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From Earth to Architecture:

Between Historical Knowledge and Contemporary Practice

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Abstract

This thesis examines the historical development and contemporary revival of earth construction in architecture, investigating how vernacular building techniques are being reinterpreted in response to today's environmental and social challenges. Through a comparative and historically grounded analysis, the study explores how earthen architecture—once rooted in collective, site-based knowledge—has evolved across regions and continues to shape sustainable design practices.

By combining historical research, visual analysis, and case study methodology, the thesis demonstrates that many so-called innovations in earth architecture are grounded in long-standing traditions. It highlights the shift from communal building methods to industrialized systems, raising questions about authorship, access, and the role of the architect in mediating between inherited knowledge and contemporary demands.

The findings argue that understanding the cultural and technical history of earth construction is essential to reimagining architectural practice in more ecological, inclusive, and context-sensitive ways.

Keywords: Earth construction, building techniques, sustainable architecture, vernacular architecture, building history.

Outline

Abstract 2

Prologue 4

Introduction 5

1. Overview of Earth Construction History 6

1.1 Foundations of Earth Architecture 6

1.2 Earth Construction across continents 6

1.2.1 Middle East 7

1.2.2. Asia 11

1.2.3. Europe 13

1.2.4. Americas 14

1.2.5. Africa 16

1.2.6. Australasia 17

2. Continuity and Change in Earth Building Techniques 19

2.1. Tradition and Transformation 19

2.2 Overview of earth building practices 19

2.3 Innovative use in earth building techniques 20

2.3.1 Adobe 20

2.3.2 Rammed Earth 23

2.3.3 Wattle and daub 25

3. Building Forward with Earth 29

3.1 Earth's resurgence 29

3.2 Case study: Alnatura Arbeitswelt 27

4. Conclusion 32

Epilogue 33

List of figures 34

List of references 36

Bibliography 37

Prologue

This research motivation is rooted in both a personal and academic interest in the topic. Earth construction exemplifies a more harmonious relationship between architectural practices and ecological balance. In contradiction to steel and concrete, earth's availability worldwide, its thermal properties, and its role in vernacular traditions becomes remarkably relevant, especially in a time of escalating climate crisis. Moreover, while significant research exists on sustainable architecture, the specific contributions and revival of earth techniques remain underexplored in mainstream academic discourse. By focusing on this material, I aim to contribute a nuanced perspective to the dialogue on sustainable architectural methods.

As I explore the historical and contemporary relevance of earth techniques, I am also drawn to the question of what role the architect can play in this context. Earth-based practices are often shaped by collective knowledge and built through shared labour, suggesting a model of practice grounded in process, proximity, and participation. They invite a reconsideration of the architect not as a distant author, but as an engaged collaborator, that is closer to the site, the material, and the act of building itself.

Introduction

The proposed thesis investigates the historical significance and contemporary revival of earth construction techniques in sustainable architecture, in light of the research question: *What is the history behind earth building practices in architecture? A analysis of earth building methods and its contemporary applications.* This study seeks to bridge the gap between traditional vernacular practices and their reemergence as innovative solutions for contemporary environmental challenges.

The first component of the thesis will provide an overview of earth construction as a global architectural trend, its techniques and regional variations. The section will examine how and when earth construction practices evolved across Asia, the Middle East, Africa, the Americas, Europe, and Australia. This comparative analysis will illustrate the adaptability of earth as a building material and its widespread application in both traditional and modern architecture.

The second chapter briefly discusses the meanings of traditional and vernacular architecture and examines how some techniques are being reinterpreted in contemporary contexts through new tools, design approaches, and building standards.

The final section focuses on the contemporary resurgence of earth construction, highlighting the work of architects and institutions leading this revival. A case study of the Alnatura Arbeitswelt illustrates how rammed earth can be integrated into high-performance architecture, combining prefabrication, thermal mass, and passive design strategies.

The methodological approach draws on literature from architecture, engineering, and heritage studies. The analysis is structured around three key themes: (1) material history, presented through synthetic timelines tracing the evolution of construction techniques; (2) regional and typological overviews, identifying key patterns across continents; and (3) the role of the builder or architect, questioning how architectural knowledge has been produced, transmitted, and transformed. Illustrations are used as primary visual sources to explore how practices were recorded and represented historically. Together, these analytical categories frame earth construction as both a technical and cultural practice.

This thesis argues that earth construction represents a vital link between past architectural knowledge (or “techknowledge”) and future sustainable practices. As the co-founders of CRATerre, Houben & Guillaud (2006) point out, is not possible to value the technological approach in relation to the vernacular approach, or vice versa (p. 9). By tracing the material's historical trajectory and examining how it is being reimagined today, this study seeks to contribute to ongoing debates about sustainability, the values of the architectural practice, and the future of the profession.

Chapter 1. Overview of Earth Construction History

This chapter presents a global overview of earth construction practices, tracing their historical development across continents while situating them within broader shifts in architectural knowledge and transmission. French engineer Hugo Houben and architect Hubert Guillaud, co-founders of CRAterre in Grenoble, France, have been central in redefining the academic and practical value of earthen architecture (Houben & Guillaud, 2006). British structural engineer Paul Jaquin (2014), known for his work on the mechanics of rammed earth and historical preservation, offers an important technical lens on the material. The synthetic timelines developed throughout this chapter draw on these foundational works to illustrate how earth techniques emerged, evolved, and adapted across diverse regions and climates.

1.1 Foundations of Earth Architecture

"Building using subsoil is one of the oldest construction techniques, providing simple shelter using freely available material." (Jaquin, 2014, p. 307). Due to its worldwide availability, earth construction is one of the oldest and most widespread building techniques in human history, with evidence of its use found across all inhabited continents (figure 1.1). The practice emerged independently in various cultural contexts, often shaped by environmental conditions and the availability of alternative materials. In hot, arid climates where timber or stone was scarce, massive earth constructions dominated. In river valleys, where early civilizations first flourished, clay-rich soils were combined with agricultural byproducts like straw to form early adobe structures (Houben & Guillaud, 2006).

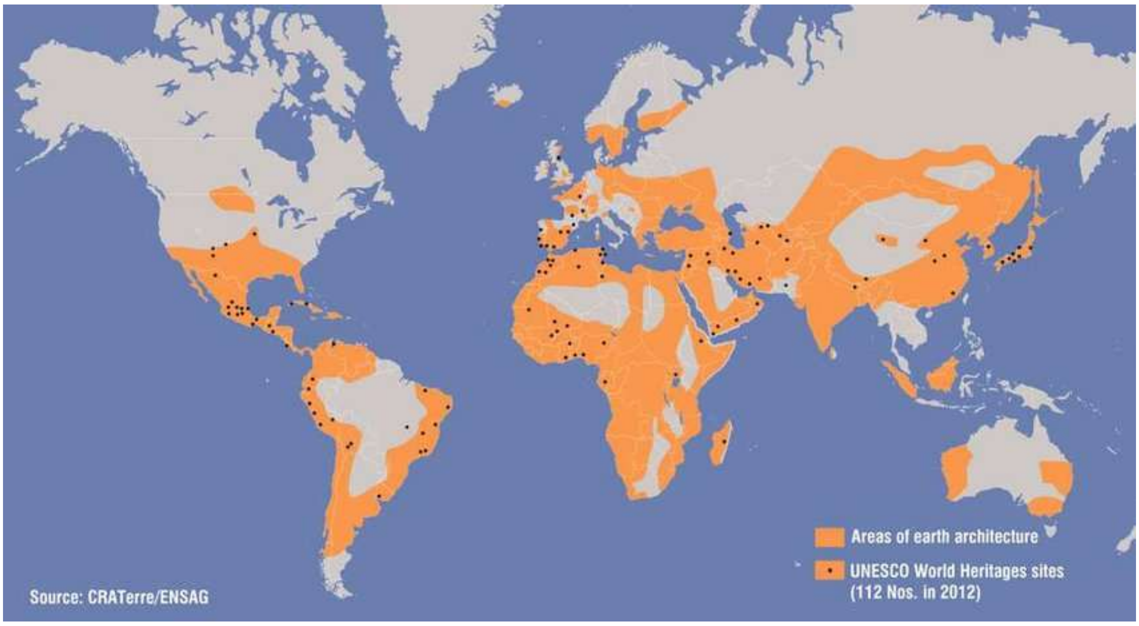


Figure 1.1. World map illustrating the worldwide use of earth in construction.

Earth construction spans a wide range of techniques, from early hand-moulded forms to more sophisticated methods like rammed earth, adobe, and cob. These can generally be categorized into three systems: monolithic, where earth is compacted or shaped directly in place; unit-based, where bricks or blocks are produced and then assembled; and infill, where earth is used within a structural framework. Systems are often combined with other materials such as timber, stone, or more recently, steel and cement, depending on local resources and traditions.

While the technical evolution of earth building is central to architectural history, it also raises questions about who produced architecture. These structures were often built not by formally trained architects, but by master builders and communities, relying on knowledge passed down through hands-on practice rather than formal education.

