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Endemic architectural forms of Malabar and South Canara: the role of building material in shaping megaliths and temples

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The strip of land constituting the regions of Malabar and South Canara along the western coast of India is renowned for unique architectural forms endemic to the region, including protohistoric megaliths and medieval temples. This paper argues that this propensity for architectural endemism is primarily due to the properties of locally available building materials – mainly laterite and timber, rather than the geographical isolation imposed by the Western Ghats and the Arabian Sea, as traditionally believed. The megaliths in this region, mostly from the Iron Age (1000BCE-500CE), and the medieval temples (800-1700CE), exhibit adaptations of the mainstream architectural traditions to suit the physical properties of laterite. This paper examines how architectural forms originally developed for construction using hard stone were re-interpreted to accommodate the properties of laterite. By analysing examples from both megalithic and temple contexts, it highlights the role of building material in determining the architectural identity of Malabar and South Canara.

Keywords: Laterite, Malabar, Megaliths, South canara, Temple architecture

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The part of the western coast of India, from Daman in the north to Kanyakumari in the south, is unique in terms of its geography and built-heritage. It comprises the Konkan, Kanara, and Malabar plains, forming a narrow stretch between the Western Ghats and the Arabian Sea. This stretch is characterised by a warm-humid climate with seasonal monsoons that lasts for almost four to six months. Laterite and timber constitute the predominant naturally available building materials. This study focuses on the region comprising the Malabar coast and the erstwhile South Canara district. Malabar coast extends from Kanyakumari district (Tamil Nadu) in the South to Kannur district (Kerala) in the north, whereas South Canara historically included the present-day Kasaragod (Kerala), Dakshina Kannada and Udupi (Karnataka) districts.

This region is well-known for its unique architectural forms, endemic to the area. Traditionally, it has been argued that the geographical isolation created by the Western Ghats and the Arabian Sea led to the cultural uniqueness and the distinctive architecture of the region[1]. However, historical records suggest the existence of significant political and cultural connections, despite the natural boundaries[1-3], challenging the assumption that isolation was the primary factor shaping its distinct architecture. This paper examines the cause of architectural endemism in this region by studying two distinct monument types-megaliths and temples. Megaliths, dating to the Iron Age (1000BCE–500CE), represent the region's earliest form of monumental architecture of the region, while the temples, built between the 9th and 18th centuries CE, evolved over time. Megaliths and temples, unlike other monument types, are more widely distributed across the study area and neighbouring regions, making them ideal subjects for this research. By analysing their external forms, this paper explores their design responses to the local context and investigates the factors contributing to the unique architectural forms in Malabar and South Canara.

Methodology

This study employs comparative architectural analysis to examine how building materials influenced the development of endemic architectural forms of megaliths and temples in Malabar and South

Canara. The methodology is structured around four aspects: architectural forms of megaliths and temples, material use, and regional context.

Data was gathered through both fieldwork and secondary sources. Temples in Kerala and South Canara were documented through site visits, photographs, and measured drawings. Whereas data on temples from Tamil Nadu and other parts of Karnataka were collected mainly from literature sources, with limited field visits. The data pertaining to megaliths across all regions was obtained exclusively through secondary sources such as archaeological reports and academic publications, focusing on the various typologies and their distribution patterns.

The architectural analysis examined external form, layout, and spatial organization of the monuments. Additionally, features like plinth profiles, wall projections, roof and gable profiles, and decorative details were observed in the case of temples. These features were compared across regions to identify continuities amongst the forms and material adaptations.

Material study involved understanding the properties of laterite, timber, and granite, particularly their availability, workability, and durability. This was done based on literature study. This clarified how material influenced the architectural outcomes.

The contextual study focussed on historical, and geographical data to assess how political linkage, climate, physiography, and material availability shaped architectural responses. The monuments were analysed within this framework to bring out how regional factors and cultural continuity guided material choices and architectural form.

Megalithic forms in India

Megaliths are known to have existed since pre-historic times and are found across various parts of the globe. The term Megalith literally translates to large stone (*mega*: large; *lith*: stone)[4,5], though not all megaliths are necessarily built of large pieces of stones[6]. It is commonly used to refer to a class of memorial or burial monuments built using stone, while the term megalithic denotes a cultural practice that involves erecting stone monuments for the dead[6]. Nearly 3000 megalithic monuments/sites have been reported so far in India, and a major concentration of these are found in the southern peninsula[4-7]. Beyond their main areas of occurrence, megalithic structures are also found in scattered pockets across the country, including the Vidarbha region in Maharashtra, parts of Kumaon, Jharkhand, Bihar, and Kashmir (Fig. 1). Dating of the burial goods, artifacts, and tools from megalithic sites indicates that megalith construction in Indian sub-continent was at its peak during the Iron age[4,6,7]. Megalith-building practices also persist as a living tradition among certain tribes in the northeastern part of India[4,6]. However, it will not form part of this discussion, since they do not appear to be part of the same cultural complex.

Megalithic forms in the Southern Peninsula

Peninsular India exhibits a wide range of megalithic forms, which includes various subterranean features (burials) and surface markers. They exist in a variety of forms and size[5]. The common sub-terranean megalithic forms include pit burials, cist burials, urn burials, and rock-cut burial chambers (chenkalara). The various types of surface markers include cairns, stone circles, hat stones (thoppikkallu), dolmenoid cists, dolmens,

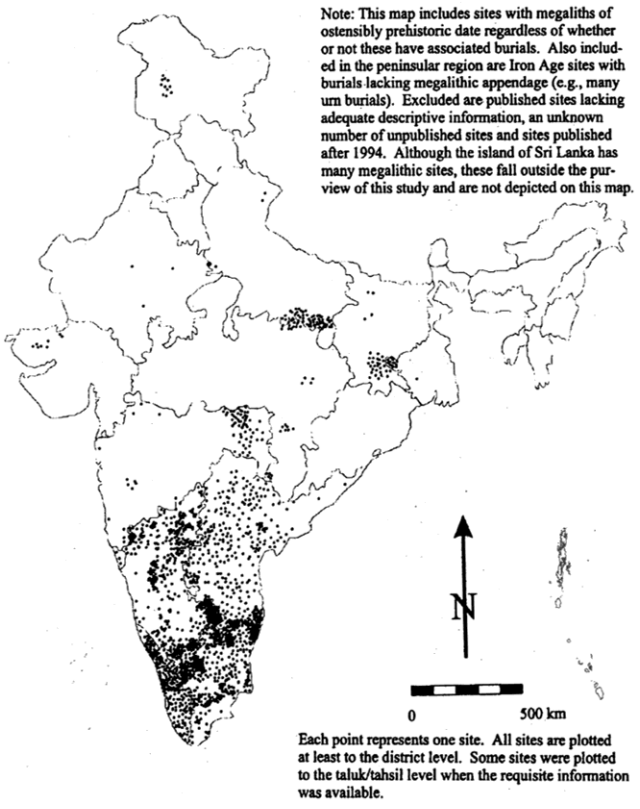

Fig. 1 — Map showing the distribution of reported megalithic sites in India
(Source: Adapted from 'Aspects of mortuary variability in the South Indian Iron Age' by Robert Brubaker, Bulletin of the Deccan College Postgraduate and Research Institute, 60/61, p. 254. Copyright by Robert Brubaker. Reprinted with permission)

