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Article *in* Asian Archaeology · August 2022

DOI: 10.1007/s41826-022-00056-y

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Asian Archaeology
https://doi.org/10.1007/s41826-022-00056-y

ORIGINAL PAPER

Towards a temporal assessment of Angkor Thom's Theravada "Buddhist Terrace" archaeology

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Received: 28 March 2022 / Accepted: 17 July 2022

Abstract
The population of the Cambodian Angkorian Empire (802–1431 CE) and its namesake capital underwent a collective, gradual religious transition from Brahmano-Buddhism (Hindu and Mahayana practice) to Theravada Buddhism beginning in the mid/late-13th century CE. Marked by a material shift from temple-mountains to smaller prayer halls ((*preah vihear* or "Buddhist Terraces") as the primary focal points of politico-religious organization, the initial "Theravadization" of Angkorian society primarily took place within the confines of the 12th century walled civic-ceremonial center of Angkor Thom. Within which, upwards of seventy Buddhist Terraces have thus far been identified, representing one of the most significant yet undocumented religious building programs in Angkorian history. Our study synthesizes the results of three field seasons (2017–2019) of Buddhist Terrace survey and excavation within Angkor Thom, and through radiometric and stratigraphic analysis we suggest that the dissemination of *preah vihear* began in earnest at Angkor during the 14th century. We also assess the structure and placement of Buddhist Terraces across Angkor Thom in relation to identified urban-spatial patterns and emerging sequences of site occupation, and contextualize this era of Theravada monastic dissemination within existing studies of Brahmano-Buddhist temple conversion at Angkor, the geopolitical decline of Angkor, and its aftermath.

Keywords Buddhism · Landscape archaeology · Religious transition · Angkor · Southeast Asia · Radiocarbon dating

1 Introduction

The late 13th -16th centuries played host to one of the most fascinating social and religious phenomena in the history of Cambodian Angkor, the politico-religious cneter of one of Southeast Asia's greatest premodern empires (9th – 15th centuries), through the society-wide shift from Brahmano-Buddhism (Hindu and Mahayana Buddhism) to Theravada (Sinhalese) Buddhism. This religious practice is believed to have spread across the Empire's northwestern frontier as early as the late 12th century (Murphy 2013, 2016; Thompson 1998, 2004). Theravada Buddhism is most abundantly represented at Angkor within the walls of the 12th -13th century civic ceremonial center of Angkor Thom, within which are found the stone substructural remains of over seventy wooden Theravada Buddhist prayer-halls (*preah vihear/praḥ vihār/vihara*); these edifices are known in the archaeological record as *terrasses bouddhiques*, "Buddhist Terraces" (Marchal 1918). In combination with the contemporary iconographic and structural conversion of existing Brahmano-Buddhist temples, Angkorian Theravada Buddhist archaeology represents the study of a complete spiritual re-envisioning of Angkor Thom's urban landscape (A. Harris 2019, 2021; Thompson 1998, 2004).

Despite these abundant remains, very little attention has been given to the processes and dynamics of Angkor's Theravada ascendancy as can be ascertained from the archaeological record. This is primarily due to the narratives of "absence", "demise", and "epochal shift" which remain pertinent within studies of Angkor's final centuries as capital of Cambodia. Notably, early scholarship saw

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Published online: 25 August 2022

Theravada Buddhism as a detachment from existing traditions of temple-centric royal worship, indicative of either an upending of Angkor's cosmic order or an almost democratic social revolution over a rigid stratification of society commanded by exaggeratedly tyrannical god-kings (Briggs 1951; Spiro 1971; I. Harris 2004). The stark decline in epigraphy following the reign of Jayavarman VII (r. 1181–1218 CE) as well as the dedication of the final Angkorian temple in 1295 CE, a Vaisnava temple within Angkor Thom known as the Mangalartha (K.567) (Finot 1925: 393), has often been utilized to uphold this narrative, which culminated in the often-disputed 1431 CE sack of Angkor by Siamese forces from Ayutthaya and the abandonment of the ruling class of Angkor for a series of successive capitals near modern Phnom Penh (Vickery 1977, 2004). Much of the Theravada Buddhist activity at Angkor, meanwhile, has been blindly attributed to the much-celebrated rediscovery and restoration of the 12th century Vaiṣṇava temple of Angkor Wat during the "post-Angkorian/Middle Period" (c. 15th -19th centuries) by King Ang Chan from Longvek (r. 1516–1566 CE) (Groslier 1958), which through epigraphic and radiometric evidence is known to have formed the focus of an international pilgrimage site well into the 19th century (Carter et al. 2019; Pou 1970). Additionally, the rise and dissemination of Theravada Buddhism during the late Angkorian Period is often overshadowed in recent scholarship by models of contemporary environmental and hydraulic collapse (see Fletcher et al. 2017; Klassen et al. 2021a), which while relevant to understanding the gradual depopulation and subsequent desertion of Angkor by its ruling class does not easily allow for a discussion of concurrent social processes.

In this paper we present a formative temporal analysis of Angkor Thom's Theravada Buddhist Terrace/*preah vihear* construction campaign and landscape. Utilizing existing colonial-era maps (Trouvé and Marchal 1957 [1935]) (SI Appendix Fig. S12), GIS data (Gaucher 2004a; Evans et al. 2013), and LiDAR (Evans et al. 2013), our fieldwork employed an extensive program of ground-survey followed by site-mapping and test-pit excavation to understand the palimpsest of Theravada *preah vihear* found within Angkor Thom. From radiometric and artifactual data, we suggest that social organization surrounding *preah vihear* occurred in earnest at Angkor during the late 13th - late 14th centuries, but assess the possibility of later (15th – 16th century) activity through structural analysis of visible renovation phases at several Buddhist Terrace sites as well as stratigraphic evidence for the placement of *preah vihear* on earlier sites of occupation. We use this data to assess the gradual, multifaceted development of Angkor Thom's Theravada Buddhist monastic infrastructure to better understand religious and urban development during Angkor's final centuries as capital of Cambodia, as well as provide a foundational framework to understand a unique, almost entirely undocumented socio-religious phenomenon within Southeast Asian history.

2 Theravada Buddhism at Angkor Thom – consolidating the evidence

The term "Angkor" ("capital city" or "great city") describes a vast, dispersed region of temples, canals, roads, and reservoirs located in northwestern Cambodia (Fig. 1). Covering an area of approximately 1000km^2 with a peak population of approximately 750,000–1 million, scholars have argued that Angkor formed the world's largest pre-industrial urban area (Evans et al. 2007; Fletcher 2009; Klassen et al. 2021a) and the focal point of an undisputedly dominant regional power. Beginning in the late 9th century with the establishment of the hilltop temple of Phnom Bakheng in 907 CE, kings imbued with divine essence ordered the construction of royal civic-ceremonial centers focalizing temple-mountains at Angkor (Filliozat 1951). These acts of construction not only cosmically renewed the landscape as an act of kingship validation, but also reified existing politico-religious infrastructures and hierarchies and formed an integral pivot for the social, economic, and political dynamics of everyday life (Dumarçay and Royère 2001; Pollock 2006; Tambiah 1973). Scholars such as Kenneth R. Hall also argue that the replication of the religious center functioned to regulate settlement across the Angkorian landscape as nodes of imperial authority (Hall 1992: 239–240; see Groslier 1960; Klassen et al. 2021b). As microcosms of the state temple, village shrines and regional temples constructed during a multitude of periods embodied the same political and economic symbolism as state temples on a smaller scale and "reinforced the political and social linkages within the network" (Evans 2007: 20–21).

The Angkor region is centered on the 9km^2 walled citadel of Angkor Thom (Fig. 2), called *Indrapattha* (a translation of "Phra Nakhon"[1]) in 15th century Thai sources. The terminal civic-ceremonial urban center within Central Angkor, Angkor Thom formed the pivot of the intensive building campaign of satellite civic-ceremonial centres, hospital-chapels, rest-houses, roads and other collective infrastructure which personified Jayavarman VII's rule of the Angkorian Empire (see Hendrickson 2010; Sharrock 2009). Angkor Thom was

[1] "City of Indra". Vickery's assessment of four Siamese chronicle fragments disputes this 1431 date. The *Luang Praseut* (LP), often considered the most accurate chronicle (see Cushman 2006), dates the attack to 1431 CE and refers to Angkor as *Nakhon Hluan* or *Phra Nakhon*. In contrast, the 18th century *1157* fragment provides the date of the invasion as 1421 CE, while the 2k.125 fragment (Vickery 1977) records 1441 CE. The fourth source, the 17th -19th century Vliet-Sangitiyavansha, does not mention this event at all.

