REVISITING THE ARCHAEOLOGICAL SITES AND SURROUNDINGS OF THE LALMAI-MAINAMATI REGION FOR UNDERSTANDING THE SIGNIFICANCE OF BUDDHISM: A GIS-BASED STUDY

NAZMUL ALAM RIDOY[1] AND MOHAMMAD MAHMUDUL HASAN KHAN[2]
[1]Corresponding Author, BSS and MSS in Archaeology, Department of Archaeology,
*Comilla University, Kot*Bari*, Cumilla, Bangladesh. E-mail: nazmulalamridoy00@gmail.com*
*[2]Assistant Professor, Department of Archaeology, Comilla University, Kot*Bari*, Cumilla, Bangladesh.*
E-mail: smkhanju@gmail.com

Abstract: The Lalmai-Mainamati region in Cumilla, Bangladesh, designated as a UNESCO Tentative World Heritage Site, is historically associated with the ancient Buddhist civilisation of Samatata. This study aims to comprehend the cultural significance of Buddhism in the region through a comprehensive Geographic Information System (GIS)-based database of archaeological sites, featuring a structured data table with geographic coordinates and additional information, complemented by scaled digital maps. Notwithstanding its historical importance, documentation is insufficient, with about 23 sites officially recorded by the Department of Archaeology, Bangladesh. Nevertheless, significantly more than 55 sites have been recognised in literature and surveys. Numerous sites remain unexcavated, and current maps differ in both scope and precision. A mixed-methods approach was utilised, integrating GIS, Remote Sensing, literature studies, and ground-truthing. Research indicates that 77% of locations remain unexcavated. The dense aggregation of Buddhist edifices on the eastern inclines indicates a deliberate positioning for both spiritual and defensive purposes. This is the inaugural endeavour to comprehensively document the region digitally. The resultant database will facilitate future research on the

dissemination of Buddhism from Devaparvata to Southeast Asia, positioning Lalmai-Mainamati within the broader context of archaeological and Buddhist studies discourse.

Keywords: Ancient culture of Bangladesh, Buddhist Heritage of Devaparvata, GIS-mapping and documentation, Geo-database of Lalmai-Mainamati, Importance of exploration and excavation.

1. Introduction

The Lalmai-Mainamati Hill Range stretches north-south and is situated near the centre of Cumilla City. The region is part of the tentatively listed UNESCO World Heritage Sites (Alam *et al.*, 2021, pp. 93–103; Huda *et al.*, 2021). The evidence suggests that people inhabited this region since the prehistoric Neolithic era (Haque & Haque, 1997, p. 287; Hazarika, 2013, p. 19, 2017). It is located in the old Samatata township, approximately 8 km from Cumilla City (Bhuiyan, 2003; Hossain, 1998, p. 170; Khan, 2018; Shahnawaz & Imran, 2017, p. 36). Hiuen Tsang indicated that Gautama Buddha spent seven days at Samatata (Barua, n.d., p. 25). Nevertheless, the precise location information remains undiscovered. Hiuen Tsang also observed 30 Buddhist sites in Bihar, specifically at Samatata (Dasgupta, 2016, p. 143; Niyogi, 1985, p. 7). Yuan Chwang also stated, similar to Heiun Tasang (Alam, 1982, p. 8). He characterised Samatata as a low-lying coastal area adjacent to the sea (Aziz, 2018, p. 21). At that time, Cumilla was referred to as *Kamalanka* (Hasan, 1970, p. 81). Geologists think that the hills originated during the Pleistocene epoch, some 25 million years ago, coinciding with the geological period of *Varendrabhumi*, Madhupur, and Bhawal Garh in Bangladesh. Numerous narratives exist concerning the origins of the hills, including one in which Hanuma presents a tree of opulence that leads to their creation. The northern terminus is at the Queen's Bungalow, while the southern terminus reaches Chandi Mound. The northern segment is designated as Mainamati, whereas the southern segment is recognised as Lalmai. The term *'Lalmai'* is believed to be derived from *'Lalmati,'* signifying red soil, or from the *'Lalambi'* jungle, a forest that once existed near Devaparvata, the capital of the Devas of Samatata (Monsor, 2014). The characteristics of the region's red soil have been documented in several sources, including Brammer (1996, p. 24), Hasan (1970, p. 73) and Rahman *et al.* (2021, pp. 331–343), as well as in the soil usage charter accompanied by a comprehensive updated soil map

from the Agricultural Ministry of Bangladesh (Hossen, 2015, 2018). The area is abundant in archaeological findings. The early medieval Devaparvata is associated with the historical accounts of dynasties, including Khadga, Deva, and Raat, among others.

A total of 47 (with two ponds, it's 49) archaeological site names have been found in diverse sources such as, Zakariah (1997, p. 126). On the other hand, Morrison (1974, p. 14) recorded 45 places (with two ponds, the number is 47). Nonetheless, these sites are omitted from modern georeferenced maps. Multiple georeferenced maps indicate the presence of 23 to 27 archaeological sites only. However, ascertaining the exact current location has become difficult due to the absence of scales. A comprehensive database containing geographic coordinates has not been found yet.

The primary objective of this research was to investigate the significance of Buddhism by accurately representing the locations of these archaeological sites on a map using modern coordinates. This was accomplished by collecting locational data from diverse literary sources and utilising GIS and GPS technologies. This is of considerable significance, as the accomplishments of this historically rich archaeological city are at risk of being obscured by the passage of time. They are undergoing persistent deterioration. Consequently, initial measures for their conservation can be accomplished by developing the geo maps and database that accurately reflect the specific position of the area. The map produced by scholars across different periods delineates the boundary of Lalmai-Mainamati, also referred to as ancient Devaparvata, as shown in the georeferenced map, located 100 meters above sea level. Efforts have been made to define the boundaries of this region according to elevation. A total of 53 site locations were documented based on various field activities and remote sensing surveys. After that, the significance of Buddhism was explored.

During the literature survey, several research works have been found on Buddhism in the area, such as the work of Begum (2010), Husain *et al*. (1997), Morrison (1974), Murshed (2024), Prova (2024), Rashid (2008), and Zakariah (2011b) among others. However, all of this work was based on iconography, non-GIS-based site survey, literature, etc. But the primary focus of this study was understanding the significance of Buddhism through developing the GIS-based maps and geo database. Overall, this study will play a beneficial role through developing digital maps and a database for future research, while also focusing on the necessity for extensive exploration and excavation to

understand the Buddhist culture of the UNESCO's tentatively listed Lalmai-Mainamati, South and Southeast Asia, as well.

2.   Study Area and Its Significance

The geographical range spans from 23°20′ to 23°30′ North latitude and from 91°05′ to 91°10′ East longitude, including an area of 33 square kilometres (Figure 1). The hills possess an average elevation of 15 metres, with some summits surpassing 45 metres. Kotbari Mound, the highest archaeological site, was recorded at 53.1 metres. The hills are predominantly covered with red-brown mud known as the Madhupur strata, which originates from the Pleistocene epoch. Below this layer lies the Dupi *Tila* strata from the Paleo-Pleistocene epoch. The strata are separated by quartz-calcite gravel, particularly evident near the Queen's Bungalow. Fossilised wood is located in the newly identified Dupi mound layer at various sites within the hills (Monsor, 2014).

Some hilltops are flat and resemble plateaus, whereas valleys are sharply incised and function to divide the hills. The Lalmai range is considered an extension of the Arakan Yoma Mountain range. The hills possess archaeological importance owing to the existence of ancient sites, such as Lalmai *Pahar*, Shalban Vihara, Ananda Vihara, Kotila Mound, Itakhola Mound, Rupban Mound, Chandi Temple, and 54 other mounds and Buddhist monasteries (Bhuiyan, 2018, p. 264). These regions act as silent witnesses to the region's profound past. Numerous Buddhist monasteries were constructed on elevated terrains, particularly in the region extending from Mainamati to Shalban Vihara and the Lalmai hills, which are renowned for their archaeological importance (Monsor, 2014).

The Gomati River and its paleochannel link these sites to the Meghna River, which discharges into the Bay of Bengal to the south (Monsor, 2014). Recent archaeological excavations in the region have uncovered significant resources, including diverse inscriptions, over 400 ancient gold and silver coins, numerous seals and artefacts, as well as stone, bronze, and terracotta plaques featuring intricate sculptures. Architectural remnants and assorted quotidian artefacts have provided significant insights into the region's history and civilisation. Devaparvata is not merely a city; it represents a significant chapter in the history of Samatata. In 1874, the British administration transferred ownership of the hills to the raja of Tripra (Webster, 1910, p. 85). Prova (2024) suggested that the *Mahayana* tradition of Buddhism evolved in Bengal into a distinct variety

known as *Vajrayana*. This practice started in southeastern Bengal, particularly in Lalmai-Mainamati and Vikrampur, and then disseminated to Sri Lanka, Myanmar, and Thailand. Murshed (2024) indicated that metal sculptures were produced in the Mainamati-Devaparvata region of South-East Bengal, with the practice of cast sculpture reaching its zenith in the 9th or early 10th century.
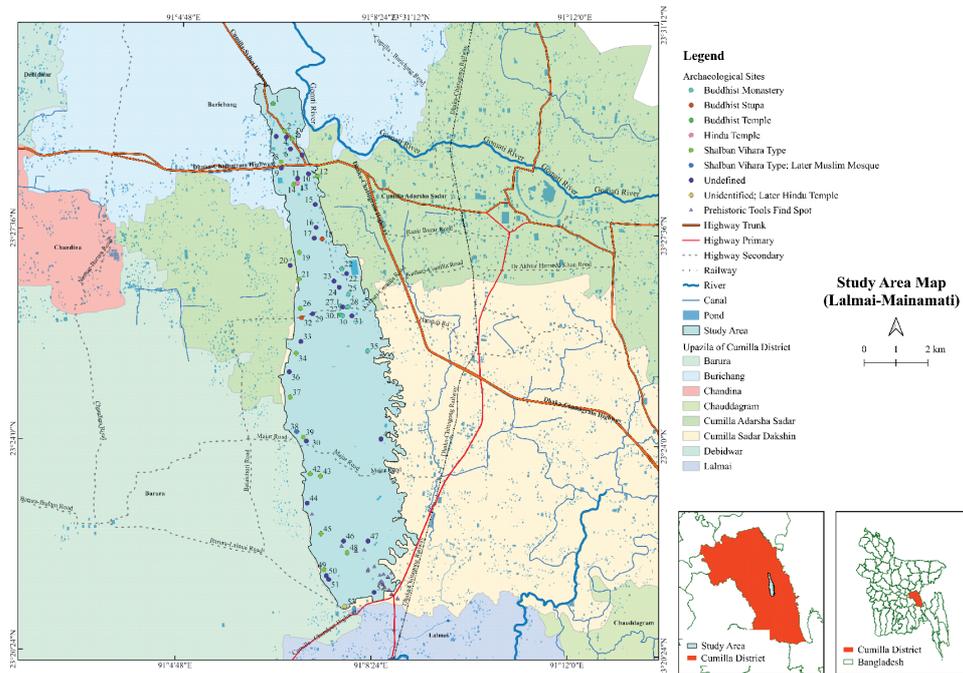

Figure 1: Study area map

Devaparvata was the third and most prominent of the five historically acknowledged capitals of Samatata (Rashid, 2015). Before its emergence as a political centre, it was acknowledged as an important pilgrimage destination and cultural hub. The exact origins of Devaparvata remain ambiguous; yet, its geographical position offered the crucial natural attributes and resources for advancement. The elevated location, surrounded by forested hills and near a river resembling a moat, was ideal for a royal capital. The monasteries and Viharas founded in this secure location were pivotal, influencing art, architecture, and daily life in the city. The unearthed ruins and artefacts illustrate the cultural wealth of this old community.

