



Modelled Sculptures in Buddhist Temples Across Central Asia

RESEARCH

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ABSTRACT

The creation of Buddha images occupies a central role within Buddhist cultural traditions along the Silk Road. In Central Asia, such sculptures were predominantly produced using plastic materials shaped through modelling techniques, referred to in this study as ‘modelled sculptures.’ These sculptures were built into temple structures and feature characteristics that appear to vary by region, as they were influenced by local architectural practices. However, comprehensive investigations into sculptural production across Central Asia remain limited.

This study aims to elucidate regional trends in modelled sculptures by examining *in situ* examples from Buddhist temples in northwestern Pakistan, southeastern Afghanistan, southern Uzbekistan, and southwestern Tajikistan. The analysis focuses on the spatial placement of sculptures in temples, their constituent materials, and their integration with architectural features.

The findings reveal distinct regional patterns in the production of modelled sculptures. In northwest Pakistan, sculptures on exterior architectural elements centred around stupas are particularly prominent. While stupa-related examples continue to appear at Hadda, sculptures installed indoors also increase. In regions beyond these areas, sculptures are found primarily within interior spaces. These patterns likely reflect regional variations in temple layout that correspond to differences in worship practices. Correlations between building surface treatments and sculptural materials also show regional distinctions. ‘White plaster’ (a general term encompassing both lime and gypsum) was primarily used in northwest Pakistan, while earth-based modelling was more common north of the Amu Darya. In the southern Hindu Kush, both white plaster and earthen materials were employed; however, a shift toward earth-based techniques is evident.

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1. INTRODUCTION

Buddhist temples adorned with sculptures produced from modeling techniques and plastic materials are a widespread feature across Central Asia, representing a distinctive aspect of the region's Buddhist culture. However, few studies have comprehensively looked at these sculptures within the broader context of Central Asian Buddhist temples, and the characteristics and variations particular to each site and region remain insufficiently organized. As a result, a clear understanding of the regional features and developmental changes shaping these sculptures has not yet been reached. Therefore, this paper seeks to systematically identify the similarities and differences among sculptures at various Buddhist sites in Central Asia and to elucidate their regional characteristics.

To date, no unified academic terminology has been established for sculptures produced in this region using plastic materials with modeling techniques. The term 'stucco' has frequently been applied to sculptures excavated from Buddhist sites in Central Asia, particularly within archaeological and art-historical studies of Gandhara¹ in present-day northwest Pakistan, and is derived from the terminology of Western architectural decoration. It primarily denotes a soft, white decorative architectural material, and has been used based largely on superficial similarities in appearance. In contrast, those sculptures of Central Asia are widely understood to consist not only of white materials such as lime and gypsum but also of various earthen components. Nevertheless, the lack of a precise technical definition contributes to ongoing ambiguity and disagreement in scholarly discourse concerning the region's sculptural tradition, as the term 'stucco' is sometimes employed without clearly distinguishing these different substances.

This paper refers to these works as *modelled sculptures*, in contrast to carved sculptures, and classifies them according to material and technique. Therein, brownish, soft materials that cohere when mixed with water and harden upon moisture loss through drying or heating are collectively referred to as 'earth.' Unlike earth, lime and gypsum exhibit fine-grained, white appearances that are often difficult to distinguish with the naked eye and have therefore commonly been grouped under the 'stucco' label. Furthermore, lime and gypsum harden as a result of chemical reactions in most cases,² and this process makes them technologically distinct from earthen materials. Consequently, when the specific material cannot be identified in this study, the term 'white plaster' will be used as a general label for hardened materials with a white surface finish.

2. RESEARCH METHODS

In Buddhist temples, modelled sculptures are typically excavated from architectural contexts such as stupas and chapels. This indicates that they did not exist as independent objects but were created as components integrated into architectural structures. Therefore, understanding the relationship between the sculptures and their surrounding architectural settings is essential.

Previous comparative studies of Buddhist temples in Central Asia have shown that temple layouts exhibit notable regional characteristics and chronological developments. In principle, Buddhist temples in Central Asia consist of a stupa, a typical Buddhist monument that contains the relics of Śākyamuni Buddha, and buildings housing the monks. In northwest Pakistan, at Hadda, it became common to construct small subsidiary stupas around the main stupa, forming a 'stupa court', an area sometimes further enclosed by rows of chapels. In the Taxila region of northwest Pakistan and at Hadda, this stupa court was typically accompanied by large rectangular monastic complexes with central courtyards, a layout noted as particularly characteristic of these areas (Iwai 2006). In contrast, in the present-day Kabul region and the northern foothills of the Hindu Kush, while the basic combination of a stupa and monastic quarters is likewise observed, the development of stupa courts is far less pronounced (Iwai 2006, 2019). If temple layouts varied, it is reasonable to assume that the production and placement of modelled sculptures may also have been shaped by these architectural differences.

Moreover, construction practices in Central Asia differ regionally, influencing both the materials and the processes used in temple architecture. Previous studies note that in areas such as northwest Pakistan, stupas, chapels, and monastic quarters were entirely constructed of stone. In contrast, at sites near Kabul, the above method was observed in parts of them, while the broader structures were built with earth-based materials, including sun-dried bricks and clay blocks; only the stupas were constructed of stone. In the northern Hindu Kush region, the whole architecture was made of earth-based materials (Kuwayama 1973: 337–338, Iwai 2006). Additionally, Kuwayama (1973) noted that at Tapa Shotor, the main stupa, constructed of stone, was coated with 'stucco,' and the sculptures were likewise made of 'stucco,' whereas monasteries and chapels built of earthen materials predominantly featured earthen sculptures. This suggests that sculptural materials were closely linked to the architectural materials used in their surroundings, for both technical and aesthetic reasons.

Taken together, these observations imply that both the temple's layout and the materials and methods used in its production differ regionally (including chronological changes); consequently, modelled sculptures are

assumed to display features strongly associated with the architectural traditions of the temples in which they were produced.

This study began with the compilation of documented examples of *in situ* modelled sculptures from 21 Buddhist archaeological sites across Central Asia, including in northwest Pakistan, eastern and southeastern Afghanistan, southern Uzbekistan, and southwestern Tajikistan, as shown in Map 1 and Table 1. An analysis of characteristics of modelled sculptures in each temple, including their location and the images depicted, was conducted using information from published records. Additionally, the data is organized to explore the relationship between the modeled sculptures and the surrounding architectures, to the extent that available information on the materials used and the architectural structures involved allowed.

3. MODELLED SCULPTURES IN BUDDHIST TEMPLES

The modelled sculptures in Buddhist temples can be broadly classified into the outdoors, installed outside, and the indoors, protected inside. The following section examines cases for each type. Based on the compilation

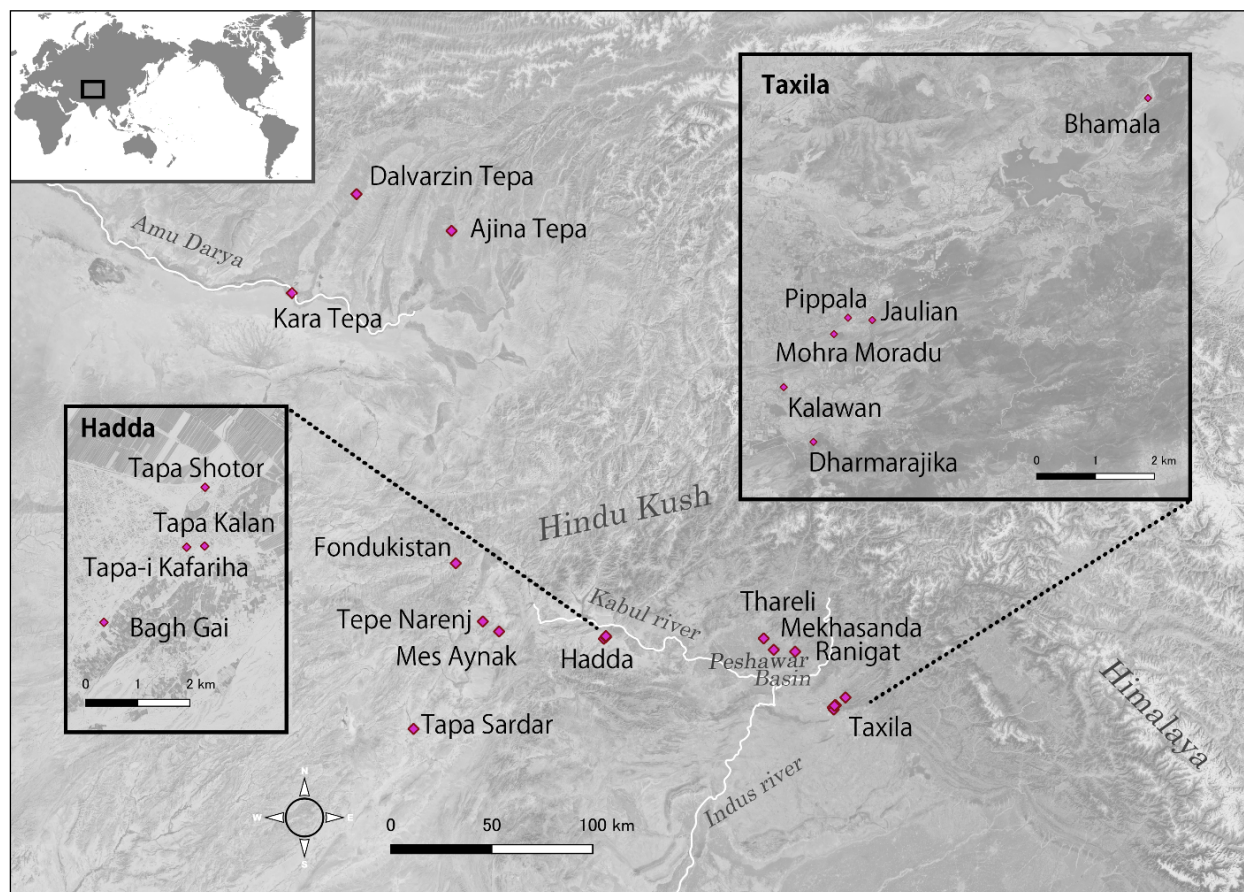
of *in situ* cases, the outdoors is discussed under categories, stupa and building exterior, with roofed examples treated separately, as these are situated outside but protected by upper structures. The indoors are grouped into stupa, interior space, and wall niche. The main archaeological sites and collected cases are shown in Figures 1–4. All the collected cases are presented in Tables 4–6, arranged by geographic region: northwest Pakistan, the southern Hindu Kush, and the northern Amu Darya.

