Indigenous Building Techniques: an inspiration for contemporary tectonic architecture

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Abstract

In response to increasing environmental pressures and material scarcity, this research explores how indigenous building techniques can inform contemporary approaches to tectonic architecture. The study identifies global case-studies on their recurring construction logics and categorizes them into four themes: Stack, Wrap, Fill, and Scaffold. These themes are further examined through complementary contemporary case studies, which demonstrate the continued relevance of material intelligence, structural clarity, and contextual adaptation in modern architectural practice. To test the applicability of these principles, four experimental prototypes were developed using reclaimed materials sourced from the urban environment of Rotterdam. The research illustrates that when reframed through a tectonic lens, traditional ecological knowledge offers valuable insights for developing circular, demountable, and expressive construction systems. By positioning the city as a contemporary material landscape, the study proposes an expanded architectural approach that engages with indigenous wisdom as a foundation for innovative sustainable building constructions.

Keywords: indigenous building techniques, material recourcing, tectonics, construction logics

1. Introduction

In the face of accelerating climate change, globalisation, and resource scarcity, contemporary architecture has been increasingly challenged to reconsider the role of material and constructional intelligence in shaping more responsible design futures. However, over the past few decades, the Western building industry has largely prioritised principles such as modernisation, efficiency, and standardisation, resulting in homogeneous architectures that could be placed anywhere, at any time, with little regard for local context or material streams. A response to this has been a renewed interest in bio-based design, an architectural approach that embraces local resourcing and bio-based materials such as straw, wood and clay. However, as these materials re-enter architectural discourse, it is crucial to recognise that these design principles are not recent innovations but rather have existed for centuries. They have long formed the foundation of indigenous and traditional building techniques, many of which remain in use across diverse regions of our planet today.

Lo–TEK, popularized by writer Julia Watson, is a design approach rooted in Local and Traditional Ecological Knowledge and celebrates the wisdom of communities that have lived in close dialogue with their environments for generations (Watson, 2019). These indigenous building traditions, often developed through centuries of adaptation to specific climates, geographies, and available resources, represent sophisticated and resilient systems of construction. Yet, their relevance has largely been overlooked throughout the industrialisation of Western architecture, often dismissed as 'primitive' rather than understood as highly innovative responses to environmental and material constraints.

This thesis proposes a reframing of such practices, not as relics of the past, but as design systems rich in ecological intelligence, construction logic, and tectonic expression. The material resourcefulness, structural clarity, and detailed craftsmanship found in Lo–TEK techniques resonates with contemporary tectonic architecture, which similarly places material honesty and the expression of construction at the heart of its aesthetical expression (Frampton, 1995).

The research embodies a broad analysis and categorisation of indigenous- and complementary tectonic case-studies based on constructional logics. The shared design principles identified across these case studies are translated into experimental prototypes for structural elements that explore construction- and material logics. To reflect the principles of local resourcefulness and the reclaimability of materials, as found in the case-studies, the prototypes are constructed with urban materials harvested from the Rotterdam region. In doing so, the research aims to demonstrate how indigenous wisdom can serve as a meaningful source of inspiration for contemporary tectonic innovation.

This leads to the central research question of this paper:
How can the traditional ecological knowledge embedded in indigenous building techniques inform innovative tectonic prototypes for constructional elements?

2. Methodology

For the broader framework of this research (which can be found in the appendix VI), eight indigenous case studies were chosen for their characteristic Lo-TEK designs and organized into four key constructional principles. The principles 'Stack, Wrap, Fill and Scaffold' are inspired by the categorisation used in the book Heterogeneous Constructions (2024) by A. Forrest, B. Schneider and Y. Vobis in which the authors advocate for the value of multi-material structures in which the combination of material properties enhances structural capabilities. While many indigenous building techniques are naturally homogeneous, underscoring their intelligence, not all of the case studies examined in this research are strictly so. Nevertheless, the categorisation based on construction logic provides a meaningful and consistent framework for analysis.

For each constructional principle, the two indigenous case studies are complemented by a contemporary tectonic case study that reflects the constructional character of the theme. The methodology used in this research consists of a combination of empirical and analytical methods: the empirical component establishes the broader ecological and cultural context of the case studies and draws on literature and factual data, while the analytical component examines the construction logic, material relationships, detailing and joinery of the building techniques through hand-made drawings.

Following the case study research, for each theme, the identified design principles were translated into experimental prototypes for constructive building elements. The prototypes explore innovative material combinations, construction and joinery made from urban materials harvested from the Rotterdam region. Rotterdam in this, serves as the intended context for the up following design intervention to this research. The use of harvested materials for the design of the prototypes reflects the character of the indigenous case studies, where environmental responsiveness, reliance on local materials , and contextual adaptation played key roles in the development of the building techniques, while also translating these principles to a contemporary context in which urban environments no longer naturally offer ecological materials, but rather industrial ones. The main goal in the prototypes was to combine these urban materials in a way that allows them to be demounted and returned to the urban material bank after fulfilling their purpose, echoing the mindset found in Lo-TEK design.