The inherent beauty of Devaparvata, encompassing its plains, forests, rivers, lakes, and diverse plants and animals, contributes to its economic prosperity

and cultural advancement. The progress in agriculture and proximity to notable geographical features facilitate these achievements. To the east are the distant Tripura and Arakan hills, while the west reveals the nebulous stretch of the Meghna River. The two unique characteristics have historically provided a basis for the region's economic development. Research undertaken over the last fifty years has unequivocally established that Devaparvata was located in the present Lalmai-Mainamati region. Devaparvata, a prominent city in early medieval Bengal, holds a crucial role in its historical narrative. Located atop the Lalmai-Mainamati ridge and bordered by the Khiroda River, it evolved into a hub of culture, politics, and religion. Inscriptions and archaeological discoveries underscore its importance as the capital of *Samatata* during various dynasties (Khan, 1977, pp. 29–34).

To comprehend the political context sequentially, it is necessary to know the background of *Samatata.* The initial reference to the *Samatata* realm is located in the Allahabad Pillar Inscription of the Gupta Emperor, Samudragupta. In the 4th century CE, Samatata became a subordinate kingdom on the boundary under Emperor Samudragupta's authority. The first documented monarch of *Samatata* was King Vainyagupta, as indicated in the copperplate inscriptions of Ghunaighar and Shalban Vihara. He ruled the kingdom from *Jayaskandhavara* in Kripura. The Nath and Rata royal dynasties ruled *Samatata* concurrently during the same historical epochs (Samaddar, 2018, pp. 165–168).

Devaparvata is one of the five capitals of ancient *Samatata*. It was renowned for its Buddhist religious and educational establishments, which housed numerous viharas, stupas, and *chaityas,* including the notable *Mahabhogasrama,* which earned it the title 'Mount Olympus of Buddhist Gods' (Rashid, 1997, p. 1). The Ratas, succeeding the Khadgas, established Devaparvata as their capital. The Kailan copperplate of Sridharana Rata designates it as *'sarvatobhadraka,'* signifying that it is reinforced with four gates (Husain *et al*., 1997, pp. 262–275).

Devaparvata, a distinguished city in ancient Bengal, holds a significant position in its historical narrative. Situated on the Lalmai-Mainamati ridge and encircled by the sacred river Khiroda, Devaparvata emerged as a cultural, political, and religious hub. Epigraphic and archaeological evidence indicate the city's significant history as the capital of *Samatata* under various kings. Hossain (2011, pp. 54–55) asserted that the region was first established as a Buddhist cultural centre, but ultimately succumbed to Hindu dominion. The historical limits are derived from ancient documents; however, they extend

further back, as evidenced by the discovery of fossilised wood.

3.   Findings

3.1. *Revisiting the Geographical Boundary of The Study Area*

The initial territory of the Lalmai-Mainamati area is shown in multiple formats across various map types within this archaeological zone. Previous academics in this domain sought to depict the outline of the Lalmai-Mainamati hills according to their interpretations. After observing all the maps, a new boundary outline or border has been marked for the region, based on altitudes ranging from 100 to 110 feet above sea level. This section displays all georeferenced maps, following the comparative discussions, and delineates the geographical boundaries of the areas indicated by the maps.

The initial map under consideration is one developed by Morrison (1974), subsequently revised and utilised by Husain *et al*. (1997) (Figure 2). This map indicates that the area encompassed by the Dhaka-Chittagong highway is excluded from the hills. This section is presently unfinished, and to the north, portions of the hills are illustrated as separate segments, despite the fact that they should be represented as interconnected.

The subsequent map, exhibiting several similarities, was utilised by Zakariah (2011, p. 630). This is a scaled hand-drawn map (Figure 3). Nonetheless, the absence of modern geographic coordinates in these maps, largely because of their infrequent utilisation at that period, poses difficulties in georeferencing them now. These maps offer a lucid understanding of the study area. The northern regions remain incomplete, and certain locations are depicted as distinct. The depictions do not align with contemporary maps.

The next map (Figure 4) utilised by Begum (2010) for this region resembles that of Mainamati-Devaparvata. Upon georeferencing this map, it became apparent that it represented a considerably wider area than the actual region. The discrepancy arose due to the exclusion of the decimal values following the grid coordinates on the map. The map illustrates the Queen Mainamati Palace area as a distinct section. Upon examining the elevation profile in Google Earth, it is observed that this segment is relatively lower. The existence of an ancient canal in this location is questionable due to insufficient references. An ancient course of the Gomati River is thought to have traversed westward towards Bindiar *Char* in this region.

The subsequent map (Figure 5) provided by Khan (2012), which was originally the black and white map of Rashid (1997, p. 20), differentiates itself from earlier versions by illustrating the Queen Palace area as a component of an integrated region rather than as an isolated entity.

The historical map (Figure 6) created by Rennell (1794) pertains to Lalmai-Mainamati; yet, it has considerable flaws. The difficulty in adequately depicting Mainamati on the map is likely due to the extensive area the map encompasses, considering that Mainamati is a rather small location. This map, albeit distinct from earlier iterations, successfully conveys the historical importance of this region and offers valuable assistance for our research.

The following map (Figure 7) is derived from Roy *et al*. (2012, p. 140). This map illustrates the distribution of diverse soil types, including Chandina deltaic floodplain deposits, Madhupur clay, and deposits from the Holocene, Pleistocene, and Plio-Pleistocene epochs, within the research area. Nonetheless, a substantial segment of the present Comilla Cantonment region is designated as Chandina, raising questions regarding its legitimacy within legal and academic contexts.

Rashid (2008, p. 258) presents a map intended to appropriately represent the hilly area of Mainamati (Figure 8). Nevertheless, he excludes a significant chunk of the southern region near Kali Bazar Road in Comilla from the Lalmai Hills. This part is enclosed in a box, indicating that additional interpretation may be necessary.

Bhuiyan (2018) utilised a map that substantially mimics the one provided by Rashid (1997, p. 20) (Figure 9). He excluded the archaeological site of Queen Mainamati Palace from his map of the mountainous area. He recorded a total of 23 archaeological sites utilising geographic coordinates. The eighth location on his map, Queen Mainamati Palace, is clearly located in the Lalmai-Mainamati hilly region.

The Joint Operation Graphic military map (Figure 10), distinguished by its exceptional accuracy and displayed on an extensive scale (*JOINT OPERATIONS GRAPHIC (AIR) NF, 46-01*, 1992). This document does not explicitly identify archaeological sites; rather, it offers a comprehensive depiction of the region that nearly corresponds with modern maps. This map provides a more accurate understanding of the region's geography.

The map (Figure 11) herein is derived from the archaeological report on the Rupban Mound of Alam *et al*. (2000), produced by the Department of

Archaeology (DoA), represents a modification in AutoCAD of the one utilised by Dr. Harunur Rashid. This project seems to have utilised AutoCAD software in its development.

Abdullah *et al*. (2021, p. 7) present an extra key map in their research (Figure 12). It delineates the soil composition of the Lalmai region, categorised into three types: Alluvium, Madhupur clay, and Dupitila formation. Furthermore, it recognises geographical names, such as Salmanpur, which is denoted above as Shalbanpur. The georeferencing of this map was exceptionally precise, as it was produced with accuracy by the author. Nevertheless, the map omits details concerning the portion of the Cumilla Kalir Bazar Road traversing the middle area of the Mainamati highlands. This road was built by excavating the hills and presently crosses the Kotbari Mound region.

The final map (Figure 13) by Chakrabarti (1992, p. 195) poses critical enquiries concerning the depiction of the Mainamati hills' morphology. This seeks to emphasise an ancient trajectory of the Khiru River. This input is essential for understanding the region's paleochannels. The map depicts the historical encirclement of the area by canals, providing insights into the region's hydrological and terrestrial history.
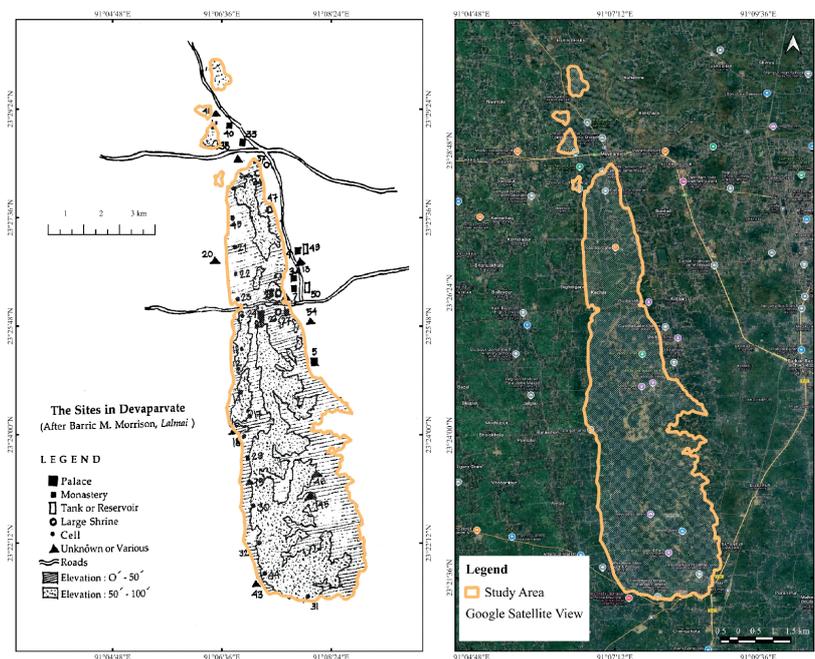

Figure 2: Study area boundary in Morrison (1974)'s map.