1.2. Earth Construction Across Continents

1.2.1. Middle East

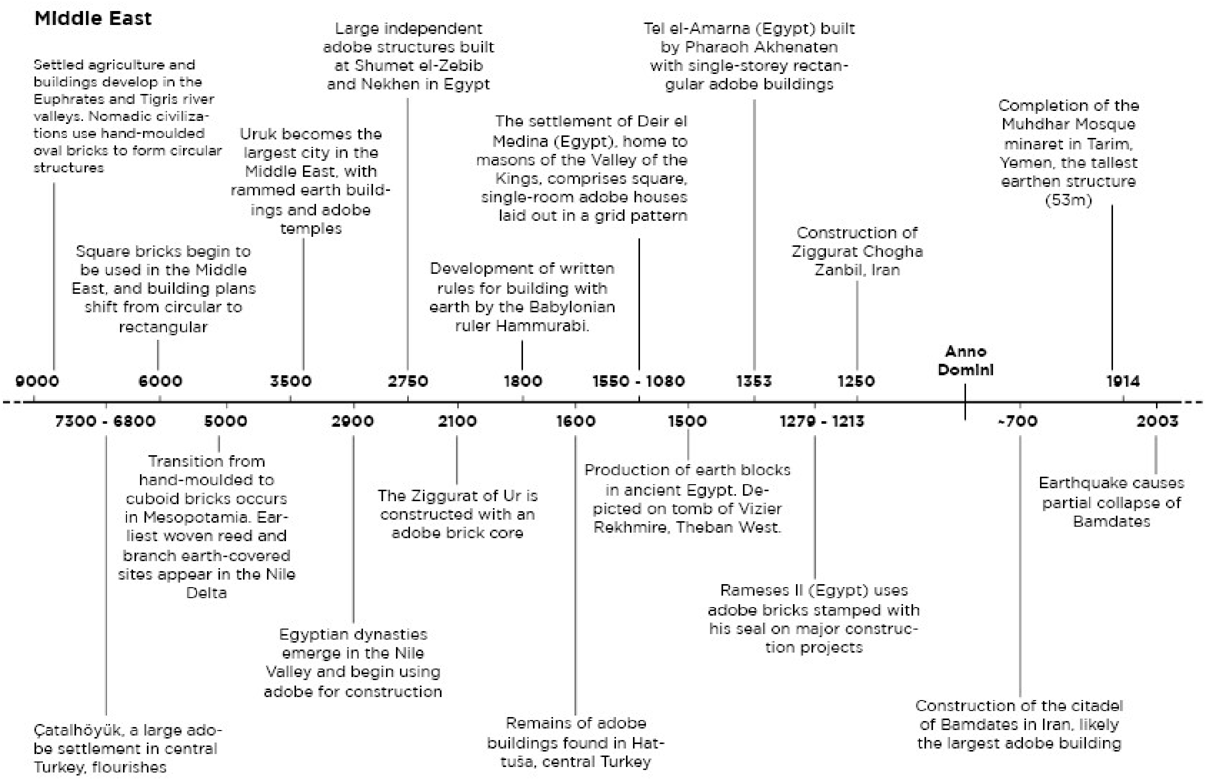


Figure 1.2. Timeline of relevant historical events in earth construction in the Middle East.

The Middle East is one of the earliest cradles of earth construction, with settlements such as Çatalhöyük in Turkey (7300–6800 BC) showcasing early adobe structures (figure 1,3). Mesopotamian civilizations transitioned from oval hand-moulded bricks to standardized cuboid bricks by 5000 BC, paving the way for large-scale urban developments. The Ziggurat of Ur (2100 BC) and the adobe cities of Mari and Elba are prime examples of monumental earth architecture (Jaquin, 2014, p. 311-313).

Iran's Bamdates Citadel (7th century AD), stood as the largest adobe structure until its partial collapse in 2003. In Yemen, the city of Shibam, known as the "Manhattan of the Desert," features multi-story adobe buildings dating back to the 16th century, demonstrating the versatility of earth as a material for vertical construction (Schroeder, 2015).

Figure 1.3. Çatalhöyük, Turkey - UNESCO World Heritage Site.

Figure 1.4. Ziggurat in Chogha Zanbil, Iran, built around 1250 BC.

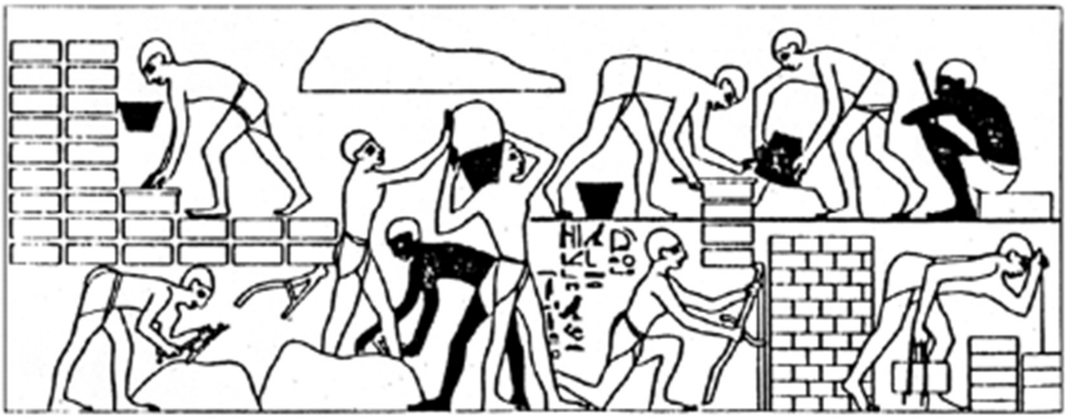


Figure 1.5. Production of earth blocks in Ancient Egypt, around 1500 BC; depiction in the tomb of Vizier Rekhmire, Theban West.

Egypt has a long-standing tradition of earth construction, dating back thousands of years. The annual flooding of the Nile deposited fertile mud from the Ethiopian highlands, which, when dried in the sun, became solid but could soften again when wet. This understanding led to the development of sun-dried mud blocks, which were strengthened by mixing in sand or plant fibres and further improved through firing (Schroeder, 2015, p. 5-10).

A symbolic image of the reigning pharaoh at the time, portrays her as a master builder herself, actively engaged in the making of an earth block (figure 1.6). This visual association between royal authority and manual labour underlines the cultural and political significance attributed to construction activities at the time.

Figure 1.5 depicts the full sequence of production, from soil collection and preparation to moulding and laying the blocks, emphasizing the collective labour and technical knowledge involved in the process. The fact that this process was recorded at all, painstakingly illustrated on the walls of a high official's tomb, suggests an awareness of its value not just as practical knowledge, but as a meaningful social and state-building act. Unlike contemporary architectural culture, where recognition is often reserved for the architect or the architectural product, these depictions foreground the builders and the act of building itself. These illustrations may arouse the question: if a monument of our time were to represent a major construction process, would it include the workers?

Figure 1.6. Pharaoh Hatshepsut during the production of an earth block, around 1500 BC.

1.2.2. Asia

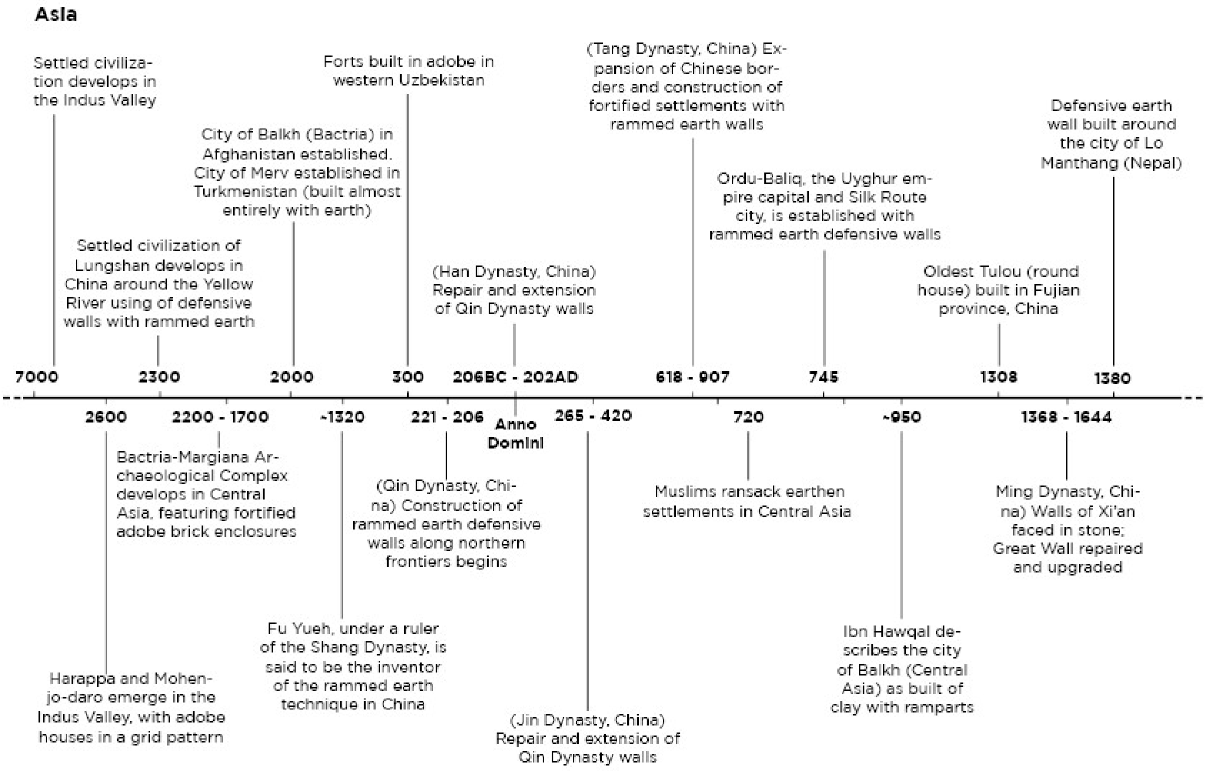


Figure 1.7. Timeline of relevant historical events in earth construction in Asia.

The history of earth construction in Asia dates back to early civilizations along major river valleys. In China, the Lungshan culture (c. 2300 BC) utilized rammed earth for defensive settlements, a technique that would later be instrumental in the construction of the Great Wall during the Qin and Han dynasties. The Tulou roundhouses of the Hakka people in Fujian province exemplify the endurance of this technique, with structures dating back to 1308 AD (Schroeder, 2015, p. 4-5).

Figure 1.8 depicts the legendary figure of Fu Yueh, considered one of the earliest known "rammed earth master builders." According to the myth, Fu Yueh was discovered while building a rammed earth house, recognized for his skill, and subsequently appointed as a minister by the Emperor. Figure 1.9, shows a more systematic depiction of earth block production, illustrating the continuity of these practices over centuries.