With the categorisation of indigenous case studies based on construction principles, followed by contemporary case-studies and prototyping experiments with comparable constructional logic, this research aims to reposition the primitive character of indigenous building techniques as a valuable source of inspiration for contemporary tectonic architecture.

3. Stack, wrap, fill, scaffold

This chapter explores the four constructional principles: Stack, Wrap, Fill, and Scaffold. For each principle, two indigenous and one contemporary case study were selected for their Lo–TEK character and tectonic expression, and analysed in terms of ecological adaptation, social context, material resources, climatic responsiveness, and constructional logic. The insights gained from this research were compiled into a broader analytical framework, which documents each example in detail through text and drawings (see Appendix VI). In this chapter, the most important aspects of all case studies are highlighted and connected to their respective constructional theme.

3.1 Stack

The theme 'stack' follows construction principles in which building elements are assembled without the use of mortar or adhesives, relying solely on gravitational- or compressive forces and intelligent craftsmanship to achieve structural stability.

In the granite structures constructed by the Inca's at *Machu Picchu* in the Peruvian Andes mountains, this principle is exemplified through exceptional precision in masonry stone joinery. The massive blocks, used in the structures for both their dwellings and the reinforcement of agricultural terraces, were quarried locally, minimizing the need of transportation and reflecting efficient use of regional sources (Reinhard, 2007). The carving of the blocks was done with incredible craftmanship and included interlocking cuts that not only ensured structural stability without the use of mortar, but also enhanced seismic resilience (Wright & Zegarra, 2000).

Seismic resilience was also a fundamental consideration in the design of the traditional *Kath-kuni* constructions of the Himachal Pradesh region in Northern India (Baldev et al., 2024). These hybrid structures, characterized by the alternating layers of locally sourced stone and timber, are a great example of empirical wisdom passed down through generations. The intelligence in this case study lies in the understanding of the combination of flexible horizontal beams, which also serve as a bracing for an infill of small unregularly shaped pebbles, with stone blocks whose mass anchors the structure (Dharmarajul et al., 2017). This construction logic, combined with the local sourcing of materials, demonstrates both structural ingenuity and a deep sensitivity to environmental context.

The use of intelligent material joinery, as seen in the constructions of Machu Picchu and the Himachal Pradesh region, is echoed in the design of the Armadillo Pavilion by the Block Research Group for the 2016 Venice Biennale. In this structure, a span of over sixteen meters, containing nearly 400 limestone slabs, was assembled without the use of any mortar or adhesives. Fore the construction, an external timber framework was employed to position each precisely cut stone in place until the compression ring of the shell structure was closed (Block Research Group, 2016). After removal of the timber frame, the surface structure remained intact, held together solely by compressive force exemplifying how a deep understanding of material properties and force can result into a innovative structural design.

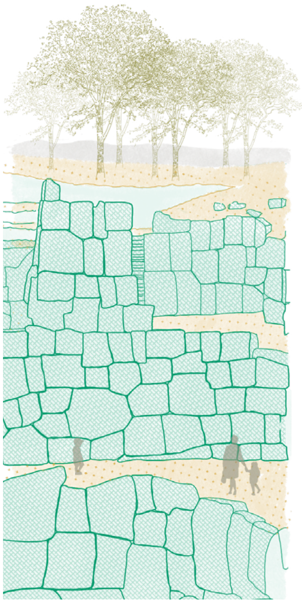
These three diverse examples demonstrate how the logic of stacking, grounded in gravitational force, compression, and precision informed traditional technologies and how it is continuously valuable in contemporary construction approaches. This enduring relevance of dry-assembled stacked structures invites renewed attention to the material intelligence embedded in the act.

3.2 Wrap

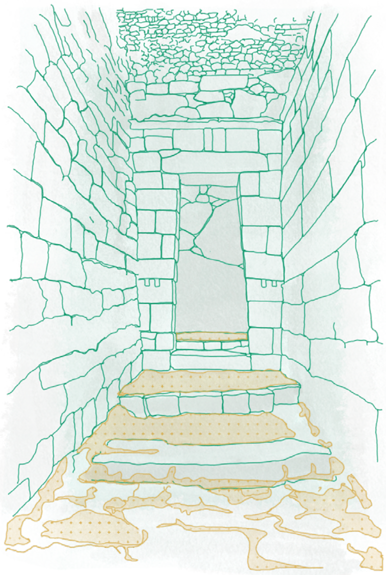
The theme 'wrapped' embodies buildings or elements that consist of materials, bound together in concentric layers, held together by radial force.