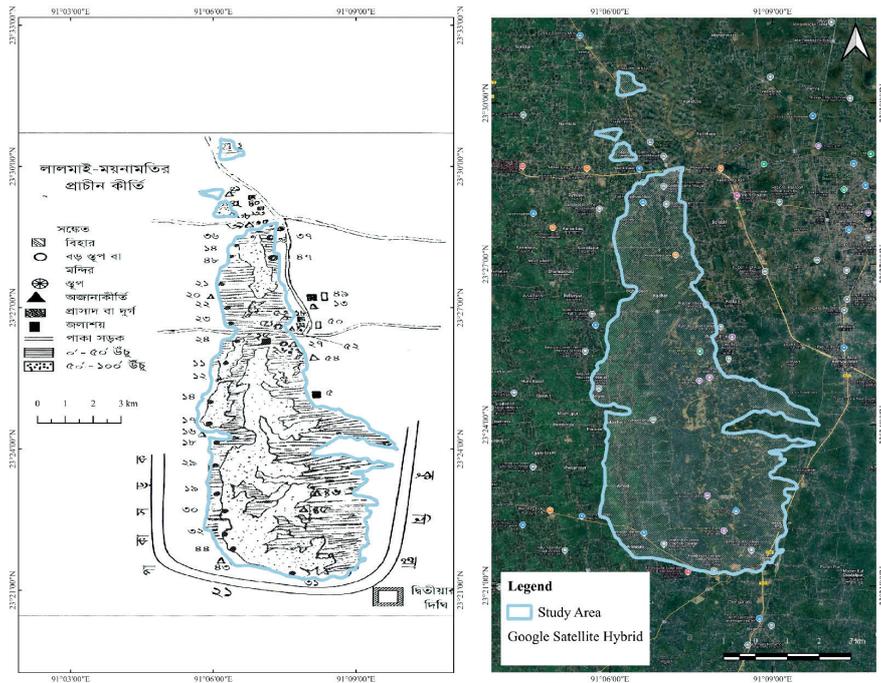**Figure 3: Study area boundary in Zakariah (2011, p. 630)'s map.**
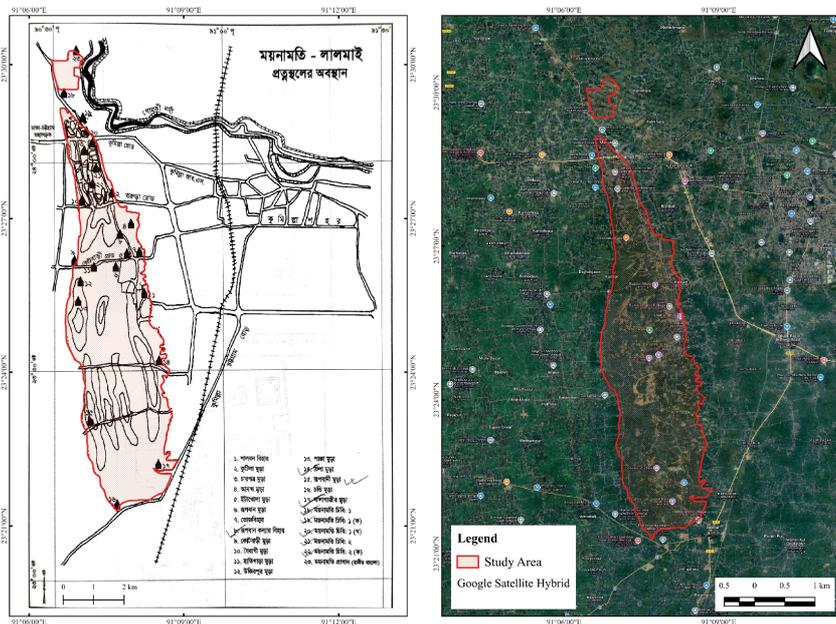
Figure 4: Stury are boundary in Begum (2010)'s map.
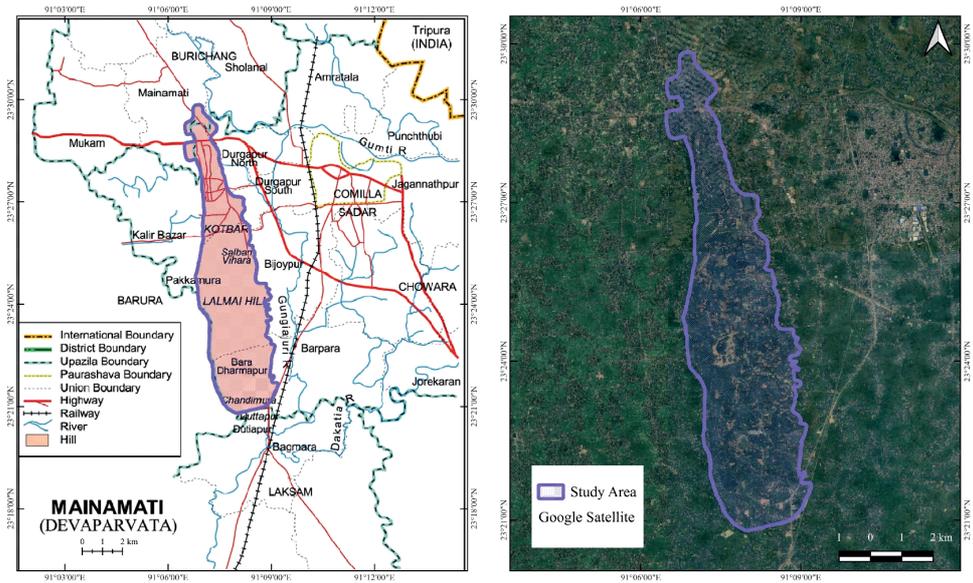
Figure 5: Study area boundary in Khan (2012), originally Rashid (1997, p. 20) map.
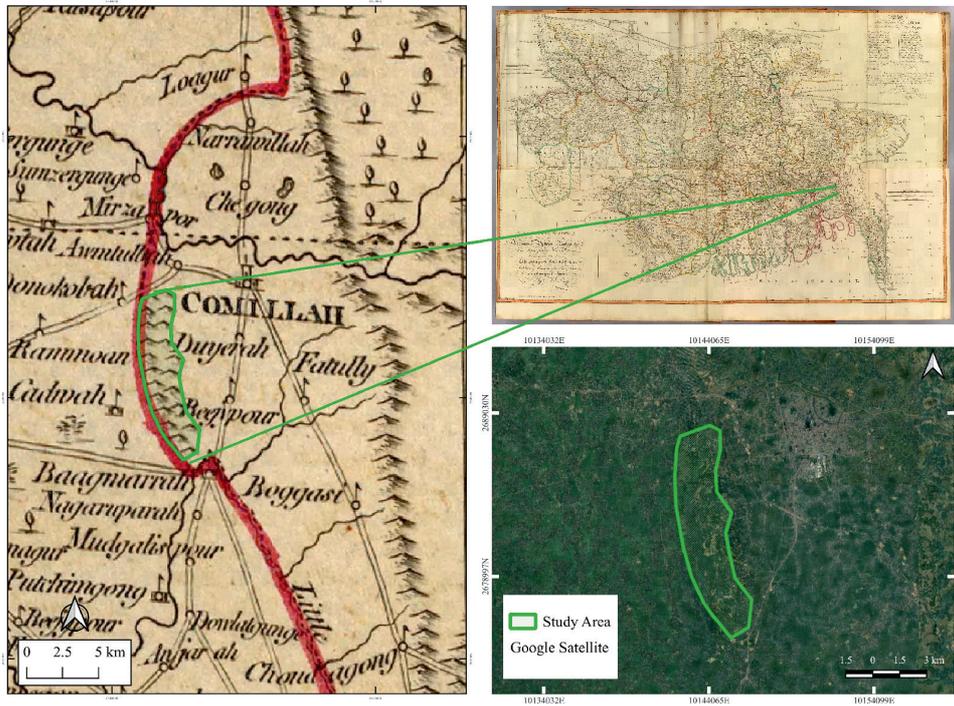
Figure 6: Study area boundary in Rennell (1794) map.

Figure 7: Study area boundary in Roy *et al.* (2012, p. 140)'s map.

Figure 8: Study area boundary in (Rashid, 2008, p. 258) map.
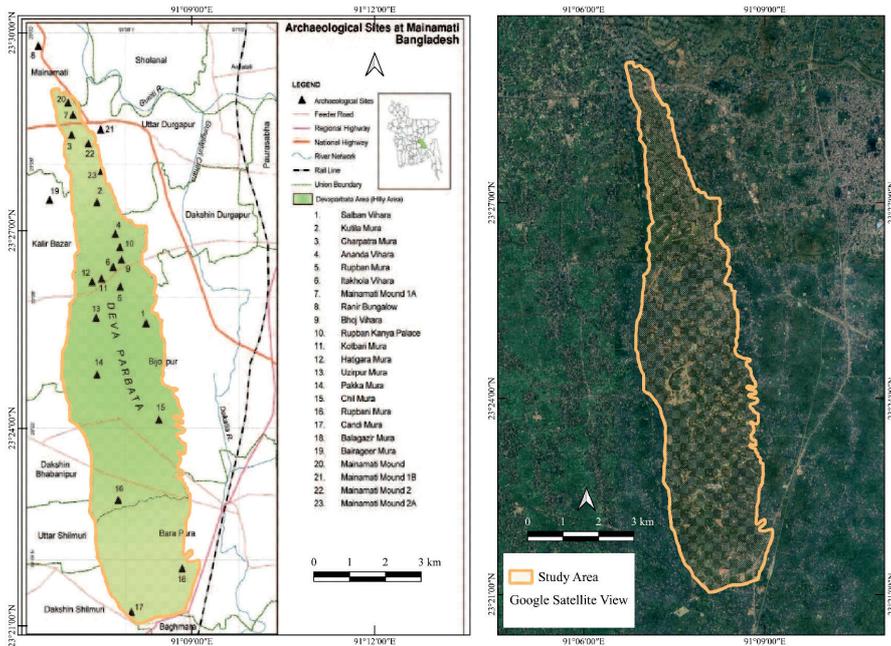
Figure 9: Study area boundary in Bhuiyan (2018) map.