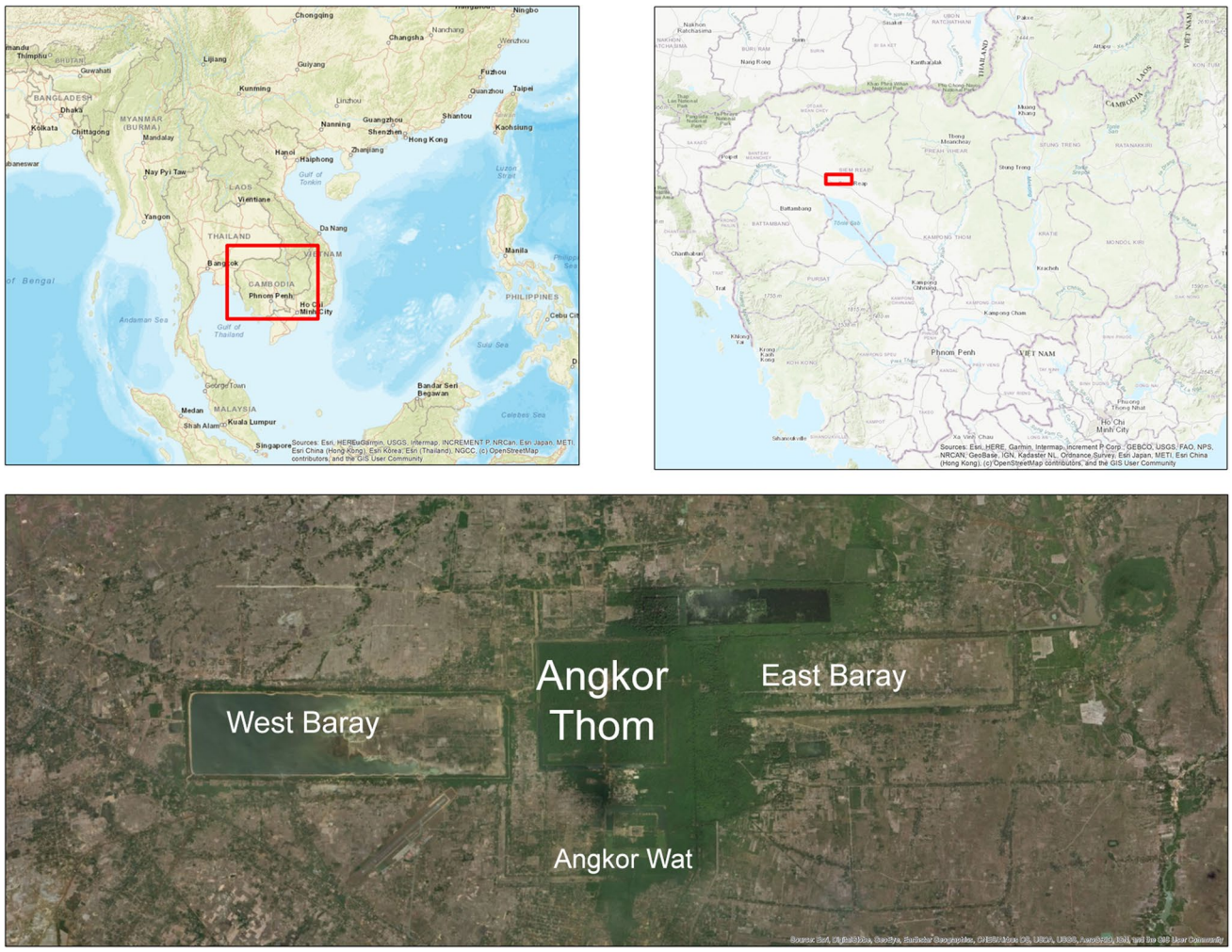


Fig. 1 Overview of Cambodia, Siem Reap region, and Angkor. Imagery source: ArcGIS

constructed as a physical manifestation of the Churning of the Ocean of Milk episode of Indic mythology (Williams 1992), and essentially superseded all other civic-ceremonial development before it, incorporating over three centuries of existing imperial infrastructure surrounding the 9th century Royal Palace. The citadel was defined infrastructurally by an orthogonal road-grid intersected by five cardinally-aligned arterial roads, each lined with canals connected to Angkor's vast hydraulic system (Gaucher 2004a, b). Stark et al. emphasize that Angkor Thom represented the "grandest urban vision in Angkorian History" (2015a, b: 165) and the citadel consequently formed the major theatre for Theravada Buddhist place-making within Angkor's imperial core.

Although epigraphic evidence indicates that several iterations of Buddhism were patronized alongside Hinduism in Cambodia as early as the 5th century CE, most notably Mahayana Buddhist and even possibly Vajrayana Buddhist schools patronized by Jayavarman VII (Sharrock 2009), Theravada Buddhist practices recognizable to modern Cambodian traditions were established at Angkor at an undocumented point before the end of the 13th century. The institutionalization of Theravada Buddhism within Southeast Asia likely occurred much earlier, possibly within Pyu city-states in Central Thailand and southern Burma (c. 3rd -4th centuries CE), but more concretely within civic-ceremonial centers across Thailand's Khorat Plateau associated with the "Dvaravati" material culture (c. 6th -11th century CE) (Murphy 2016; Stargardt 2016). It is likely that *bhikkhu* from this area were essential to the transmission of Theravada Buddhism across mainland Southeast Asia in later periods; the standardization of monastic architecture and artistry found at Angkor, for example, clearly has roots in archetypes from both these and subsequent regional polities such as the 13th-15th century Kingdom of Sukhothai (see Aasen 1998; Murphy 2013).

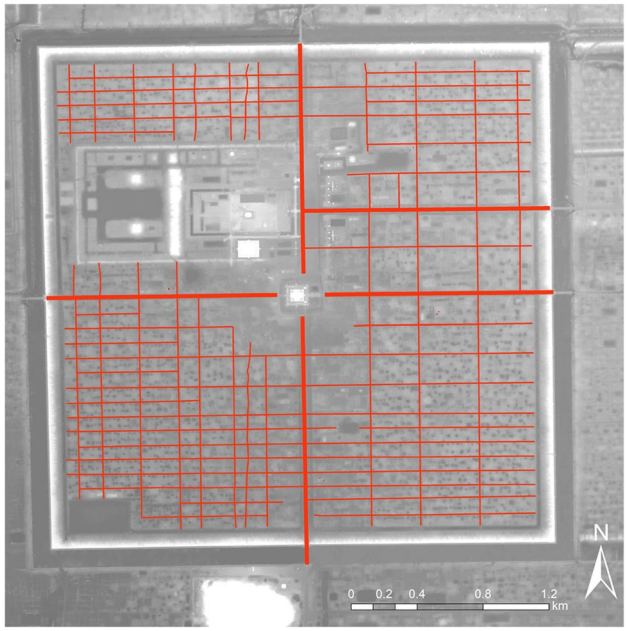


Fig. 2 LiDAR image of Angkor Thom with road-grid highlighted. Source: Khmer Archaeological LiDAR consortium (KALC) (Evans et al. 2013)

A more explicit reference to active Theravada practice at Angkor by monks and congregants comes from the 1296 CE account of Angkor by Chinese emissary Zhou Daguan, entitled *A Record of Cambodia: Its Land and Its People*, which has proved invaluable for understanding Theravada's early ascendancy alongside reconstructing Khmer livelihoods and interactions with religion. Zhou proclaimed that "every family practices Buddhism" (P. Harris 2007: 55) and attests to the growing dominance of Theravada practice alongside previous traditions such as Shiva worship or general Brahmanism. Zhou also provides the first account of an active *sangha* at Angkor,[2] which alongside his descriptions of "yellow-robed" *bhikkhus*[3] within Angkor Thom he notes "for their temples…there is just one icon, an exact likeness of the Śakyamuni Buddha" (P. Harris 2007: 52), edifices analogous to what is found across Angkor's archaeological record. *Vihara* are also mentioned within a select number of inscriptions from the 14th century, most notably K.754/1309 CE[4], written in Pali rather than Sanskrit, which describes the dedication of one such building by Indravarman III (r. 1295–1308) prior to his abdication of the throne to pursue the life of a *bhikkhu*. Consequently, Zhou mentions a royal procession he witnessed, during which "the King" visited "a little golden pagoda in front of which stood a golden statue of the Buddha" (I. Harris 2004: 38) which again attests to the Buddhist fervor of this monarch and most likely that of many of his successors.