The *yurt* huts, indigenous to Mongolia and the broader region of Central Asia rely on this

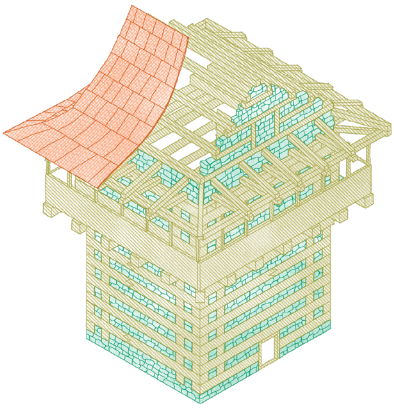
APPENDIX I



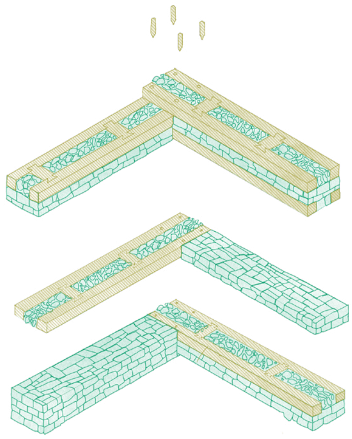
Fragment dry-stacked terracesof Machu Picchu.



Trapezium opening in walls in Machu Picchu.

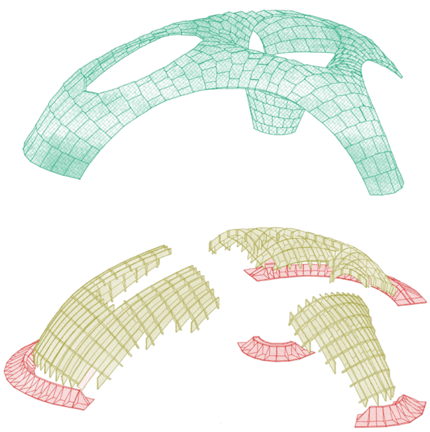


Axonometric drawing of Kath-Kuni building.



Exploded axo. of Kath-Kuni stacking system.

Free standing structure of the Armadillo Vault



Exploded axonomic drawing of the Armadillo Vault principle. These tent-like structures are composed of a collapsible timber frame and light slats bound together through tension bands traditionally made from leather or animal hair (Evers, 2025). The demountability of the structures ensures easy assembly and disassembly, making the yurts highly adaptable to the mobile lifestyles of the pastoralist communities. Typically constructed and deconstructed within a few hours by a small group of family or community members, the yurts reflect both social cooperation and passed-down knowledge. Their aerodynamic low profile combined with tightly wrapped insulating outer layers, ensures resilience to the strong winds of the open steppe's climate of the region. A central opening in the roof provides ventilation and daylight penetration while also carrying symbolic significance as a window to the heavens fulfilling both the functional needs and the spiritual worldview of its inhabitants (Schittich, 2019).

Similar to how the Mongolian people erect their yurts, the indigenous Maʻdān people of the Southern marshlands of Iraq construct their *Mudhif* buildings through communal effort (UNESCO, 2023). These public buildings, used for religious ceremonies, gathering, and the transmission of knowledge, are, like all other structures and even the very islands they stand on, constructed entirely from locally harvested reeds that grow abundantly in the surrounding marshlands (Watson, 2019). The elegant structures are made by tying reed into bundles and bending them into arched frames. The walls and roofs are covered with woven mats and fastened with ropes made from fibers of the same material. The flexible and versatile properties of the reeds enable the formation of incredibly diverse building elements born from craftsmanship and an intimate understanding of the material's behavior, resulting in structures that are both functionally adaptive and ecologically attuned.

Japanese Architect Shigeru Ban, renowned for his environmentally responsive design approach, employed a wrapped technique in the development of his iconic paper tube constructions. Following the 2001 Gujarat earthquake in Bhuj, India, he introduced these structural elements in the creation of temporary shelters as an innovative form of low cots and sustainable architecture (Ban, 2014). The paper tubes, formed by tightly rolling paper and bonded with adhesive, offered a surprising structural performance. Owing to their lightweight nature, ease of production, and recyclability, the paper logs became a foundational element in Ban's subsequent humanitarian and architectural projects, demonstrating how simple, renewable materials can meet urgent structural and social needs (Jodidio, 2016).

The constructions of the Mongolian yurts, Ma'dān mudhifs, and Ban's paper tube structures all exemplify how different wrapping techniques can be employed for the creation of building elements that are responsive to environmental conditions, cultural context, material availability, and communal demand.