menhirs, umbrella stones (kudakkallu), and hood stones (pathikkallu). While most of these megalith types can be spotted across the sub-continent, umbrella stones, hat stones, hood stones, and rock-cut burial chambers are endemic to the Malabar and South Canara region[4-6,8].

Pit burials (Fig. 2a) are roughly excavated pits where human remains are placed directly or within terracotta urns or sarcophagi. These burials are then covered with earth or gravel and, in some cases, capped using stone slabs or other surface markers[6,8]. While pit burials alone are not typically regarded as built monuments, they forma part of the broader cultural practice of commemorating the dead. Some pit burials also have megalithic surface markers, further linking them to megalithic traditions. Due to these associations, pit burials are generally categorised as megalithic monuments.

Urns (Fig. 2b) are large terracotta vessels that are used to keep the mortal remains, and these are often found associated with a pit or placed within a cist or a rock-cut chamber[6,8,9]. Cist burials (Fig. 2c) are rectangular underground chambers and these are often lined on their sides by thin stone slabs. Various surface markers like cairns, stone circles, cap stones, etc are used to mark these sub-terranean burial features[6,8].

Cairns (Fig. 3b) are surface markers and they are essentially mounds made of undressed rubble or in some cases, simple earthen mounds. Stone circles (Fig. 3a) are another type of surface marker consisting of dressed or undressed boulders arranged to form a circle. Stone circles can function as independent surface markers for burials and are sometimes found in combination with other markers such as cairns, dolmens, and kudakkallu[6,8].

Dolmens (Fig. 3c) are above-ground structures consisting of four erect stone slabs (orthostats) placed on their edges to form a box-like structure. They usually have a circular porthole on one of the erect slabs, usually on the east or west facing sides. While dolmens are generally considered commemorative[10], it is uncertain whether they originally had associated burials beneath them. Dolmenoid cists are variants of dolmens partly buried in the ground. The port holes in these structures are found closer to the ground level[6,8,9].

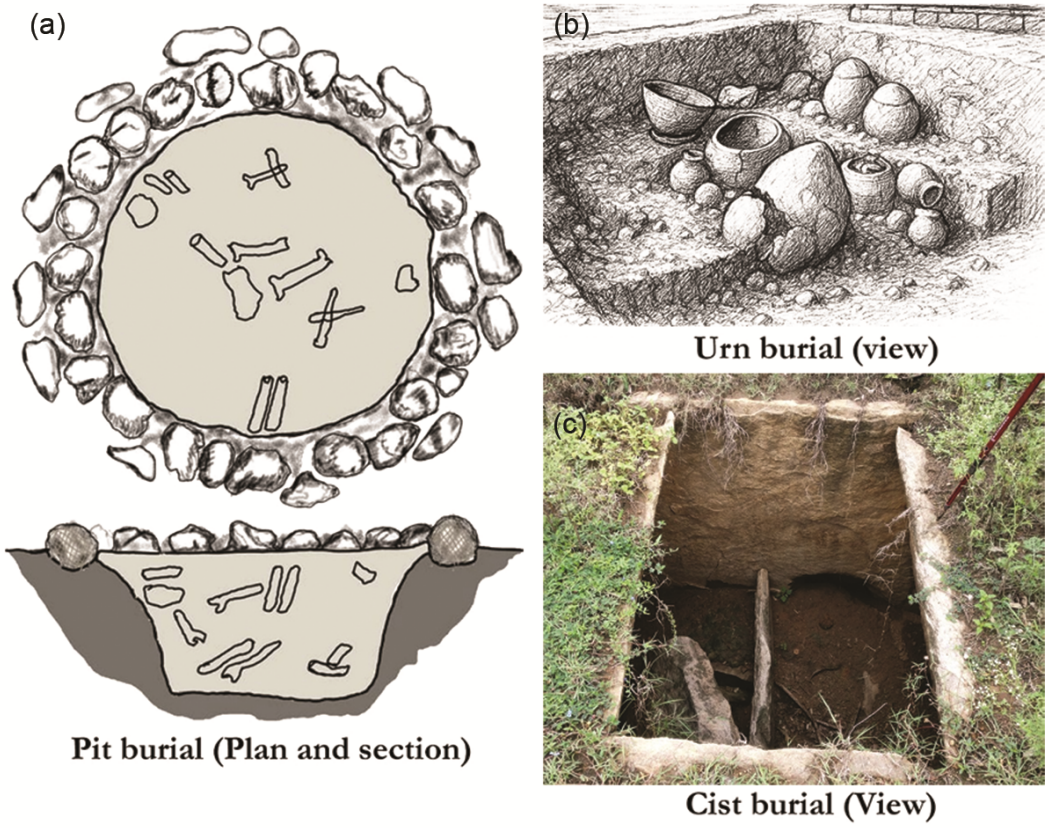

Fig. 2 — Forms of megaliths in the Southern peninsula
(Source: 2a, 2b – Author, 2c-Photograph by Srikumar M Menon, adapted with permission)