The evocation of Shiva in the latest dated Sanskrit inscription found at Angkor (K.470/1327 CE), noting the consecration of a representative *lingam* in the Bayon, suggests a brief return to Hindu rule during the reign of 14th century King Jayavarman Parameśvara (Sharrock 2009: 116). Still, beyond the speculative knowledge that Hinduism and Theravada Buddhism coexisted within the same politico-religious landscape, the absence of a substantial epigraphic record from the mid-13th century onwards has clouded any historical understanding of Theravada's ascendancy at Angkor. Furthermore, fragmentary epigraphic and chronometric analysis of Angkor's Brahmano-Buddhist monuments indicate that a substantial, yet gradual campaign of temple conversion occurred across Angkor between the 13th -16th centuries. This process is traditionally exemplified by the 16th century conversion and restoration of the 12th century temple of Angkor Wat, dedicated to Vishnu, into a Buddhist pilgrimage site (Carter et al. 2019; Pou 1970), but also by the conversion of several temples within Angkor Thom through unique, localized methods of structural transformation. This included the installation of a uniform iconography of statuary and bas-reliefs depicting episodes from the life of the Buddha (Thompson 1998; see Giteau 1975), a process exemplified by the transformation of the western wall of the 11th century Baphuon temple into a 65 m reclining Buddha (*parinirvana*) in the 15th century (Leroy et al. 2015). It is unclear what effect the 14th -15th century geopolitical expansion of Ayutthaya (1350–1767) had on Buddhist traditions at Angkor, although the introduction of spired funerary-reliquary monuments to Cambodia, commonly known as *stupas* (*chedi*), suggests some structural influence from the later Thai kingdom (Marchal 1951; Polkinghorne et al. 2013, 2018; A. Harris 2021: 345–362).

3 Architectural, religious, and spatial background of "Buddhist Terraces"/*preah vihear* at Angkor

Although the architectural and spatial reimagining of converted Brahmano-Buddhist temples such as those listed above have received much more attention in previous

[2] Zhou is often inaccurate in his identifications of religion beyond the knowledge he carries from a Chinese context. For example, he frequently notes the presence of Taoist worshippers (P. Harris 2007: 52–55), a tradition not endemic to Cambodia during the Angkorian Period.

[3] Monks. Known as *zhugu* in Zhou's description, a term derived from *chaokhun* which is a respectful title for Theravada monks in contemporary Thailand (2007: 104).

[4] Found at Kok Svay Chek, Siem Reap Province. See Cœdès 1936: 14–21.

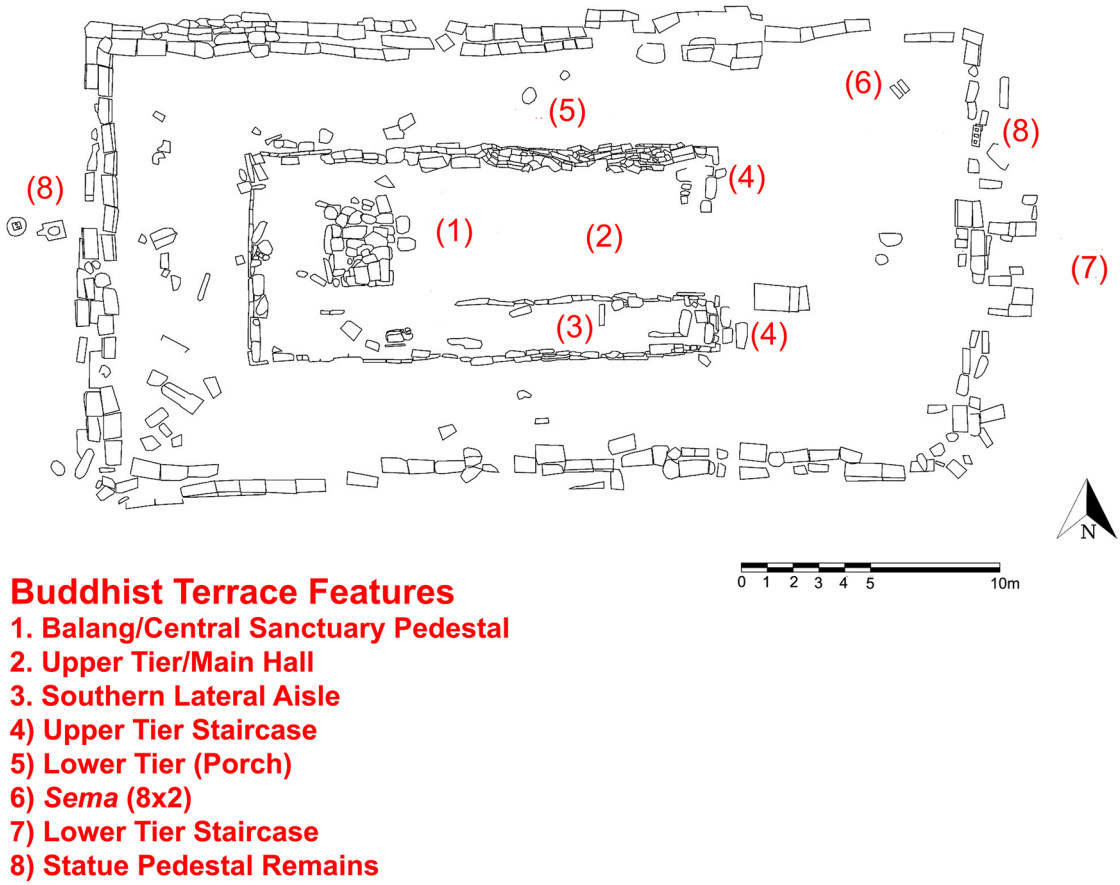


Fig. 3 Labelled plan of Terrasse Bouddhique No. 3/ATV007, Angkor Thom. Site cleared and drawn in 2019

studies than the construction of individual monasteries (Thompson 1998, 2004; Leroy et al. 2015; Nara 2012), we argue the local dissemination of *preah vihear*/"Buddhist Terraces" in fact serves as a more effective analysis of the initial spread of Theravada Buddhism throughout the general Angkorian population. As noted, this process likely began in the 13th century and progressed well beyond the disenfranchisement of Angkor as capital of Cambodia, with successive monarchs evidently continuing to dedicate land within Angkor Thom and Central Angkor for monastic construction and the expansion of the *sangha*. The structural remains of these edifices are represented in the archaeological record as short, rectangular, tiered retaining walls constructed from laterite and sandstone blocks (Fig. 3), and were originally topped with a wooden superstructure. Although the roof and supports have not survived, roof-tiles are found in abundance across the surface and within the stratigraphy of many sites (See SI Appendix Fig. S7), and post-molds in the form of molded blocks or subterranean anchors were identified during survey and excavation (A. Harris 2021: 183–185) (SI Appendix Fig. S15). Surviving bas-reliefs depicting wooden structures from temples such as the Bayon also help in our understanding of the original layout and decoration of these buildings (see Giteau 1974: 144, 1975 pl. II).

The main ritual area of the structure would have been accessed by an east-facing staircase, likely derived from the positioning of earlier temples to Shiva. This would have provided access to the Central Sanctuary (*balang)*, a 2 × 2 m-3 × 3.5 m square pedestal at the westernmost edge of the uppermost tier which featured a prominent statue of the Buddha, often seated (Fig. 4). Smaller, portable pedestals placed surrounding the main image would have held a series of less prominent statues, each representative of the standardized iconography within temples noted above, that were often gifted to the *preah vihear* as donations by wealthy patrons (Stuart-Fox and Reeve 2011: 105). Most of the supporting pedestals identified during survey featured flat chisel-marks, which as Polkinghorne et al. note likely indicate a late- or

Fig. 4 Preah Ngok Buddhist Terrace (ATV001) highlighting eastern sima and Central Sanctuary pedestal (*balang*)

post-Angkorian period of manufacture or augmentation (2013). Inscriptions from Angkor Wat's *Preah Poan* (Hall of 1000 Buddhas) dated to 1630 and 1684 establish that this practice of image donorship occurred during the post-Angkorian Period, although the volume of pedestals found at sites across Angkor Thom suggests that the tradition indeed predates activity at this temple. The varying quality of craftsmanship of these images was likely in part a product of varying levels of wealth between local monastic leaders and elite donor congregations in hiring skilled craftsmen, especially considering that centralized craft production at Angkor is thought to have ceased at the Royal Palace workshop by the 12th -13th century (Polkinghorne et al. 2014: 332).