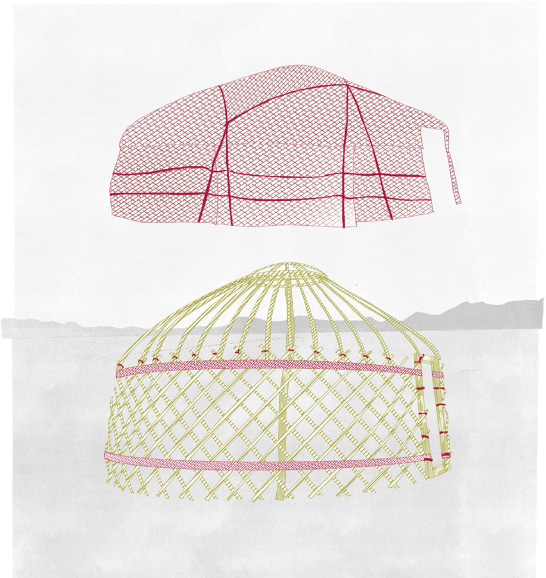
3.3 Fill

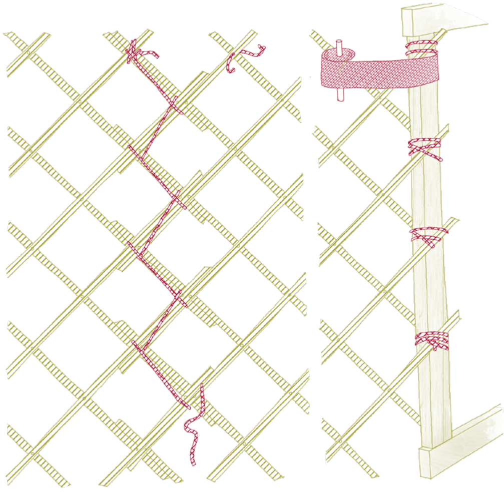
TThe theme 'Fill' represents building elements that consist of two or more materials within the same planar surface.

The indigenous dwellings of the Masai Mara in Kenia and Northern Tanzania relate to this principle. Their modest *manyatta* huts, made from a light weight structure of woven acacia branches, are filled with a mixture of mud and cow dung (Hodgson, 2001). The dwellings, constructed primarily by the female members of the community, are adapted to the climatic conditions of the savannah, providing insulation and ventilation suited to the environment. Although suitable to the semi-nomadic lifestyle of the Masai, the manyatta's require regular maintenance due to the extreme temperature fluctuations and weathering characteristics of the region (Rapoport, 1969).

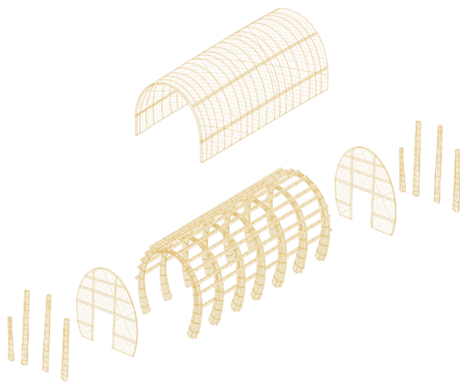
Fachwerk houses, commonly found in Central European countries during the medieval period, also embody the 'fill' principle in their construction. Although not typically seen as indigenous-but rather vernacular architecture of the West, the structures feature an intelligent technique that

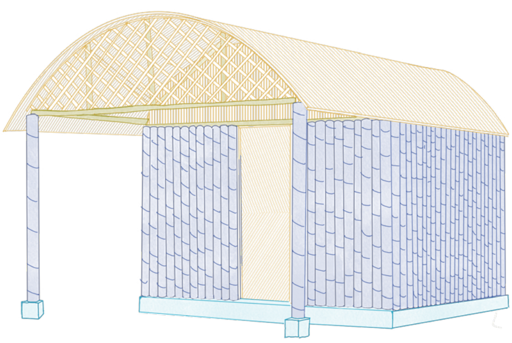
APPENDIX II

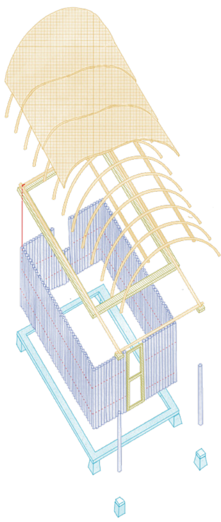

Exploded view drawing of Yurt structure.


Detail drawing of rope joinery in yurt construction.


Drawing of Madhif building in Marshlands of Southern Iraq.


Exploded axonometric drawing of Madhif.