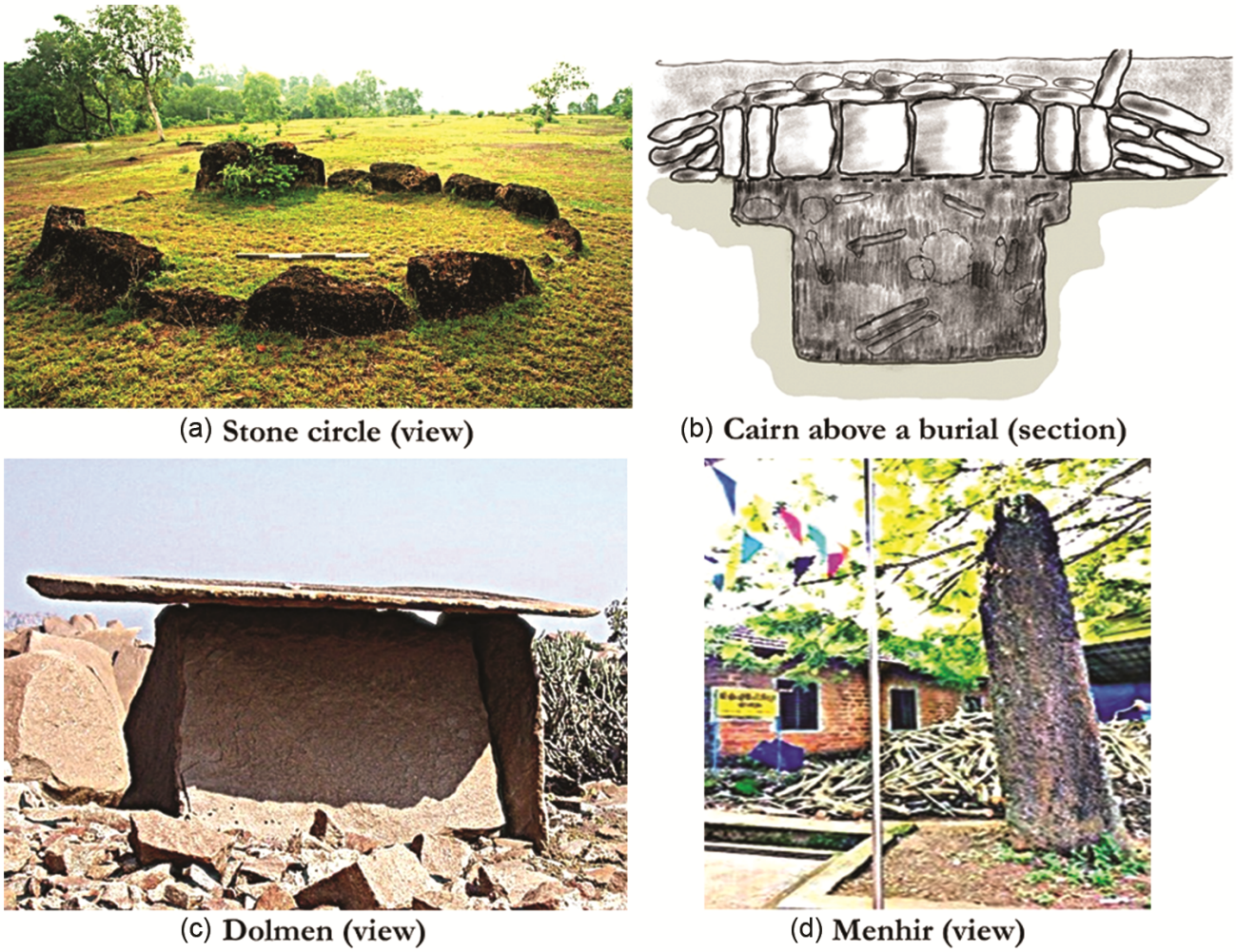

Fig. 3 — Forms of megaliths in the Southern peninsula

(Source: 3a - Adapted from 'Megaliths of Kerala: Commemorating Death through Monuments in Stone' by Rachel A. Varghese, https://www.sahapedia.org/megaliths-kerala-commemorating-death-through-monuments-stone. Copyright by Sahapedia. Reprinted with permission, 3b – Adapted from 'Site 41TA32', https://www.texasbeyondhistory.net/cairn/images/41TA32.html#. Copyright by Texas Archaeological Research Laboratory (TARL). Reprinted with permission, 3c,3d – Photographs by Srikumar M Menon, adapted with permission)

Menhirs (Fig. 3d) are boulders or erect stones that may mark a burial or be erected solely for commemorative purposes. Typically, they are monolithic and made of hard rocks like granite. However, in places like Anakkara and Malappuram in Kerala, menhirs made of laterite have also been observed[6,5]. At certain sites, multiple menhirs are erected in a grid-like pattern to form an alignment[11], while two parallel rows of menhirs form an avenue[6,8]. The purpose alignments and avenues remain unclear to date.

Megalithic forms in Malabar, and South Canara

The megaliths found in the region of Malabar and South Canara are mostly dated to the Iron Age; they appear in various forms as mentioned earlier[4-6]. While the region shares several megalith types with the broader adjoining landscape, it also exhibits endemic forms such as kudakkallu, thoppikkallu, pathikkallu, and chenkalara.

The Malabar region can be divided into three zones based on its physiography and geology. The nature of megaliths found in these zones is distinct and is largely determined by the materials available in each area[4]. Megalith types like stone circles, dolmens, dolmenoid cists, and menhirs made of hard stones like granitic gneiss and charnockite can be seen occupying the mountainous region of Malabar[4] where such material is abundantly available. In

contrast, the lateritic plains are characterised by forms such as kudakkallu, pathikkallu, thoppikkallu, menhirs and rock-cut chambers. Meanwhile, unmarked urn burials are predominant in the coastal alluvial plains[4].

Rock-cut chambers (Fig. 4a, Fig. 4e) are created by excavating laterite to form an underground chamber, where burial goods and mortal remains were placed in terracotta urns or sarcophagi. Access to the chamber is provided through a rectangular entrance court, with a series of steps cut out of the lateritic rock leading towards the chamber[6,8,9]. In most cases, the chamber is circular, and has a domed roof with a porthole opening to the outside. However, some examples have oblong or rectangular chambers with vaulted and flat roofs, respectively.

Kudakkallu or umbrella stone (Fig. 4b, Fig. 4f) consists of four inclined laterite members (clinostats), supporting a hemispherical capstone[4-6,8,9]. Each clinostat is roughly shaped into a truncated triangular profile, and they are joined to form a tapering stalk-like structure with a circular cross-section. The hemispherical capstone is placed above this stalk, giving a mushroom-like appearance to the monument. Umbrella stones function as surface markers for urn burials underneath. While rock-cut chambers are found in the lateritic plains of Malabar and South Canara, umbrella stones are primarily found in the central and northern Malabar region[12]. However, recent studies have identified Kudakallu in the Hosdurg region, which was earlier part of South Canara[12,13].