Surrounding the majority of Buddhist Terraces are *sema/sīmā*, a series of blessed stone deposits marked at surface-level by *nimitta* (more colloquially known as *sema* stones) (Fig. 4) placed in pairs at the cardinal and subcardinal boundaries of the structure. The collective *sema* (or *Buddhasima*) forms a ritual boundary for ordination rites (*uposatha*) within any monastery, and distinguishes *preah vihear* from any other stone substructure found across Angkor (Gosling 1991; A. Harris forthcoming; Thompson 1999)[5]. The common 8 × 2 alignment of *sema* likely derives from larger steles surrounding ordination halls of the earlier "Dvaravati" material culture to the northwest as well as contemporary monasteries found in the Thai kingdoms of Sukhothai and Ayutthaya. The centralized placement of *sema* stones surrounding a single edifice, however, is atypical in Southeast Asian Theravada practice, with multiple structures typically given unique ritual functions within other cultural contexts (for example a *vihara* – prayer-hall and *uposathagara* – ordination hall as separate edifices). Thompson suggests Angkorian *Sema*

[5] *Sema* stones were chosen as the primary site classification diacritic during survey. Thus, *preah vihear* with *sema* were labelled ATV (Angkor Thom *Vihar*) and those without were labelled ATTS (Angkor Thom Terrace Structure). 59 ATV and 13 ATTS-classified Buddhist Terraces have thus far been identified during survey within Angkor Thom (see A. Harris 2021). The volume of *sema* stones found deposited at ATV sites indicates that many ATTS sites were in fact surrounded by these markers at a point in the past.

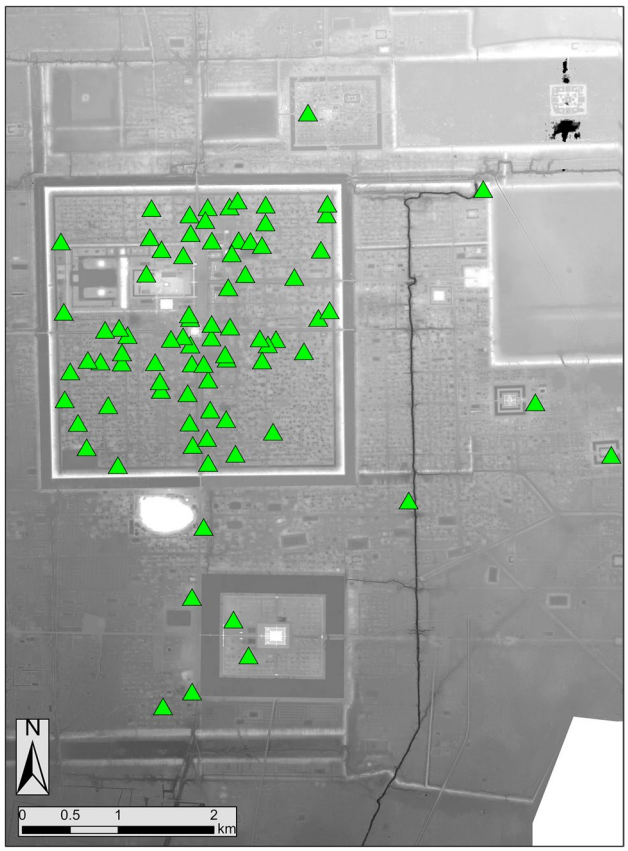


Fig. 5 LiDAR map illustrating expanse of Buddhist Terrace/*preah vihear* construction across Central Angkor

placement is derived from the focalization of ritual on a single edifice embedded within existing Brahmano-Buddhist understandings of space (1999: 402–403; see Harris forthcoming).

Finally, *stupas*, smaller funerary monuments or larger reliquaries either resembling Brahmano-Buddhist temples (*preah theat*) or more the conventional spired monuments of this period (*chedi*)[6], also feature at the western extremity of several prominent Buddhist Terraces (see SI Appendix Fig. S14), including those surrounding the Bayon (Marchal 1951). Thompson notes that many Brahmano-Buddhist temples are thought to have also been transformed into reliquaries during this period, and some even feature Buddhist Terraces directly abutting the monument, highlighting a concerted standardization of space between the ancient sanctuary, the *preah vihear*, and the newer reliquary to create a recognizable spatial alignment across Theravada religious architectures at Angkor (Thompson 1998: 278–281).

Seventy-two Buddhist Terraces have thus far been identified within Angkor Thom (A. Harris 2019: 25), although the number of fragmentary lateral substructural remains identified during survey suggest that this number underrepresents the full extent of Theravada monastic construction within the citadel. A modest yet continuously-expanding list of Buddhist Terraces (12) have also been documented in the Central Angkor region, whcih includes *preah vihear* associated with earlier civic-ceremonial centres such as Angkor Wat (Cœdès 1918), Jayavarman VII-era sites Ta Prohm, Preah Khan, and Banteay Kdei (Chamrouen 1998; Sophia 2003), as well as solitary structures proximate to the southward extension of Angkor Thom's South Gate Road. Some, too, are found along the Siem Reap River to the west of the citadel (Brotherson et al. 2014, 2019; Klassen et al. 2021a). Considering that this spatial re-imagining of Angkor's landscape also included the conversion of numerous temples, the dissemination of Theravada Buddhist monasticism may represent the largest Angkorian religious building campaign since the reign of Jayavarman VII.

4 Angkor vihara project research between 2017 and 2019

Recent understandings of Angkorian Theravada monuments and settlement have heavily benefitted from GIS work completed by teams led by Pottier (1999) and Gaucher (2002, 2004a, b) following the Cambodian Civil War. These investigations built on both Bernard-Philippe Groslier's Angkorian studies of landscape settles and hydrology (1960; 1979) as well Henri Marchal[7] and Georges Trouvé's site inventories for the early EFEO (Marchal 1918; Trouvé and Marchal 1957 [1935]). Gaucher, importantly, was the first to map both Angkor Thom's orthogonal road grid as well as position these monuments in relation to intersections and city blocks (see A. Harris 2019: 25). These observations were verified by remote sensing data and LiDAR imagery collected by the Greater Angkor Project (Evans et al. 2007, 2013). The resulting data analysis alongside extensive excavation campaigns across Greater Angkor helped model important trends of low-density agrarian expansion and collapse across the landscape based on population estimates, settlement patterns and agricultural trends, hydrology, import and exports of Chinese tradewares, ceramic typologies, and climate change (Brotherson 2019; Ea 2005; Fletcher et al. 2017; Carter et al. 2018, 2019, 2021; Hall et al. 2021; Klassen et al. 2021a, 2021b; Marriner et al. 2018; Penny et al. 2007, 2019; Stark et al. 2015a, b).

[6] We have referred to these structures as funerary-reliquary monuments given their ambiguous use through time.

[7] Though Marchal was the first to attempt a proper inventory, he arbitrarily classified Buddhist Terraces as *monuments secondaires*, an indiscriminate title he also gave to smaller temples, prominent stone-inlaid mounds, and even drainage culverts (1918: pl. I).

Fig. 6 **Left:** Locations of all excavated sites and trenches from 2019 AVP season. **Upper-right:** Architectural site-plan for excavation site ATV018. **Lower-right:** Test-pit/locus ATV027-*1004* surrounding *sema* boundary stone. **Below:** labelled LiDAR site map for ATTS009/Monument 71 and Groupe 5 Monument 1/ATV027 with test-pits labelled

Building on these investigations, the Angkor Vihara Project (AVP) completed ground survey of all known Buddhist Terrace sites within Angkor Thom between 2017 and 2018 (See SI Appendix Fig. S13). Our survey consulted colonial-era French site inventories and hand-drawn maps (see above) as well as archival photos and documentation from the EFEO's *Journaux des Fouilles* (EFEO 1909–1956), and utilized existing GIS data (Gaucher 2004a; Evans et al. 2007) and LiDAR (Evans et al. 2013) to georeference and catalogue each structure[8]. In 2018 this work was expanded to include Buddhist Terrace sites previously identified within Central Angkor outside the citadel (Fig. 5).

In 2019, in collaboration with APSARA National Authority, we completed vegetative site clearance of eight Buddhist Terraces within Angkor Thom and undertook structural analyses of each site alongside preliminary mapping of mounds and hydraulic sites (see SI Appendix Figs. S1-5 and Table S2-S3). We also excavated eight 2x1 - 2x2m test trenches across four Buddhist Terrace sites (Fig. 6). Apart from verifying structural observations documented during survey, our goals through excavation were to determine the floor-level of each structure, identify structural foundations and evidence of the original superstructure, verify renovation phases at specific monuments, excavate datable matter, and establish sites suitable for larger-scale excavations during future AVP campaigns. Test-pits were selected based on proximity to architectural features (*balang* or staircases) important ritual installations (*Sema* stones or funerary-reliquary monument remains) or evidence of superstructural remains (piles of roof-tiles possibly indicative of post-holes/molds).

Our excavations across all four sites identified three consistent layers of stratigraphy, shown with the example of ATTS009-*2000* in Fig. 7. The distribution of ceramic types through each layer is presented in SI Appendix Table S4 and Fig. S6, but a more intensive study of excavated styles and distribution of local Angkorian ceramics vis-à-vis Buddhist Terrace occupation is beyond the scope of this publication (see Ea 2009; Groslier 1981; Marriner et al. 2018). Unearthed ceramics predominantly comprised brown-glazed

[8] Our cataloguing work documented structural dimensions, construction materials, floorplans, renovation phases and junctures, spatial alignments, identifiable funerary-reliquary monuments (*preah theat* and *chedi*), proximate hydraulic features such as ponds and canals, and any physical boundaries (ex. embankment walls) associated with each Buddhist Terrace.