3.1 THE OUTDOORS

Stupa

There are different types of stupas, but most surviving examples in this compilation are ones with a cylindrical body set upon a square base.³ In this discussion, larger main stupas and those with a size of five meters or less and situated in proximity to larger ones in the vicinity, including small-sized ones in chapels or small chambers, are treated separately.

As for smaller stupas, most examples are on the vertical wall of the square base. The sculptures are frequently depicted as seated Buddhas between pilasters,⁴ sometimes in spaces like niches⁵ or with attendants.⁶ Some are standing between pilasters,⁷ others lack pilasters,⁸ and one is in the form of a reclining Buddha.⁹ TK 70 is regarded as representing the ‘Great



Map 1 The Central Asian region discussed in this article.

(Note: Lalma is located in Hadda, but its exact position is unclear, so it is not plotted on this map.)

	NO.	SITES		ABBR	ESTIMATED PERIOD OF ACTIVITY (REFERENCES)
Northwest Pakistan	1	Taxila	Dharmarajika	DR	3rd-1st centuries BC to 4th-5th centuries AD (Marshall 1951)
	2		Kalawan	KW	1st century to 5th century AD (Marshall 1951)
	3		Jaulian	JL	2nd century to 5th century AD (Marshall 1951)
	4		Pippala	PP	1st century to 5th-6th centuries AD (Marshall 1951)
	5		Mohra Moradu	MM	2nd century to 5th century AD? (Marshall 1951)
	6		Bahmala	BM	4th century to 5th century AD? (Marshall 1951)
	7		Ranigat	RG	late 1st-late 2nd centuries to 7th–8th centuries AD? (Nishikawa 1999)
	8		Mehasanda	MS	mid-2nd–3rd centuries to mid-4th-mid-5th centuries AD (Mizuno 1969)
	9		Thareli	TH	2nd century AD to 5th century AD (Mizuno & Higuchi 1978)
Southern Hindu Kush	10	Hadda	Tapa Kalan	TK	Unclear parallel to Taxila? (2nd century AD to 4th century AD?) (Vanleene 2018)
	11		Tapa-i Kafariha	KF	
	12		Bagh Gai	BG	
	13		Lalma	LM	mid-3rd century AD to mid-5th century AD (Mizuno 1968)
	14		Tapa Shotor	TST	2nd century to 4th century AD* (Kuwayama 1973, Tarzi 2005)
	15		Tepe Narenj	TN	late 5th century to 10th-11th centuries AD (Paiman & Alram 2012)
	16	Mes Aynak	Kafiriat Tepe	MAK	2nd century to 9th century AD (Engel 2013) Note: Sculptures date back to the 5 th century at the earliest. (Klimburg-Salter 2018: 227–228).
			Gol Hamid	MAGH	
	17	Tapa Sardar		TS	3rd century to 8th-9th centuries AD Note: Examples recorded <i>in situ</i> are attested from the early 6th to 7th century layers onward. (Verardi & Paparatti 2005)
18	Fondukistan		FD	late 7th century AD to? (Novotny 2017)	
Northern Amu Darya	19	Kara Tepa	North Hill	KT-NH	2nd century to 5th century~? AD (Fussman 2011)
			West Hill	KT-WH	mid-1st-late-1st to around 4th century~? AD (Pidaev 2020)
			South Hill	KT-SH	late-1st-mid-2nd centuries to around 4th century~? AD (Pidaev 2020)
	20	Dalvarzin Tepa (DT-25)		DT-25	3rd century to mid-4th century AD (SUSRRC 2012)
	21	Ajina Tepa		AT	late 7th century to 8th century AD (Litvinskij 1971)

Table 1 Sites discussed in this article.

Dates that have only been estimated and not confirmed in the literature are marked with an asterisk (*).

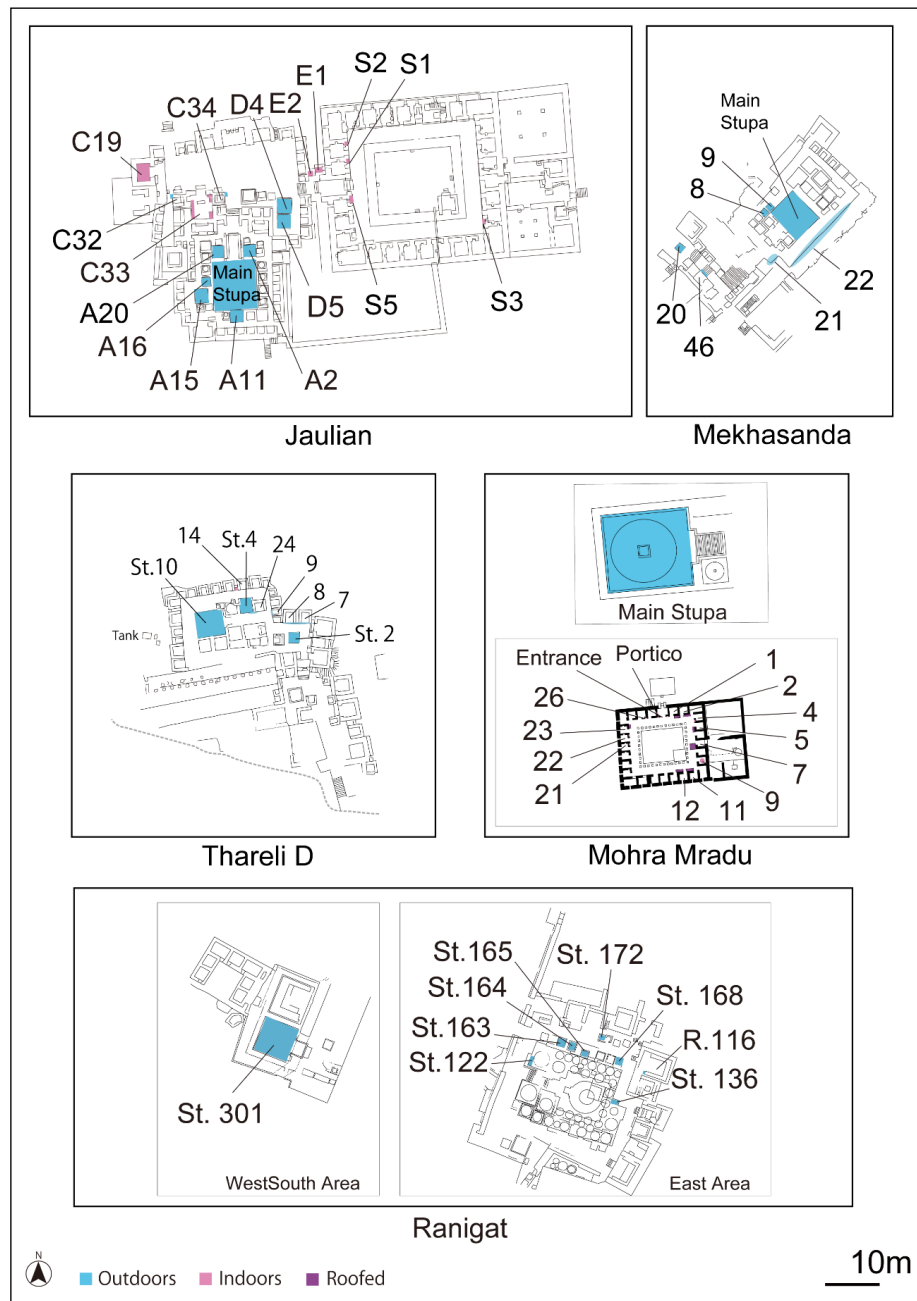


Figure 1 Maps of main Buddhist sites in northwest Pakistan and the location of *in situ* examples.

Based on the following sources, traced and created by the author. Jaulian, Mohra Moradu: Based on [Marshall 1951](#), Mekhasanda: [Mizuno 1969](#), Thareli D: [Mizuno & Higuchi 1978](#), Ranigat: [Nishikawa 1999](#).