Thoppikallu or hat stones (Fig. 4c & Fig. 4h) are surface markers for burials seen in the Malabar region. These are dressed laterite stones roughly shaped into a hemispherical form[6,8]. Pathikkallu or hood stones (Fig. 4d, Fig. 4g) are dressed laterite members (clinostats), arranged to form an elliptical profile on the ground. The cluster of clinostats would resemble the hood of a snake[5]. The clinostats are wider at the base and gradually taper towards the top.

Worship systems in India have evolved over millennia, transitioning from pre-historic practices like nature worship, animism, and ancestor worship to more structured rituals and organised faiths. Megaliths, the oldest surviving stone monuments, associated with reverence for individuals or ideas, may represent an early manifestation of ancestor worship. Similarly, the veneration of the divine is manifested through temples, whose form varies from simple hypaethral shrines to elaborately planned temple complexes. Both megaliths and temples are widespread across the southern peninsula, with certain forms endemic to the study area. While conceptual parallels exist between these two monument types,

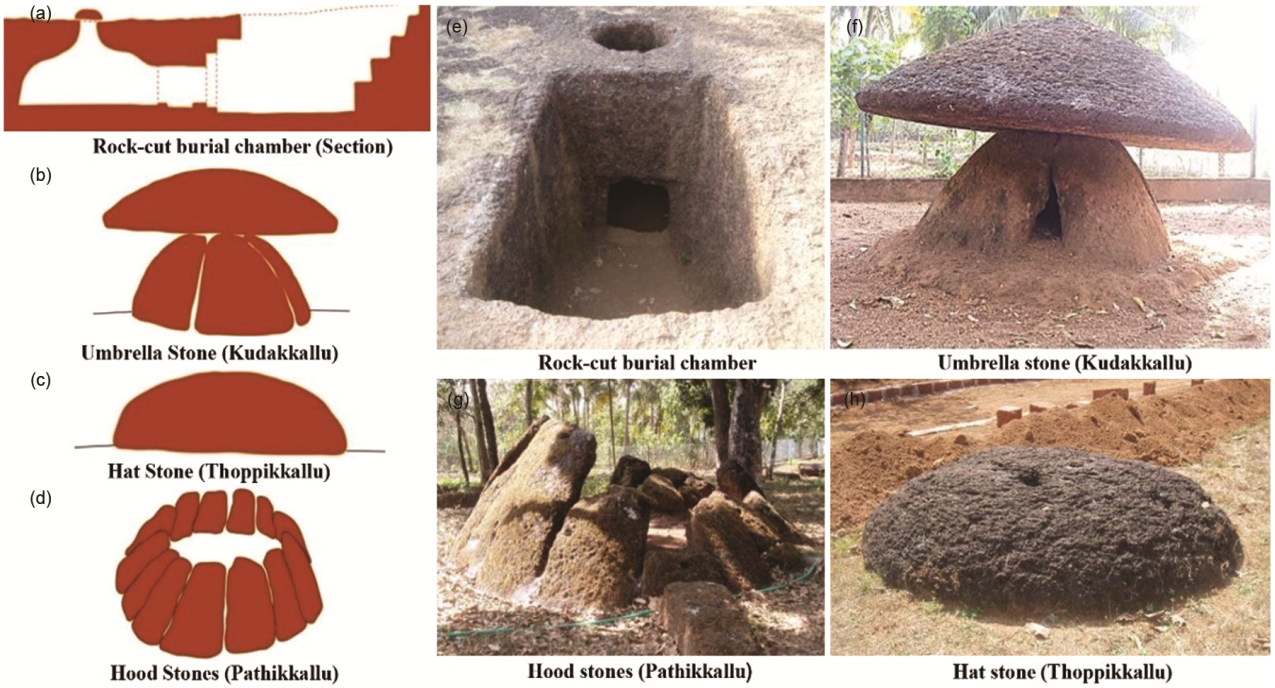

Fig. 4 — Endemic megalith types – Illustrations and photographs
(Source: 4a-4d: Adapted from 'Iron Age Culture in Kerala, South India' byAbhayan G S,Iron Age in South Asia, p. 151.Copyright by Abhayan G S. Reprinted with permission, 4e-4h: Photographs by Srikumar M Menon, adapted with permission)

this paper does not compare them on that basis. Instead, it focuses on their architectural forms to understand the factors which led to the development of endemic structures.

A brief overview of temple forms in India

Temple is fundamentally conceptualized as the house of the deity to whom it is dedicated[14]. This idea is materialised through a shrine-a structure that encloses the sanctum, where the image/idol of the principal deity is enshrined. The earliest temples were structures built with perishable materials like timber, earth, and thatch, and none of them are extant. These vernacular shrine forms were later adapted into stone and brick generating prototypes that eventually gave rise to distinct temple-building traditions[15-18].

The design principles of temple-building in stone evolved gradually, over centuries, across the Indian landscape. Starting with the early flat-roofed shrines of the Gupta period, temple forms underwent continuous development, eventually crystallizing into two distinct traditions-the Nagara and the Dravida-by the 7th century CE[2,15-18] (Fig. 5). These traditions became the foundation for temple construction in the country, and underwent multiple revivals and adaptations almost until the 17th century.

Nagara temples, commonly found in northern India, typically have a square base and a curvilinear shikhara[2,14-18]. Various modes and sometimes regional variations of this tradition emerged over time, such as the Kalinga school of temple architecture, which is considered as aregional derivative of the Nagara tradition that developed around Odisha. In contrast, Dravida temples feature square or polygonal base and stepped pyramidical shikhara and they are commonly found in southern India[2,14-18]. However, these architectural traditions cannot be strictly attributed to a particular region. For instance, at Pattadakal in Karnataka, both Nagara and Dravida temples coexist within the same site. The Dravida tradition developed from at least two nuclei, giving rise to two sub-traditions-the Tamil Dravida under the Pallava dynasty at Mahabalipuram in Tamil Nadu and the Karnata Dravida under the Badami Chalukyas in Karnataka.

Nagara and Dravidacan be considered as pan-Indian traditions, due to their sheer number and widespread distribution across the country. Certain temple types fall outside these broad classifications. These include the pitched-roof, wooden temples of Himachal Pradesh, laterite and timber temples of the West coast (including Kerala, Karnataka, and Konkan region), and the terracotta temples of Bengal[2,16].