Drawing of paper log shelter by Shigeru Ban.


exploded axonometric of paper log shelter construction

is still prevalent in parts of the continent, but dominantly visible in the landscape of southern Germany today. Originated to minimalize material usage and maximalize floor surface space, the structures consist of a timber frame in which each floor extends slightly beyond the lower. The frame, composed of vertical posts, horizontal beams and diagonal bracing is filled with regionally sourced materials such as loam, fired brick or woven reeds covered with clay (Lukas, 2024). Half-timber constructions with similar structural principles can be found in various parts of the world, such as the *minka* in Japan, *hımış* in Turkey, and *dhajji dewari* in Northern India. In these regions, the combination of a flexible timber framework with a massive infill system has proven to be particularly effective in enhancing seismic resilience (Aktaş et al., 2013).

In 2023, Chinese architecture studio HCCH challenged material boundaries through the filling technique used for their Twisted Shell Library. Located in the rural landscape of Zhejiang Province, the public pavilion aimed to reinterpret vernacular architecture through innovation (HCCH Studio, 2021). The dome-like structure, formed by the intersection of two sweeping arches, was optimized using computational design and exists of a double-perforated steel frame, which serves as the armature, that is filled with bricks bound with intelligently cast concrete. After hardening, the surface was sanded to expose the red brick, creating the expressive tectonic finish. The project exemplifies how filling techniques, risen from the innovative combination of material properties, can bridge traditional craftsmanship with modern construction logic.

The three examples each reflect distinct interpretations of filling techniques in construction, expressing the versatile potential of the technique and illustrating how it can mediate between tradition and technology.

3.4 Scaffold

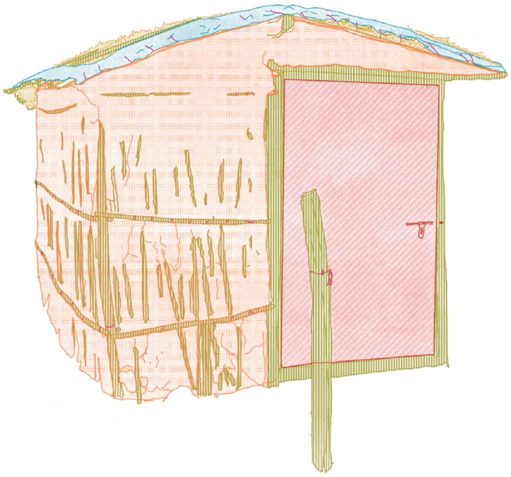
The theme ‘scaffold’ embodies buildings in which the structure used for erecting of maintaining remains a key aspect of the visual appearance after construction.

The indigenous Korowai people of Papua New Guinea for example, use scaffolding in one of its most extreme ways. Their elevated dwellings, which rise up to over 35 meters above the forest floor in order to avoid floods, insects, wild animals, and other tribes, are supported by a tall timber scaffolding built from slender, locally harvested trunks (Stasch, 2011). Constructed using techniques passed down through generations of men, the tallest tree houses, called lu-up or ‘climbing house’ serve as both strategic lookout points and showcases to impress and scare off rival tribes. Once nestled into the treetops, the Korowai dwellings are constructed by tightly binding horizontal and vertical layered branches into walls and floors with liana and rattan ties that contract as they dry, strengthening the whole (Schittich, 2019). In the architecture of these brave remote folks, the scaffolding structures supporting their homes are foundational to both the construction process and the overall living experience of the dwellings.

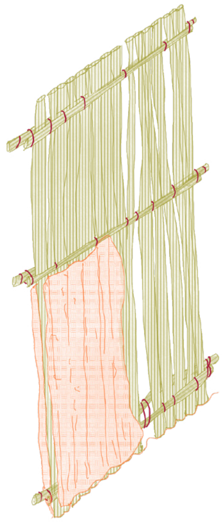
In contrast to the Korowai, the Musgum people of Northern Cameroon are more earth-bound, using soil even as the primary material for constructing their dwellings. Known as *cases obos*, these structures resemble catenary arches: a geometry optimized for bearing maximum weight with minimal material. Reaching up to 9 meters in height, the domes passively regulate temperature through their internal volume, which helps retain cool air (Craig, 2010.). Their ribbed exteriors, both visually striking and functional, serve as built-in scaffolding during construction and maintenance, and allow for sealing the roof opening with a clay pot during heavy rain. The grooves also channel rainwater, enhancing durability (Chin, 2014). Built and maintained through communal effort, the structures embody collective knowledge of materials, climate, and craft.