Departure,’ though no figures or photos are available ([Barthoux 1933: 90](#)). The cylindrical body is often poorly preserved, with fewer sculptures than on bases.¹⁰

Larger stupas carry similar imagery on bases and, less often, cylindrical bodies,¹¹ including seated Buddhas between pilasters,¹² standing Buddhas,¹³ some enshrined in a niche-like space,¹⁴ and compositions with attendants.¹⁵ Some parts of the Mohra Moradu Main Stupa shows dense arrangements, and Bhamala has a reclining Buddha 50 cm long ([Marshall 1951: 392](#)). There are also cases of Buddhas on staircase sidewalls.¹⁶

Outside of northwest Pakistan and Hadda, a Buddha in the niche of Stupa 20 in Tapa Sardar is also reported,

though details are unclear ([Verardi & Paparatti 2005: 438](#)).¹⁷

Building exterior

In northwest Pakistan, most such examples belong to the chapel’s outer wall,¹⁸ and some are fixed to the chapel’s dado.¹⁹ These include Buddhas between pilasters (MS: Chapel 21), multiple seated Buddhas (TH: D7–8, C100–iii), solitary Buddha figures (RG: R.116), and figures with attendants.²⁰ A few examples also appear on building walls identified as gates.²¹ At Dharmarajika, R1, which was originally the exterior wall of an entrance building, depicts a scene interpreted as the ‘Great Departure’ or

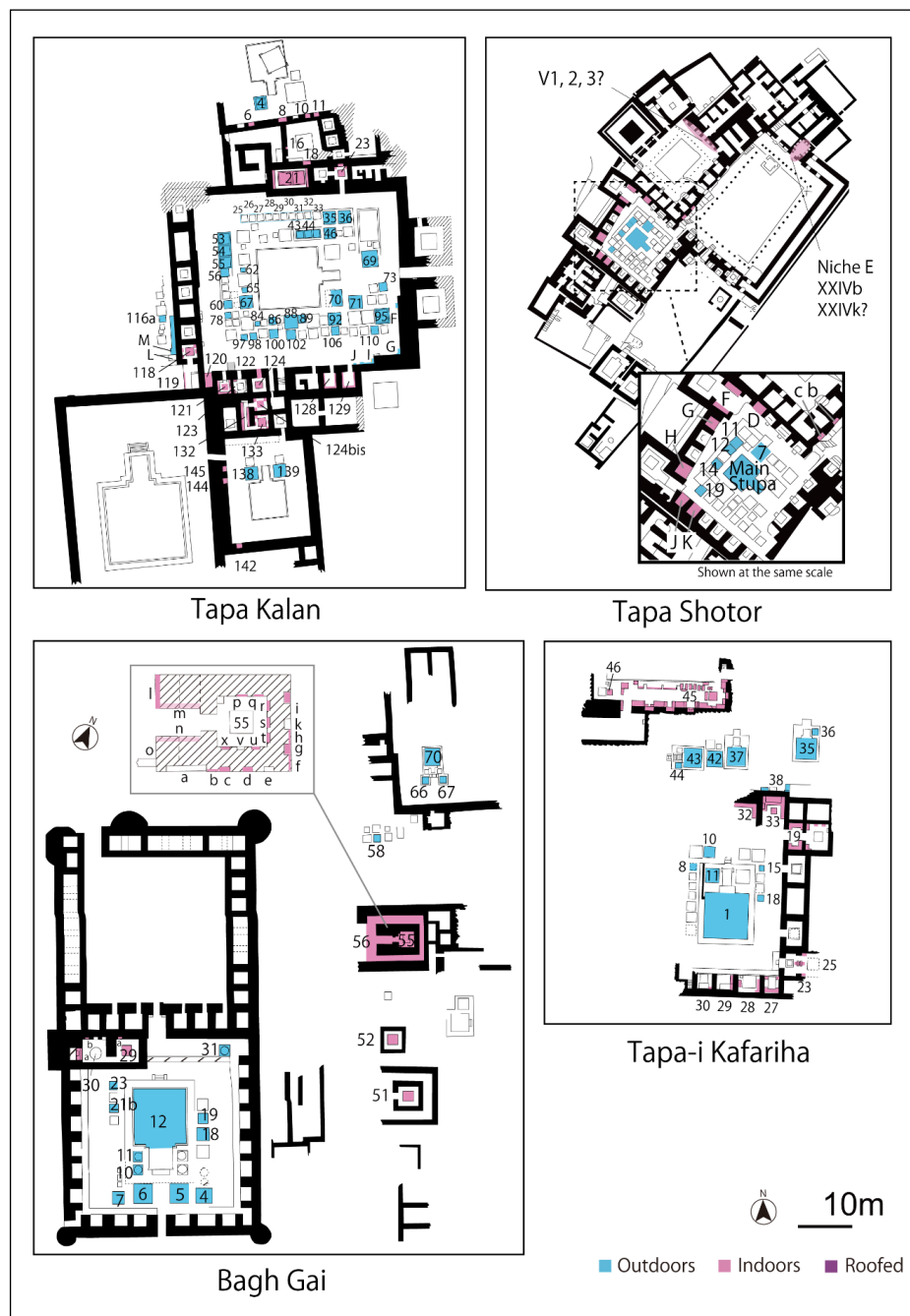


Figure 2 Plans of main Buddhist sites in Hadda in the Southern Hindu Kush and the location of *in situ* examples.

Based on the following sources, traced and created by the author. Tapa Kalan, Tapa-i Kafariha, Bagh Gai: [Barthoux 1933](#), Tapa Shotor: [Tarzi 2005](#).

‘Farewell to the Beloved Horse,’ dated to the early period, 2nd century ([Marshall 1951: Pl. 55, 54b, c, 253](#)).

Outside northwest Pakistan, at Hadda, sculptures on benches along the exterior of the courtyard wall are recorded (cf. [Table 6](#)). At Tapa Sardar no. 18, a foot on a pedestal has been identified as a part of the ‘outer’ wall of the corridor ([Taddei 1968: 118, fig. 38–39](#)); however, the precise nature of its relationship to the surrounding structures remains ambiguous.²²

Roofed

There are instances where structures were built outdoors but are thought to have been protected by upper

structures, such as roofs or eaves. Firstly, small stupa examples are in Tapa Sardar, where the east of the main stupa depicts seated Buddhas or Bodhisattvas on the cylindrical body (no. 4, 8, 1) and standing Buddhas between pilasters with arches on the base (no. 7), likely once covered by wooden structures ([Verardi & Paparatti, 2005: 438](#)). Next is the building exterior, at Mohra Moradu, examples are on pedestals in front of monastic cells (MM: Rooms 1, 2, 5, 11–12, 23). It is presumed that there was a wooden structure resembling a balcony on the upper part ([Marshall 1951: 360](#)). At Dalvarzin Tepa, DT25, numerous sculptures were found on what is presumed to have been the outer wall of a courtyard without a ceiling

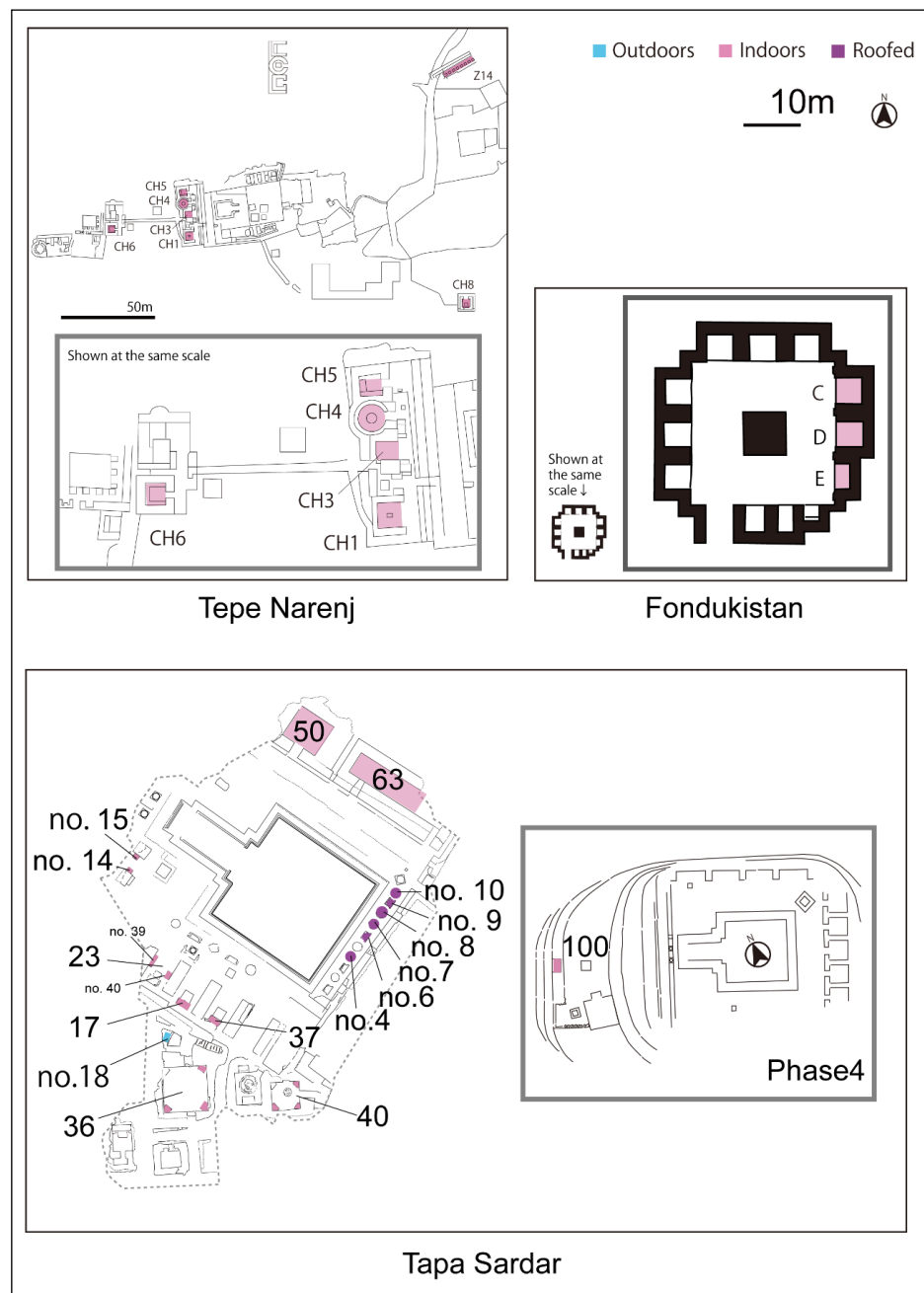


Figure 3 Plans of main Buddhist sites in the Southern Hindu Kush (outside Hadda) and the location of *in situ* examples.

