by many rivers. The Lawu volcano, the Wilis volcanic mountain range, and the Southern Mountain Range each serve as catchment areas (Setyawan1, 2022). Geologic stratigraphy due to the volcanism process also makes the area a groundwater storage and groundwater flowing area, and forms thick aquifers (Kumazawa, 1994). The groundwater contained in the aquifer along with overlandflow then becomes the inflow for the river system on the slopes of Mount Lawu and Wilis volcanic mountains and then accumulates in *Kali* (river) Madiun.

The number of rivers that become streamflow from higher elevation areas, plus the movement of groundwater (groundwater flowing) in the Madiun-Ponorogo area, as well as springs in the vicinity increase the inflow of *Kali* (river) Madiun (Kumazawa, 1994) (Purnama, 2023). Kali Madiun, which is connected to rivers in the area between Lawu Volcano, Wilis Volcanoes, and the Southern Mountains, then forms a river system that connects rivers that have upstream in the three uplands (areas that have higher elevations than the surrounding areas) and eventually connects to a larger river system, namely the Bengawan Solo watershed (Marhaento, Booij, & Ahmed, 2021).

It can be concluded that at that time the waterway was more likely to be used as the main transportation route that increased connectivity between regions, namely the Bengawan Madiun. In the end, the differentiation of the landscape led to the establishment and development of two main cultures, namely Gegelang or Wurawan and Wengker which had a cosmological concept, and stood between Mount Lawu and the Wilis volcanic mountain range (Reinhart, Supardi, & Carey, 2022).

Sirah Keteng Area Community System.

1) Irrigation System

At the Sirah Keteng Spring Site there is a water tunnel or underground larung which is indicated to be connected to other spring or irrigation sites, namely Telaga Mantili Dirja and Dong Lesung. This is reinforced by the recognition of residents in 1985 who threw merang in Dong Lesung and three days later the merang arrived at Sendang Sirah Keteng. This tunnel is also connected to Telaga Mantili Dirja, so that the three places form an imaginary line pattern that stretches for five kilometers with the distance between Sendang Sirah Keteng to Mantili Dirja for three kilometers and Mantili Dirja to Dong Lesung for two kilometers (Sucahyo et al., 2024).

Similar underground tunnels or streams like the one in *Sendang Sirah Keteng* are also found in other areas as well as the closest one in Madiun. The area is named Sumur Gumuling Glonggong which is an underground water channel, Sumur Gumuling Grogol which may have an underground tunnel there and Sumber mbrebes, about a hundred meters from *Sumber Mbrebes* there is the Ngguwo tunnel. This tunnel has a function as a water installation line that existed during the Old Javanese period (Riyanto, 2018).

2) Territory Sharing System

Based on previous research, Wengker Culture which is Jayawarsa's territory is divided into three areas, namely population or peasant settlements, king's grant land for religionists or *dharma lpas* and settlements for religionists or *karesyian*.

The most vital area is the Farming Area, which is a residential area. In the farming area there are many springs that allow people to grow crops and fulfill their needs. In the farming area there is also the Dharma Lpas area which includes the *Sendang Sirah Keteng* site where various findings were found such as *kala*, temple pieces and ancient water tunnels. The existence of water tunnels at this site shows that there is an advanced culture in terms of irrigation (Sucahyo et al., 2024).

3) Cosmology

The majority of sites in Jayawarsa's territory face Mount Wilis and some sites face Mount Lawu. According to ancient Javanese beliefs, Mount Wilis and Mount Lawu are

sacred mountains because they are considered one of the fragments of Mount Mahameru. This is written in the story of the removal of Mount Mahameru in the Book of Tantu Panggelaran and supported by various archaeological findings such as statues and ancient terraces around Mount Wilis. Ancient Javanese beliefs about celestial bodies were also minimal. In building a place of worship, they were more oriented towards the mountain, because the mountain was considered the dwelling place of the gods. Based on the facing direction with azimuth calculation, it shows that the majority of sites in this area are oriented towards Mount Wilis.

Mount Wilis and Mount Lawu are places that are considered sacred, making these two mountains the center of worship cosmology for the ancient Javanese community around them. This condition is also in accordance with the results of archaeological analysis of sites located in the southern mountainous region. The site there is thought to be the place of the resi or keresyian. The position of the *keresyian* in the highlands and facing directly towards Mount Wilis or Lawu, a suitable place to carry out and deepen religious education (Sucahyo et al., 2024).