The METI Handmade School in Rudrapur, Bangladesh, designed by Anna Heringer, was also constructed using the help and knowledge of a local community. Heringer, who had previously

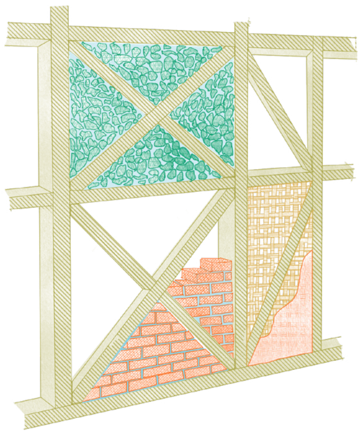
APPENDIX III

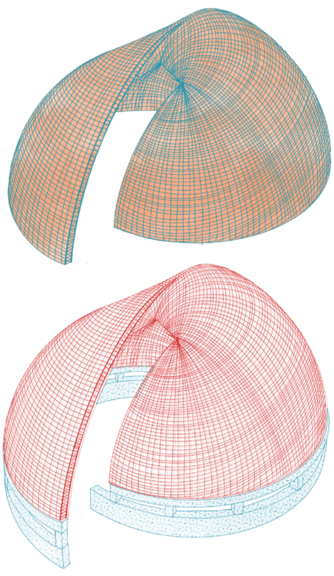


Drawing of Masaai dwelling.

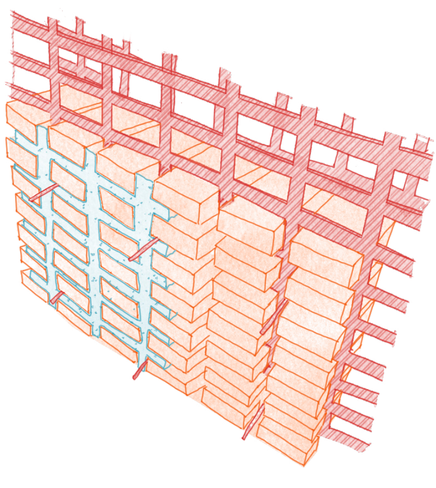


Detail drawing of wall element fill, Masaai dwelling.





Exploded axonometric drawing of Shell Library



Detailed drawing of construction method Shell Library studied vernacular architecture, developed the plans for the school in order to improve the local construction techniques by creating a 2-story building that was resilient to heavy rainfalls in contrast to the previous limitation to only ground level structures in the area (Shanti, n.d.). The building was constructed with the help of local mud-pressing techniques for the ground level while bamboo structures were used for the first floor and the roof, creating a hybrid construction in which two different construction techniques complement each other (Heringer, 2011). The tectonic expression of the bamboo, which is commonly used for scaffolding structures, and even so during the construction of METI, emphasizes the building's maintainability and repairability by the local community after completion. The design for the school demonstrates how contemporary architecture can be rooted in vernacular materials, communal labor and respect for local knowledge.

The three case studies each represent scaffolding in a distinct way, suggesting the wide range of possible construction techniques and architectural expressions that can emerge within the theme as either structural necessity, cultural symbol, or a strategy for adaptability and repair.

All the cases-studies embodied in the four themes, express deep understanding of local resources material behavior, constitutional logic and building techniques. All of the indigenous case-studies demonstrate how the transmission and development of traditional knowledge have resulted in designs that are deeply harmonized with the properties of the local environment and rely solely on materials that nature can reclaim. The contemporary case-studies show how indigenous knowledge, or the principles found with it, can serve as valuable resources for today's architecture in which we aim for sustainability, adaptability and resilience. The framework created through the exploration of both these indigenous and contemporary examples captures a rich body of knowledge that bridges tradition and innovation, and serves as a foundation for the experimental prototyping phase of this research.

4. The urban jungle as material bank

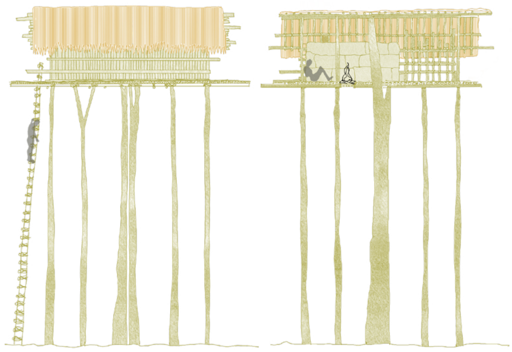
As revealed through the case study research, indigenous- or Lo–TEK design offers a rich and underutilised source of knowledge and inspiration for contemporary architecture. These systems, developed through generations of environmental adaptation and empirical experimentation, are deeply rooted in local context and material intelligence. One particularly significant principle found within many indigenous building traditions is the use of locally sourced materials, a practice not only environmentally responsive but also inherently circular.