Based on the following sources, traced and created by the author. Tepe Narenj: [Paiman & Alram 2013](#), Fondukistan: [Novotny 2017: Fig.1](#), Tapa Sardar all: [Taddei & Verardi 1985: Fig.1](#), Tapa Sardar-Phase 4: [Verardi & Paparatti 2005: Fig. 22](#).

but considered to have had eaves ([SUSRRRC 1997](#)). On the eastern wall are the upper body and legs of a woman, and a dug-out area like a niche at floor level, and the lower half of a seated statue estimated at 3 m high (id. 105). The northern wall preserves legs of a standing statue, the southern wall has legs draped in clothing, and eight other statues are reported from the site, though details remain unknown (id. 107–108). Finally, in Tapa Sardar, sculpture remains were found on thrones east of the main stupa (TS: Throne 6, 9, [Taddei & Verardi 1985: Pls. 4, 5](#)). Although a structure likely existed behind it, unlike other examples, the statues themselves were characteristically produced independently. They were likely protected by a wooden covering, like the small stupas.

3.2 THE INDOORS

Stupa

The examples of stupa placed in interior spaces, or small chambers reported as chapels, remain in northwest Pakistan and are distinctive in Hadda. They feature a relief-style Buddha image on its base, like the aforementioned stupa examples.²³

Interior space

In this section, examples of accessible and navigable interior spaces are addressed, and most occur in small worship chambers, often called ‘chapels’ in published reports. These are usually built around a stupa or the area directly accessible from the stupa court,²⁴ while

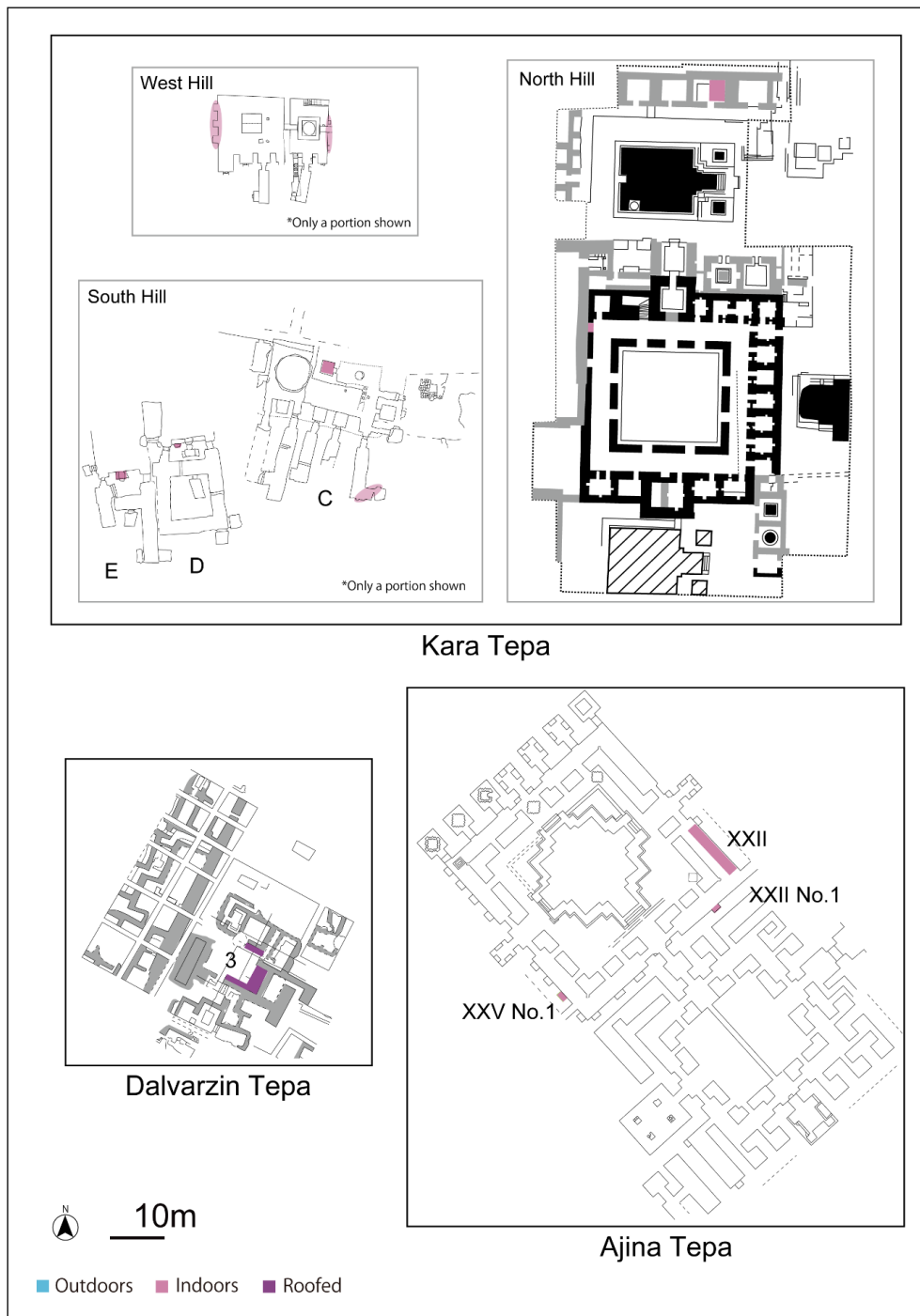


Figure 4 Plans of main Buddhist sites in the Northern Amu Darya and the location of *in situ* examples.

Based on the following sources, traced and created by the author. Kara Tapa-North Hill: [Fussman 2011](#), Kara Tapa-West Hill: [Pidaev 2002: Fig.5](#), Kara Tapa South-Hill: [Stavisky 1996: Fig.3](#), Dalvarzin Tapa: [SUSRARG 1997: Fig.1](#), Ajina Tapa: [Litvinskij & Zeimal 2004: Fig.3](#).

others are in monasteries.²⁵ Additional chapels, which are difficult to say belong to either, are seen in the southern Hindu Kush.²⁶

In most chapels, multiple figures are preserved on the floor, pedestals, or benches, often with a seated Buddha along the rear wall flanked by figures along the side walls.²⁷ This arrangement is common in northwest Pakistan and Hadda, and sporadic in the southern Hindu Kush. Chapel 100 at Tapa Sardar had a massive Buddha foot, seated in European style or standing, toward the rear wall, with figures on

the sides, which is a similar case. Additionally, Tapa Shotor's Chapel H (Niche XII, 'Fish-Porch'),²⁸ eight figures regarded as Vajrapani, Naga King, and deities, is considered the arrangement once centred on a now-lost seated Buddha placed against the rear wall; notably, one freestanding round sculpture is preserved ([Mustamandi 1968b](#); [Kuwayama 1973: 344–348](#), [Tarzi 2005](#)). Another pattern, seen in Hadda, Tapa Kalan, Tapa-i Kafariha, and Tepe Narenj,²⁹ features Buddhas or Bodhisattvas on the floor, pedestals, or benches along the walls surrounding a central stupa, or a worship

object (TN: Chapel 4). In some cases, a main sculpture is on each wall with pedestals,³⁰ and at each corner.³¹ Others have multiple Buddhas on each wall.³²

Beyond chapels, corridors are also included.³³ At Ajina Tepa, a giant reclining Buddha remains on a pedestal along the corridor wall ([Litvinskij 1971: 81, 92](#)). The above examples are being modelled in more three-dimensional forms, but at Bagh Gai, relief-like instances can be observed where Buddha statues are depicted between wall pillars on the wall surface. Other examples are considered inner space but are difficult to reconstruct in terms of architectural context.³⁴

As for sizes, they range from under 1 m³⁵ to life-size, with some estimated to exceed 2 m,³⁶ and larger ones are 5–6 m.³⁷ Large reclining Buddhas in Tapa Sardar Chapel 63 and Ajina Tepa exceed 10 m ([Taddei & Verardi 1972: 381](#); [Litvinskij 1971: 81, 92](#)).

Wall Niche

Here, niches, small rooms not intended for people to enter and move around inside, installed above the floor within the structure's walls are included. In northwest Pakistan, most are along the corridor of monasteries,³⁸ with one in a stupa court (TH: D'14). The building of niches in monastery corridors are also attested in Tapa Shotor (C, B, V1, V2, V3), Kara Tepa (NH). In the southern Hindu Kush and the northern Amu Darya, niches are settled on the walls surrounding the stupa,³⁹ and others in corridors.⁴⁰ In Kara Tepa, there are examples along the inner wall of the courtyard (WH, SH-D, E).