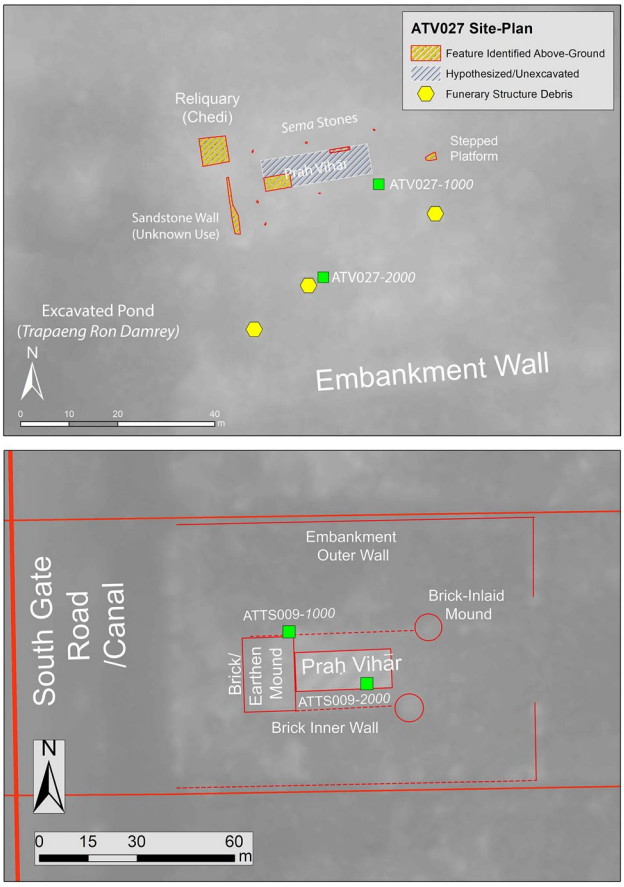


Fig. 6 (continued)

or earthenware roof tiles, brown-glazed stoneware vessels, and earthenware cooking/storage vessels, and were primarily found in layer 2 of each trench. Of important note in seriating eras of occupation across Angkor, an assortment of white and celadon Chinese tradewares were identified within each trench at varying depths, as well as a small number of Vietnamese export ware sherds (SI Appendix Figs. S9-10).

5 Formative dating of *prah vihar* site occupation and activity

Figure 8 below illustrates the range of radiocarbon dates obtained from ten charcoal deposits from each of the four Buddhist Terrace sites excavated in 2019[9]. These samples represent either stratigraphic or habitational episodes of activity across three of Angkor Thom's four quadrants, and reflect two distinctive occupation phases associated with Buddhist Terrace sites (fully realized through our excavations of ATV012). Interestingly, no evidence was excavated associated with Angkor Thom's initial planning and construction by Jayavarman VII; however, unless local land use within the citadel was diachronically reorganized at some point prior to the 14th century, this discrepancy will likely be rectified in future studies.

The first phase presents a range of late 10th – early 12th century activity, which was detected from charcoal excavated from arbitrary stratigraphic contexts from the base of layer 2 and the first 10-20 cm of layer 3. This phase is contemporary with the construction of the Baphuon temple under Suryavarman I (r. 1006–1050 CE) and thus predates the foundation of Angkor Thom by more than a century. The abundance of ceramics and roof-tiles found contiguous with these charcoal samples in layer 2 is potentially significant in understanding the locations chosen for *preah vihear* construction in later eras; it is thus likely that these edifices were built in areas people were already living. This is especially notable at site ATV012, where multiple eras of activity are represented far beyond the established floor-level of the *preah vihear*, as well as ATV027, where no carbon dates later than this phase have thus far been identified despite the presence of a Buddhist Terrace; it is improbable that the site's Buddhist monastery dates from this early period.

The second identifiable phase spans the 14th century and was primarily dated from charcoal excavated from the upper loci of layer 2 in each trench[10]. The context in which each sample was recovered is more clearly related to activities in direct association with *preah vihear* complexes, for example alongside deposits of burnt bone at floor-level or at the base of a Buddhist Terrace's inner staircase. 14th century activity would in part corroborate Zhou's observation of Buddhist pagodas in Angkor Thom during the late-13th century, as well as the earliest carbon date (late 13th century) unearthed from the converted temple of West Prasat Top, found in Angkor Thom's southwest quadrant; in reference to the negotiation of Theravada space noted above, this temple indeed features a conjoining Buddhist Terrace as part of its conversion (Nara 2012: 192–194).

This second phase of occupation currently forms the uppermost identified limit of activity identified across three of four excavated *preah vihear* sites, which did not feature any reliable chronometric evidence for activity during the post-Angkorian Period. Aside from ATV018-*1004*, which was found in a heavily disturbed context, no charcoal was identified within layer 1 in any excavation unit. Additionally, the absence of any blue-and-white Chinese tradewares, which are known to have been exported to Cambodia during the Ming Dynasty (1368–1644) suggests the possibility that these specific sites were primarily occupied during the 14th century; the sherds

[9] A small offset of -21 +/- 6 years was applied to each calibrate date as proposed by Hua et al. (2004) to account for monsoonal climactic variability. Calibrations were also converted from INTCAL13 to SHCal13 (see Leroy et al. 2015). See SI Appendix and Table S1 for carbon date methodology and context.

[10] Future excavation will no doubt clarify any further divisions within this stratum's deposition.