These visual records not only trace the evolution of earth construction but also highlight position the builder not as a marginal labourer, but as a central, respected figure, linking technical skill with social status. They highlight how, in early Chinese culture, construction was valued as a meaningful act, in contrast to contemporary representations, where the act of building is often overshadowed and the construction workers rendered invisible.

Figure 1.8. Fu Yueh, known as the first “rammed earth construction master” in ancient China, Shang Dinasty (around 1320 BC). (left)

Figure 1.9. Production of earth blocks during the Ming Dinasty. (right)

In Central Asia and the Indus Valley, adobe settlements such as those at Mehrgarh (7000 BC) and the cities of Harappa and Mohenjo-Daro (2600 BC) demonstrate early urban planning with grid-patterned streets. The Bactria-Margiana Archaeological Complex (2200–1700 BC) features fortified adobe enclosures, emphasizing the region's reliance on earth construction (Jaquin, 2014, p. 309-311).

Figure 1.10. The Great Wall of China, rammed earth section in Gansu Province, built around 220 BC.

1.2.3. Europe

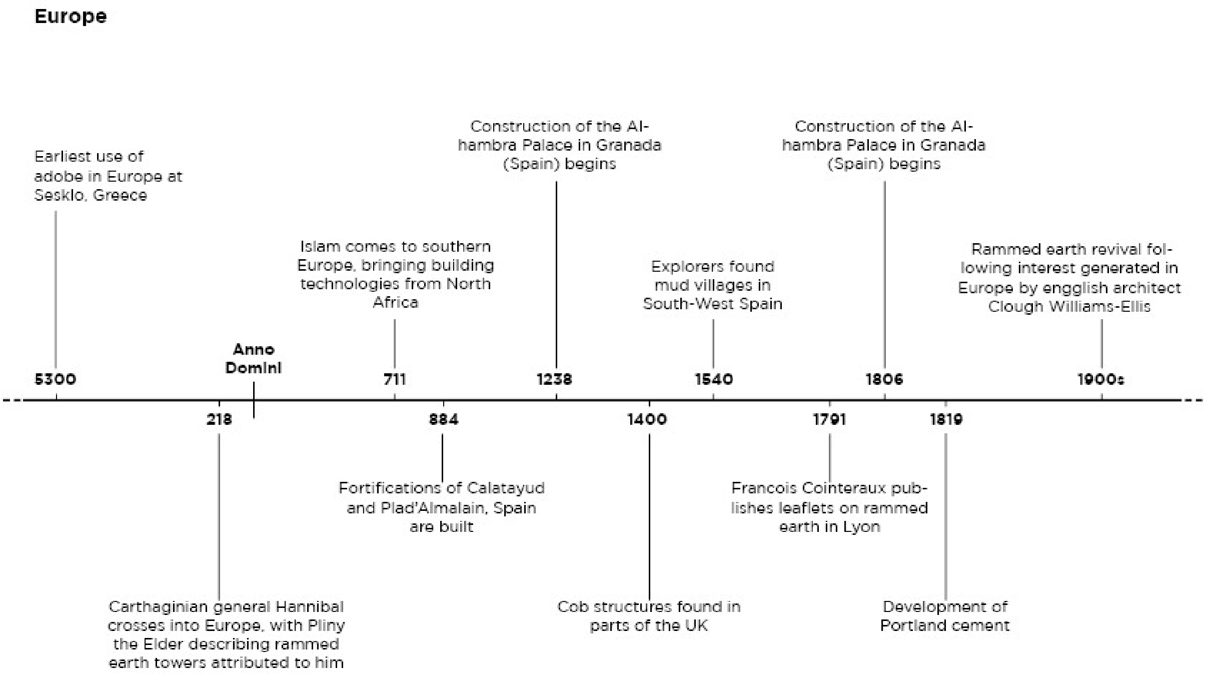


Figure 1.11. Timeline of relevant historical events in earth construction in Europe.

Europe has a rich tradition of earth construction, ranging from adobe and rammed earth in the Mediterranean to wattle and daub in northern regions. The earliest use of adobe in Europe is found at the Neolithic site of Sesklo, Greece (5300 BC). Roman and Islamic influences further developed earth construction techniques, with rammed earth being used in military fortifications such as the city walls of Córdoba and the Alhambra Palace in Spain.

The technique saw a revival in the late 18th century when French architect François Cointeraux promoted rammed earth as an economical alternative to stone and brick. Despite its decline due to industrialization, earth construction experienced another resurgence in the early 20th century, particularly in rural and experimental architecture (Jaquin, 2014, p. 315-316).

1.2.4. Americas

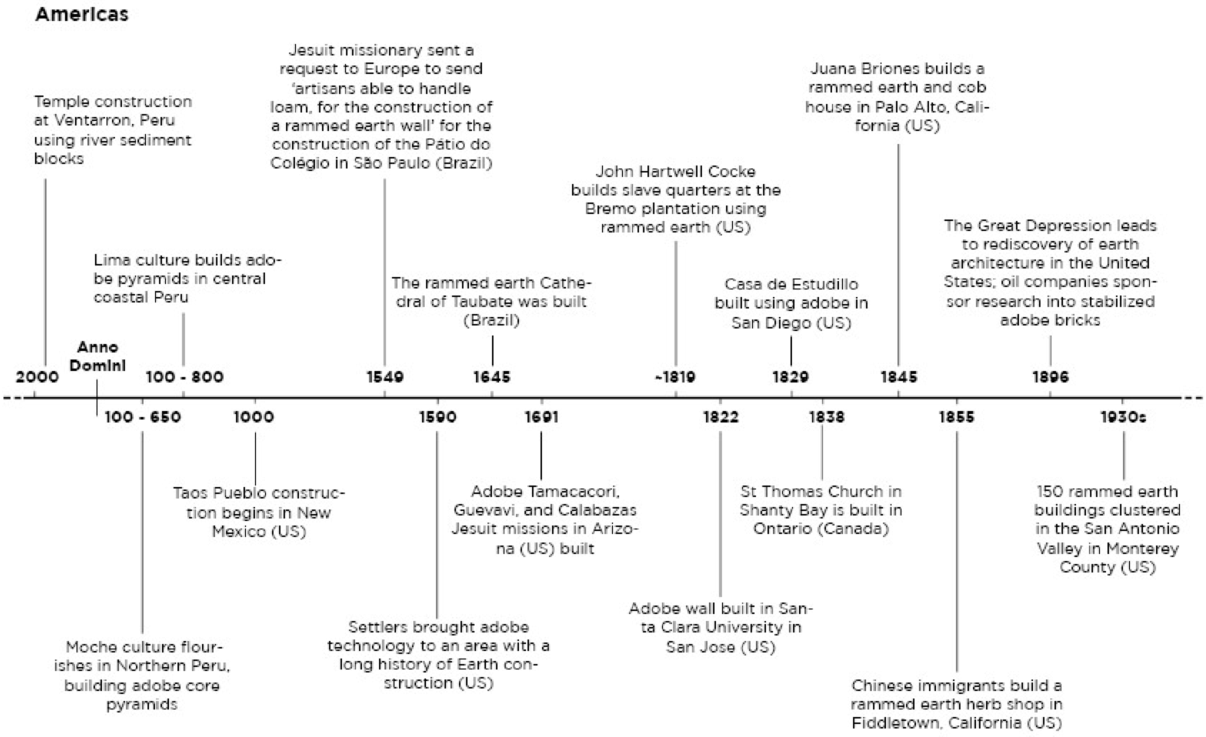


Figure 1.12. Timeline of relevant historical events in earth construction in the Americas.

Earth construction in the Americas dates back to pre-Columbian civilizations, with adobe being the predominant material. In Peru, the Moche culture (100–800 AD) built impressive adobe pyramids such as Huaca del Sol, while figure 1.13 shows the city of Chan Chan, once the largest adobe city in the world (Jaquin, 2014, p. 318-319.)

In North America, Native American pueblos, such as Taos Pueblo in New Mexico (c. 1000 AD), remain inhabited to this day (figure 1.14). Spanish settlers introduced adobe construction to regions like California and Arizona, leading to the establishment of missions and forts in the 17th and 18th centuries. Chinese immigrants in the 19th century further contributed to the spread of rammed earth techniques in the American West (Schroeder, 2015, p. 9).

Figure 1.13. Chan Chan Archaeological Zone, Peru.

Figure 1.14. Pueblo de Taos, New Mexico, USA, adobe buildings with flat roofs and earth plaster.