Many niches centre on a seated Buddha against the rear wall, flanked by multiple worshippers or bodhisattvas.⁴¹ A unique variant of this type includes Fondukistan, where Buddha figures occupy the rear and side walls in C, D, while a pair of secular figures in E depicts royal couples, nagas, and 'Bejewelled Buddha' imagery ([Novotny 2017](#)). Others enshrine a single-seated Buddha.⁴² In addition, a standing Buddha on the rear wall, surrounded by 12 figures, is confirmed in Jaulian (Cell 29), and some niches house multiple Buddhas.⁴³

Recorded sizes range up to 2 m (TK: 142; [Barthoux 1933: 114](#)) and over 3.5 m at Tepe Narenj Zone XIV no. 15, where a foot on a lotus remains ([Paiman & Alram 2013: 71](#)), at the largest. Most sculptures are installed on the floor or pedestals, and have contact with the wall, but some sculptures in Fondukistan are detached from the rear wall (e.g. C, D, E).

4. THE MATERIALS OF TEMPLE ARCHITECTURE AND SCULPTURES

This section aims to reveal the regional characteristics of the materials used for modelled sculptures. Additionally, it seeks to estimate the relationship between sculptural and architectural materials by extracting and specifically

organizing information on the materials used in modelled sculptures and the surface coatings of architecture, as described in reports. The descriptions are organized into the same classifications as the above chapter, by geographic region: northwest Pakistan, the southern Hindu Kush, and the northern Amu Darya.

In the collected examples, the materials used in sculptures were predominantly earth, with many reports mentioning 'stucco.' 'White plaster' will be used to refer to the latter instances here. Regarding the materials used in both architecture and sculpture, lime or gypsum were identified in a few examples in the reports. Oftentimes, when such identification is made, the criteria for this determination are not provided, and the definitions used in the reports are frequently unclear. Therefore, for the purpose of this study, I have simplified the classification of the materials from the collected examples into two categories that can be visually distinguished by the naked eye: 'white plaster' and 'earth.' These materials differ in their technical nature, as previously mentioned. This will help clarify the usage patterns of 'these two materials' in the target region.

4.1 NORTHWEST PAKISTAN (TABLE 4)

The outdoors

Stupa: Both small and larger stupas are generally believed to have been constructed with stone masonry or finished with cut stone surfaces, onto which white plaster was applied (DR, JL, PP, MM: [Marshall 1951](#); RG: [Nishikawa 1999](#); MS: [Mizuno 1969](#); TH: [Mizuno & Higuchi 1978](#)). The accompanying modelled sculptures are all classified as being made of white plaster. However, one report suggests that the internal composition of the sculptures may have involved materials primarily composed of earth (JL: Main stupa, [Marshall 1951: 371, 524](#)).

Building exterior: The surface coating of the building is not explicitly described, but it is assumed to have been finished with white plaster rather than earth, based on evidence from documentary photographs (DR: N18, R1; JL: C34; MS: Chapels 21, 22, 46; TH: D7–8, 9, C100–iii). The modelled sculptures are all reported to be made of white plaster.⁴⁴

Roofed: No description of individual materials, and it remains unclear, but it is possible to be made of white plaster, based on the photograph ([Marshall 1951, Pl 96-a](#)).

The indoors

Stupa: The examples reported to be made of white plaster with a stone core (kanjur), and the stupa was likely covered with white plaster (id. 361).

Interior space: a few explicitly mention the surface coatings of the buildings among the collected examples. One example, the Dharmarajika chapel (N18), is reported to have a stone-built structure covered with white plaster (id. 267–268). Most modelled sculptures are made from

ARCHITECTURE		SCULPTURES		EXAMPLES	
SURFACE COATING	FINISH COATING	INNER LAYER	OUTER LAYER		
White plaster		White plaster		Stupa	Outdoors
				【Larger】 DR: J1, K1; PP: Stupa K; MM: Main stupa; MS: Main stupa; TH: D stupa 10; (RG: West court stupa 301?) 【Smaller】 PP: Cell 31; JL: Small stupas; MS: Stupas 8, 9, 20; TH: D stupa 2; (RG: East court stupa 122, stupas 163–172)	
White plaster		Earth	White plaster	Stupa	Indoors
				Interior space	DR: N18

Table 2 Patterns in architectural and sculptural materials in northwest Pakistan.

Items in parentheses: Not described in the text, but estimated from photos.

white plaster, although some reports indicate that the core material was earth-based (JL: E1, C33, Cell 31; DR: N18). Sculptures made of earth are mostly reported from Taxila (KW: B20; JL: E1). In Taxila, while stupas and outer walls were often coated with white plaster, it has been reported that the interior walls of chapels and monasteries were finished with earth (id. 337, 378). Thus, the chapel walls with earth sculptures likely had earthen walls as the main material.

Wall Niche: The surface coatings of the niches themselves are not clearly described. The sculptures at the entrance to the monastery at Mohra Moradu are reported to be made of white plaster (id. 359), and D'14 in Thareli is likely the same, but details are not provided. The other examples at Mohra Moradu are reported to be made of white plaster and terracotta, but they are not clearly described (id. 360–361). The cases in front of the vihara at Jaulian are all said to be made of earth (id. 381).

Table 2 summarizes the cases where the materials used in sculptures and architecture are described in northwest Pakistan. In the collected examples, many architectural structures, including stupas, are reported to have been coated with white plaster, and the materials of the modelled sculptures generally correspond to this finish. On the other hand, especially in Taxila, it has been reported that the interior walls of chapels and monasteries were finished with earth (Marshall 1951), and some sculptures inside these buildings are also said to be made of earth; thus, sculptures made mainly from earth may also have been created in connection with interior surface coatings.

4.2 THE SOUTHERN HINDU KUSH (TABLE 6)

The outdoors

Stupa: At Hadda, the available records for each example are limited, however, the main stupa and the small stupas at Tapa Shotor and Lalma are reported to have stone masonry structures coated with white plaster, and the modelled sculptures are also made of white plaster (Kuwayama 1973; Mostamindi & Mostamindi 1969; Mizuno 1968: 73–78). Barthoux's report contains

few specific details about the materials of individual examples, but the sculptures on the stupas are generally described as being made of white plaster (Barthoux 1933: 58, etc.). On the other hand, the later examples of Tapa Sardar (no. 4, 7, 8, 10), following Hadda, it's reported that the sculptures and stupas are made with a yellowish earth inner structure and a reddish earth outer layer (Taddei & Verardi 1985: 20).

Building exterior: No description of individual cases, and it remains unclear.

Roofed: The examples of Tapa Sardar are made of earth, like the above stupas, and seem to be supported by the behind structure made of earth (Taddei & Verardi 1985: Pls. 4, 5).

The indoors

Stupa: Descriptions of individual cases are not available in Hadda, but the observation of small stupas and sculptures from the collections of the Guimet Museum (cf. TK23, 121), which are also made of white plaster. Taken together with the interpretations by Kuwayama (1973) and others, it can be inferred that most stupas examples in this site group were likely constructed and sculpted using white plaster.

Interior space: Records on the examples at Hadda are scarce, making it difficult to discuss the collected cases in detail. However, Barthoux mentions that walls are built with beaten earth, and some thick ones are supported by a less than 0.9m structure with rubble and earth (Barthoux 1933: 14, 17), while some interior walls in chapels were usually coated with white plaster (id. 62). For instance, the wall at B56 at Bagh Gai is reported to be made of beaten earth with a white plaster coating, and the sculpture's finish is white plaster (while the inner structure is unknown). In the case of Tapa Shotor, it has been reported that both the interior walls and sculptures were primarily made of earth (Mustamandi 1968a, b; Kuwayama 1973, etc.). Outside Hadda, most building materials were composed of sun-dried bricks, although stone masonry was also used, like in Tepe Narenj for the lower part of the wall (Paiman & Alram 2013). Surface

coatings were typically made of earth (cf. TN: 22; MAK; TS: Vihara17, Ch23, etc.). At Gol Hamid in Mes Aynak, a mixture of white plaster⁴⁵ and earth has been reported (Paiman 2010: 62). The modelled sculptures in these examples are all mainly made of earth. At Tepe Narenj, the sculptures coated with white plaster are typical of the earlier phase.

Wall niche: While some details of Hadda examples remain unclear, B56 is reported as mentioned above. It is believed that both Tapa Shotor and Fondukistan were constructed using sun-dried bricks, and it has been reported that earth was used for the modelled sculptures (Kuwayama 1973; Tarzi 1976; Novotny 2017). The Tapa Sardar sculpture in niche 76 is modelled with earth. The surface coating of each example is not clearly described, but it is assumed to have been made from earth-based materials, depending on the overview description of construction materials and photographs. In niche C of the Tapa Shotor,⁴⁶ traces of white plaster were reported on the interior walls (Mustamandi 1968a: 64), but such a coating is not mentioned in the sculpture.

Table 3 summarizes the cases in which materials used for sculptures and architecture were recorded in the southern Hindu Kush. Surface coatings of white plaster and earth-based materials are evident, with the latter being predominant at sites outside Hadda, where modelled sculptures were also primarily made of earth. The use of white plaster as a surface layer on sculptures made of earth is also observed.

4.3 THE NORTHERN AMU DARYA (TABLE 5)

The outdoors – Roofed

Dalvarzin Tepa is thought to have been built with sun-dried bricks and coated with an earth material (SUSRRRC 2012: 12–31, 293). The dug-out space on the east wall is believed to have been constructed with sun-dried bricks, with an earthen wall surface applied⁴⁷ (SUSRRRC 2012:

294), and Room 3 is assumed to have been constructed in the same manner. The modelled sculptures are made of earth, with some having a white plaster layer over an earth-based structure (SUSRRRC 2012).