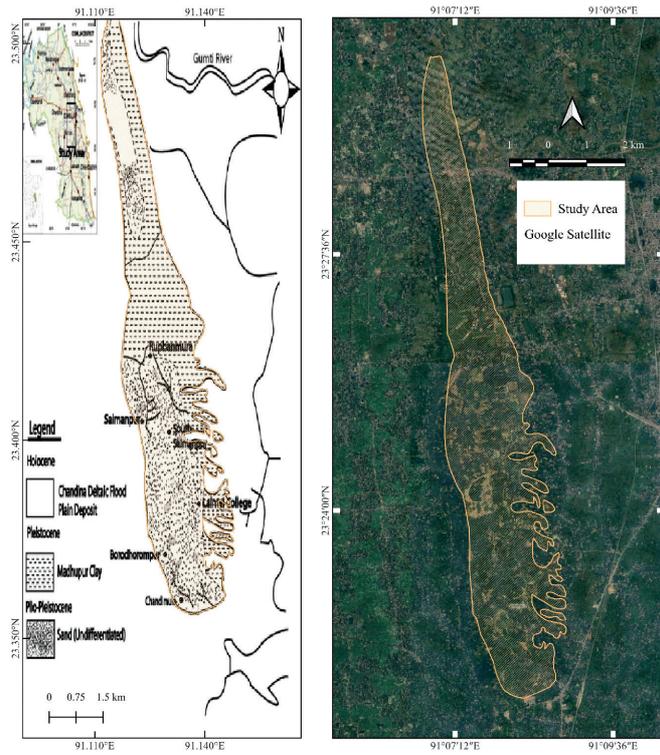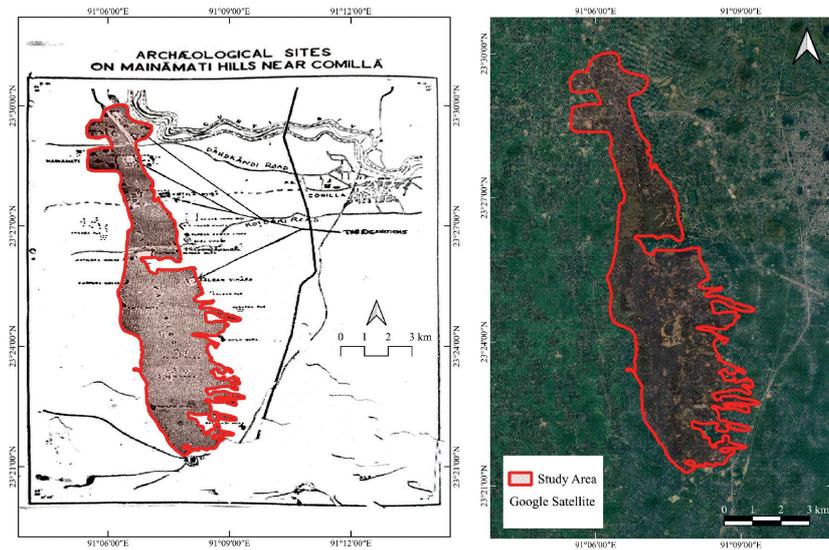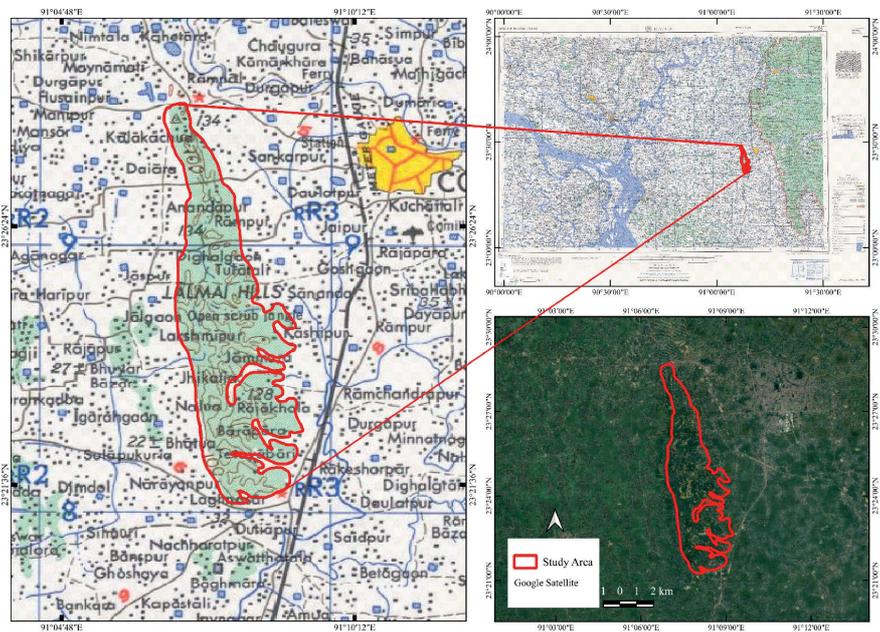
Figure 10: Study area boundary in JOG military map.
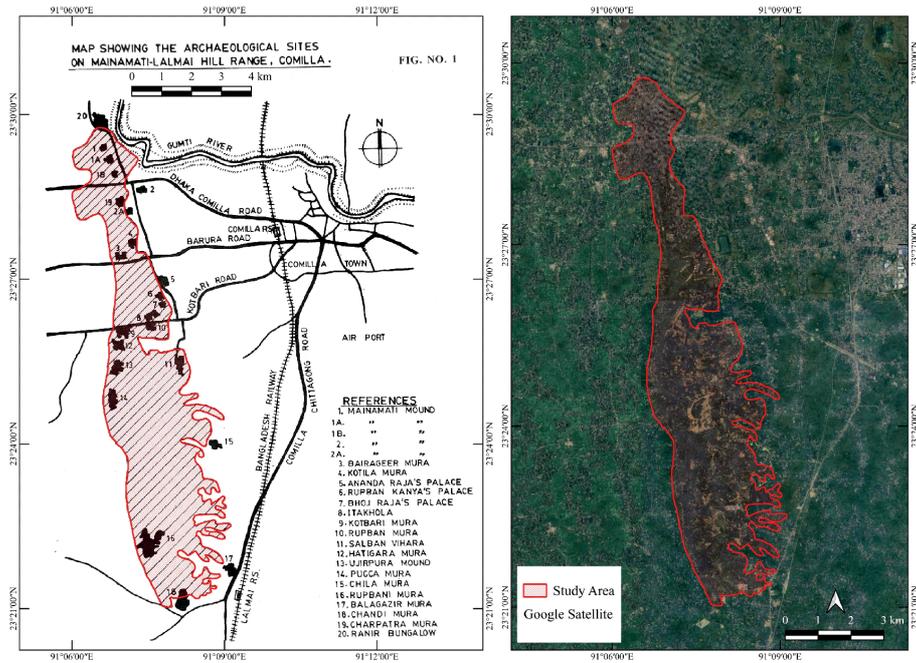
Figure 11: Study area boundary in DoA map.
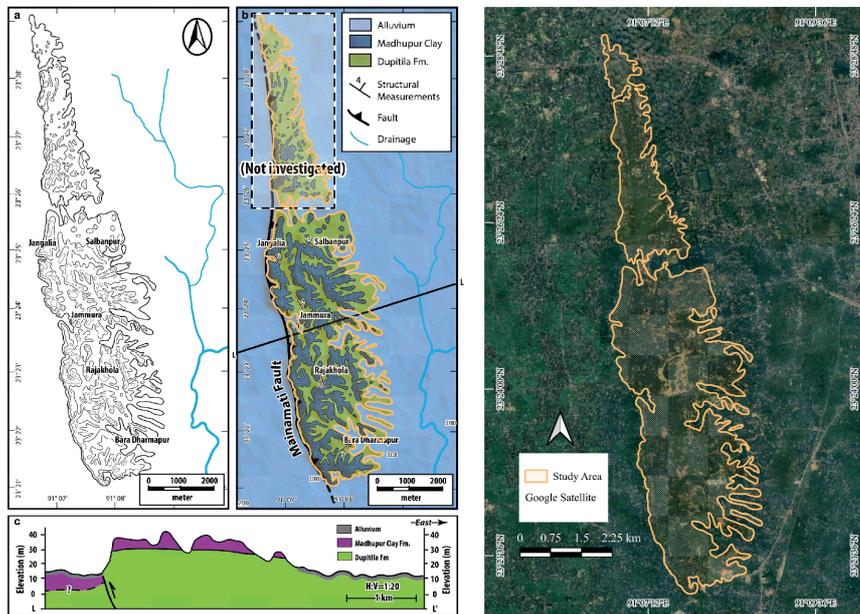
Figure 12: Study area boundary in Abdullah *et al.* (2021, p. 7) map.
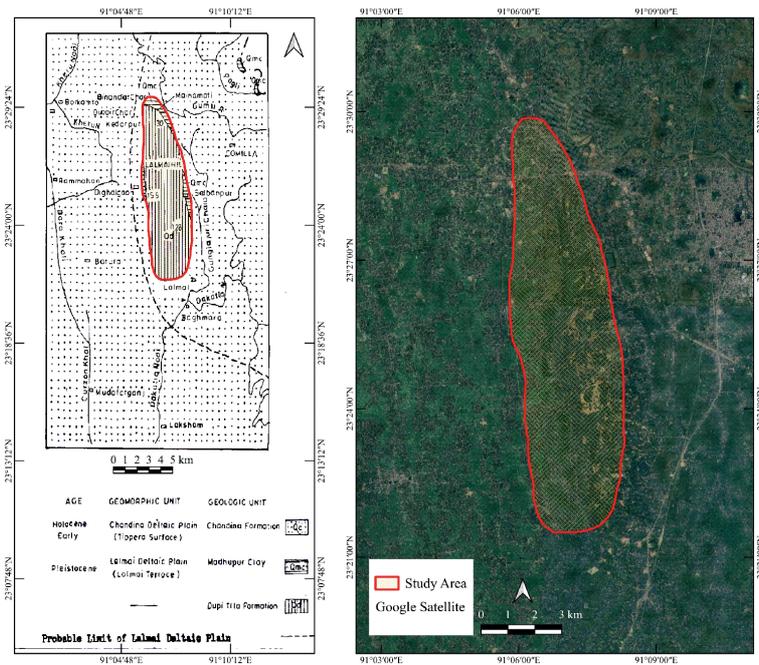
Figure 13: Study Area in Chakrabarti (1992, p. 195)'s map.