Traces of Mruwak Ancient Settlement

1) Traces of Water Transportation and Village Dispalcement

The inscription Mrwak writes that this village had experienced a move. The move occurred because Mruwak Village was suddenly attacked by outsiders. The attack came from the northwest of the river using a large ship (Bahita Raksa) and it is not yet known from which party (kingdom) the attack came. In this attack, sri kanuruhan and a large number of his soldiers died.

As a result of the attack, Mruwak Village was moved to a higher place at the foot of Mount Wilis with the help of the juru manutan. This was done to make the villagers feel safe and for defense. Because of the attack, the prince nwara nusa sarwweyanapala was ordered to guard Mruwak Village, the guard included a large river which was indicated as the chess river (Nasoichah, 2017).

In a previous study, it was mentioned that there had been a movement of Mruwak Village from the lower elevation area towards the kadahaka tyas (the hard part in the middle of the mountain valley) (Nasoichah, 2017). Hydrologically, this event can be interpreted as a migration of the population towards the upstream area. The further upstream, the number of meeting points between streams (in ancient Java called campuhan), tempuran or confluence will decrease which causes the accumulation of water discharge to decrease because the presence of tempuran (campuhan or confluence) is influential in increasing water input (inflow) (Mosley, 1976). Hydrologically, areas with these characteristics will be difficult to reach by large vessels.

In terms of geomorphology, the movement of the village towards the kadahaka tyas can be interpreted as the migration of the population towards areas of higher elevation, in the Dagangan sub-district, this means the slopes of the Wilis Volcanoes. Higher elevation areas coupled with the presence of ridges allow the width of the river to be narrower, preventing the Bahita Raksa from passing through the river. Due to vertical erosion of the river, the development of the river after vertical erosion will form a U-shaped cross section, meaning that the erosion process only increases the depth of the river, without significantly changing its width (Tarbuck & Lutgens, 2015). Therefore, the purpose of village displacement from a hydrological and geomorphological perspective can be speculated as a preventive measure to prevent a second invasion of the village using Bahita Raksa.

The hydrological and geomorphological analysis concluded that the Catur River (Kali) is a water transportation route that allows Bahita Raksa to pass through the river. However, there was a need for a specific area of Mruwak Village before moving to the

current location. When using hydrological analysis, inscription context, and artifactual distribution, there are criteria in determining the old settlement area as listed in Table 2.

Table 2: Criteria for determining old settlement areas

No	Criteria	Reference
1.	There is a river that has a northwest orientation.	Content context analysis of *Mrwak* Inscription (Nasoichah, 2007)
2.	The location of the previous village was to the southeast of the river in question.	Content context analysis of *Mrwak* Inscription (Nasoichah, 2007)
3.	It has a lower elevation than the current Mruwak Village.	Content context analysis of *Mrwak* Inscription (Nasoichah, 2007)
4.	The width and flow of the river allows *Bahita Raksa* to pass through.	Geography analysis
5.	Has a supporting artifactual distribution.	Artifactual Scatter Analysis

These criteria led to a new opinion in the estimation of the old settlement area of Mruwak Village, namely area 1 and area 2 around the campuhan or confluence. Campuhan in ancient Javanese culture was the union of two great energies so that the location was often chosen for the construction of sacred buildings (Santiko, 1977). In sector 5, two altars were found that probably functioned as spiritual facilities. Not far from this location, there is a confluence which is the meeting point between the river system that covers the other four artifactual distribution sectors and Kali Catur which has a higher stream order with Strahler's order of 4 and Shreve's order of 28. Hydrologically, it is still possible for Bahita Raksa to go to area 2, but it cannot continue beyond that because after the confluence, each river will split into order 11, and order 6 in Shreve's method which causes a reduction in river discharge and size. While this is possible, area 1 is the area with the higher probability as it is supported by the artifactual distribution in the vicinity. The river order values of the streamflow in each sector of the artifactual distribution are listed in Table 3.