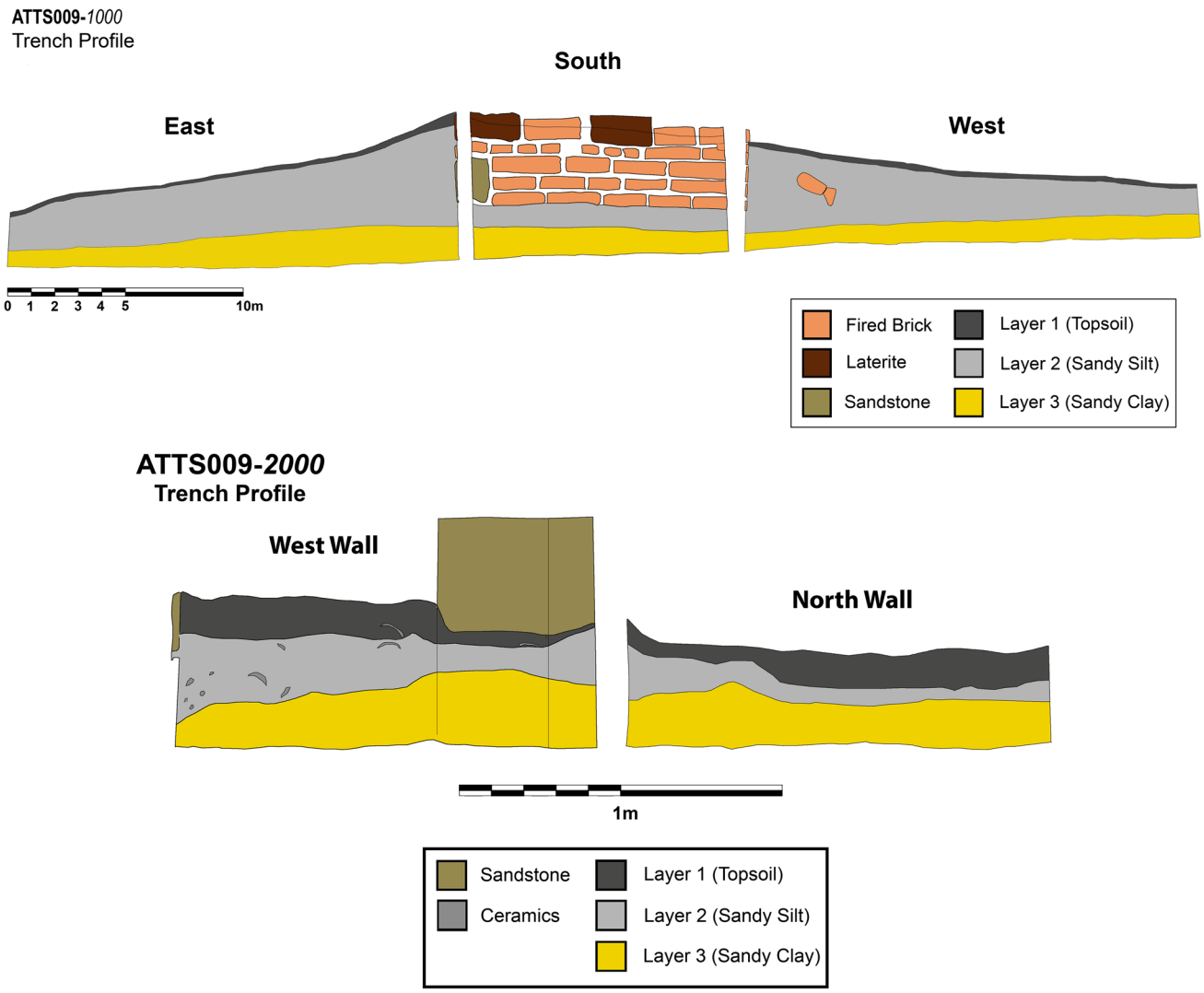


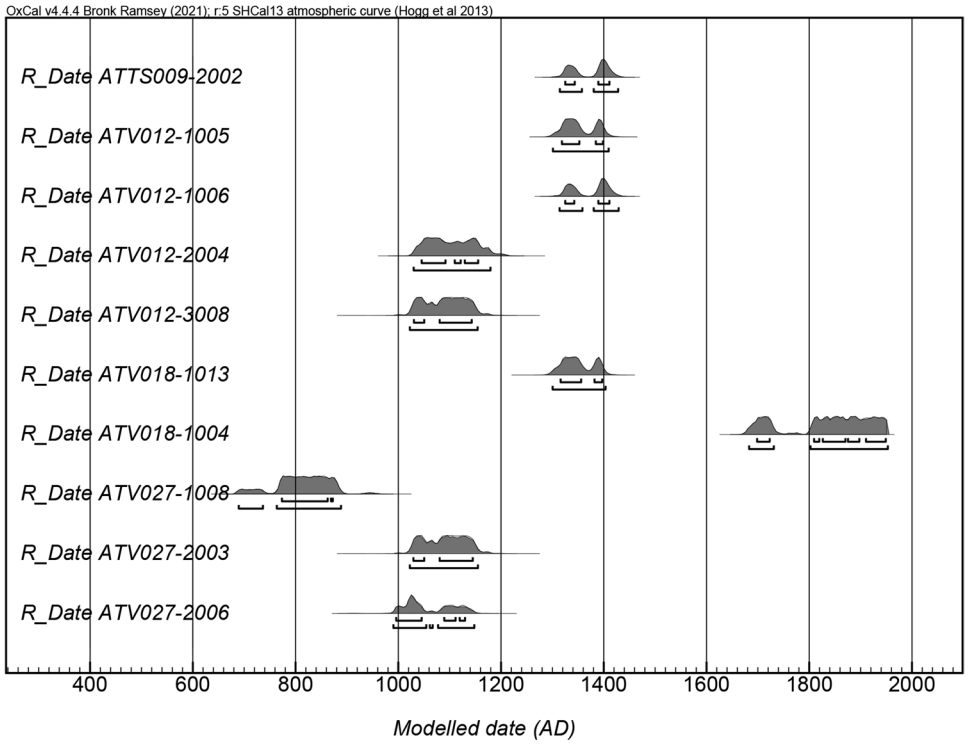
Fig. 7 Drawn stratigraphic sequence of Buddhist Terrace test-pit ATTS009-*1000* and ATTS009-*2000* north and west walls

identified in our trenches were celadon and white-glazed porcelains likely of Song-Yuan Dynasty export (10th -14th century) (Cremin 2006; Ea 2005; Brotherson 2019). Ming wares have been found in abundance at excavations from the post-Angkorian capital of Longvek (Sato and Polkinghorne 2017) and in the upper layers of many of the occupation mounds at Angkor Wat (Carter et al. 2019; Stark et al. 2015a, b). Thus, it is not currently possible to connect Buddhist Terrace construction/habitation at Angkor Thom with historically documented activities undertaken at Angkor Wat from the 16th century onwards using radiometric data.

It is important to note that these carbon dates exclusively reflect occupation associated with Buddhist Terrace sites, and do not directly date any construction activities. That said, ample evidence exists beyond the upper limits of the 14 C data discussed above to suggest that these structures were not single-phase constructions and were indeed renovated or even reoccupied over time. While the recycling of masonry from earlier temples is far too widespread within Buddhist Terrace foundations to currently assess whether these structures postdate those built in quarried (purpose-carved) sanstone, renovations marked by "junctures" between earlier and later iterations of construction are evident across several Buddhist Terrace sites within Angkor Thom (See Appendix SI Fig. S16). This include the Royal Palace-situated Buddhist Terrace of Tep Pranam, which forms the focus of Angkor's largest Theravada Buddhist monastery (see A. Harris 2019: 19–20).

The most prevalent renovation to Buddhist Terrace structures across Angkor Thom comes in the form of a distinct "southern lateral aisle" (see Fig. 3). This feature, also found within modern Cambodian *vihara*, comprises a raised tract featuring a retaining wall of mismatched, recycled blocks; Henri Marchal hypothesized was a pathway "reserved for

Fig. 8 **Above:** 14C dates for all excavated charcoal samples from 2019 test-pits. **Below:** Focused diagram highlighting 14C dates excavated from established 14th century Buddhist Terrace activity period



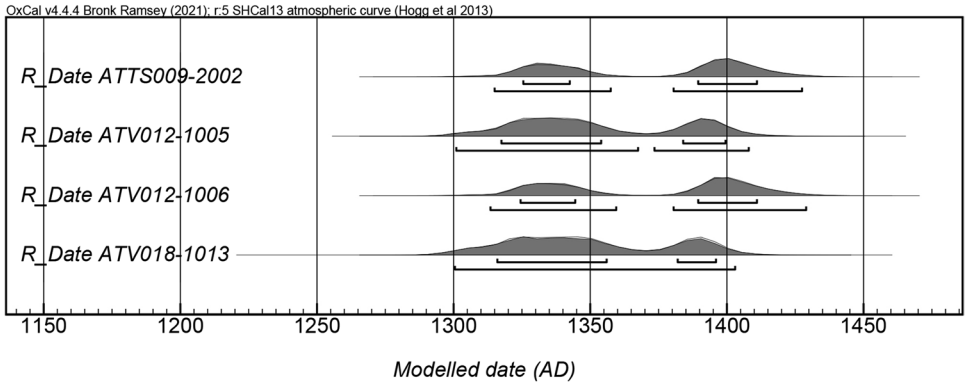


Fig. 9 Excavation of Terrace H/ATV012-*1014* along southern lateral aisle

Fig. 10 Fired brick overtop sandstone blocks, ATV033/Monument 68, Angkor Thom

the monks" accessed directly from the floor or doorway (1918: 10). Our excavation of ATV012-*1000* revealed that this sandstone aisle does not interlock with the terrace's original laterite substructure, and the vertically-stacked blocks which constituted the inner retaining wall of the aisle were mismatched and evidently recycled from earlier sites (Fig. 9). The widespread installation of this aisle, found across approximately 24 of the 72 *preah vihar* surveyed sites within Angkor Thom, potentially illustrates a sudden popularity or urgency to install these features within Angkorian monasteries in a later period.

The use of squared, fired bricks in Buddhist Terrace construction, primarily renovations abutting or atop older sandstone/laterite constructions, is also significant (Fig. 10). Little is currently known about the techniques of brick manufacture during the late- and post-Angkorian Periods, but excavations surrounding the 921-CE dedicated Śaiva temple of Prasat Kravan (K.270/921 CE) (*IC IV*: 68) suggest that bricks were typically fired on-site in a similar manner to earthenware ceramics (Dumarçay and Royère 2001: 13). Prasat Kravan is coincidentally the final inscribed temple at Angkor constructed entirely in brick, which while found within the architecture of later temple-mountains such as East Mebon (953 CE) and Pre Rup (961-2 CE) appears to have been phased out of Angkorian temple-construction by the 11th century. A likely possibility is that many brick renovations identified within *preah vihear* at Angkor, and thus the reintroduction of brick architecture in abundance to Angkor, are products of growing Ayutthayan geopolitical influence on Angkor from the mid-14th century onwards (Gosling 1991: 70; Vickery 1977; Polkinghorne et al. 2013). Brick and plaster feature prominently within the structural foundations of Thai religious architecture as early as the Dvaravati Period onwards (Griswold 1967: 18), and brick structures are found in abundance across Buddhist complexes in contemporary Sukhothai and Ayutthaya (See SI Appendix Fig. S17). The same might be said for the construction of spired funerary and reliquary stupas at Angkor, some of which are also constructed in brick.