3.2. *Revisiting the Archaeological Sites of The Lalmai-Mainamati*

Initially, TN Ramachandran from the Department of Archaeology in India conducted an observation of the area and, following a brief study, discovered 15 sites. Between 1955 and 1956, subsequent to World War II, 55 archaeological sites were identified (Begum, 2010, p. 26). Out of these, only 20 sites were later designated as protected by the Department of Archaeology, Pakistan (Zakariah, 1997, p. 126). Rashid (1969) also indicated that more than fifty archaeological sites are located throughout the Mainamati Lalami Ridge and its adjacent regions. Nevertheless, the complete list is absent from all literature, including the journal volumes of Pakistan Archaeology. 47 site names were identified in Morrison's record (1974, p. 15). Where he has assigned the serial numbers CM 1, CM 2, CM 3, etc, there, the CM stands for Comilla Mainamati (Zakariah, 1997, p. 127). Two ponds/water tanks are indicated by CM 49 and CM 50. Except for the two ponds, the total number of sites identified in Morrison's text is 45. Conversely, Zakariah (1997, pp. 126–127) mentioned a total of 49 site names, inclusive of the CM serial number, which encompasses the two ponds. The same author in 2011b mentioned this (pp. 707–710) .

Through the execution of a field survey and literature analysis, a data table comprising 56 archaeological sites was compiled, as referenced by Morrison (1974) and Zakariah (1997), along with their geographic coordinates, which are detailed in Table 1. However, it will be observed that the serial number ceases at 53. Location 22.1 is situated south of Ananda Vihara, 27.1 is positioned at the Eastern Foot of Big Itkhola Mound, and 30.1 corresponds to Rupban Mound Hall. So, 22.1 was categorised as a component of 22 (Ananda Vihara Complex), 27.1 as a component of 27 (Big Itakhula Mound), and 30.1 as a component of 30 (Rupban Mound). Additionally, it is important to note that, alongside the field survey, a GIS-based coordinate identification of the Remote Sensing survey has been conducted, utilising the Quadrant Bearing measurements of some sites documented by Morrison (1974).

ArcGIS was employed for this purpose. For instance, he recorded the coordinates of the Rupban Kanya Vihara (CM 28) as follows: "Compass bearings from the central raised area gave readings south 56° west to PARD water tower and north 20° west to the central height within Ananda Vihara (CM 4)" (p. 33). Here, PARD or Pakistan Academy of Rural Development is now BARD or Bangladesh Academy of Rural Development. The initial bearing, S56W to the PARD water tower, has been altered to N56E from the PARD water tower. The second bearing, N20W from Ananda Vihara, has been inversely translated to S20E from Ananda Vihara. Subsequently, two lines were drawn in the opposite direction, and the intersection point was designated as the location of the Rupban Kanya Vihara.

The Department of Archaeology, Ministry of Cultural Affairs, Bangladesh, has revised its list of sites in Cumilla, now enumerating a total of 25 sites in Lalmai-Mainamati (Pratnatatta Odhidapter...[List of Declared A.....Cumilla], 2025, pp. 2–8). Following Zakariah (1997, pp. 126–127), certain sites are absent, as indicated by the number that remains unnamed and unrepresented in Table 1.

Numerous sites experienced considerable disruption; yet, the importance of safeguarding the ancient legacy in Bangladesh is underscored, especially in relation to the worldwide framework of public archaeology and its connection to the Fourth Industrial Revolution (Hassan, 2019). Some researchers, such Tuhin *et al*. (2014), concentrated on tourism inside the study area. Faisal (2019) discussed the attainment of the Sustainable Development Goals through the establishment of sustainable tourism focused on the cultural and natural resources of the studied area.

Table 1: Archaeological sites database (data table)

* Here, SL CM is the combination of the data mentioned by Morrison (1974) and Zakariah (1997) and the serial followed from north to south.

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates		Status	Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude							
1	Palace of Queen Mainamati	2	Mainamati *Mandir*	Mainamati *Mandir*	Buddhist Temple	91° 6'27.90"E	23°29'46.94"N	Confirm	29	8th-12th century AD	23690.58	Burichang	Cumilla	Excavated
2	Banyan Tree Mound	42	Banyan Tree	Batagachh Mura	Undefined	91° 6'40.96"E	23°29'18.84"N	Predictive	11.4	Undefined	516.2	Burichang	Cumilla	Unexcavated
3	Mainamati Mound 1	1	-	Mainamati Mound	Undefined	91° 6'31.90"E	23°29'13.20"N	Confirm	26.9	Undefined	-	Adarsha Sadar	Cumilla	Unexcavated
4	Mainamati National Cemetery Mound	40	Mainamati National Cemetery	Mainamati National Cemetery	Undefined	91° 6'43.24"E	23°29'12.66"N	Confirm	24.2	7th - 8th century AD	12100	Burichang	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates Latitude	Geographic Coordinates Longitude	Status	Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
5	Gab Tree Mound	41	Gab Tree	Gabgachh Mura	Undefined	23°29'10.69"N	91° 6'49.70"E	Predictive	11.4	Undefined	-	Burichang	Cumilla	Unexcavated
6	Army Bungalow Mound	33	Army Bungalow	Army Bungalow Mura	Undefined	23°29'0.60"N	91° 6'47.85"E	Predictive	29.1	Undefined	1464	Adarsha Sadar	Cumilla	Unexcavated
7	Mainamati Mound 1A	1A	-	Mainamati Mound	Undefined	23°28'54.42"N	91° 7'0.77"E	Confirm	16.2	8th-12th century AD	-	Adarsha Sadar	Cumilla	Excavated
8	Singara Mound	38	Singara Mura	Singara Mura	Undefined	23°28'47.19"N	91° 6'37.69"E	Predictive	21.4	Undefined	-	Adarsha Sadar	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates			Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude	Status						
9	Executive Officer Bungalow Mound	39	Executive Officer Bungalow	Executive Officer Bungalow Mura	Undefined	91° 6'38.00"E	23°28'40.81"N	Predictive	16.8	Undefined	8361.27	Burichang	Cumilla	Unexcavated
10	Mainamati Mound 1B (Mound Behind Ispahani School)	1B	-	Mainamati Mound	Undefined	91° 7'7.98"E	23°28'35.36"N	Confirm	21.3	Undefined	-	Adarsha Sadar	Cumilla	Unexcavated
11	Chulla Mound	35	Chulla Mura	Chulla Mura	Undefined	91° 6'56.17"E	23°28'30.46"N	Predictive	28	Undefined	-	Adarsha Sadar	Cumilla	Unexcavated
12	Abbas Ali Mound	37	Abbas Ali Mura	Abbas Ali Mura	Undefined	91° 7'17.79"E	23°28'32.91"N	Confirm	12.2	Undefined	504	Adarsha Sadar	Cumilla	Unexcavated
13	Charpatra Mound	34	Charpatra Mura	Charpatra Mura	Hindu Temple	91° 6'56.18"E	23°28'25.80"N	Confirm	27.3	10th-12th century AD	529.95	Adarsha Sadar	Cumilla	Excavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates Longitude	Geographic Coordinates Latitude	Status	Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
14	Fakir Mound	36	Fakir Mura	Faqira Mura	Undefined	91° 6'51.85"E	23°28'23.87"N	Predictive	28.4	Undefined	486	Adarsha Sadar	Cumilla	Unexcavated
15	Mainamai Mound 2 (Flag-Staff House)	-	-	Mainamati Mound	Undefined	91° 7'16.00"E	23°28'4.02"N	Predictive	26	Undefined	-	Adarsha Sadar	Cumilla	Unexcavated
16	Mainamati Mound 2A	-	-	Mainamati Mound	Undefined	91° 7'17.28"E	23°27'40.40"N	Confirm	26.4	Undefined	-	Adarsha Sadar	Cumilla	Excavated
17	Boiragi Mound I	48	Bairagi Mura	Bairagir Mura	Undefined	91° 7'15.35"E	23°27'29.27"N	Confirm	25.8	10th–11th century AD	516.2	Adarsha Sadar	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates		Status	Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude							
18	Kotila Mound	47	Kotila Mura	Kotila Mura	Buddhist Stupa	91° 7'24.06"E	23°27'28.62"N	Confirm	25.4	7th century AD	32581.08	Adarsha Sadar	Cumilla	Excavated
19	Borogach Mound	21	Borogach Mura	Bara Gachh Mura	Undefined	91° 6'59.21"E	23°27'14.60"N	Predictive	29.2	Undefined	324	Sadar Dakshin	Cumilla	Unexcavated
20	Southwest Foot of Borogach Mound	20	Southwest Foot of Borogach Mura	South-west Foot of Baragacha Mura	Undefined	91° 6'49.19"E	23°27'1.10"N	Predictive	7.9	Undefined	1045.16	Adarsha Sadar	Cumilla	Unexcavated
21	Niranjan Mound	22	Niranjan Mura	Niranjaner Mura	Undefined	91° 6'59.12"E	23°26'47.14"N	Predictive	22.8	Undefined	324	Sadar Dakshin	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates			Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude	Status						
22	Ananda Buddhist Monastery Complex	4	Ananda Vihara	Ananda Rajar Bari	Buddhist Monastery	91°7'46.20"E	23°26'58.30"N	Confirm	17.5	7th - 8th century AD	54810	Sadar Dakshin	Cumilla	Excavated
22.1	South of Ananda Vihara	13	South of Ananda Vihara	South of Ananda Rajar Bari	Undefined	91°7'51.49"E	23°26'53.53"N	Predictive	16.5	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated
23	Rupban Kanya's Monastery	28	Rupban Kanya Vihara	Rupban Kanyar Vihara	Undefined	91°7'37.70"E	23°26'45.60"N	Confirm	40.7	7th - 8th century AD	6750	Sadar Dakshin	Cumilla	Unexcavated
24	Hilltop Sites West of Bhoj Monastery	53	West Bhoj Vihara	West of Bhoja Vihara	Undefined	91°7'43.65"E	23°26'39.27"N	Predictive	26.9	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates			Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude	Status						
25	Bhoj Monastery	7	Bhoj Vihara	Bhoj Rajar Bari	Buddhist Monastery	91° 7'53.71"E	23°26'32.28"N	Confirm	15.4	8th century AD	18823.84	Sadar Dakshin	Cumilla	Excavated
26	Khachar Mound	23	Khachar Mura	Khachar Mura	Undefined	91° 7'1.05"E	23°26'17.19"N	Predictive	33.2	Undefined	324	Sadar Dakshin	Cumilla	Unexcavated
27	Big Itakhula Mound	51	Big Itakhola Mura	*Bara* Itakhola Mura	Buddhist Monastery and temple	91° 7'45.53"E	23°26'19.98"N	Confirm	32.4	7th century AD	16000	Sadar Dakshin	Cumilla	Excavated
27.1	Eastern Foot of Big Itkhola Mound	52	Eastern Foot of Big Itkhola Mura	Eastern Foot of *Bara* Itkhola Mura	Undefined	91° 7'47.66"E	23°26'19.26"N	Confirm	26.5	7th century AD	-	Sadar Dakshin	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates			Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude	Status						
28	Latikot Monastery	-	-	-	Buddhist Monastery	91° 7'53.29"E	23°26'19.44"N	Confirm	19.7	8th - 13th century AD	2101.26	Sadar Dakshin	Cumilla	Excavated
29	Kotbari Monastery	25	Kotbari Vihara	Kotbari Vihara	Undefined	91° 7'14.70"E	23°26'11.71"N	Confirm	49.8	8th century AD	5806.44	Sadar Dakshin	Cumilla	Unexcavated
30	Rupban Mound	26	Rupban Mura	Rupban Mura	Buddhist Temple	91° 7'45.34"E	23°26'11.14"N	Confirm	33.2	8th century AD	7544	Sadar Dakshin	Cumilla	Excavated
30.1	Rupban Mound Hall	27	Rupban Mura Hall	Rupban Mura Hall	Buddhist Monastery	91° 7'47.60"E	23°26'10.29"N	Confirm	34	8th century AD	-	Sadar Dakshin	Cumilla	Excavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates			Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude	Status						
31	BARD's Artifact Finding Spot	54	P.A.R.D. (Pakistan Academy of Rural Development)	BARD (Bangladesh Academy of Rural Development)	Undefined	91° 7'58.09"E	23°26'10.27"N	Confirm	24.7	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated
32	Hatigara Mound	24	Hatigara Mura	Hatigara Mura	Buddhist Stupa	91° 7'2.51"E	23°26'7.61"N	Confirm	25.8	7th century AD	330.88	Sadar Dakshin	Cumilla	Excavated
33	Ujirpur Mound	-	-	-	Undefined	91° 7'2.02"E	23°25'43.32"N	Confirm	40.4	11th century AD	-	Sadar Dakshin	Cumilla	Unexcavated
34	Dhan Mound	11	Dhan Mura	Dhan Mura	Undefined	91° 6'57.03"E	23°25'31.18"N	Predictive	42.5	Undefined	234	Sadar Dakshin	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates Latitude	Geographic Coordinates Longitude	Status	Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
35	Salban Buddhist Monastery	5	Salban Vihara	Salban Vihara	Buddhist Monastery	23°25'34.28"N	91° 8'15.87"E	Confirm	16	7th - 8th century AD	50008	Sadar Dakshin	Cumilla	Excavated
36	Pakka Mound	12	Pakka Mura	Pacca Mura	Undefined	23°25'11.98"N	91° 6'49.75"E	Confirm	35.2	8th century AD	24934	Sadar Dakshin	Cumilla	Unexcavated
37	Hugni Mound	14	Hugni Mura	Hugni Mura	Undefined	23°24'46.04"N	91° 6'51.07"E	Predictive	33.2	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated
38	Adina Mound	17	Madina (or Adina) Mura	Adina or Madina Mura	Undefine; Later Muslim Mosque	23°24'10.83"N	91° 6'58.69"E	Confirm	41.1	Undefined	434.79	Sadar Dakshin	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates		Status	Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Latitude	Longitude							
39	Madina Mound	-	-	-	Undefined	23°24'5.28"N	91°7'6.13"E	Confirm	34.9	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated
40	Valley Site below Madina Mound	16	Valley Site	Valley Site	Undefined	23°24'1.20"N	91°7'9.63"E	Predictive	16.3	Undefined	585.22	Sadar Dakshin	Cumilla	Unexcavated
41	Chila/Ghila Mound	-	-	-	Undefined	23°244.30"N	91°8'31.90"E	Confirm	20.2	7th century AD	10451.59	Sadar Dakshin	Cumilla	Unexcavated
42	Little Itakhola Mound	29	Itakhola Mura	Itakhola Mura	Undefined	23°23'27.68"N	91°7'14.30"E	Confirm	33.7	Undefined	301.01	Sadar Dakshin	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates			Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude	Status						
43	Sabura/Bokshi Mound	18	Sabura Mura	Sabura Mura	Undefined	91° 7'25.74"E	23°23'25.41"N	Confirm	38.3	Undefined	195.65	Sadar Dakshin	Cumilla	Unexcavated
44	Rupbani Mound	19	Rupbani Mura	Rupbani Mura	Undefined	91° 7'11.45"E	23°22'57.60"N	Confirm	38.6	Undefined	301.01	Sadar Dakshin	Cumilla	Unexcavated
45	Arjunakhola Mound	30	Arjunakhola Mura	Arjun Khola Mura	Undefined	91° 7'27.02"E	23°22'26.36"N	Predictive	31.1	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated
46	Colonel Mound	-	-	-	Undefined	91° 7'52.08"E	23°22'19.20"N	Confirm	35.1	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates		Status	Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude							
47	Balagazi Mound	46	Balagazi Mura	Balaghazir Mura	Undefined	91°8'18.94"E	23°22'19.52"N	Predictive	22.4	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated
48	Takka Mound/ Burma Oil Company/Lalmai Gas Field	45	Takka Mura	Takka Mura	Undefined	91°7'56.28"E	23°22'7.30"N	Confirm	40.6	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated
49	Kalidas Mound	32	Kalidasar Mura	Kalidaser Mura	Undefined	91°7'31.12"E	23°21'49.43"N	Predictive	23.4	Undefined	-	Sadar Dakshin	Cumilla	Unexcavated
50	West Foot of Minarkhil Mound	43	West Foot of Minarkhil Hill	West Foot of Minarkhil Mura	Undefined	91°7'33.54"E	23°21'43.38"N	Predictive	37.8	Undefined	539.3	Sadar Dakshin	Cumilla	Unexcavated