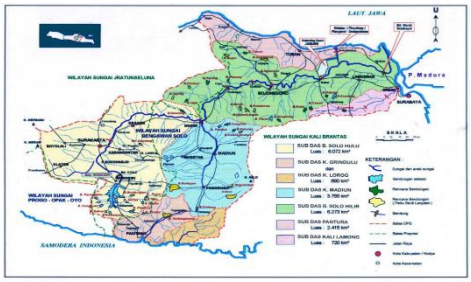
Table 3. River order by artifactual distribution sector

Sector	Strahler River Order	Order of the Shreve River
Sector 1	2	5
Sector 2	2	5
Sector 3	2	3
Sector 4	1	1
Sector 5	4	28

The results of the geographical analysis as well as taking into account the context of the inscription content and artifactual distribution direct the river as a main stream that plays an important role in improving connectivity between the surrounding areas. Large ships can be allowed to pass through the Bengawan Solo River as the main streamflow in the Bengawan Solo watershed river system. Kali Madiun as one of the tributaries of Bengawan Solo River may be able to pass smaller vessels up to Kali Catur. At Kali Catur, larger vessels may be able to pass through on a limited basis up to areas 1 and 2. After that, the rivers at higher elevations can only be crossed by small vessels. It can be concluded that the tributaries on the slopes of the Wilis Volcanoes are local scale water transportation routes. Then the Madiun River, which is in a larger river system, becomes a regional-scale water transportation route. The Madiun River, which is the inflow for the Bengawan Solo

watershed, increases connectivity to an international scale with its estuary at the port in Gresik and Surabaya area. The connectivity of the Bengawan Solo and Chess watersheds can be seen in Figure 3 can and Figure 4, respectively.

Figure 3 Map of Bengawan Solo watershed and sub-watersheds



Source: Decree of the Minister of Public Works No. 266/KPTS/M/2010 on the Water Resources Management Pattern of the Bengawan Solo River Basin.

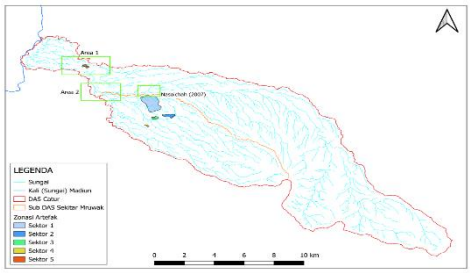


Figure 4 Map of the alleged village

Source: Processing using "r.watershed" and "r.water.outlet" features of GRASS 2.12 plugin in QGIS software.

2) The Economic Pattern

First, Agriculture. The economy in ancient Java consisted of a combination of agriculture and maritime trade. Large kingdoms such as Majapahit, besides having a strong agricultural base, also controlled inter-island trade networks and even reached further afield in Southeast Asia. Majapahit was known to trade with Sumatra, Kalimantan and the Malay Peninsula. This trading system strengthened Majapahit's economic position as an influential kingdom in the region. However, coastal trade was dominated by port cities, while inland areas relied more on agriculture as the backbone of the economy (Ricklefs, 2008).

Rice fields were the center of the agrarian system in ancient Java, with irrigation systems allowing the fields to be cultivated intensively. These paddies are divided into two types, namely rainwater-dependent tadahan paddies and artificial irrigation-dependent sorotan paddies. Paddy fields produce rice, which is the main commodity in the agricultural economy, and the yield of paddy fields is measured in units of hamat to determine production capacity (Meer, 1979).

When *Mruwak* Village was moved, it is likely that the rice fields that were originally located near the river, moved up the hills (Nasoichah, 2017). This certainly changed the agricultural system that initially used terraced rice fields, which is indicated to use the highlighted rice field system or rice fields with artificial irrigation as stated by Meer (1979), but flat rice fields can still be found in the village. The irrigation system that initially relied on rivers then relied more on springs located in the highlands and forests with a rice field system that may be tadahan rice fields or those that rely on water from nature directly such as rain and springs.

The *Mrwak* inscription also mentions various flora and fauna, such as mentioning *sarabha* (a type of mongoose that was later used as an animal in fables; thought to be 8-legged and inhabiting snow mountains) (Zoetmulder, 1995), crows, deer, and monkeys. The animals mentioned are animals that come from the forest so it is likely that *Mruwak*

Village after the move was still in the form of forests or near forests. In addition to animals, *Mrwak* inscriptions also mention several plants such as tubers and paya or now better known as bitter melon (Nasoichah, 2017).