Temple forms in Malabar, and South Canara

Temples along the western coast reflect the region's indigenous architectural traditions, adapting to its geography and climate. Characterised by sloping roofs supported on timber framework covered using thatch or tile, these structures effectively channel the heavy monsoon rains[3,19,20]. The walls are constructed using mud, laterite, or timber. The deep overhangs formed by the roofs protect the walls from sun and

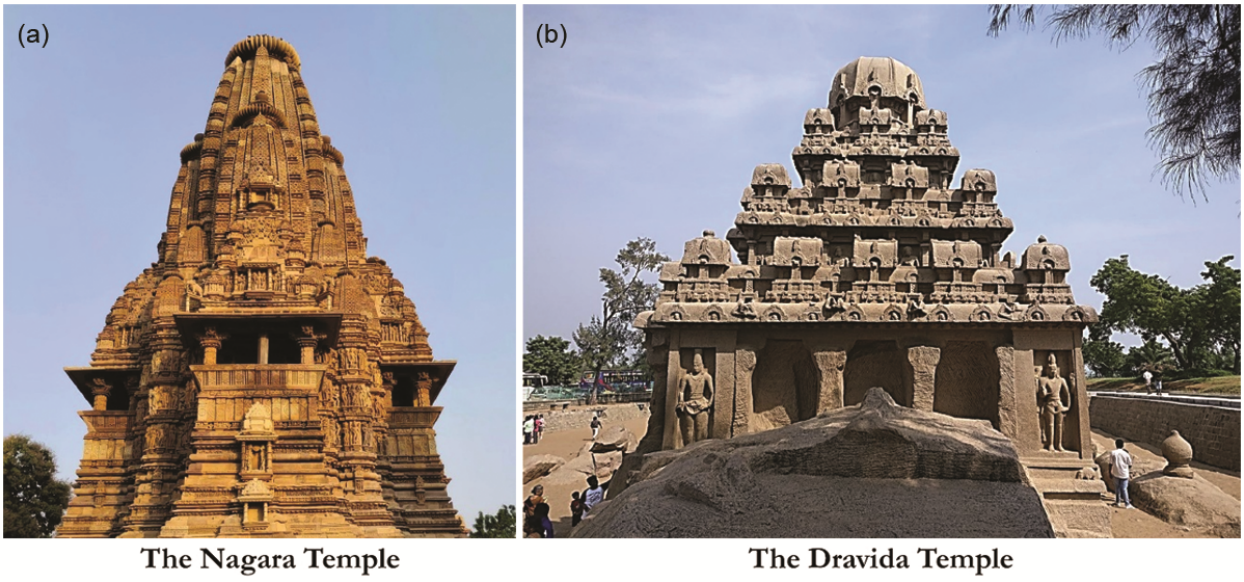

Fig. 5 — Nagara and Dravida temple forms
(Source: Photographs by Srikumar M Menon, adapted with permission)

heavy rain. These temple structures are unique to the region and represent its indigenous temple types. Variations exist within this tradition across different stretches of the coastline, which could be possibly due to multiple reasons including the socio-political and economical connections with other regions. For instance, some temples in South Canara exhibit an outer envelope of timber or stone trellis around the laterite walls[21-23] (Fig. 6a), a feature that is absent in the temples of Malabar (Fig. 6b) and Konkan. Similarly, pitch of the sanctum roof is much steeper in the temples of Konkan, when compared to Malabar and South Canara.

Although Malabar and South Canara primarily consist of the above-mentioned indigenous temple typologies, one can also find instances where the pan-Indian Dravida traditions are being followed[3,19,20,24]. These are typically located in regions where hard rock, usually granite, is easily available. Dravida temples in this region are invariably constructed using granite, whereas the indigenous temple types are usually built with laterite and timber. Some notable examples of Dravida temples in the region include the Vizhinjam temple in Thiruvananthapuram (early 9th century), Kattil Madom shrine in Palakkad (11th century), Pandakasala Ganapathy Temple in Kollam (15th century), and Ganesha shrine in Someshwara temple, Mangaluru (9th century).

The indigenous temple type vastly outnumbers the granite Dravida temples as laterite and timber are more readily available than granite. A few exceptions exist in the Udupi region, where indigenous temple forms have been entirely constructed using granite, featuring granite masonry walls and sloping roofs made of granite slabs[24]. This can be attributed to the availability of granite in certain parts of the region.

Temple design principles – Dravida and indigenous traditions

Temples can vary in scale from small, single-celled shrines housing the deity, to elaborate complexes with multiple enclosures, ancillary structures, and ritualistic spaces. However, in this paper, the term

Fig. 6 — The Indigenous temples of South Canara and Malabar region, (Source: Author)

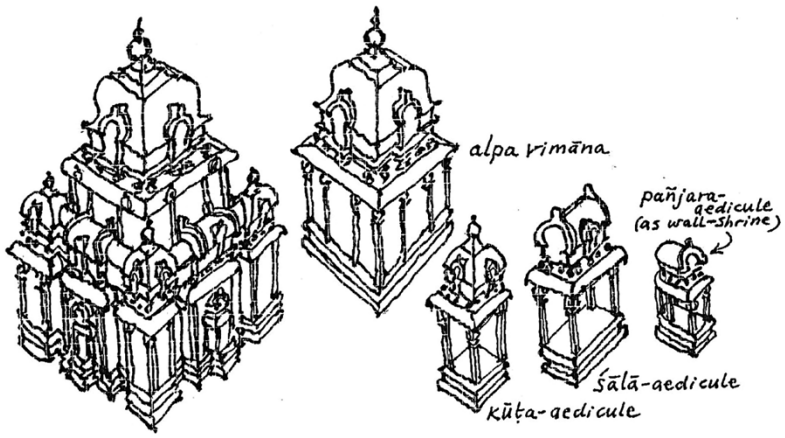

Fig. 7 — Two-tiered Dravida vimana and its compositional units – Dravida alpa vimana and the aedicules
(Source: Adapted from the thesis 'The Karnāṭa Drāviḍa Tradition: Development of Temple Architecture in Karnataka, 7th-13th Centuries Volume 2 Drawings' by Adam Hardy, Fig. A2. Copyright by Adam Hardy. Reprinted with permission)

"temple" refers specifically to the vimana, the central structure that encloses the garbhagriha or sanctum sanctorum, where the deity is enshrined.

The simplest form of a Dravida temple is an alpa vimana, consisting of a base and a roof. A Kuta is an alpa vimana having a square base crowned by a domed pavilion, while a sala has a rectangular base crowned by a barrel-vaulted pavilion. Dravida temple forms with multiple levels typically consists of a square sanctuary topped by a tower composed of stepped, receding levels that form a pyramidical profile. Each receding level is distinguished by a series of miniature alpa vimanas or aedicules[15,16]. Gary Tartakov[25] defines Dravida temples as, *"the temples whose designs are characterized by towers composed of distinct horizontal stories carrying distinct miniature cells and capped by a simple dome".* The miniature cells/aedicules that make up the Dravida shikhara are thekuta, sala and panjara (sala viewed from the side). This characteristic feature of generating new forms by combining the existing alpa vimanas is known as aedicularity, and it forms the basic design principle of a Dravida vimana[15,16] (Fig. 7).