SL No	Name	SL CM	Name in Morrison (1974, p. 15)	Name in Zakariah (1997, pp. 126–127)	Type	Geographic Coordinates			Altitude (m)	Timeframe	Measurement (m²)	Upazila	District	Excavation Status
						Longitude	Latitude	Status						
51	Bairagi Mound II	44	Bairagi Mura	Bairagir Mura	Undefined	91°7'36.23"E	23°21'39.56"N	Confirm	40.9	Undefined	334.45	Sadar Dakshin	Cumilla	Unexcavated
52	Lalmai Mound 1	-	-	-	Undefined	91°8'26.59"E	23°21'27.02"N	Confirm	14	Undefined	120.34	Sadar Dakshin	Cumilla	Unexcavated
53	Chandi Mound Complex	31	Candi Mura	Chandi Mura	Unidentified; Later Hindu Temple	91°7'54.40"E	23°21'12.17"N	Confirm	26.9	Undefined	2652	Sadar Dakshin	Cumilla	Unexcavated

3.3. *Maps of the Archaeological Sites of the Study Area*

Based on the aforementioned Table 1, Maps (Figure 14.i, ii, iii, iv, and Figure 15) have been generated to facilitate comprehension and visualisation of the archaeological sites. It is anticipated that these maps would provide a distinct visual representation of the locations and their environs.
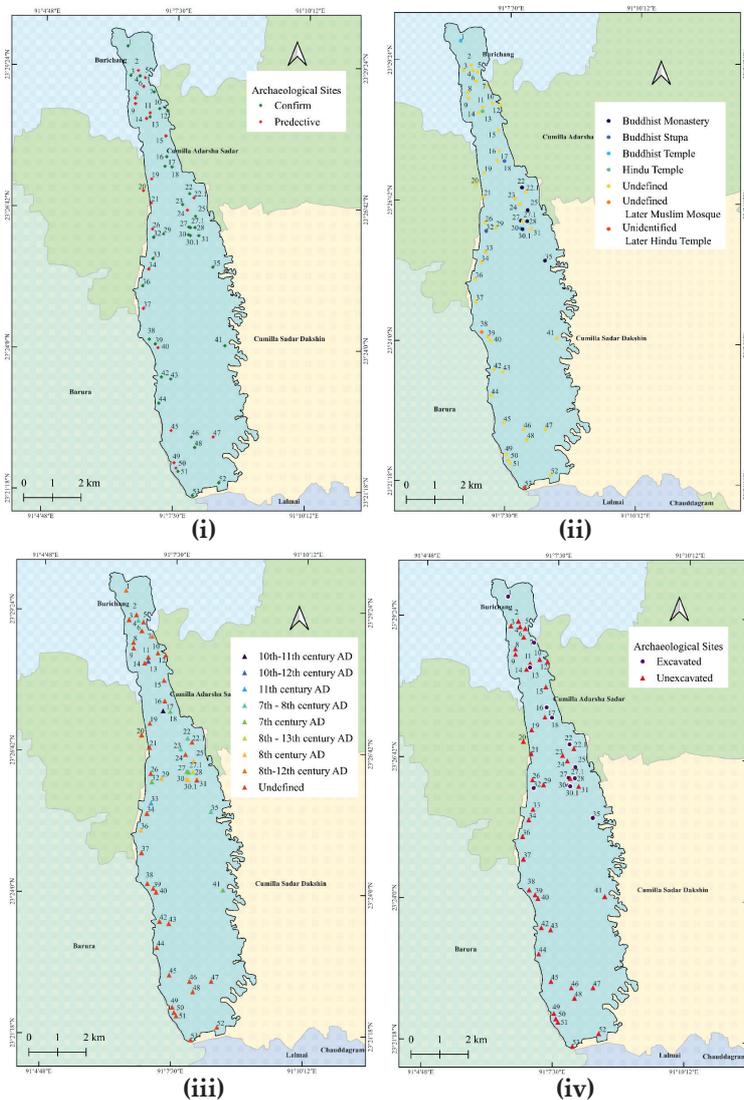

Figure 14: i. Archaeological sites geocoordinate (based on confirmation), ii. Archaeological sites of the study area (based on type), iii. Archaeological sites of the study area (based on timeframe), iv. Archaeological sites of the study area (based on excavation).
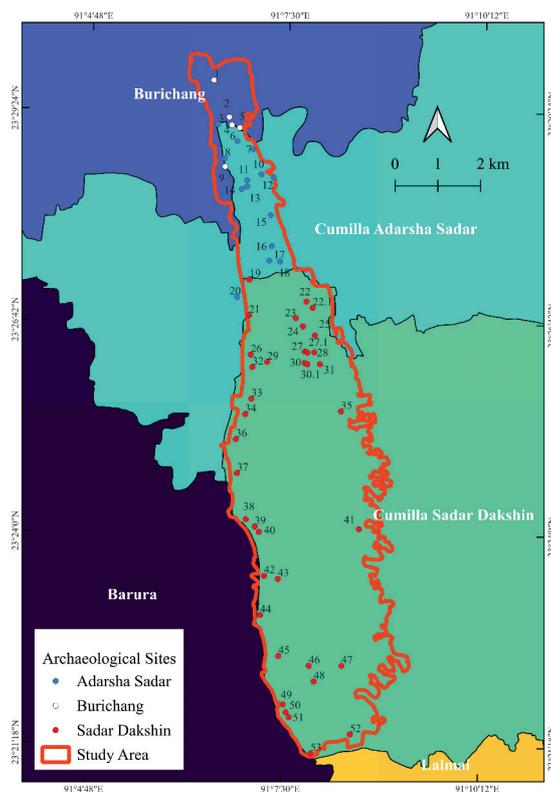
Figure 15: Archaeological sites of the study area (based on upazila).