Second, Economic Interaction with Outside World. Water transportation routes played an important role in the political and economic development of the Mruwak region. At the same time, the coastal kingdoms also thrived as sea trade centers, establishing The economy of Java during the Hindu-Buddhist kingdoms showed significant development with agriculture as the main element, especially in the inland areas known as agrarian-rich regions. Regions such as Pajang and Mataram had fertile agricultural land, which played a role in trade relations with various regions in Southeast Asia (Ricklefs, 2008).

Waterborne trade also spread to Mruwak village with the mention of Bahita Raksa or large ships in the village attack incident in the Mrwak Inscription. Researchers found evidence indicating the results of the waterway trade in ceramic fragments (M3/ SBG4) in the Sector Three area. The presence of these ceramics indicates that Sector Three was a fairly developed settlement compared to other sectors. This is because ceramic fragments can be indicated as imported and luxury goods in ancient Java. Ceramics are said to have originated from China, high quality glazed ceramics fired at high temperatures and beautifully decorated, plates and bowls of these ceramics are usually of high value. In the Philippines, Sulawesi and the Moluccas, plates and bowls are placed around the corpse at funerals, to accompany the corpse on its journey to the other world. In Java, Bali and South Sulawesi, glazed ceramics were used to decorate mosques, tombs and palaces (Reid, 1992).

Third, Division of Mruwak Village Area. The formation of a culture is inseparable from the natural potential around it as Daldjoeni's opinion suggests the driving factors of culture and civilization and one of them is the natural environment and cultural transmission (Daldjoni, 1982). The complexity of settlements in ancient Java was arranged based on a caste that was divided into three groups, namely the first villagers or peasants, the second nobility and the third was the religious community (Casparis, 2020).

The form of settlement of each class in ancient Javanese society was strongly influenced by geographical conditions as well as in the territory of Sri Jayawarsa. Jayawarsa's territory in the Ponorogo area identified as Wengker has been divided into three, namely the settlement of the population or peasants, the king's land grant for religionists or dharma lpas and the settlement for religionists or karesyian. The division is based on geographical conditions and artifactual forms. The peasant group in the Ponorogo area is located in an area with abundant water sources that allow people to fulfill their needs such as cooking and farming. In the peasant area there is also Dharma Lpas or king's grant land which is characterized by irrigation technology and quite advanced sacred buildings at the Sirah Keteng Site. The next area is the area of the religionists who are on higher ground and tend to be remote from other areas (Sucahyo et al., 2024).

Based on previous research on Jayawarsa's area of power in the Ponorogo area and the theories of experts, the researcher divides Jayawarsa's area of power around the Mrwak Inscription into several areas, namely the area of Sima establishment, the area of new settlements or villages, the area of the religionists and the village area.

Sima Designation Area

The *Mrwak* inscription mentions that *Mruwak* Village received the status of Sima which reads "Juru manutan all change easily then Sima mrwak" (Nasoichah, 2017). Sima itself in the ancient Javanese order was an area that was exempted from tax obligations to the kingdom because the village contributed to the kingdom such as maintaining public facilities in the form of temples or dams (Haryono, 1980), and helping the king defeat enemies such as the Sirah Keteng area (Sucahyo et al., 2024). Different from *Sirah Keteng* which received sima or *dharma lpas* status from

Jayawarsa due to a meritorious figure, the reason for the Sima of *Mruwak* Village has not been clearly confirmed.

The area of Sima Determination referred to here includes Sector One. This determination is marked by the discovery of the *Mrwak* Inscription (M1/P1) as well as other inscription fragments (M1/P2). If we look at the context of its use, the inscription functions as a charter issued by the royal ruler for the purpose of determining an area to be a sima, then many inscriptions do not contain the background of events that occurred at that time (Dwiyanto, 1998). So it can be interpreted that this area is a commemorative area for the attack on *Mruwak* Village as well as a sign of the sima designation. The findings of stone strokes and brick fragments in this sector also indicate that there were settlements in the sector one area.