6 Discussion: contextualizing Angkor Thom's "Buddhist Terrace"/*preah vihear* chronology and landscape

Beginning in the 13th century, Theravada *preah vihear*/Buddhist Terraces clearly played an important role in the religious organization of Angkorian society and successful dissemination of Theravada Buddhism within Cambodia. The radiometric and excavation data presented above provides important formative evidence for the development and habitation of monastic sites and communities across Angkor Thom during the late Angkorian Period and beyond. But what insight can this data give to further understanding the placement and patterning of Buddhist Terraces within Angkor Thom, as well as the development of the citadel's urban landscape over time?

AVP research in 2017 and 2018 focused on the position of Brahmano-Buddhist temples, the Royal Palace complex, and the citadel's orthogonal road grid (emphasizing its five arterial roads) as focal points of *preah vihear* place-making and Buddhist worship (see A. Harris 2019). The sparse surviving evidence dating select temple conversions within Angkor Thom, for example West Prasat Top (late 13th century) and the Baphuon temple (early-mid 15th century), in fact appears contemporary with the period of Buddhist Terrace activity established in this study. The alignments of Buddhist Terraces surrounding ancient focal points of politico-religious authority also arguably validated both the ancient temple and the new *preah vihear* as a unique negotiation of past and present religious space (*sensu* Lefebvre 1991). For instance, we mapped a unique alignment of seven Buddhist Terrace structures encircling Jayavarman VII's Bayon temple, one which clearly emphasized the continuous sacrality of the monument as a Buddhist sanctuary in Angkor's later centuries; however, the variation of size and construction between Buddhist Terraces in this specific area is noteworthy, suggesting some temporal variation or even localized vs. centralized construction. The same can be said of the unique stagger of *preah vihear* along Angkor Thom's longitudinal thoroughfare spanning from the North to South Gates (A. Harris 2019: 29, Map 2; see Gaucher 2004a). Beyond specific temples, we also identified a noticeable correlation between *preah vihear* surface area (m^2) and centrality during survey, defined by larger Buddhist Terraces built along major thoroughfares and within the citadel's ancient central zone (A. Harris 2021: 277–280) (Fig. 11). This analysis illustrates that later construction evidently

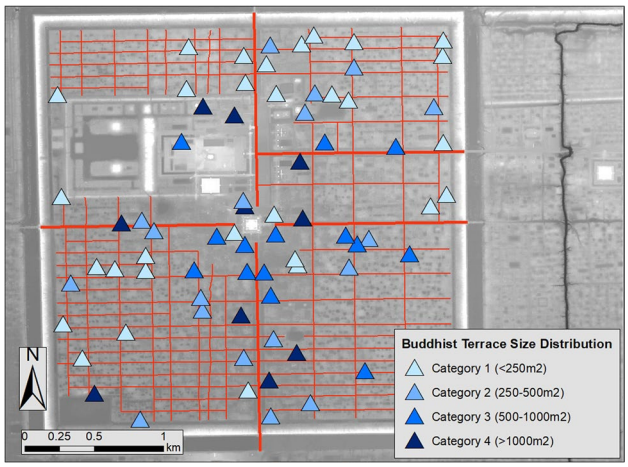


Fig. 11 Buddhist Terrace size/area map

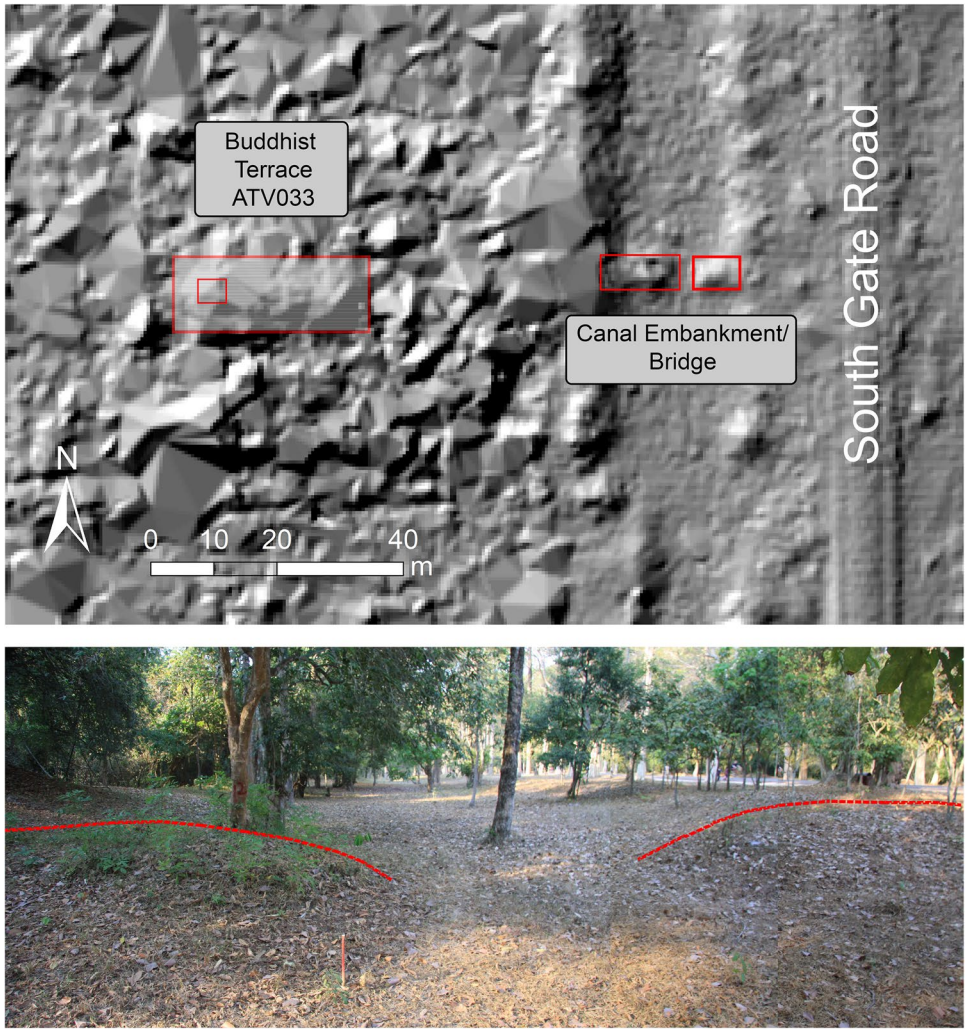


Fig. 12 LiDAR map and image of possible embankment bridge fronting Buddhist Terrace ATV033/Monument 68, Angkor Thom. Site cleared in 2019 (See Fig. 10)

upheld a collective understanding of Angkor Thom's urban geometry, cosmology, and hierarchy (Gaucher 2002).

Our 2019 campaign focused on a disparate selection of Buddhist Terrace complexes within three of Angkor Thom's four quadrants, located in both central and remote areas of the citadel, and identified consistent evidence for 14th century *preah vihear* habitation and occupation. This included one site (ATTS009/Monument 71) along the southern portion of the longitudinal stagger noted above, which suggests aspects of this unique alignment, if not the alignment itself, originated during this period. However, at this point in our investigations, the radiometric dates presented above can only be said to accurately represent the time period in which activity at specific *preah vihear* occurred as opposed to the entire landscape of Buddhist Terraces within Angkor Thom. This assertion would require far more fieldwork to verify, and would thus be premature to attribute what is found at Angkor Thom in its entirety to any focused monastic construction "program" or "boom" by a single ruler or rulers.

The landscape of *preah vihear* found within Angkor Thom is in all probability cumulative of several centuries of activity, potentially spanning as late as the 15th -16th century. And while Buddhist Terraces were also constructed within proximate civic-ceremonial centers such as Preah Khan, Ta Prohm, and Angkor Wat, the comparative volume of *preah vihear* found within Angkor Thom suggests that the citadel remained not only an important religious focal point during this period but also an urban one (see Castillo et al. 2018). Research by the Greater Angkor Project has established the 13th -15th as a period of steady, gradual decline at Angkor in part due to period of megadroughts and mega-monsoons which irreparably damaged the interconnected system of canals, moats, ponds/pools (*trapaeng/srah*), and reservoirs (*baray*) which crossed Angkor's low-density agrarian landscape (Buckley et al. 2010, 2014; Fletcher et al. 2008, 2017). With the breakdown of urban infrastructure across Greater Angkor and estimates that the population of Central Angkor decreased by nearly 50% (300,000 to 150,000) between 1250 and 1350 CE (Fletcher

et al. 2017: 284), it is possible that populations began to constrict within areas housing reliable infrastructure; the rechanneled Siem Reap River canal to the west of Angkor Thom likely anchored one of these areas as early as the 13th century (Brotherson 2019; Klassen et al. 2021a). Analysis of sediment cores by GAP illustrate that this breakdown warranted the re-excavation of several prominent pools and reservoirs across Angkor c. 14th -18th centuries, as by c. 1420 CE the outer moat of the citadel is believed to have become stagnant and swamp-like (Penny et al. 2007, 2019: 4873; Hall et al. 2021). Embankment bridges mapped crossing the South and North Gate Road canals linking Buddhist Terraces to their proximate longitudinal roads, as well as the mention of a functioning hydraulic system in European chronicles, suggest that at least some water continued to flow through the citadel in later centuries (Groslier 1958: 21) (Fig. 12).