1.2.5. Africa

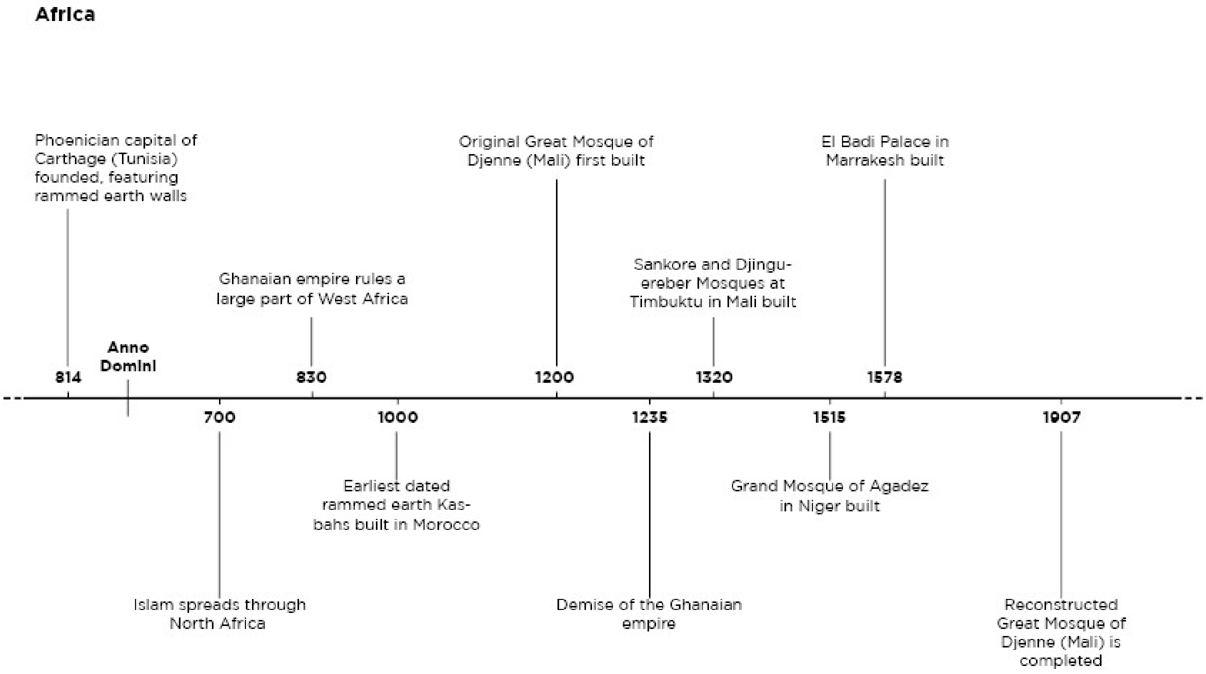


Figure 1.15. Timeline of relevant historical events in earth construction in Africa.

Egypt remained somehow isolated from the rest of the African continent, and there's little evidence of its influence in other African countries.

In North Africa, rammed earth was extensively used, with early examples found in Phoenician settlements such as Carthage (814 BC). Excavations reveal that rammed earth walls were common in homes, and historical accounts suggest the technique was used in military fortifications attributed to Hannibal. With the spread of Islam around 700 AD, rammed earth became prominent in Morocco, where fortified Kasbahs like Ait Ben Haddou (figure 1.16) and Tamnougalt (c. 1000 AD) were built (Schroeder, 2015, p. 11-13). The cities of Marrakesh and Fes feature extensive rammed earth architecture, including defensive walls and monumental structures such as the El Badi Palace .

In West Africa, adobe and cob construction were essential for vernacular architecture, likely in use since the Ghanaian Empire (830–1235 AD). The rise of the Mali Empire saw the expansion of monumental earthen architecture, particularly in cities like Djenné and Timbuktu. The Great Mosque of Djenné (first built c. 1200 AD, reconstructed in 1907) and the Sankore and Djinguereber Mosques (1320 AD) exemplify the region's distinct mud-brick style, characterized by projecting palm stalks that serve as scaffolding for annual replastering. Similar adobe structures, such as the Grand Mosque of Agadez

(1515 AD), highlight the continued use of earth in monumental West African construction. Further east, the Musgum people of Cameroon developed unique earthen dwellings with inverted catenary dome structures. While humid regions of Central and Southern Africa have fewer monumental earth buildings, vernacular earth construction remains widespread across the continent (Jaquin, 2014, p. 315-316).

Figure 1.16. Ait Ben Haddou, Morrocco.

1.2.6. Australasia

Australia's history of earth construction is largely tied to European settlement. Early references to rammed earth date back to 1823 in Tasmania, with its use increasing during the 19th-century gold rush. New Zealand saw similar experimentation with adobe and rammed earth, but the destructive earthquakes of 1846 and 1855 led to a decline in its use. In the mid-20th century, G.F. Middleton's Bulletin No. 5 (1953) laid the groundwork for the modern revival of rammed earth construction in Australia (Jaquin, 2014, p. 319-320).

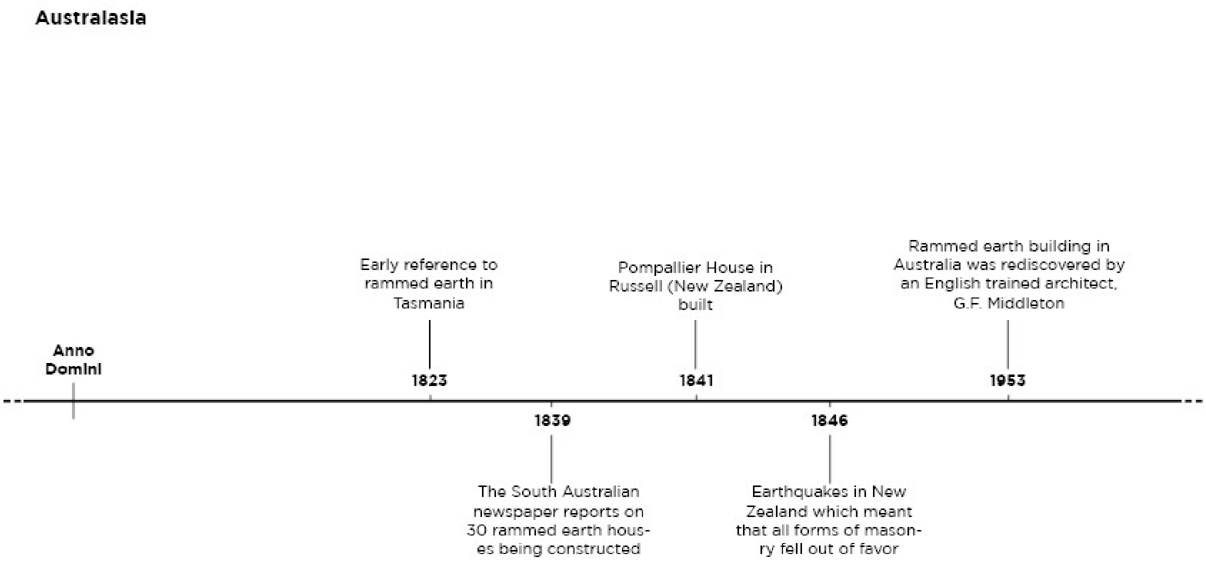


Figure 1,17. Timeline of relevant historical events in earth construction in Australasia.

Chapter conclusion

Earth construction has been a fundamental building technique across civilizations, adapting to different climates, resources, and cultural influences. As architecture became professionalized, particularly through industrialization and economic pressures to reduce costs, it moved away from these vernacular methods in favour of standardized materials and techniques.

Today, rising concerns around sustainability have sparked renewed interest in pre-industrial building systems. Yet, this revival often occurs within frameworks that disconnect design from making, and overlook the contributions of those who build. Ancient illustrations from Egypt and China remind us of a time when builders were valued figures, their knowledge embedded in both practice and representation. These depictions challenge the invisibility of labour in contemporary architecture and prompt reflection on who is remembered, and who is not, in the architectural record.

Chapter 2 will shift from historical and geographical overviews to a closer examination of earth building systems.

2. Continuity and Change in Earth Building Techniques

This chapter explores how the role of the architect can be rethought through a closer examination of earth construction techniques, beginning with an overview of traditional systems and classifications, then comparing how selected methods have been reinterpreted in contemporary contexts. The work of Houben and Hubert Guillaud continues to provide a foundation for understanding the diversity and technical evolution of earth architecture. German architect and researcher Gernot Minke (2012), founder of the Building Research Institute at the University of Kassel, brings decades of global experience in ecological design. Further insights into earth-building practices are drawn from the fieldwork and consultancy experience of Wilfredo Carazas Aedo, who has worked extensively across Africa, Latin America, and the Middle East, and from Alba Rivero Olmos, an architect affiliated with CRAterre.

2.1. Tradition and Transformation

The terms "traditional" and "vernacular" are often used interchangeably in architectural discourse, yet they carry distinct meanings, particularly when examined through the lens of building techniques. Traditional architecture generally refers to methods and styles that have been passed down through generations, often tied to cultural heritage and historical continuity. “Architecture is still one of the most traditional arts. A work of architecture is meant to be used, [...] no architect can avoid using the work of earlier architects” (Fathy, 2000, p. 40)

Vernacular architecture emerges from practical responses to the environment, rooted in local knowledge, materials, and climate-adaptive techniques refined through trial and error rather than formal design. As Teixeira (2017) notes, the architect—as we understand the profession today—is largely absent from these processes. Vernacular architecture operates without formal drawings or a designated designer; it is, fundamentally, architecture without architects. This raises a critical question: how might architects today engage with this knowledge—not as distant interpreters, but as collaborators in adapting it to present-day needs?

2.2. Constructive Systems and Techniques

Earth construction methods are as diverse as the cultures that developed them, shaped by both material versatility and the ingenuity of vernacular traditions. CRATerre identifies twelve fundamental techniques (figure 2.1), though variations number close to one hundred (Houben & Guillaud, 2006). These methods typically fall under three categories introduced earlier: monolithic, unit-based, and infill systems—each offering different responses to climate, material availability, and local building culture.

Monolithic techniques, such as rammed earth, cob, and poured earth, involve shaping moist earth directly in place, forming continuous masses with or without formwork. Unit construction includes methods like adobe and compressed earth blocks, where the material is first shaped into individual elements, then assembled like masonry. Infill systems, such as wattle and daub or light straw clay, use earth as a filling material within a structural framework, usually timber, where the earth is thrown, pressed, or layered into a supportive mesh. Each of the twelve primary methods—ranging from cut or dug earth, moulded or extruded bricks, to shaped, filled, or covered forms—offers different solutions for climate, material availability, and building culture. These techniques have been used to construct not only modest dwellings but also large and significant buildings, underscoring earth's enduring relevance as a material shaped as much by human hands as by environmental context.