4. Discussion

Devaparvata's Boundary Remapping: The initial phase involved redetermining the boundaries of the Lalmai-Mainamati region. Various maps have depicted distinct depictions. Preliminary scholars, including Morrison, Zakariah, Ayesha Begum and others, created maps of the region; however, they often demonstrated a deficiency in geographic precision. Recent studies highlight the challenges in georeferencing due to outdated methodologies or inadequate data. Modern tools like GIS and AutoCAD have improved accuracy, as evidenced in the maps of *JOINT OPERATIONS GRAPHIC (AIR) NF 46-01* (1992) and Abdullah *et al*. (2021). These maps analyse soil classifications and regional topography, providing significant insights into the area's historical and archaeological background. Following the observation of the pertinent maps from Figure 2 to Figure 13, the geographical boundaries of the Lalmai-Mainamati study region have been remapped concerning the elevation profile (Figure 1).

The elevation between 100 and 110 feet above sea level has been recognised as the minimal criterion for remapping the Lalmai-Mainamati hill outline. Although due to destruction, defining the exact boundary outline is tough, the recreated boundary is providing us with a comparable understanding of the boundary created by others. The task was accomplished using the tools Google Earth Pro and QGIS.

Archaeological Sites Remapping: The subsequent stage involved designating the site's location on the digital maps. Following the Table 1 the pie chart (Figure 16) illustrates the distribution of several site types identified through archaeological study. A significant majority of the sites, 43 out of 56 (about 77%), are categorised as undefined. The elevated percentage indicates an insufficiency of architectural, epigraphic, or stratigraphic data to establish a definitive classification. This site remains unexcavated. This indicates that additional archaeological study and analysis are required. A significant proportion of the discernible locations are Buddhist Viharas or temples. There are six Buddhist monasteries, two stupas, and two temples, constituting ten sites, or around 18% of the total. This distribution indicates that Buddhism has existed in the region for an extended period, as evidenced by its influence on architecture and culture.

Only one Hindu temple site remains, alongside the place (mound) of two sites reused for religious use: one as a Muslim mosque and the other as a Hindu temple; however, their original functions remain undetermined. These instances of religious transformation illustrate the evolution of the region's social, cultural, and religious dynamics across time. Consequently, the chart (Figure 16) illustrates the challenges and opportunities associated with the classification of archaeological discoveries. Numerous undefined sites underscore the necessity of conducting thorough excavations and documentation. Buddhist and reused religious edifices provide significant insights into the region's historical and cultural transformations.

Importance of Excavation: The clustered bar (Figure 17) illustrates the categorisation of archaeological sites according to their excavation status. The visualisation indicates that a significant majority of the sites, 43 out of 56, remain unexcavated, while only 13 sites have undergone some form of excavation. It is noteworthy that excavation activities are currently underway at a site referred to as 'Balagazi Mound' in 2025. The excavation remains incomplete; hence, it is classified as unexcavated. The data indicate a significant
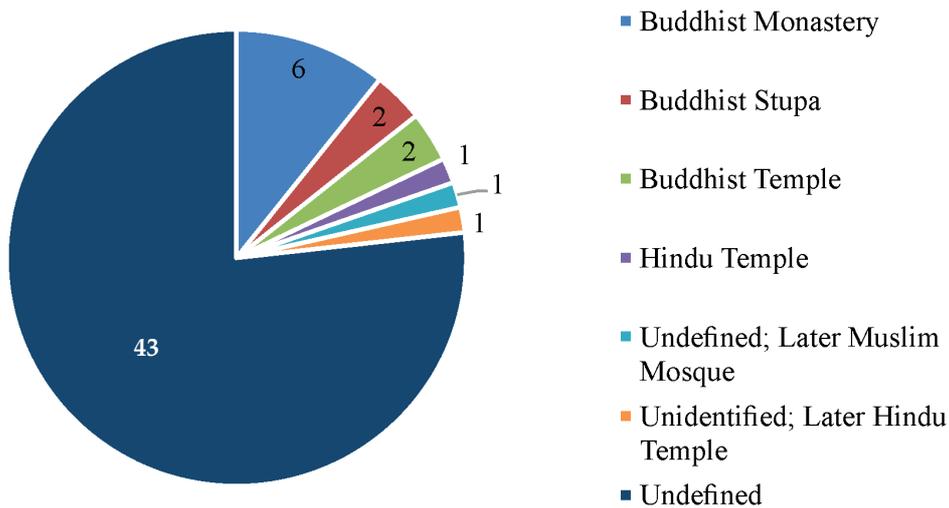
Figure 16: Type based sites classifications.

deficiency in archaeological excavation, since around 77% of documented sites remain inadequately investigated. Few excavated sites exist, resulting in little comprehensive information regarding the culture, structure, and temporal context of these locations. This information is crucial for comprehending the intricate historical background and intent. Numerous sites remain unexcavated, indicating the potential for further insights into the region's archaeological landscape in the future. This underscores the significance of prioritising excavation and documentation, particularly for sites that are now 'undefined' or deemed to possess cultural value based on surface artefacts or historical documents.

Upazila-Based Sites Distribution: The clustered column (Figure 18) illustrates the distribution of archaeological sites over three upazilas. This is not always steady, as the government frequently establishes new upazilas, which are administrative divisions. However, it will merely provide us with a general understanding of the distribution. Till now, Sadar Dakshin possesses the highest number of sites, at 37, indicating its richness in archaeological evidence. Adarsha Sadar possesses 14 sites, whilst Burichang has the least, with only 5 sites. This distinction renders Sadar Dakshin a significant archaeological site and indicates the necessity for further exploration, with the help of both the DoA and local government, and preservation efforts to ensure comprehensive documentation of its historical artefacts.
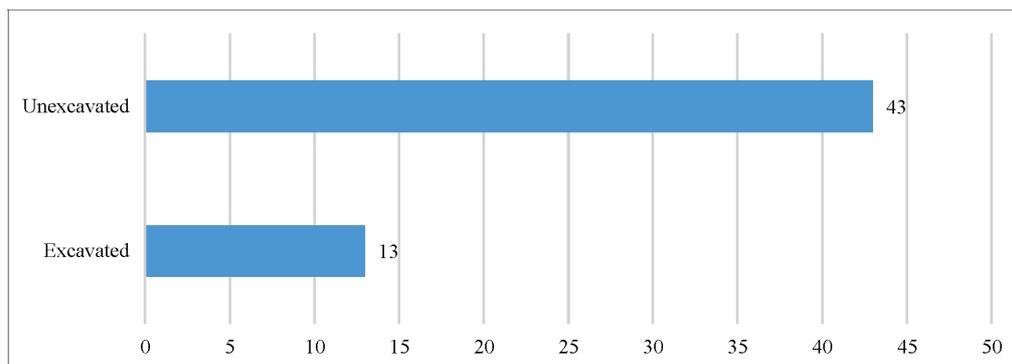
Figure 17: Excavation based sites classification

Elevation and Natural Defence System: Conversely, another clustered bar (Figure 17) presents a comprehensive enumeration of 53 archaeological sites (56 names belonging here, as previously noted) along with their elevations above sea level. The minimum elevation is 7.9 metres (Southwest Foot of Borogach Mound), while the maximum elevation is 49.8 metres (Kotbari Monastery). The Ananda Buddhist Monastery Complex (17.5 m), Salban Buddhist Monastery (16 m), and Chandi Mound Complex (26.9 m) are significant high sites. They are situated in various types of terrain. It also indicates potential correlations between the geographical position and elevation of these locations, which may have influenced historical human habitation, visibility, defensive strategies, or ritual significance. It may be noted that, based on the excavated sites, all the Viharas are situated on the eastern side of the hill at a lower elevation, while some are positioned on the western side at a higher elevation. The western
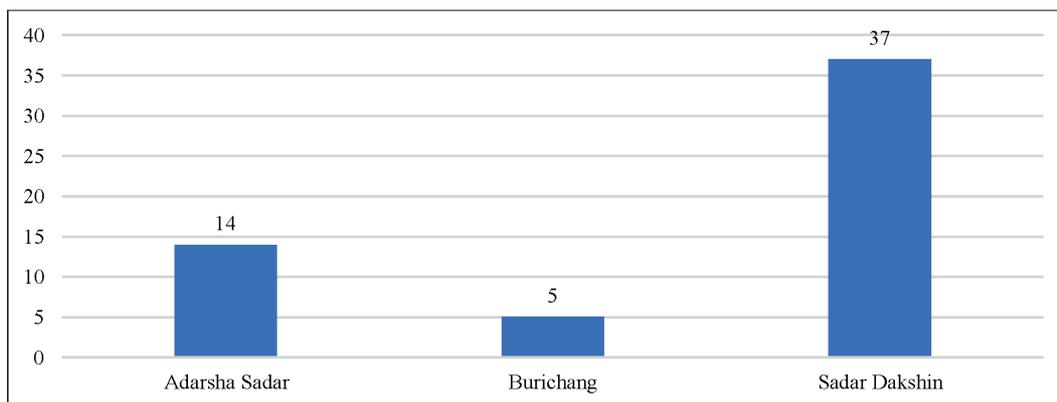