Prevalent use of locally-fired bricks, laterite, and recycled sandstone in Buddhist Terrace architecture might point to this reality, given that quarried sandstone had previously been transported to Angkor via canals from the Kulen Hills to the northwest and was thus potentially far less accessible than previous eras (Uchida and Shimoda 2012). This theory, however, does not discount the possibility that recycling of *spolia* may have served a ritual function if the stone was reused from an earlier site in the same vicinity, for example through the structural conversion of the Baphuon temples which utilized components of the existing architecture to realize its transformation (in this case dismantling part of the temple's original summit) (see Leroy et al. 2015; Thompson 1998). Still, the overwhelming presence of brick utilized within Buddhist Terrace construction or renovation found along the South Gate Road and surrounding the Bayon imply that these areas may have been some of the last to be continuously occupied. Site ATTS009, for example, features visible brick expansions surrounding a smaller laterite Buddhist Terrace, which include boundary walls and a prominent brick-lined embankment mound that may have formed the base of a *chedi*; future excavations at this site should focus on the sequencing of these two phases through additional radiometric and artifactual analysis. The construction of southern lateral aisles, while relatively widespread, does not share any similar pattern of construction across the landscape, but these complimentary lines of evidence point to a gradual yet circumstantial building campaign. The absence of Ming tradeware ceramics in our investigations, too, suggest the possibility that some of Buddhist Terraces were abandoned prior to the dedication of others.

Evidence for earlier settlement at several sites predating *preah vihear* construction may verify the placement of many seemingly arbitrarily-situated structures within Angkor Thom. Buddhist Terrace ATV027, for example, is not located in proximity to any local or arterial road, but within a prominent compound surrounded by an earthen embankment wall which may have been occupied as early as the 11th century[11]. ATV012, placed at the junction of a local and arterial road, also features 11-12th century occupation directly below the level of the existing Buddhist Terrace. The abundance of roof-tiles found in the lower strata of layer 2 at ATV012 indicates that the Buddhist Terrace was potentially built on the site of an elite or royal perishable structure; Zhou Daguan explicitly notes that construction using roof-tiles was rigidly controlled by existing sumptuary laws (P. Harris 2007: 52). De Bernon notes that a monastery in any area would exist once a fully ordained *bhikkhu* would build a house of worship (2003: 211), a basic fact which indicates many of the *preah vihear* built beyond centralized areas of the citadel were intentionally placed in areas of existing local settlement. More intensive excavations into the lower strata of *preah vihear* would aid in further understanding the sequencing of settlement both predating and contemporary with the 12th century foundation of Angkor Thom (see Gaucher 2004b).

7 Conclusions

In this paper we present a new perspective from which to view the development of Theravada Buddhist religion, monasticism, and social organization at Angkor through a focus on the archaeology of its *preah vihear*/Buddhist Terrace architecture. Through examination of these edifices as important focal points of Angkorian societal evolution and urbanism, our research establishes the foundations of a renewed civic-ceremonial landscape model of Angkor Thom, where recognition of past infrastructure and meanings of both space and landscape shaped new construction. Our suggestion of a period of concentrated monastic construction within Angkor Thom during the 14th century establishes a preliminary stage of Theravada Buddhist infrastructural development potentially separate from Angkor Wat's 16th century restoration, one which also correlates with recent research investigating Brahmano-Buddhist temple conversions and gives important clarity to many of the patterns of *preah vihear* construction mapped across the capital. However, in examining renovation phases identifiable within Buddhist

[11] ATV027 forms the easternmost of three Buddhist Terraces (ATV027, ATV028, ATV030) 100 m south of the East Gate Road known collectively by Marchal as "Groupe 5" (1918: 17–18). These structures were built entirely from laterite and recycled stone and are each surrounded by numerous *trapaeng* and occupation mounds. ATV027 and ATV030 are each surrounded by earthen embankment walls, suggesting some degree of autonomy between complexes. 14^{C} evidence situates the original occupation of ATV027 at some point during the 11th century, although it is currently unclear when Buddhist Terrace construction occurred at any of the three sites. Although probable, it is also unclear whether prior occupation directly influenced the construction of ATV027.

Terrace architecture we suggest that these radiometric dates may not mark the upper limit of activity at each site and occupation may indeed postdate the proposed period. Identification of previous eras of occupation, too, gives important clarity to the placement of these edifices across Angkor Thom. Finally, the dissemination of *preah vihear* stands as a parallel process incorporative but not inextricably connected to recent models of hydraulic decline and geopolitical shift causing Angkor's 15th century demise, and future research investigating the collapse of Angkor's low-density agrarian landscape may be wise to investigate *preah vihear* construction as reflective of changes in types of local settlement during this period.

Sparse evidence exists to effectively document community organization and social hierarchy integrated within Theravada Buddhist dissemination during the late- and post-Angkorian Periods, whether archaeologically and historically. And despite epigraphic evidence (K.754/1309 CE) that the king was still responsible for distributing land for monastic construction, we deem it unwise to attempt to reconstruct these socio-political infrastructures through fragmentary archaeological evidence. As our conclusions are at this point preliminary, the suggestion of a centralized 14th century monastic building "boom" in a manner similar to earlier monarchs such as Jayavarman VII is in part credible but not absolute, and more direct archaeological investigations are necessary to verify the temporal hypotheses introduced here. That said, the variations visible between standardized Theravada monastic infrastructures point to a consistent yet decentralized authority which governed the construction and placement of *preah vihear* within Angkor Thom over time, a model that finds consistency with earlier Brahmano-Buddhist practices through Pollock's "Sanskritized states" paradigm (2006: 530–531; see Pou 2012; Thompson 2016: 11–12, 64), which relies on codified religious and linguistic traditions of an elite culture to effectively uphold and propagate politico-religious institutions. Notably, the excavation of more directly datable structural elements such as iron crampons and nails may verify periods of *preah vihear* construction alongside occupations as well as a timeline for Buddhist Terrace renovations, as both are processes that may have been centralized. Our study also omits analyses of population trends during Angkor's final centuries; T. Hall (2021: 11), for example, contend that the recovery of secondary forest within Angkor Thom between the 15th -16th century is indicative of gradual population decline forecasted by Fletcher et al. and others (2017; Penny et al. 2019).

Using Carter et al.'s methodology at Angkor Wat and Ta Prohm (2018, 2019), an analysis of the stratigraphy of occupation mounds proximate to *preah vihear* within Angkor Thom could potentially verify any changes in the intensity of settlement corresponding with Buddhist Terrace construction. Direct excavations of infrastructure associated with Angkor Thom's hydrology, too, such as local ponds (*trapaeng*) and associated earthworks diverting earlier hydraulic channels would also shed light on the role of *preah vihear* development vis-à-vis evolving trends in water management (and thus urban development) during Angkor's final centuries. Finally, investigations of Buddhist Terraces constructed outside of Angkor Thom would help understand how *preah vihear* shaped local settlement beyond the walls of the citadel. We anticipate future seasons of fieldwork will help clarify many of the questions posed above.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s41826-022-00056-y.

Acknowledgements The first author would like to thank APSARA National Authority for the permission and privilege to conduct fieldwork at Angkor and for all future permissions. I would individually like to thank current HE DG Dr. Hang Peou, former DG HE Dr. Sum Map, Dr. Ea Darith. Dr. Chea Socheat, and Chhay Rachna. I would like to thank AVP 2019 co-collaborators and co-authors Dr. Tin Tina, Soeng Sreytouch, He Horth, Chhouk Somala, Chheng Vouchnea (APSARA) our workers from Siem Reap Province, especially our foreman Leap Lounh and driver Mr. Si, and international collaborators Drs. Francesca Monteith (Peking), Alexei Vranich (Poznan), and Stephen Berquist (Sewanee). I would also like to acknowledge the advice and mentorship of Drs. Dominique Soutif and Christophe Pottier (EFEO), Edward Swenson and Heather Miller (Toronto), Martin Polkinghorne (Flinders), Roland Fletcher (Sydney), Mitch Hendrickson (Illinois-Chicago), and Alison Carter (Oregon).

Declarations

The authors declare that the information presented is original and valid, and they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper. Permissions for all images previously published in previous papers have been attained by the primary author. We confirm that no unethical actions were undertaken in completing this research paper.

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