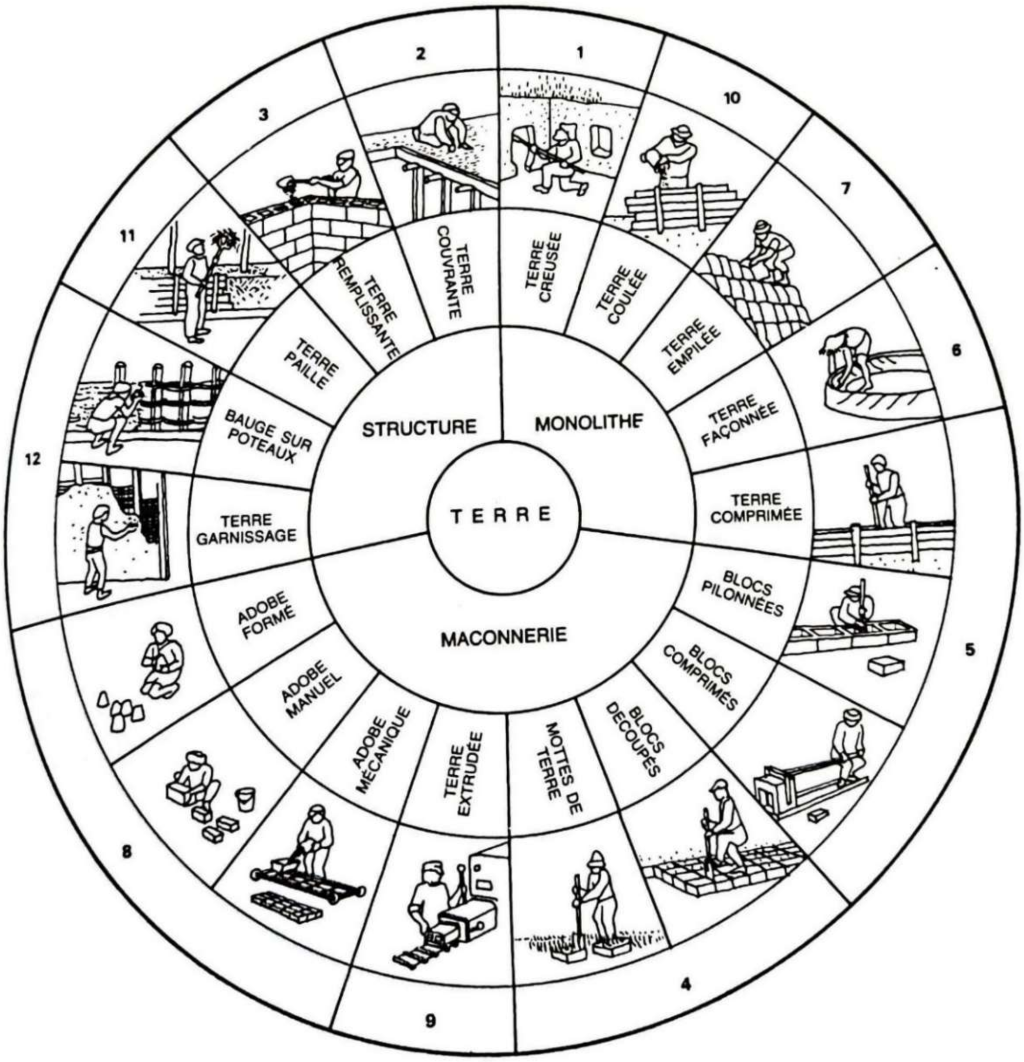


Figure 2.1. Diagram showcasing an overview of earth building techniques.

2.3. Innovative use in earth building techniques

2.3.1. Adobe

Adobe is one of the oldest and most widespread earth building techniques, with archaeological evidence tracing its use back over 6,000 years in regions like Turkey and

Egypt. Particularly prevalent in areas lacking abundant timber or stone, adobe has long served as a practical and efficient method for creating durable structures from locally available soil (Minke, 2012).

The traditional adobe technique involves mixing sandy loam with water and often adding straw to improve cohesion and reduce cracking. This labour-intensive work is often carried out by such as donkeys, mules, oxen or horses, animals that trample the earth with their hooves (Houben & Guillaud, 2006). Figure 2.4 makes it clear how deeply building practices are embedded in local context and culture: so much so that even the animals part of daily life become integral to the construction process. The mixture is then thrown or poured into wooden moulds(figure 2.3), to form bricks. The surface is smoothed either by hand or by a timber piece, trowel or wire (figure 2.5) and once formed, the blocks are left to dry in the sun for several days. This production method enables a single person to produce up to 300 blocks per day (figure 2.2).

Figure 2.2. Manual production of adobe bricks.

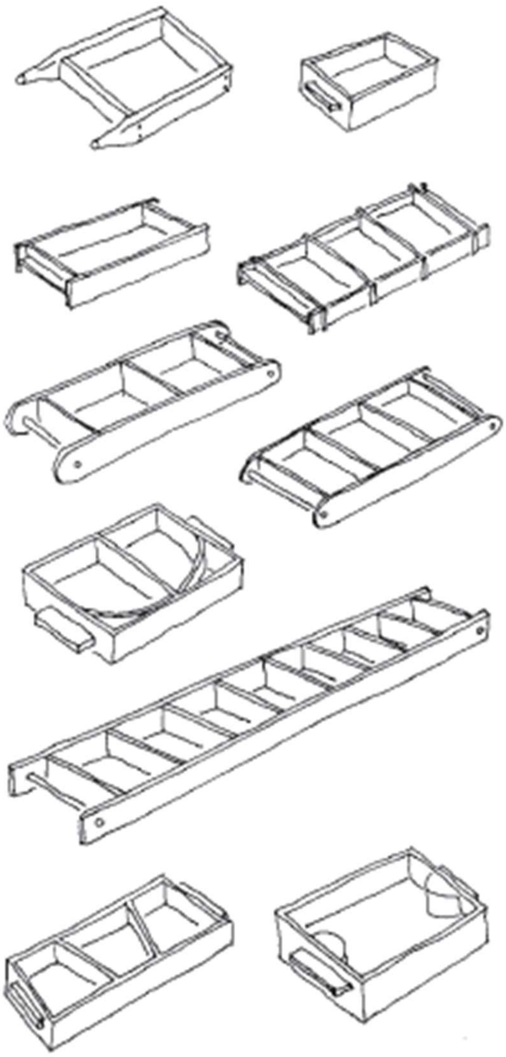
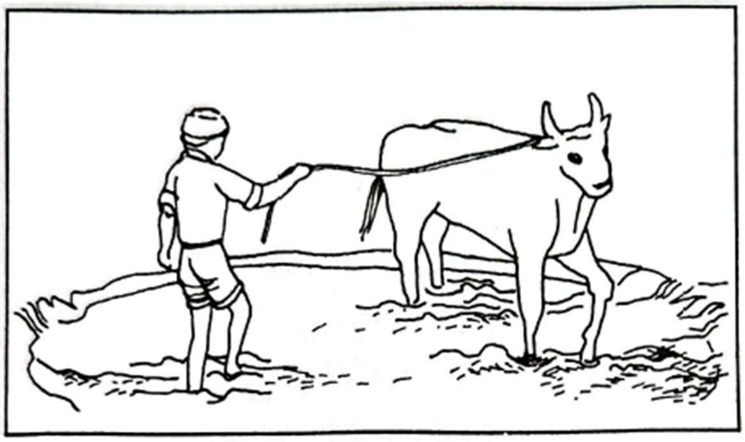


Figure 2.3. Moulds for adobes.



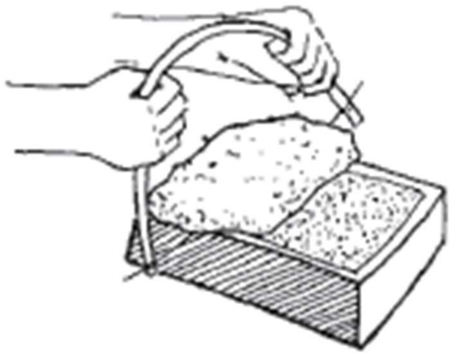


Figure 2.4. Mixing of earth used for construction using animals. (left)

Figure 2.5. Removal of surplus loam with a wire. (right)

In modern contexts, adobe has evolved through technologies that improve strength, consistency, and production efficiency. Since the 1940s, mechanized presses (figure 2.6) have enabled the production of compressed earth blocks (CEBs), often stabilized with small amounts of cement to enhance durability. These machines offer greater precision, making them suitable for structural use, but they require consistent soil quality and moisture control, which can be challenging in resource-limited settings. Fully automated systems can produce thousands of blocks per day, though they demand significant investment and maintenance. Contemporary applications also emphasize improved surface treatments, adherence to sustainability standards, and compatibility with modern aesthetics (Minke, 2012).

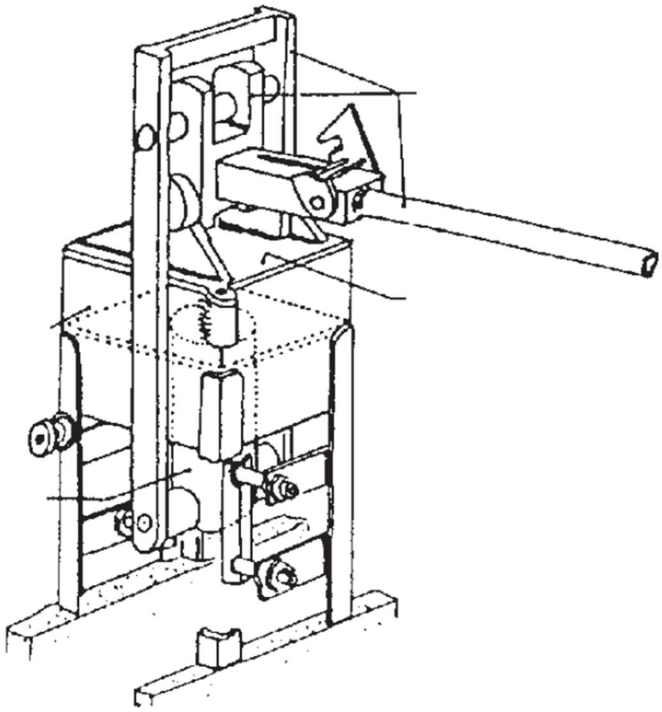


Figure 2.6. Mechanical adobe press.