Figure 18: Upazila based sites distribution

high hill region and eastern paleochannel of the Khiroda River likely protect all the Vihara identified thus far in the eastern part.
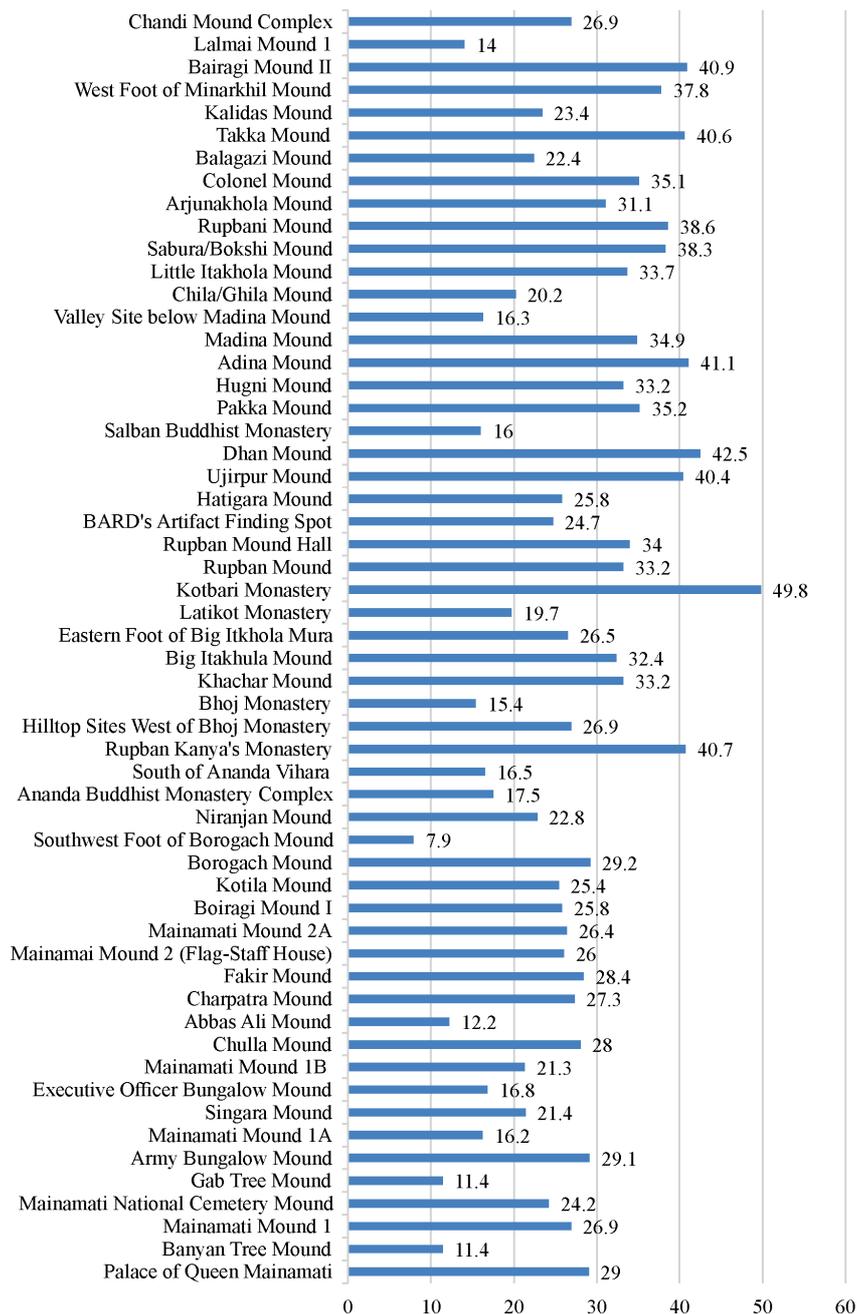

Figure 19: Elevation profile (altitude from the sea level in meter).

Spread of Buddhism: The Lalmai-Mainamati ridge in Cumilla, Bangladesh, holds significant archaeological and historical value due to its numerous Buddhist ruins. This region possesses a rich historical legacy of Buddhist practice, architecture, and cultural impact, shown in early findings as well as contemporary mapping and excavation efforts. This discourse explores the proliferation of Buddhism in the region, its sociocultural ramifications, religious influence, and enduring significance through the integration of archaeological surveys, historical documents, and digital cartography.

The numerous Vihara*s, stupas*, and temple complexes in Lalmai-Mainamati indicate that Buddhists resided there in great splendour. Several of these edifices are from the early medieval era (7th–12th century CE). This analysis indicates that of the 53 recognised sites (out of a total of 56, with three being integral to the main section), 10 are directly associated with Buddhist religious practices, including 6 monasteries, 2 stupas, and 2 temples. This is around 18% of all documented sites, indicating that Buddhism was a significant religious and cultural influence in this region historically. Prominent locations like as the Salban Vihara, Ananda Vihara Complex have become icons of this history.

A significant number of archaeological sites remain unidentified (43 out of 56, approximately 77%) due to incomplete excavations and insufficient, understandable stratigraphic, architectural, or epigraphic evidence. The concentration of recognised Buddhist sites and their architectural form indicates that many of the unnamed sites are likely associated with Buddhist rituals. Conversely, the map (Figure 14.i) illustrates the rate of confirmed geographic coordinates. Thirty-five sites have proven geolocations, while the remaining twenty-one are based on predictions. The disturbance and restrictions imposed by the military prevented the identification of the accurate location for 37.5% of the sites. These findings underscore the significance of doing comprehensive excavation and archaeological investigations in the Lalmai-Mainamati, or old Devaparvata, to further understand Buddhism's influence on cultures.

The evolution of Buddhism in this region likely coincided with the political and cultural ascendance of the early *Pala* Empire, which promoted *Mahayana* Buddhism and facilitated the establishment of substantial monastic institutions. These monastic sites served not just as places of worship but also as centres of education, trade, and governance. The architectural design of the monasteries, featuring a central temple and individual monk cells, illustrates that the monks resided in a structured manner intricately linked to society. They

were constructed on strategically advantageous locations, such as the eastern slopes of the Lalmai-Mainamati hills, indicating that the builders deliberately selected these sites for visibility, defensibility, and proximity to water sources like the Khiroda River.

The distribution of Buddhist sites around the region indicates systematic design and endorsement. A recent Least Cost Path Analysis (LCPA) based study indicates that the sites are distributed within 15 minutes of walking distance (Ridoy, 2025, p. 101). According to Figure 18, the Sadar Dakshin Upazila possesses the most renowned archaeological sites, underscoring its historical significance. This disparate distribution illustrates the significance of this region as a religious and governmental hub. Adjacent upazilas such as Adarsha Sadar and Burichang possess fewer, nevertheless significant remnants.

Another crucial aspect to consider is the significance of elevation in site selection. Figure 19 indicates that archaeological sites are situated at elevations ranging from 7.9 to 49.8 metres above sea level. The majority of prominent Buddhist sites are located on the eastern edge of the ridge, in regions of moderate to low elevation. This tendency may indicate a preference for locations that were accessible, possessed fertile soil, and were safeguarded by natural landforms. Conversely, the elevated hills in the west may have functioned as barriers or included administrative or defensive edifices, subsequently facilitating a dual religious-secular spatial arrangement.

Buddhism influenced not only religious practices but also societal and political structures. The remnants of the archaeological site indicate that the inhabitants possessed advanced workmanship and a refined material culture. This may enhance our understanding of monastery economy, royal patronage, and the connections linking Mainamati to sites such as Nalanda or Paharpur across various regions. The utilisation of some Buddhist mounds for Hindu and Muslim religious structures indicates a gradual process of cultural layering and transformation rather than abrupt abandonment.

The archaeological remnants of Buddhism in the Lalmai-Mainamati region are significantly vital to national heritage and identity in contemporary society. Individuals are increasingly perceiving this legacy through the lenses of public archaeology and sustainable tourism. Researchers such as Hassan (2019) emphasise the significance of safeguarding legacy in the context of the Fourth Industrial Revolution globally. Simultaneously, others such as Tuhin *et al.* (2014) and Faisal (2019) asserted that cultural tourism and heritage preservation had

to be associated with the Sustainable Development Goals (SDGs), particularly those pertaining to education, culture, and economic development. Conversely, the *Mahayana* branch of Buddhism that originated in Bengal evolved into a distinct form known as *Vajrayana.* This tradition originated in Lalmai-Mainamati and Vikrampur in southern Bengal and thereafter disseminated to Sri Lanka, Myanmar, and Thailand (Prova, 2024). The metal statues were produced in the Mainamati-Devaparvata region of South-East Bengal, with the tradition of sculpture casting attaining its zenith in the 9th or early 10th century (Murshed, 2024). The Buddhist archaeological heritage of the Lalmai-Mainamati ridge provides essential insights into the religious, cultural, and socio-political history of ancient Bengal. The expansion of Buddhism in this region demonstrates not just spiritual assurance but also royal patronage, geopolitical foresight, and interregional links. Extensive analysis of the data reveals that Buddhism has significantly influenced the culture of eastern Bengal. The tentatively designated World Heritage site Lalmai-Mainamati requires appropriate management and essential conservation efforts to preserve the archaeological area for future generations. Hopefully, this GIS-based study is anticipated to be beneficial for this purpose.

5. Concluding Remarks

This GIS-based study of the Lalmai-Mainamati ridge serves as a foundation for future archaeological excavations and explorations in the area's unexplored sites, supporting efforts to protect cultural heritage and promote sustainable development, including sustainable tourism. It provides a combined database and maps for focused exploration, most of which have not been excavated. The study, which uses elevation data, spatial analysis, and historical interpretation, can be used as a model for other heritage-rich but under-explored areas in Bangladesh and elsewhere. There are many possible reasons why the study will be important in the future. At first, it points out specific sites that need to be dug up right away, especially the 43 unnamed areas that might have important Buddhist artefacts and structures. This study can help the Department of Archaeology plan its excavation activities. Second, the results support the case for UNESCO World Heritage status by showing that the site is culturally important and fits together spatially. Third, the digital outputs, like georeferenced maps and elevation models, are important tools for improving tourism, educational programs, and community involvement. The arrangement

of Buddhist sites is laid out, especially their focus on the eastern slopes and closeness to one another, which shows that the monastic landscape was built with a purpose and strategy. The elevation data also shows that natural defence factors and religious symbolism played a role in choosing the site locations. The fact that religious groups have used places for different purposes over time shows how the region's culture and religion have changed over time. The results show that Lalmai-Mainamati was an important religious, educational, and political centre in ancient Bengal under the *Samatata*. This study shows how important it is to have organised exploration, excavation, documentation, and preservation. Digital mapping, database and spatial analysis open up exciting new possibilities for managing these Buddhist heritage sites and promoting sustainable archaeological tourism in the future.

Acknowledgement

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