The indoors

Interior space: The chapel in Complex B of South Hill in Kara Tepa is recorded as a ground-level building made of sun-dried bricks coated with earthen materials, and the sculptures are made of earth (Stavisky 1996: 45–46; Kovaleva 1996: 224–231). The giant reclining Buddha at Ajina Tepa is made of earth, and the wall and base on which the statue is placed are assumed to have been constructed of bricks and coated with earthen material (Litvinskij 1971: 81–82, Litvinskij & Zejmal 2004: 55–56).

Wall niche: At West Hill in Kara Tepa, the structures are made of sun-dried bricks with earth coating (Pidaev 2002: 98). The examples at South Hill in Kara Tepa were carved in sandstone. The niches in Complex D have a layer of earth that seems to cover the entire niche and a white plaster coating on some parts. Complex E has a thin layer of white plaster on its surface with what appears to be a layer of earth in between; the base is made of earth. The modelled sculptures are made of earth and have a white plaster layer on their surface (WH-Courtyard: Pidaev 2002: 101, SH-D: Stavisky 1996: 66–70, Kovaleva 1996: 239–241; E: Stavisky 1996: 83–86, Kovaleva 1996: 242–245). At Ajina Tepa, there are no exact records of materials for each niche; the site is reported to have been constructed with sun-dried bricks or clay blocks, while walls were coated with a mixture of earth and straw (Litvinskij 1971, Litvinskij & Zejmal 2004: 55–56). Thus, it is assumed that the niches were built in the same manner. The sculptures are reported to be made of earth (Litvinskij 1971: 80, 83, 92).

In the northern Amu Darya, buildings are generally constructed of earthen materials such as sun-dried

ARCHITECTURE		SCULPTURES		EXAMPLES
SURFACE COATING	FINISH COATING	INNER LAYER	OUTER LAYER	
White plaster		White plaster		Stupa 【Larger】 TST: Main stupa; LM: Main stupa 【Smaller】 TST: Stupa 7 (11, 12, 14, 19) ; LM: Stupas 3–5 Outdoors
Earth		Earth		Stupa 【Smaller】 TS: nos.4, 7, 8, 10 Roofed
				Wall niche TN: Zone XIV (no.15) Indoors
				Interior space TST: D, F, J, K, G, H; TN: Chapel 6, Zone XIV (nos2, 9), TS: Vihara 17, Ch23
Earth + white plaster		Earth		Interior space MAG: West Chapel
Earth		Earth	White plaster	Interior space TN: Chapel1, 3, 4, 8*, Zone XIV (nos.1*, 3, 4*, 5*, 7*, 8, 10, 12, 13, 16)

Table 3 Patterns in architectural and sculptural materials in the southern Hindu Kush.

Items in parentheses: Not described in the text, but estimated from photos.

*: A red earth coating was added later.

CATEGORIES		DHARMA-RAJIKA	KALAWAN	JAULIAN	PIPPA-LA	MOHRA MORADU	BHAMALA	RANIGAT	MEHA-SANDA	THARELI
Outdoors	Stupa	Larger	P1, Stupa1, 2 J1, K1	-	Main stupa	Stupa K	Main stupa	West-south court: stupa 301	Main stupa	D stupa 10
		Smaller	-	-	Stupa D4, 5, A2, 11, 15, 16, 20 (D1, 2, 3, 5, 6, 7, 8, 10) *	Cell 31 stupa	A1, 15	East court: stupa 122, 136, 163, 164, 165, 168, 172 West court: 217	Stupas 8, 9, 20	D stupas 2, 4
Building exterior		R1?	-	C32, 34	-	【Roofed】 Vihara 1, 2, 5, 7, 11, 12, 23	Stupa court gate	East court: R.116	Chopels 21, 22, 46	D: 7-8, 9, 24, 60, C: 100-ii
Indoors	Stupa	-	-	-	-	Cell 9 stupa	-	-	-	-
	Interior space	N17, N18	B20	E1, 2, C19, 33	-	-	-	-	-	-
	Wall niche	-	-	S1, 2, 3, 5	-	Monastery entrance, Portico, Cells 4, 21, 22, 26	-	-	-	D14'
References		Marshall 1951	Marshall 1951	Marshall 1951	Marshall 1951	Marshall 1951	Marshall 1951	Nishikawa 1999	Mizuno 1969	Mizuno, Higuchi 1978

Table 4 Cases found in surviving *in situ* records concerning northwest Pakistan.

*: The cases where sculptures appear to remain from photographs, but the details are unclear.

CATEGORIES			KARA TEPA	DALVARZIN TEPA-DT25	AJINA TEPA
Outdoors	Stupa	Larger	–	–	–
		Smaller	–	–	–
	Building exterior		–	【Roofed】 Room 3 south, east, north wall	–
Indoors	Interior space		SH-C: chapel NH: Center room on the north side of the main stupa	–	XXII
	Wall niche		SH-C: entrance to cave no.1, -D: courtyard, -E: courtyard south wall WH-A: East wall of the east side room, Central niche of the west wall of the courtyard	–	XXII niche No. 1, XXV niche No. 1
References			Stavisky 1996, Pidaev 2002 Pidaev, Kato 2007	SUSRARG 1997	Litvinskij 1971, Litvinskij & Zejmal 2004

Table 5 Cases found in surviving *in situ* records concerning the northern Amu Darya.

bricks or clay blocks (paksha), with layers of earth applied on the surface and, in some cases, covered with white plaster. An exception is Kara Tapa, where the parts of the temple were carved out of sandstone but appear to have been covered with earth and then white plaster. Although examples are very limited, the modelled sculptures are mainly made of earth, and some have a white layer of plaster on the surface.

5. DISCUSSION

5.1 CHARACTERISTICS OF SCULPTURE PRODUCTION IN TEMPLES

Modelled sculptures outdoors are typically found in northwest Pakistan and Hadda, but are scarce outside these regions. These are commonly made as the exterior of structures, especially stupas, are distinctive in these regions, and it is common to find representations of the Buddha along the vertical faces of their base. On the small stupas, most sculptures appear as small, often formalized and uniform in appearance. In contrast, sculptures associated with larger stupas are comparatively diverse in scale and depictions, ranging from slightly smaller than life-size to larger-than-life. Although small stupas tend to be formal in composition, in contrast to the predominance of seated Buddhas in northwest Pakistan, a broader range of representational forms is seen in Hadda examples. Other than stupas, the examples of exterior buildings are a distinctive feature of northwest Pakistan, and they are more commonly associated with the outer walls of chapels. These are more relief-like, including cases where seated figures are placed within pilasters or aligned in series, employing representational schemes like those found on stupas

in the same region. Conversely, at Tapa Kalan in Hadda, examples exist where benches were installed, and sculptures placed upon them. These appear to have been added in later periods.

Indoor examples are widely recognized within the region. For interior space, most are small chambers regarded as chapels. In northwest Pakistan, chapels containing sculptures are in stupa courts. Similarly, along the southern foothills of the Hindu Kush, chapels associated with stupa courts are common. However, a notable characteristic of this region outside Hadda is the presence of examples modelled in chapels that do not belong to or are directly accessible from either stupa courts or monastic complexes. In chapels, a common configuration involves a central Buddha statue along the rear wall, accompanied by multiple images placed along the side walls, a layout observed especially in northwest Pakistan and at Hadda. Additionally, there are examples of small chambers that house a central votive stupa and feature multiple modelled sculptures on the surrounding walls, as attested at Hadda and Tepe Narenj. Another configuration, where a main figure is placed on a pedestal on each wall, became prevalent in the southern Hindu Kush region outside Hadda. At Tapa Sardar, there are also examples of figures placed in each corner of the room; it is attested from Afghanistan to the Tarim Basin ([Forgione 2023](#)). In addition to chapels, there are several examples of corridors preserved outside northwest Pakistan, but regularity cannot be discerned in their arrangement or composition.

Wall niches occur throughout the region, though their locations vary, and are thought to have been created in relation to people's movement routes. The compiled examples can be broadly categorized into those associated with stupa worship and those associated

CATEGORIES	HADDA		TEPE NARENJ		MES AYNAK		TAPA SARDAR	FONDU-KISTAN		
	TAPA KALAN	TAPA-I KAFARIHA	BAGH GAI	LALMA	TAPA SHOTOR	KAFIRIAT TEPE			GOL HAMID	
Outdoors	Stupa	Larger	TK141	K1, 35	B12, 70	Main stupa	Main stupa	-	-	-
		Smaller	TK4, 25-33, 35, 36, 43-45, 46, 53-55, 56, 60, 62, 65, 67, 69, 70, 71, 73, 78, 84, 86, 88, 89, 92, 95, 97, 98, 100, 102, 106, 110, 116-a, 138, 139	K8, 10, 11, 15, 18, 36, 37, 42, 43, 44	B4, 6, 7, 18, 19, 21b, 23, 31, 58, 66-67, 76-77	Stupas 3, 4, 5	Stupas 7, 11, 12, 14, 19	Stupa 20		-
Indoors	Building exterior	F, G, I, J, L, M	K38	-	-	-	-	-	no.18	-
	Other	-	-	-	-	-	-	-	【Roofed】Throne6, 9	-
	Stupa	TK21, 23, 118, 121, 124-1, 124-2, 133	33, 45, 46	29, 51, 52	-	-	-	-	-	-
	Interior space	TK21, 23, 118, 119, 120, Cellure 121, 122, 123, TK124, 124 bis 128-129, 132, 133	K19, 23, 25, 27, 28, 29, 30, 32, 33, 45, 49	B30-a, 56 (b, f, h, l, m/n)	-	Chapels D, F, J, K, G, H (Niche XII)	Stupa court: Plinth Monastery: South chapel, North chapel, Central room	nos.14, 15, Room 36 (nos.44-46), 75 (nos.84, 85, 108), Chapel 17, 23, 37, 50, 63, 100, 163	-	-
	Wall niche	TK6, 8, 10, 11, 13, 16, 18, 23, 142, 144, 145	-	B29, 30-b, 56 (c, d, g, i, p, q, r, s, t, u, x)	-	Niches C, B, E-XXIV-b, -XXIV-k, V1, V2, V3	Zone XIV no.15	-	Niche 76	Niches C, D, E
	References	Barthoux 1933	Barthoux 1933	Barthoux 1933	Mizuno 1968	Mustamandi 1968a, b, 1969, Kuwayama 1973, Tarzi 1976, 2005	Paiman 2005, 2006, 2008, 2010, Paiman & Alram 2013	Kabul National Museum 2012	Paiman 2010, Kabul National Museum 2012	Taddei 1968, Taddei & Verardi 1972, 1978, 1985, Verardi & Paparatti 2005