2.3.2. Rammed earth

The Rammed earth is a monolithic building technique with ancient origins and global application, traditionally used in regions with hot, dry climates. Rammed earth is prized for their thermal mass, simplicity, and greater compressive strength compared to adobe or cob. The basic construction method involves pouring a moist, crumbly earth mix into wooden, steel, or composite formwork (figure 2.9) in layers typically 10–15 cm deep (Minke, 2012). Each layer is compacted, traditionally by hand using wooden or metal rammers (figure 2.8) until its volume reduces by about one-third. Known for its aesthetic texture and durability, rammed earth surfaces (figure 2.10) can be left exposed or lightly sponged for a refined, natural appearance (Houben & Guillaud, 2006).

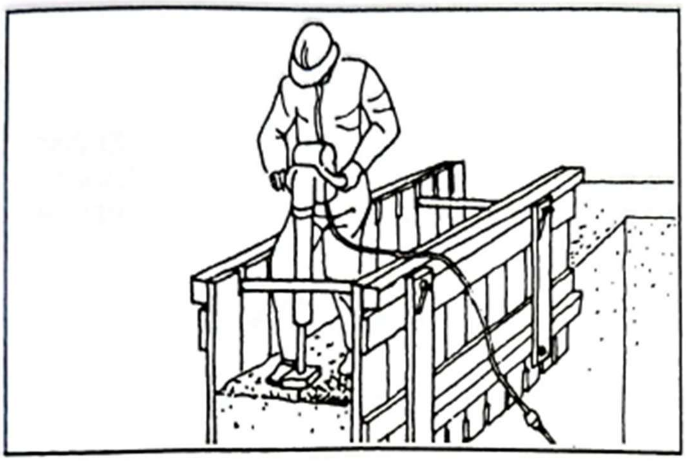


Figure 2.7. Pneumatic rammer.

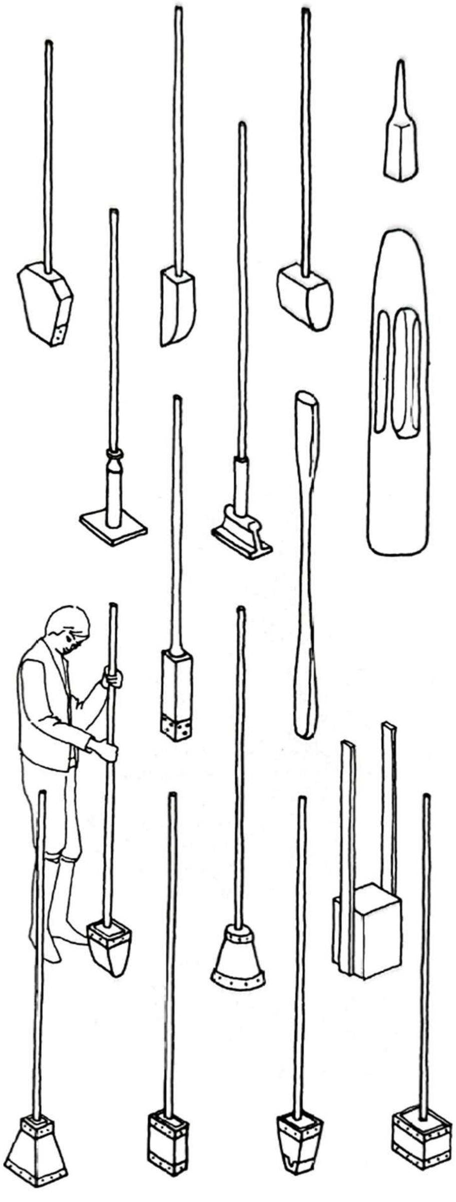


Figure 2.8. Rams used for manual compacting.

Contemporary innovations have significantly improved efficiency, precision, and architectural freedom in rammed earth construction. Prefabricated rammed earth panels are increasingly common, manufactured on or off-site and then craned into place (figure 2.11), they streamline construction timelines and improve quality control. Lightweight, adjustable formworks made from plywood or aluminium replace heavy timber structures, and pneumatic or electric rammers (figure 2.8) achieve faster compaction at higher consistency. Soil stabilization, particularly with 4–12% cement or lime, enhances strength and moisture resistance, allowing for load-bearing walls even in seismic zones (Minke, 2012).

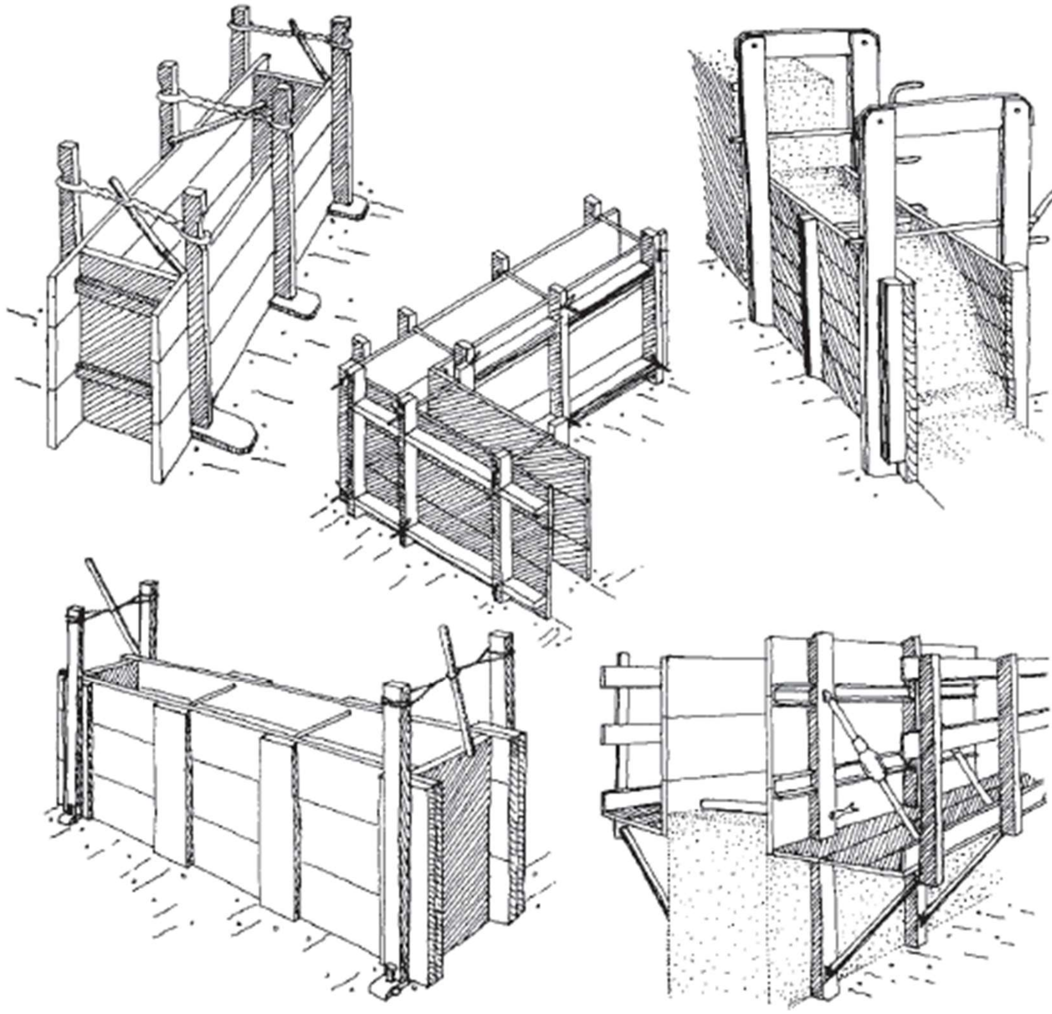


Figure 2.9. Formwork for rammed earth.

Figure 2.10. Rammed earth wall surface.

Figure 2.11. Prefabricated rammed earth panel being craned into place on the Alnatura Campus project.

2.3.3. Wattle and daub

Wattle and daub is an infill earth construction system used across diverse climates in Africa, Asia, the Americas, and Europe. Closely tied to timber-framed and vernacular architecture, it involves weaving a lattice of flexible branches or stakes (the “wattle”) and coating it with a wet earth mixture (the “daub”), often mixed with straw or fibres (Minke, 2012). The result is a lightweight, breathable, and thermally efficient wall system (figure 2.12).

Figure 2.12. Wattle and daub construction system found at the 19th century, Bulgaria.

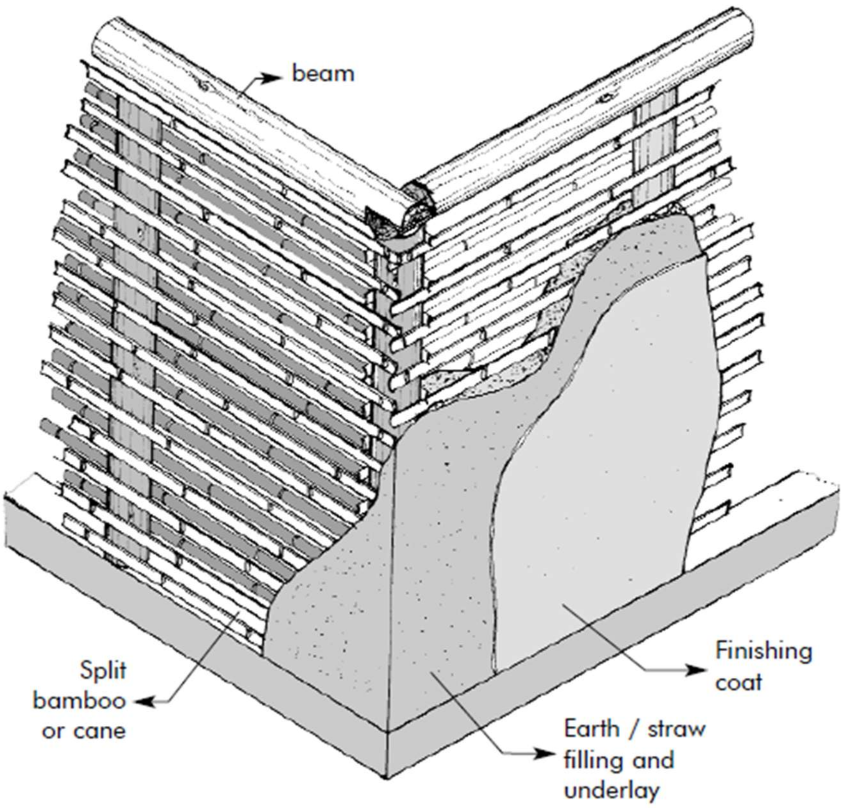


Figure 2.13. Scheme of traditional wattle and daub system.