Although the indigenous temples may look completely distinct from Dravida temples in their overall form, they exhibit several similarities in elevation. A Dravida alpa vimana typically comprises six parts from base to apex: adhishthana (plinth), bhitti (wall), prastara (cornice), griva (pedestal above the sanctum terrace), shikhara (roof), and stupi (finial)[3]. The simplest form of an indigenous temple exhibits five of these six components-adhishthana, bhitti, prastara, shikhara and stupi; sloping roof replaces the griva and shikhara[3] (Fig. 8).

The multi-storied indigenous temples of Malabar and South Canara feature a series of aedicules, such as kuta, sala, and panjaras in their upper levels, resembling their Dravida counterparts. Like in Dravida temples, the aedicules decrease in both number and size as they ascend the levels (Fig. 9). Unlike in the Dravida vimana, where aedicules shape the temple three-dimensionally[15,16], in the indigenous temple architecture of Malabar and South Canara, they appear as high-relief elements that form the outer skin of the structure.

Additionally, elements such as toranas, sthambhas, panjaras, and koshtas-commonly adorning the bhitti (wall) of Dravida temples, are also present in the indigenous temple forms. Similarly, elements like the pranala (waterspout) and carved banisters, characteristic of Dravida temples, are found in these regional temple types as well. In essence, apart from the shikhara, all fundamental features of Dravida

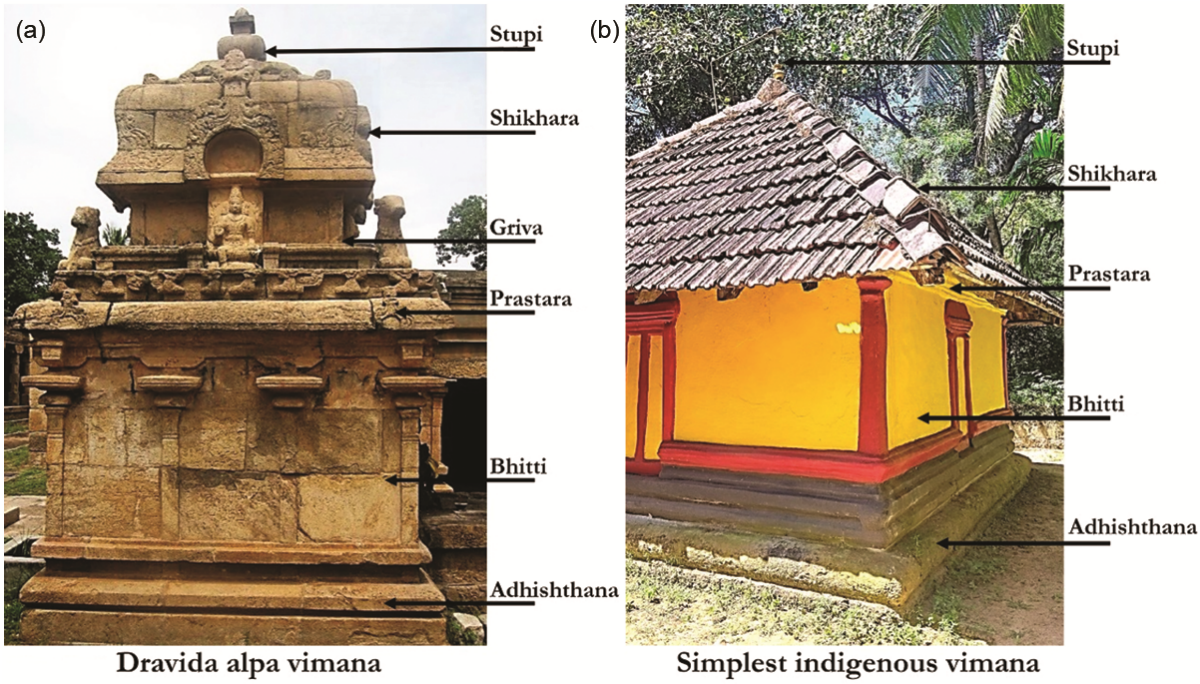

Fig. 8 — Components of Dravida alpa vimana and Indigenous alpa vimana
(Source: 8a: Adapted from 'Visalur – Margasahayeshvara Temple' by Saurabh Saxena, https://puratattva.in/visalurvasukisvaramudaiya-mahadeva-temple/. Copyright by Puratattva. Reprinted with permission, 8b – Author)

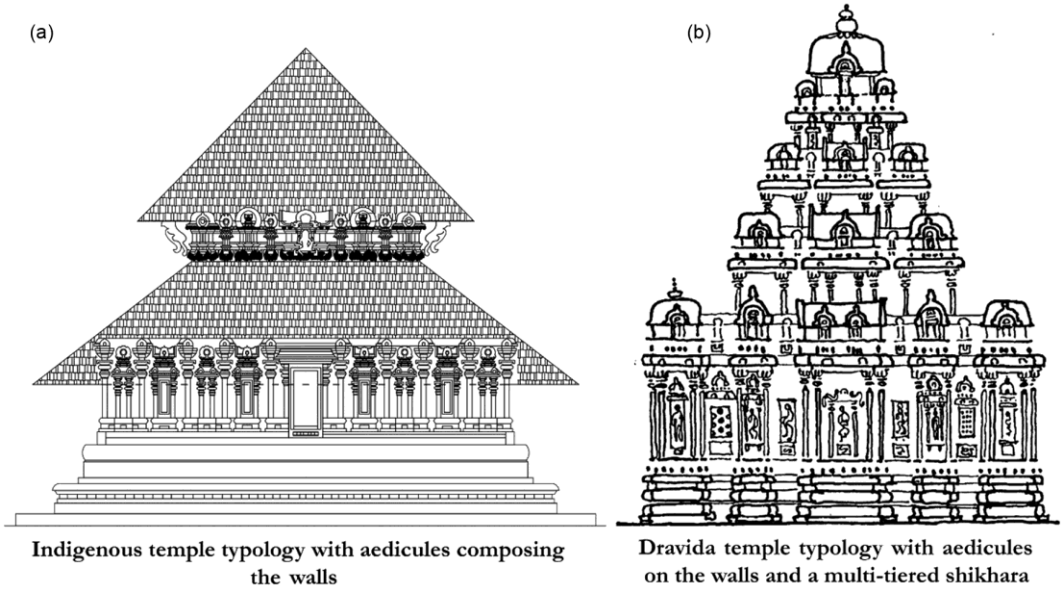

Fig. 9 — Comparison of wall treatment in Indigenous and Dravida temple-building traditions
Source: 9a – Author, 9b - Adapted from the thesis 'The Karnāṭa Drāviḍa Tradition: Development of Temple Architecture in Karnataka, 7th-13th Centuries Volume 2 Drawings' by Adam Hardy, Fig. D3-b. Copyright by Adam Hardy. Reprinted with permission

temples can be observed in the indigenous temple forms of Malabar and South Canara.