In recent years, modern society has seen a growing demand for recycled and second-hand goods, such as clothing, furniture, and appliences. This cultural shift toward reuse reflects a broader re-evaluation of consumer habits. Yet, while the fashion and consumer goods sectors have rapidly adapted to this new ethos, the construction industry has been comparatively slow to respond. Despite increasing awareness of environmental challenges, building practices remain largely dependent on resource-intensive methods and globalised supply chains. Organisations such as Superuse Studios, located in Rotterdam, have been instrumental in challenging this norm by demonstrating how urban environments can be mined for overlooked materials and reassembled into new, contextually meaningful architecture (Superuse, n.d.). Likewise, Design- and research group Material Cultures' calls for a fundamental rethinking of how materials are sourced, valued, and constructed and advocates for localised, regenerative systems that align closely with ecological and cultural conditions (Material Cultures, 2022).

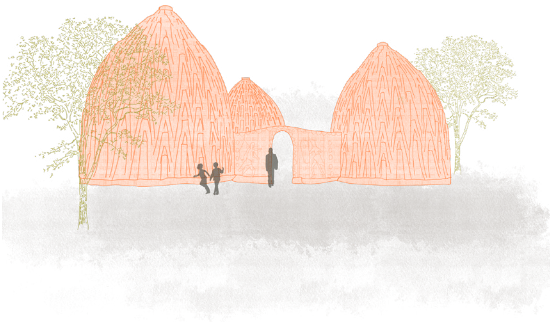
The experimental prototyping phase of this research addresses this disparity by drawing on the constructional intelligence of indigenous techniques to develop new building elements for a contemporary urban context. Grounded in the belief that, within large cities, natural materials as promoted in bio-based design, are no longer readily available, this research proposes an alternative approach to ecological materialisation. Acknowledging that in the material reality of cities today, it

APPENDIX IV

Drawing of Korowai 'lu-up' treehouse.

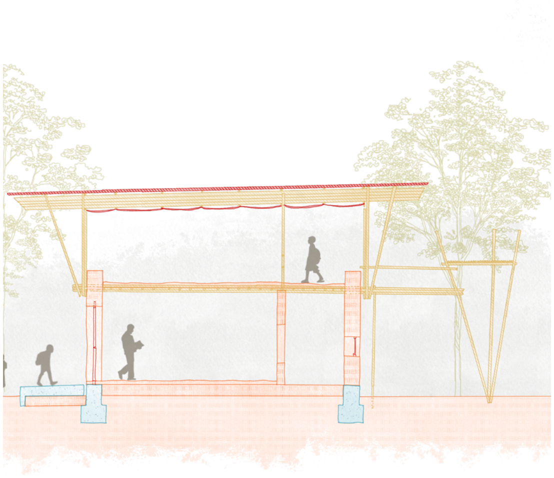


Facade and section drawing of Korowai treehouse.

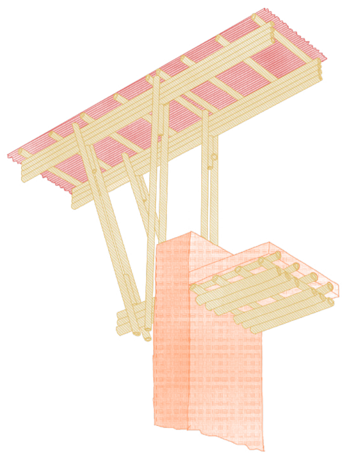


Musgum tolek settlement from outside enclosed wall.

Section drawing of Musgum tolek settlement



Section drawing of METI School



Section drawing of upper floor detail of METI School is industrial matter, not raw nature, that forms the local landscape. As such, the urban environment becomes a contemporary analogue to the indigenous context: a place of abundant, though overlooked, material potential. The prototypes developed in this research are therefore aimed to be constructed entirely from reclaimed materials sourced from the city of Rotterdam. In doing so, the city is reframed as a metaphorical urban jungle, a complex ecosystem of industrial materials waiting to be harvested. This approach not only draws from indigenous principles of resourcefulness and contextual adaptation but also pushes forward a contemporary tectonic language rooted in circularity and local responsiveness.

5. Prototypes

The four material prototypes explore alternative structural principles inspired by indigenous techniques and adaptable reuse. The designs emerged from the combination of initial concepts inspired by the thematic research and the availability of the materials found during a harvesting tour to five recycling and second-hand material centers in the Rotterdam region. This process reflects the resourceful and adaptive mindset observed in the case studies.

The design for the Stack prototype draws from the Kath Kuni construction technique, combining mass and bracing for stability. In this version, concrete bricks are interlayered with timber slats that interlock at the corners. The slats extend outward to allow vertical compression through elastic braces, which could potentially be replaced by a more permanent system such as steel wire and bolts. The prototype shows a mortarless masonry system secured through interlocking and compression.