Traditionally, vertical stakes were fitted into timber frames, with horizontal branches or cane woven between them to create a mesh. The loam mixture, typically made of clay, sand, straw, and water, was then thrown or pressed into this lattice from both sides. In traditional repair practices, damaged areas could be patched simply by reapplying fresh daub. This method's flexibility and local material use made it widely accessible, though its labour-intensive nature and vulnerability to shrinkage cracks posed challenges (Schroeder, 2015).

Modern interpretations of wattle and daub aim to retain its ecological value while improving durability, efficiency, and performance. Prefabricated panels, feature cane or bamboo battens fixed to wooden frames with wires or nails that can be rapidly assembled and plastered with earth-based mortars in multiple layers as seen in figure 2.15. One notable innovation is "quincha metálica" (figure 2.14), a system developed in Chile involving a steel skeleton structure with cane formwork, filled with a sprayed loam mix stabilized with lime. This technique not only improves curing and reduces cracking, but also offers resistance to corrosion and seismic activity (Aedo & Olmos, 2003).

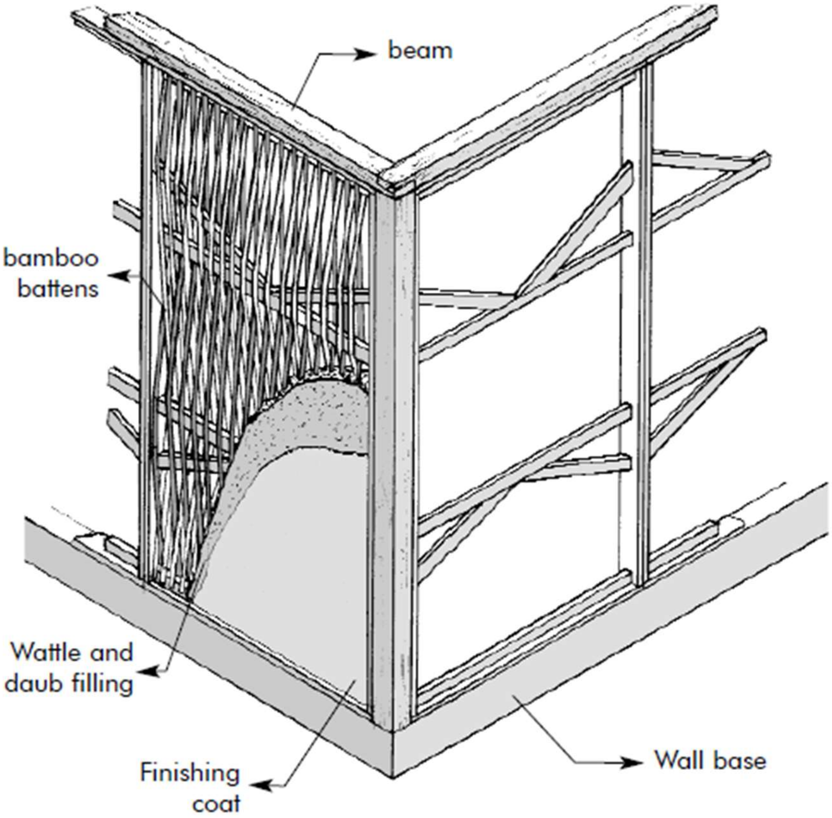


Figure 2.14. Scheme of the "quincha" prefabricated system.

Figure 2.15. Prefabricated wattle and daub system in Brazil.

Chapter conclusion

The exploration of earth construction practices reveals that many so-called "innovations" are in fact reinterpretations of long-standing, site-specific knowledge. From hand-moulded adobe bricks to prefabricated rammed earth panels and mechanized daub applications, these techniques have evolved in dialogue with new tools, regulations, and design cultures. However, in the process, many recent applications have become detached from the communities and builders that originally developed them. While vernacular earth construction was once embedded in local practices, contemporary reinterpretations often exclude those same communities from the architectural and economic benefits of the work. What does remain, however, are key principles—such as climate responsiveness and low embodied energy—that continue to shape the relevance of earth as a building material today.

Architect Yasmeen Lari challenges the architectural profession to move beyond the pursuit of innovation for its own sake and to reengage with low-carbon, locally grounded methods. As she puts it "the time has come for us to look back and see what was relevant then because it is going to be relevant today because of climate change." (2025). Her work, along with that of other socially engaged practitioners, highlights the potential of architects to serve as facilitators, bridging historical knowledge with contemporary design, and empowering communities rather than imposing solutions.

As we transition into Chapter 3, which focuses on the recent resurgence of earth construction, these reflections remain relevant.

3. Building Forward with Earth

3.1. Earth's Resurgence

In recent decades, earth architecture has experienced a notable resurgence, prompted by urgent environmental concerns and a growing interest in low-carbon, context-sensitive building methods. This revival is not only theoretical but actively supported by architects, engineers, and institutions who seek alternatives to industrialized materials like concrete and steel.

Co-founded in 1979, at the *École Nationale Supérieure d'Architecture de Grenoble*, by engineer Hugo Houben and architect Hubert Guillaud, the key research centre for earth architecture CRAterre combines scientific rigor with cultural advocacy. Their influential publications, such as *Traité de construction en terre*, emphasize the dual value of earthen techniques: both as a scientific field of study and as a cultural heritage practice deserving of preservation and reinterpretation (Houben & Guillaud, 2006).

While some architects, such as Martin Rauch and BC Architects, have focused on refining rammed earth within advanced design and engineering contexts in Europe, developing not only architectural projects but also initiatives like BC Materials to commercialize and expand access to earth-based construction—others, including Marina Tabassum, Yasmeen Lari, and Anna Heringer, adopt more socially engaged approaches, rooted in community participation and climate resilience. These contrasting practices reflect broader debates within the contemporary revival of earth architecture: whether it serves primarily as a high-performance, aesthetic material or as a tool for social empowerment and environmental adaptation.

This chapter delves into the case study Alnatura Arbeitswelt, to help us gain a deeper understanding of how earth construction is transitioning from a vernacular tradition to a contemporary architectural movement.

3.2. Case study: Alnatura Arbeitswelt

The Alnatura Campus in Darmstadt, completed in 2019 by Haas Cook Zemmrich STUDIO2050 in collaboration with Martin Rauch's *Lehm Ton Erde*, stands as a landmark in the contemporary application of rammed earth. Recognized as the largest office building in Europe to feature an earthen façade, the project reflects how traditional materials and techniques are being reimagined to meet the needs of modern sustainable architecture.

What makes the Alnatura Campus especially significant is its use of prefabricated rammed earth panels, each integrating insulation and geothermal wall heating systems. These panels were produced using earth sourced from a nearby infrastructure project (Stuttgart 21), illustrating how local and reclaimed materials can support large-scale building efforts. The prefabrication process enabled efficient construction of self-supporting, three-story-high walls with exposed loam surfaces, both inside and out.

Figure 3.1. Alnatura Arbeitswelt project built using rammed earth.

Figure 3.2.Rammed earth on-site prefabricated rammed earth wall panels.

Historically, earth construction was deeply tied to manual, on-site labour. As seen in illustrations in chapter 1, the process of shaping and placing earth was communal and performative, slow but adaptive. In contrast, the Alnatura Campus uses mechanized prefabrication to scale the material for commercial use, responding to regulatory, economic, and thermal performance demands. While this move distances the process from its vernacular roots, it demonstrates how earth construction is adapting in the face of industrial building systems.

The project also engages with broader sustainability goals. Its thick loam walls regulate indoor temperatures passively, reducing dependence on mechanical systems. This performance, paired with attention to life-cycle impact, positions the building as a model for low-carbon architecture in the global North. Yet, it also raises important questions: How can such techniques remain accessible beyond high-profile projects? And to what extent can prefabricated earth respond to social and ecological contexts without becoming a niche, aestheticized material?

As this case shows, the revival of earth construction is not a return to the past, but a reworking of historical knowledge through contemporary tools and demands.

4. Conclusion

From ancient vernacular traditions to contemporary sustainable design, earth has remained a resilient and adaptable material. This research has traced its evolution across diverse regions, revealing how many so-called innovations are in fact reinterpretations of long-standing practices. Techniques once rooted in communal, site-based construction are now being reshaped through industrial processes, such as prefabrication, to meet modern regulatory and performance demands.

This transformation, however, raises questions of authorship, access, and knowledge transfer. Historically built through collective expertise, earth construction was not tied to the figure of the architect as we know it today. As earth re-enters architectural discourse, who should define its applications: architects, institutions, or the communities from which it originated? Industrialized reinterpretations can offer technical advancements, but risk displacing the adaptability, local agency, and cultural embeddedness that once defined the practice.

This research contributes to a historically grounded framework for understanding how earth construction is not just being revived, but reconfigured: shaped by the demands of sustainability, new actors, and shifting definitions of architectural practice. By combining cross-regional timelines, visual documentation, and a critical reading of contemporary case studies, the paper provides a unique lens for analysing how earth building techniques migrate, adapt, and are reappropriated today.