Table 6 Cases found in surviving in situ records concerning the southern Hindu Kush.

with other forms of movement. The former are found throughout the region but are particularly common in the southern Hindu Kush. The latter are frequently associated with monastery corridors or passageways, being predominant in northwest Pakistan, while elsewhere they appear mainly in relatively early-period sites where monasteries remain, Kara Tepa and Tapa Shotor. Furthermore, in the Kara Tepa in the northern Amu Darya, it is characteristic to possess a courtyard and to create niches in the walls of the structures forming it. As for the compositional scheme, in which a central seated Buddha is placed on the rear wall with multiple attendant figures along the side walls, is observed from northwest Pakistan through the southern Hindu Kush, this is the same as the situation of chapels. In contrast, the predominant arrangement north of the Amu Darya appears to involve a single seated Buddha placed alone, and this type is also seen in Hadda.

Two features are confirmed in the sculptural modelling. One with a relatively strong emphasis on architectural decoration, mostly consisting of two-dimensional, more relief-like expressions that are closely associated with the vertical walls, tends to be formal and typological. The other is essentially as objects of veneration, three-dimensional and more statue-like expressions that tend to feature sculptures placed on pedestals or benches and are treated with care. It can be said that modelled sculptures associated with temple architecture possess dual characteristics: they serve as objects of worship and as architectural decoration. While some examples more clearly embody one aspect, others show a more intermediate balance between the two. As a tendency, outdoor examples have more decorative characteristics related to the surrounding architecture, while indoor ones have characteristics that more acutely serve as images for worship. Among the more statue-like examples, some appear to have been positioned as intentional components of the spatial layout, whereas others seem to have been added gradually through donations and other forms of patronage.

To sum up the regional trends, architecturally decorative ones like reliefs on stupas and exterior buildings are common in northwest Pakistan, while sculptures are also found in interior spaces and niches. In the southern Hindu Kush, while examples of Buddha images rendered decoratively on stupa exist especially at Hadda, the production of sculpture as such within interior buildings or niches is predominant. The northern Amu Darya region is the same as the southern Hindu Kush, and as far as collected case examples of architectural decoration are rare, suggesting that sculptural modelling was undertaken as statues from the outset.

In terms of images, as mentioned in previous studies conducted at the regional level ([Marshall 1951](#), [Nishikawa 1999](#), etc.), the examples show that traditional Buddhist narrative scenes are rare; rather,

the solitary Buddha statue, the configuration of Buddha and worshipers, repetitive depictions of Buddhas and Bodhisattvas, sometimes in large sizes, are characteristic features. Additionally, secular images, such as devotees, become common. This indicates a strong inclination toward revered figures such as Buddha statues and Bodhisattvas rather than narrative stories, suggesting that the ideological basis of modelled sculptures differs from that of stone art.

5.2 RELATIONSHIPS BETWEEN TEMPLE ARCHITECTURE AND SCULPTURES

Detailed information drawn from careful observation of temple architecture and modelled sculptures is critical for the study of the relationship between them, but such records are limited. Therefore, this paper estimates trends and correlations between the two based on surface coatings found on the architecture surrounding modelled sculptures and the materials used for the sculptures.

Published records confirm that these combinations of construction methods and surface coating vary across buildings, even within the same site, however, they also confirm that each region does have its own tendencies. In northwest Pakistan, earth is sometimes used indoors, but white plaster finish on stone masonry is the norm. North of the Amu Darya, construction with sun-dried bricks with clay blocks is common, often covered with earth, and these are occasionally finished with white plaster. In the southern Hindu Kush, the use of various building materials and surface finishes is observed, but the walls constructed with earth or sun-dried bricks and earth coating are predominant and have become the norm outside Hadda.

The collected examples show that sculptures associated with buildings finished with white plaster are reported to be made of white plaster. Similarly, sculptures along earthen walls tend to be primarily made from earth. From reports and records, it can be assumed that the materials inside the sculptures follow the same trend. However, one report on the main stupa at Jaulian (Stupa 1) notes that the core of modelled sculptures attached to a stupa finished with white plaster was made from earth-based materials ([Marshall 1951: 371](#)), suggesting that exceptions may exist. Nonetheless, at the very least it can be said that the material on the outer surface of modelled sculptures is harmonious in color and texture with the surface of the edifices on which they are affixed.

White plaster is primarily found in northwest Pakistan and Hadda, where it was used to decorate stupas. In some cases, similar materials were used for the core, while in the chapels of northwest Pakistan, modelled sculptures made with earth-based materials and finished with white plaster added to their surfaces have also been reported. Sculptures formed from earth with a relatively thin layer of white plaster on their surfaces are common

in both the northern Amu Darya region and the southern Hindu Kush, indicating that this is a characteristic feature of the surrounding area.

The use of earth is widely recognized in the production of Buddhist sculptures in Central Asia. Although there are only a limited number of records of *in situ* examples in northwest Pakistan, some reports of earth-based sculptures, often identified as terracotta, have still been found (Marshall 1951: 468–472; Nishikawa 1999: 111). It is uncertain whether the terracotta was intentionally fired, but the presence of earth materials is acknowledged. At Hadda, earth-based sculptures have been found among items housed in the Guimet Museum (cf. KF: MG1791, 17283, 21203; TK: MG17235), and at the site of Tapa Shotor, it seems that the use of earth was not so uncommon. In the southern Hindu Kush, the use of earth-based sculptures became the norm outside of Hadda. In contrast, no such shift is recognized in the northern Amu Darya, suggesting that the use of earth has been the predominant method there from the start.⁴⁸

5.3 MATERIALS USED IN MODELLED SCULPTURES

In this paper, the materials used in modelled sculptures have been organized into two categories: white plaster and earth, each of which can be distinguished by the naked eye. However, white plaster likely contains at least two distinct materials, lime and gypsum, and even those categorized as earth likely include several types, such as clay, silty, or muddy variants. Based on previous reports and analytical results where materials were specifically identified, a summary is provided to discuss the finer aspects of each of the categories of white plaster and earth.

First, it has already been mentioned that white plaster is predominant in the northwestern part of Pakistan and Hadda. Many of these instances of white plaster are reported to be made from lime (Marshall 1951; Mizuno 1969; Mizuno & Higuchi 1978; Nishikawa 1999, etc.). In the archaeology of northwest Pakistan, well-bonded, white-finished materials are generally considered to be lime. It is not unreasonable to assume that lime was commonly used in this region, as some Buddhist sites are known to have water tank facilities for mixing lime⁴⁹ (e.g. Thareli, Ranigat), and Taxila is located near a limestone source (Rosa et al. 2019, etc.). Additionally, the frequent use of white plaster in outdoor environments suggests that lime, which is more durable than gypsum, was preferred.

Other regions, such as Hadda (Pannuzi et al. 2019: nos.6 & 7) and Mes Aynak (Ohlidalová et al. 2016: Cat. no. 49), have also confirmed the use of lime in modelled sculptures through scientific analysis. At Mes Aynak, there are cases where sculptures were made with earth and coated with lime (Ohlidalová et al. 2016: Cat. nos.21 & 51).

The use of gypsum has been reported in examples from regions surrounding the Hindu Kush mountains. In the southern foothills, sculptures from Tepe Narenj (Ohlidalová et al. 2016; López-Prat et al. 2024) and Mes Aynak (Ohlidalová et al. 2016; Tisucká & Stančo 2016: Cat. no. 30) have been found to contain gypsum. In the northern Amu Darya, the white plaster surface is reported to be made of gypsum (Stavisky 1996; Pugachenkova & Turgunov 1989). While it is unclear whether each of these findings was based on scientific criteria, the analysis of sculptures from Dalvarzin Tepa confirmed the use of gypsum for the modeling paste (SUSRRRC 2012: 272–275, 285–286), supporting the validity of previous reports. Furthermore, it has been proposed that at sites such as Lalma and Mekhasanda lime was poured into gypsum shells (Mizuno 1968: 79; Mizuno 1969: 39), although the grounds for this identification are not clear, and the result of the chemical survey, which was conducted summer in 2025 by the authors, indicates that most of the Mekhasanda subjects are lime-made. These details will be published in the near future.

The materials referred to as earth have not yet been systematically compared or studied from a unified perspective, and the specific characteristics of earthen materials in different regions have not been established. However, regarding sites like Tepe Narenj and Tapa Sardar, there have been reports of red earth being used on the surface of modelled sculptures (Forgione 2019; Taddei & Verardi 1978: 46–47), and similar examples have been found among sculptures in the Fondukistan. This technique is noted to have become prominent in the southern foothills of the Hindu Kush in the late seventh to early eighth centuries (Forgione 2019), representing a specific timeframe for its use.