The influence of pan-Indian built-traditions in the indigenous built forms of Malabar and South Canara

The fundamental idea that underlies a funerary monument is to create a space for holding mortal remains. This common purpose connects the megalithic forms which are sepulchral in nature-all of them are essentially conceptualized as chambers to contain burial goods and mortal remains[6]. Despite differences in shape, size, and material, pit burials, urn burials, cist burials, and rock-cut chambers, all appear to adhere to this chamber concept. Although dolmens are believed to have never contained burial remains, their structure, enclosed by four orthostats and a capstone, resembles a chamber. A similar approach is seen in the construction of Kudakkallu, where the clinostats and capstone create an enclosed space. This demonstrates how the fundamental concept of a chamber was adapted in various ways, both above and below the ground, resulting in a diverse range of megalithic monuments.

While examining the endemic forms of megaliths, certain conceptual similarities can be observed with those widely recognised forms built using hard stone. For instance, both dolmens and kudakallu are built above the ground and they enclose a chamber-like space. Dolmens consist of four upright stone slabs (orthostats) topped by a flat capstone, whereas kudakkallu comprises four inclined stone members (clinostats) covered by a hemispherical capstone. Despite their structural differences, both forms are derived from the same fundamental concept.

Likewise, the concept of a cist burial may have influenced the development of rock-cut chambers, since both function as underground burial chambers. While thin slabs of granite stone form the walls of cist burials, rock-cut chambers are created by excavating and shaping laterite deposits. In all these cases, the popular megalithic forms constructed using hardstone have been adapted to the context of South Canara and Malabar.

Similarly, while the indigenous temple forms of South Canara and Malabar do not conform to the fundamental definition of a Dravida vimana, with a stepped pyramidical tower composed of aedicules, a comparable design logic can be observed in their external treatment. Although the temples follow an indigenous architectural approach by incorporating sloping roofs to suit the local climate, they integrate the elements and embellishments characteristic of Dravida temple architecture into the elevation, resulting in a distinctive and synthesized form.

The existence of megalith and temple forms similar to those found in mainstream architectural traditions suggests that the coastal stretches of Malabar and South Canara were always connected to their neighbouring counterparts, which facilitated the

exchange of cultural concepts and design ideas. Yet, the region has produced unique megalithic and temple forms endemic to the region and are primarily constructed using laterite. Notably, while the local builders modified the built forms when building with laterite, they retained the architectural form as that of the neighbouring regions when using hard stones like granite. This raises the need to examine whether the properties of building materials influenced the development of these distinct regional forms.

Discussion

Building material as the determinant of the built form

Laterite – properties, possibilities, and limitations

Laterite is both a naturally occurring soil and stone, commonly found in tropical and sub-tropical regions around the globe[26-28]. It is a residual rock, formed due to the weathering of parent rocks such as basalt and granite. Composed primarily of iron and aluminium oxides, it also contains traces of other minerals along with clay[27]. The color of laterite can vary from yellow and red to dark brown and grey depending on the proportion of iron-oxides present[29]. The upper profiles of the laterite formations usually contain hard laterite with a vermiculite structure[27,30]. These are preferred for construction purposes since, the hardness of laterite decreases with more depth, due to increase in clay content[27,29,30]. Compared to other hard stones like granite, laterite blocks are easier to quarry and require less processing than mud bricks and other similar masonry units. Laterite has been used for building purposes in regions where it is abundant and more economical than other building materials[26-29].

The mechanical properties of laterite blocks vary according to the quarry sites and depth of extraction[27]. On average, quarried laterite blocks exhibit compressive strength comparable to mud bricks of similar size, and upon exposure to atmosphere, a slight increase in strength has been observed. The vermiculite/porous structure enhances the workability of laterite when compared to other hard stones. Laterite is suitable for low-rise construction of up to 2-3 stories[28,29].

Laterite is highly hygroscopic - it has a high rate of water absorption and retains moisture due to its clay content. The porous structure of laterite blocks facilitates water ingress, leading to absorption and retention, which causes a reduction in the compressive strength[26,28-30]. Moisture is a primary cause of deterioration in laterite blocks[26,29], and it can happen in various ways such as, (i) physical disintegration due to lashing rain, (ii) bio/vegetation growth, exacerbated by warm, humid conditions, leading to gradual but significant damage, and (iii) progressive deterioration caused by efflorescence (salt deposition) on walls due to water absorption from the ground and rain[29]. Given these vulnerabilities, it is crucial to take necessary precautions to protect laterite structures from water ingress[26,28,29].

Role of building materials in shaping megaliths and temples

The presence of Dravida temples in the region of Malabar and South Canara clearly indicates that the local builders were familiar with the Dravida temple-building tradition and practiced it alongside the indigenous temple-building tradition. The elements found on the walls and adhishthana of temples built in these two traditions, despite minor differences, exhibit many similarities and appear to have originated from the same source. It is primarily the roof/shikhara that creates a significant distinction between the indigenous and the Dravida temple types.

To illustrate this, we examine two case examples: Pallimanna Siva Temple in Thrissur (Fig. 10a) and Kattil Madom temple in Palakkad (Fig. 10b). Both structures belong to the same broader cultural region and are square alpa vimanas with a single-tiered elevation. The Pallimanna Siva Temple, constructed in laterite, follows the indigenous temple-building tradition of Malabar, whereas the Kattil Madom temple follows the Dravida temple-building tradition and is built using granite.