Ultimately, this thesis argues that historical knowledge must play an active role in shaping future architectural practices. Understanding earth construction as both material technique and cultural practice allows us to challenge dominant narratives of innovation and to rethink how architecture engages with ecology, labour, and heritage. Rather than being confined to nostalgia or aesthetic revival, history can serve as a critical lens through which we reconsider what architecture is—and what it might become.

Epilogue

The renewed interest in earth construction is not only a material response to climate and resource challenges, but it also invites a reconsideration of the architect's role. Its practices, often rooted in collective labour and vernacular knowledge, stand in contrast to dominant models of architectural production that rely on detached authorship and industrialized systems. Revisiting these techniques does not mean idealizing the past, but rather understanding how knowledge is transmitted, transformed, and sometimes lost when building becomes disconnected from place and process.

In this context, the work of architects like Marina Tabassum and Yasmeen Lari offers compelling models for rethinking architectural agency. Their practices question the centrality of the architect as a singular designer and suggest alternative roles: facilitator, mediator, and collaborator, engaged with both history and community.

Can contemporary architecture incorporate these practices without detaching them from their cultural roots? And how can architects act not just as designers, but as mediators between inherited knowledge and future needs? Earth construction, in its layered past and evolving present, invites architecture to look inward, downward, and outward: to the ground beneath our feet, to the communities that shape it, and to the futures we collectively build.

List of figures

Figure 1.1. World map illustrating the worldwide use of earth in construction. From *"Research Gate,"* by J. Vyncke, 2018 (https://www.researchgate.net/figure/World-map-illustrating-the-worldwide-use-of-earth-construction-4_fig2_323171283). Licensed under CC Attribution 4.0 International.

Figure 1.2. Timeline of relevant historical events in earth construction in the Middle East. Own work, based on Houben & Guillaud (2006), Jaquin (2014) and Schroeder (2015).

Figure 1.3. Çatalhöyük, Turkey - UNESCO World Heritage Site. From *"Wikimedia Commons,"* by M. Özsoy, 2019 (https://commons.wikimedia.org/wiki/File:%C3%87atalh%C3%B6y%C3%BCk,_7400_BC,_Konya,_Turkey_-_UNESCO_World_Heritage_Site,_08.jpg). Licensed under CC Attribution-Share Alike 4.0 International.

Figure 1.4. Ziggurat in Chogha Zanbil, Iran, built around 1250 BC. From *"Wikimedia Commons,"* by C. Raddato, 2019 (https://commons.wikimedia.org/w/index.php?search=ziggurat+of+chogha+zanbil&title=Special:MediaSearch&type=image). Licensed under CC Attribution-Share Alike 2.0 Generic.

Figure 1.5: Production of earth blocks in Ancient Egypt, around 1500 BC; depiction in the tomb of Vizier Rekhmire, Theban West. From *Städtischer Wohnbau in Ägypten*. 1994, by Gebr. Mann, Berlin.

Figure 1.6: Pharaoh Hatshepsut during the production of earth blocks made of mud from the Nile River, around 1500 BC. From *Architecture for the Poor (2nd editon)*. 2000, by University of Chicago Press, Chicago.

Figure 1.7. Timeline of relevant historical events in earth construction in Asia. Own work, based on Houben & Guillaud (2006), Jaquin (2014) and Schroeder (2015).

Figure 1.8: Fu Yueh, known as the first "rammed earth construction master" in ancient China, Shang Dinasty (around 1320 BC). From *Chinesische Stampfbauten* (3rd edition, pp. 16-22). 1953, by Sinologica, Basel.

Figure 1.9: Production of earth blocks during the Ming Dinasty. From *Tian gong kai wu* (vol. 2, leaf 1). 1959, by Zhonghua shuzhu, Xinhua shudian zongjing xiao, Beijing.

Figure 1.10. The Great Wall of China, rammed earth section in Gansu Province, built around 220 BC. From *"Wikimedia Commons,"* by H. Ogawa, 2015 (https://commons.wikimedia.org/wiki/File:Western_End_of_the_Great_Wall_Hanchangcheng_Dunhuang_Jiuquan_Gansu_China_%E6%95%A6%E7%85%8C_%E6%B1%89%E9%95%BF%E5%9F%8E%E9%81%97%E5%9D%80_-_panoramio_(3).jpg). Licensed under CC Attribution 3.0 Unported.

Figure 1.11. Timeline of relevant historical events in earth construction in Europe. Own work, based on Houben & Guillaud (2006), Jaquin (2014) and Schroeder (2015).

Figure 1.12. Timeline of relevant historical events in earth construction in the Americas. Own work, based on Houben & Guillaud (2006), Jaquin (2014) and Schroeder (2015).

Figure 1.13. Chan Chan Archaeological Zone (UNESCO Heritage site). From *"UNESCO,"* by J. Williams, 2007 (https://whc.unesco.org/en/documents/110903). Licensed under CC Attribution-Share Alike 3.0 IGO.

Figure 1.14. Pueblo de Taos, New Mexico, USA, adobe buildings with flat roofs and earth plaster. From *"Wikimedia Commons,"* by J. Mackenzie, 2017 (https://commons.wikimedia.org/wiki/File:Taos_Pueblo_2017-05-05.jpg). Licensed under CC Attribution-Share Alike 4.0 International.

Figure 1.15. Timeline of relevant historical events in earth construction in Africa. Own work, based on Houben & Guillaud (2006), Jaquin (2014) and Schroeder (2015).

Figure 1.16. Ait Ben Haddou, Morroco. Own photograph, 2022.

Figure 1.17. Timeline of relevant historical events in earth construction in Australasia. Own work, based on Houben & Guillaud (2006), Jaquin (2014) and Schroeder (2015).

Figure 2.1. Diagram showcasing an overview of earth building techniques. From *Traité de construction en terre*. (4th edition, p. 163), by CRATerre, 2006, Parenthèses. Copyright 2020, 2024 by Éditions Parantèses.

Figure 2.2. Manual production of adobe bricks. From *Building with Earth: Design and Technology of a Sustainable Architecture.* (3rd edition, p. 61), by Birkhäuser, Basel. Copyright 2012 by Walter de Gruyter GmbH.

Figure 2.3. Moulds for adobes. From *Building with Earth: Design and Technology of a Sustainable Architecture.* (3rd edition, p. 60), by Birkhäuser, Basel. Copyright 2012 by Walter de Gruyter GmbH.

Figure 2.4. Mixing of earth used for construction using animals. From *Traité de construction en terre*. (4th edition, p. 210), by CRATerre, 2006, Parenthèses. Copyright 2020, 2024 by Éditions Parantèses.

Figure 2.5. Removal of surplus loam with a wire. From *Building with Earth: Design and Technology of a Sustainable Architecture.* (3rd edition, p. 60), by Birkhäuser, Basel. Copyright 2012 by Walter de Gruyter GmbH.

Figure 2.6. Mechanical adobe press. From *Building with Earth: Design and Technology of a Sustainable Architecture.* (3rd edition, p. 61), by Birkhäuser, Basel. Copyright 2012 by Walter de Gruyter GmbH.

Figure 2.7. Pneumatic rammer. From *Traité de construction en terre*. (4th edition, p. 207), by CRATerre, 2006, Parenthèses. Copyright 2020, 2024 by Éditions Parantèses.

Figure 2.8. Rams used for manual compacting. From *Traité de construction en terre*. (4th edition, p. 206), by CRATerre, 2006, Parenthèses. Copyright 2020, 2024 by Éditions Parantèses.

Figure 2.9. Formwork for rammed earth. From *Building with Earth: Design and Technology of a Sustainable Architecture.* (3rd edition, p. 50), by Birkhäuser, Basel. Licensed under Copyright 2012 by Walter de Gruyter GmbH.

Figure 2.10. Rammed earth wall surface. From *"Wikimedia Commons,"* by Moshirah, 2010 (https://commons.wikimedia.org/wiki/File:Rammed_Earth_Surface.JPG). Licensed under CC Attribution 3.0 Unported.

Figure 2.11. Prefabricated rammed earth panel being craned into place on the Alnatura Campus project. From *Upscaling Earth. Material, Process, Catalyst*. (2nd edition, p. 92), by gta Verlag, 2022, Zurich. Licensed under Creative Commons License CC BY-NC-ND.

Figure 2.12. Wattle and daub construction system found at the 19th century, Bulgaria. From *"Wikimedia Commons,"* by P. Goff, 2012 (https://commons.wikimedia.org/wiki/File:Wattle_and_daub_construction.jpg). Licensed under CC Attribution-Share Alike 3.0 Unported.

Figure 2.13. Scheme of traditional wattle and daub system. From *Wattle & Daub: Anti-seismic construction Handbook.* (1st edition, p. 14), by CRATerre-EAG, 2003.

Figure 2.14. Scheme of the "quincha" prefabricated system. From *Wattle & Daub: Anti-seismic construction Handbook.* (1st edition, p. 16), by CRATerre-EAG, 2003.

Figure 2.15. Prefabricated wattle and daub system in Brazil. From *Building with Earth: Design and Technology of a Sustainable Architecture.* (3rd edition, p. 79), by Birkhäuser, Basel. Licensed under Copyright 2012 by Walter de Gruyter GmbH.

Figure 3.1. Alnatura Arbeitswelt project built using rammed earth. From *Upscaling Earth. Material, Process, Catalyst*. (2nd edition, p. 91), by gta Verlag, 2022, Zurich. Licensed under Creative Commons License CC BY-NC-ND.

Figure 3.2.Rammed earth on-site prefabricated rammed earth wall panels. From *Upscaling Earth. Material, Process, Catalyst*. (2nd edition, p. 91), by gta Verlag, 2022, Zurich. Licensed under Creative Commons License CC BY-NC-ND.

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