Farming Area or New Population Settlement

The Tani group or villagers are the largest group compared to the clergy and nobility. This group usually lives in the lowlands with abundant water sources to fulfill their life needs from agriculture to consumption (Casparis, 2020). The characteristics of the settlement can be found in the Farmer Group Settlement in Jayawara's territory in the sirah keteng area which is located in the lowlands with the discovery of many springs in the form of springs and supported by an irrigation channel system or underground larung (Sucahyo et al., 2024).

The Tani group in the Mruwak area is located on high ground in contrast to the conditions in the Sirah Keteng area. This group settled in the area covering sector two and sector three based on the findings of artifactual distribution and interpretation of the contents of the Mrwak Inscription. The Mrwak inscription states that the village was moved to higher ground after experiencing enemy attacks that came through the river. Based on the statement in the inscription, it can be interpreted that the form of population settlement experienced a transition from agrarian life on the riverbank to plantations in the highlands (Nasoichah, 2017). The pattern of water source utilization also changed from directly using the river to a smaller water source with a catchment system with evidence of an attempt to collect water in sector two (Stone Chest M2/PB1 and Pottery Fragment M2/SBG3) indicating that sector two is quite far from the water source. Apart from the artifactual data that shows the settlement pattern, the topographic conditions in sectors two and three are also higher than other sectors, this is in accordance with the interpretation of the contents of the inscription about moving the village location to a higher ground.

Farming Area or Old Population Settlement

Based on the contents of the Mrwak inscription, the settlement of Mruwak village has experienced displacement. In a previous study, Nasoichah (2017) mapped the displacement of Mruwak village with the conclusion that the displacement occurred as far as one kilometer towards the nearest river from the location of the Mrwak inscription. However, there is no clear evidence of the original location of Mruwak village given the absence of artefactual traces and the geographical condition of the river in the form of a rocky upstream, making it very difficult for Bahita Raksa or the large ship mentioned in the inscription to enter the area. Based on the findings of artifactual traces on the riverbanks and analysis based on the geographical variables of the river, it can be indicated that sector five is the initial location of Mruwak village. This is because this sector is the sector with the highest stream order among the other sectors, namely 28th order in the Shreve method and 4th order in the Strahler method. In addition to using geographical analysis, in this sector there are artifactual objects that support the evidence of traces of settlement in this sector in the form of two watu gilang (M5/BG2 and M5/BG3) or altars and the discovery of ancient bricks (M5/SBG4) on the banks of the river.

Religious Territory

Old Javanese religious education institutions are divided into two, namely for the palace environment and for the environment outside the palace which is usually called Kadewaguruan or Karesyan (Munandar, 2011). Kresyan itself was built in the Dharma Lpas region which received

funding from the kingdom such as in the Sirah Keteng area. In addition, there are also those in remote environments such as mountains and forests (Santiko, 1977).

Unlike the Sirah Keteng area which is a Dharma Lpas area, the findings of temple ruins in Mruwak can be said to be Karsyan outside the palace environment. This area covers sector four which is characterized by the findings of temple ruins with carvings that tend to be simpler than Sirah Keteng so that it is indicated that this area did not receive major funding. In addition, the location of the temple, which tends to be far from residential areas and is located in the highlands, indicates that this area is quite remote. The condition of this sector is more likely to be like the findings in the Karesyan area in the Ponorogo Area, which is also a simple Karesyan.

CONCLUSION

The study concludes that Sri Jayawarsa's rule in the Ponorogo and Madiun regions not only shaped distinctive societal patterns, but also featured a complex spatial system consisting of settlements, special areas for religion, and royal grants. This study shows how historical geography plays an important role in understanding the territorial division, irrigation system, and cosmological orientation of ancient Javanese Hindu-Buddhist society. Artifactual and textual evidence, including the Sirah Keteng and Mrwak inscriptions, help reconstruct economic patterns that combined agriculture and water transportation routes. The findings confirm the important role of geography and culture in shaping the economic and social structure of the region, and provide insights into the integration of environmental factors and community beliefs in determining the spatial layout and social interactions of the Jayawarsa period. The continuation of this research will be very beneficial by involving more disciplines, such as archaeology, geography, history, anthropology, and environmental science. Multidisciplinary collaboration will produce a more holistic understanding of the life of Jayawarsa people and how they interacted with the surrounding environment.

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