Despite the difference in material, both of these temples exhibit a high degree of similarity up to the prastara, particularly in the adhishthana profile, which includes vrittakumuda and kantha with dentils.Their wall elements also share common features, such as the ghanadwara framed by torana and split pilasters, niches framed by panjaras and split pilasters, and sthambhas. The key distinction between the two lies in their superstructure-while Kattil Madom features an octagonal griva and shikhara, Pallimanna temple has a sloping roof, reflecting its adaptation to local materials and climatic conditions. The underlying conceptual framework of both the temples appears to be derived from a common architectural source, demonstrating how regional traditions adapted shared design elements to suit locally available materials. An interesting pattern observed across the temples in this

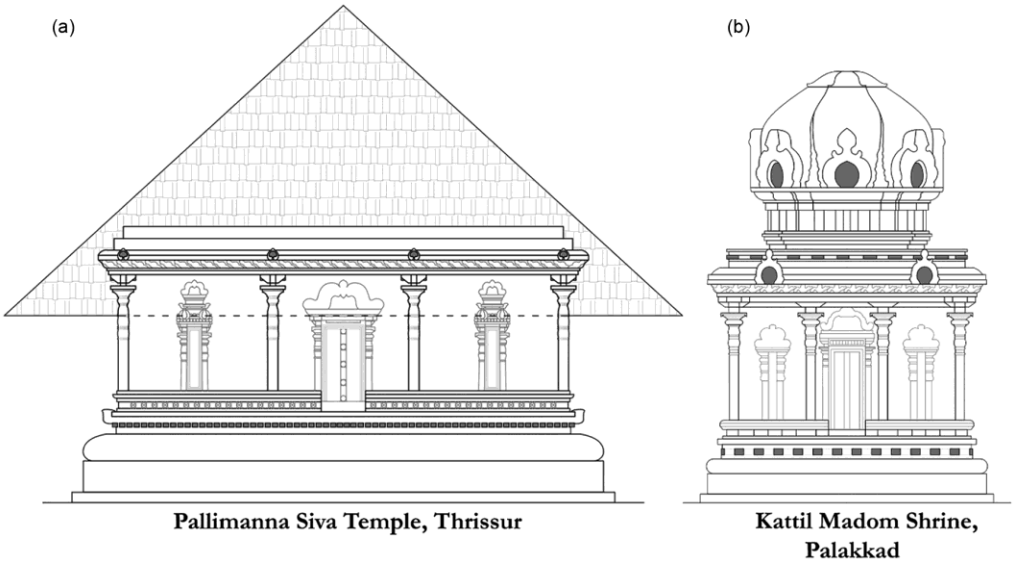

Fig. 10 — Comparison of Indigenous and Dravida temple-building traditions (Source: Author)

region is that the local builders opted for sloping roofs made of timber and tiles for structures built with laterite, while they retained the typical Dravida shikhara for those built in granite.

Even though both laterite and granite are types of stones, they differ in their characteristic properties. As discussed earlier, laterite blocks are easily susceptible to damage by the ingress of moisture from various sources including rain, and water rising through cohesion from the ground. In contrast, granite has the lowest rate of water absorption[29], making it more resistant to water-related damage and decay. The stepped profile of the Dravida shikhara tends to collect and retain rainwater at each level, thus preventing efficient drainage. In the tropical monsoon climate of the west coast, this roof form can be sustained in the case of temples built in granite. However, if the same profile is replicated in laterite, the structure deteriorates due to water ingress. The porous nature of laterite allows moisture to penetrate easily, ultimately causing damage, as discussed earlier. To protect laterite temples from such deterioration, shielding the structure from water becomes essential.

The decision to use a sloping roof instead of a stepped Dravida shikhara for temples built with laterite helps prevent water infiltration due to rain. The roof, with deep overhangs, shields the laterite walls against water ingress from both the top and sides. Additionally, the use of granite for adhishthanas acts as a barrier against water ingress from the ground.Walls of the laterite temples in this region are finished using lime plaster, which covers the porous surface of the material and reduces the chance of water absorption. The design of the indigenous temples of Malabar and South Canara inherently protects the laterite walls via its roof and plinth construction. The available building materials were thoughtfully combined by the builders to ensure the longevity of the structure while reducing the need for frequent maintenance.

Similar to the case of temples, mainstream megalithic forms made of hard stone were built alongside the endemic forms of megaliths in laterite in the Malabar region. The physical properties of laterite compelled the builders to innovate while constructing indigenous megaliths, despite their conceptual similarity. For instance, unlike granite and sandstone, it is difficult to cut laterite into thin slabs of large dimensions Due to its porous nature, laterite tends to break during the cutting process. As a result, the thin orthostats used in dolmens could not be replicated in laterite. To adapt to this limitation, the form of dolmen was modified by replacing the vertical orthostats with inclined clinostats and the thin, flat capstone with a thick, hemispherical one. The ease of carving laterite may have influenced the decision to shape the capstone this way. The clinostats are assembled under the thickest part of the capstone-its center. The weight of the capstone, along with the support of the clinostats, brings about stability to the structure. Thus, the challenges of replicating the

dolmen in laterite gave rise to the distinct umbrella stone, or kudakkallu.

The ease of cutting and shaping laterite probably resulted in the creation of other megalithic forms such asthopikkallu (capstones) and pathikkallu (hood stones), and the ability to cut through fresh laterite rock enabled the creation of the rock-cut chambers (chenkalara).

Laterite as a building material has played a pivotal role in dictating the built-forms of megaliths and temples in Malabar and South Canara. Its inherent properties challenged local builders to develop innovative design solutions that preserved the core architectural concepts while adapting them to the regional context. Along with addressing the structural limitations, they also utilized the inherent properties of laterite effectively to generate aesthetically pleasing design solutions, resulting in megalithic and temple forms endemic to the region. In essence, the indigenous megaliths and temples of South Canara and Malabar were the outcomes of deliberate, thoughtful decisions by the local builders in response to the context and the inherent properties of the building materials.

Conclusion

Megalith and temple forms in the coastal regions of Malabar and South Canara fall into two categories. One aligns with the mainstream architectural traditions in hard stone, popular in the neighbouring regions, while the other is an indigenous approach that uses locally available materials, such as laterite and timber. Although the indigenous forms in laterite were conceptually similar to their hard stone counterparts, the inherent properties of the building materials, laterite in particular, necessitated modifications, resulting in the development of unique endemic forms. Despite sharing the same context and design concepts, megaliths and temples in these regions evolved to have two distinct architectural expressions. This highlights the role of building material as the primary determinant of form in both megaliths and temples.

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Conflict of Interest

The author declares no conflict of interest.

Declaration Author

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Data Availability

The data are available upon reasonable request from the corresponding author.

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