6. CONCLUSION

The results show that the locations where sculptures are made in temples exhibit regional and possibly temporal variations, and the functions tend to differ depending on the location. The modelled sculpture serves both architectural decoration and stature roles; the former aspect is typical of stupas and exterior walls in northwest Pakistan and Hadda. Still, outside these regions, the preference for stupas or the mass construction of stupas is uncommon, and sculptural decoration of architecture is scarce, with more statue-like examples in protected spaces predominant.

A correlation was observed between the materials used in architecture and those used in sculptures. In terms of regional trends, Buddhist temples in northwest Pakistan predominantly used white plaster as a surface finish, and many modelled sculptures were made from this material. In northern Amu Darya, temples were mainly constructed with earthen materials such as sun-

dried bricks and earth-based surface coating, while the sculptures themselves were mainly made of earth. In the southern Hindu Kush, several architectural types have been found, and sculptures primarily made of white plaster and others mainly composed of earth were identified. In this region, building surfaces primarily covered by earth and earthen sculptures became dominant outside of Hadda, showing a shift in the use of materials over time. The above indicates that the production of sculptures had been closely related to the architecture of Buddhist temples, suggesting the possibility that craftspeople played a key role in the production of sculptures. While regional trends are evident, it is important to note that even within a single site, multiple construction methods and surface finishes have been identified and, accordingly, various materials and techniques used to produce sculptures also exist. Earth-based sculptures in particular are found across different regions, and careful consideration is required when discussing regional characteristics.

Due to difficulties in visually distinguishing materials, this paper uses the term white plaster as a convenient label, though it includes different materials and techniques, such as lime and gypsum. Likewise, earth encompasses a variety of types. Given the heavy and bulky nature of these materials, namely, the earth and white plaster used in sculpture production, it is assumed that both were sourced from quarries near the temples. Therefore, the materials are expected to contain information that is geologically characteristic of their origins. In the future, more detailed studies including scientific analysis are expected to clarify the specific regional characteristics of the materials in these archaeological findings.

NOTES

- Gandhara is the ancient name for the region around the present-day Peshawar Basin in northwest Pakistan. In studies of this area, the term 'Gandhara' is often used, from a cultural and historical perspective, to refer more broadly to the Gandharan cultural sphere, encompassing Taxila to the east, Swat to the north, and Nagarhara to the west. In this article, the term 'Gandhara' is used in the latter sense.
- Adding water to CaO (calcium oxide, or quicklime) produces Ca (OH)₂ (calcium hydroxide, or slaked lime), which will then react with carbon dioxide to release hydrate, thereby producing CaCO₃ (calcium carbonate, or lime). For gypsum, adding water to CaSO₄ · 1/2H₂O produces CaSO₄ · 2H₂O, which solidifies the material. While gypsum may harden through this inherent chemical reaction, it may also be consolidated using an adhesive binder.
- Exception: PP: 31; TS: Small Stupas.
- JL: Small stupas; PP: Cell31; BL: A1, 15; RG: Stupas 163–165, 168, 172, 217; TH: D Stupa 2; TK: Small stupas other than TK67, 70, 84, 86, 92; KF: Small stupas; BG: B4, 6, 7, 18, 19, 21, 23, 29, 31, 76–77; TST: Stupa 11, 12, 14; LM: 3–5; MH: Stupa 20.
- DR: K1; RG: St.217; JL: D4, A11, 16; TK: TK43–45, 65, 118; KF: K43, BG: 7, 31; LM: Stupa 4, 5, MM: cell 9, TS: Stupa 20.
- JL: D4; PP: Cell 31; TH: D Stupa 2; BG: 7, 76–77; TST: Stupas 14, 19; KF: K45.
- TK: TK62, 84, 92; BG: B7, 19, 31, 51; TST: stupas. 7, 19; KF: K45; TS: no.7.

- JL: A11, A15; TK: TK46, 67, 86, 95, 116-a; BG: B58.
- TK: TK35?, 73.
- TK: TK46, 124, 124bis, 133; BG: B31.
- MM: Main Stupa; KF: K1.
- JL: Main Stupa; PP: Stupa K; BH: Main stupa; RG: Stupa 301; MH: Main stupa; TK:141; KF: K35; BG: B12, 70; LM: Main stupa; DR: K1, J1, Stupa2.
- JL: Main Stupa; KF: K1; TST: Main Stupa; LM: Main stupa; DR: P1; MM: Main stupa.
- RG: Stupa 301, BG: B12, 70; TST: Main stupa; DR: K1.
- PP: Stupa K, MM: Main Stupa; TST: Main stupa; DR: J1.
- KF: K35; TST: Main Stupa.
- Tapa Sadar is dated based on archaeological stratigraphy, with the above cases considered to date the later period, from the eighth century onwards (Verardi & Paparatti 2005).
- JL: C32, C34; RG: R116; MH: Chapel21, 22, 46; TH: D7–8, 9, C100-ii.
- MH: Chapel21, 22, 46; TH: D7–8, 9, C100-ii.
- MS: Chapel 22; TH: D9.
- BM: Stupa court gate, TH: D60.
- In this site of outside monuments, small stupas and thrones are thought to be protected by a wooden structure, likely a roof based on its wooden remains (Verardi & Paparatti 2005: 438), so no. 18 may have been protected even though it belonged to the outer wall.
- Between pillars: TK: TK21, 23, 118, 124, 133 (also remain on cylindrical body), In niches: MM: Cell 9 (cylindrical base), With attendant: KF: K45
- DR: N17, 18; TK: TK23, 121, 122, 123, 124, 128–129; KF: K19, 23, 27, 28, 29, 30, 33; TST: Chapel D, F, G, H, J, K; TS: no.14–15, Chapel 17, 23, 37, 50, 63, 163, KT: NH
- KW: B20; MAK: monastery chapels; MAG: monastery chapel.
- BG: B56; TS: Chapel 100, TN: Chapels.
- KW: B20; JL: E1; TST: Chapel G, K; TN: Chapel 3; MAK: Stupa court, MAG: West Chapel.
- Tarzi and Mustamandi regard this place as a niche, while Kuwayama identifies it as a chapel. In terms of size, it is comparable to other chapels and larger than the niches at the site. Therefore, it is possibly accessible and is not treated here as belonging to Wall Niche.
- TK: 21, 23, 118, 121, 124, 128–129; KF: 23, 25, 33; TN: Chapel 1, 4.
- DR: N18; TN: Chapels 6, 8; TS: Chapel 23, etc.
- TS: Rooms 36, 75. It is a similar configuration in TK: 124.
- cf. TK: 119, 120, 122, 123, 132?; KF: 19, 27–29.
- TK: 120?, 132; BG: B56; KF: K45; AT: XXII.
- TK: 119, TN: Zone XIV.
- JL: C33; TK: 119; TST: Chapels K, etc.
- TN: Chapels 1, 3 [Central Buddha], 4, 6, Zone XIV; MAK: South, North Chapel; TS: Chapel 100.
- TK: 119, Cellure 123; TST: Chapels K, etc.), and over 7 m (MAK: South Chapel; DR: N18.
- JL: Cell 1, 2, 17, 29; MM: Entrance, Cell 4, 21, 22, 26.
- TK: Niches, BG: B56, TST: Niche E XXIV; FD: Niches; KT: WH-A East room.
- BG: B56; KT: SH-C; AT: XXII, XXV.
- JL: Cell 1, 2, 17; MM: Room 4, 21, 22, 26; TH: D14?, TK: TK10, 16; BG: B30; TST: V1, 2, 3, Niche-E XXIVb, -k; KT: SH-E courtyard. The example from Kara Tepa SH-E is considered to represent a specific Buddhist scene in Gandhara (Stavisky 1996: 85), but only the feet remain, making it difficult to determine. In other cases, only the lower body remains, and the original appearance of the sculptures cannot be conclusively identified.
- TK: TK6, 23; BG: B29; TS: no. 76; KT: WH, NH, SH-C, -D niches; AT: XXV no.1.
- TK: TK10, 11, 18.
- There is no clear description of Jaulian C34, but photographs suggest it is a white plaster statue (Marshall 1951: Pl. 106-b).
- The material is referred to as 'stuc' and further details are not given.
- The name of the niche is not specified in the Mustamandi (1968a) record, but based on the description of the niche and the photograph, it is thought to correspond to Niche C in

Kuwayama (1973). However, the location indicated by the map of Mustamandi (1968b: 69) differs from the place where Kuwayama regarded Niche C, but it corresponds to Niche D.

- 47 The extent of this is unknown, but there are also parts where murals were painted on a thin layer of earth and white plaster (Pugachenkova & Turgunov 1989: 522–523). Given the presence of mural paintings, one would expect the painting of the sculpture to have a harmonious relationship with the wall painting on which the sculpture is settled.
- 48 Earth-based sculptures were also excavated from Fayaz Tepa (Al'baum 1974), an early Buddhist site in the region, but these have not been included in this article due to a lack of *in situ* records. The site is estimated to date from the first to fourth centuries AD (Fussman 2011, Pidaev 2020), suggesting that earth-based sculptures were made from an early date.
- 49 These tanks reportedly had traces of white powder inside (Mizuno & Higuchi 1978: 46, Nishikawa 1999: 69). Because gypsum hardens within a few minutes of being watered, making large-scale preparation facilities like water tanks unnecessary, these are thought to be for lime preparation.

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