The design for the Wrap prototype employs translucent polycarbonate multiwall sheets braced by metal pipe clamps, which are filled with cobblestones. The circular tension of the bracing keeps the panels in place, while the stone fill adds mass and stability. The stone infill could be replaced by any available material providing mass, such as rubble or sand. The channels in the multiwall sheets also present opportunities for different infills, such as, for example, insulation. This system demonstrates potential for context-specific column structures that are easily assembled and disassembled.

In the design for the Fill prototype, paper roll tubes and metal strapping are woven into a flexible, yet secure surface. The paper tubes provide stiffness, while the metal strap allows the surface to bend into organic forms. Additional materials can be woven into the system for increased mass or enclosure, suggesting potential for modular adaptation. The technique found in this prototype can be applied to floors, walls, or even roofing, providing a strong foundation for further development.

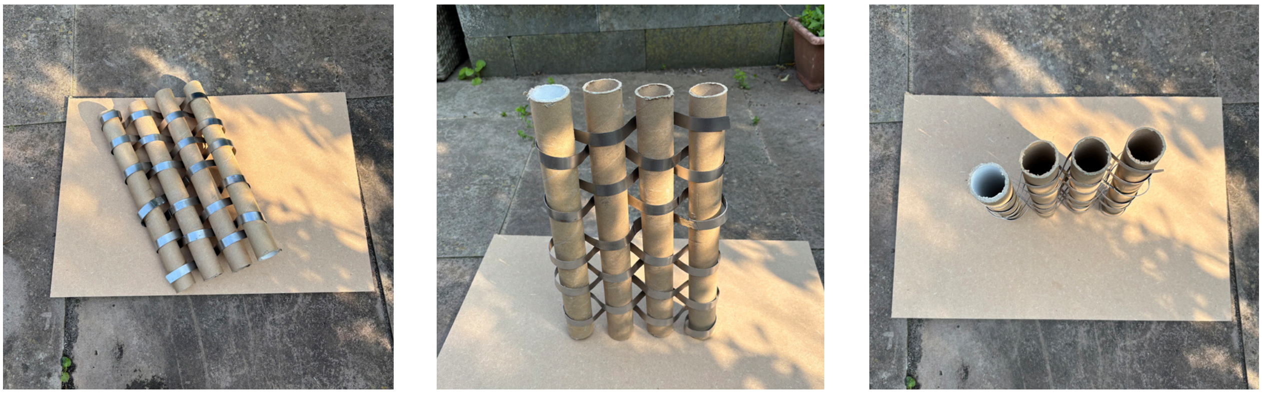
The Scaffold prototype was constructed from reclaimed terrace bricks, metal tubes, and iron wire. The metal tubes function as a scaffolding system to keep the bricks in place, while in return, the bricks keep the tubes in place by pressing their weight onto the wire bracing that pulls together the tubes between every two bricks. This hybrid system supports both vertical and lateral stability and can be adapted to various brick shapes and bracing types, offering a flexible and demountable approach to column design.

Together, these four prototypes demonstrate how low-tech, materially expressive construction methods can offer adaptable, demountable, and sustainable alternatives to conventional building systems. By reinterpreting the principles found in indigenous building techniques, such as bracing through mass, compression without mortar, and structural weaving, each prototype proposes a tectonic logic grounded in material behavior and assembly. These experiments highlight the potential of combining reclaimed or modest materials with intelligent detailing to develop resilient and site-responsive architectural systems.

APPENDIX V

STACKED

WRAPPED



FILLED

SCAFFOLDED

6. Conclusions

This research demonstrates that indigenous building techniques, often overlooked or dismissed in modern architectural discourse, embody a sophisticated understanding of materials, construction logic, and environmental responsiveness. By reframing these practices through a tectonic lens, the study reveals their continued relevance to contemporary architecture, particularly in the face of ecological urgency and material scarcity. The analytical framework, categorized into the themes Stack, Wrap, Fill, and Scaffold, has proven effective in identifying shared structural principles across diverse case studies, while the additional prototyping phase translates these logics into experimental construction elements using reclaimed urban materials.

The key insights this research provides are threefold. Firstly, indigenous construction techniques reveal a deep and intuitive understanding of materials and structural design. They often achieve resilience and efficiency through systems that are simple yet highly evolved. Examples include the way materials are combined to enhance one another's properties, as seen in the Kath-Kuni buildings, the minimal use of material and optimized forms, as exemplified in the Musgum Toleks, and the precise craftsmanship of the masonry blocks found at Machu Picchu. Secondly, indigenous case studies show how local knowledge enables buildings to be easily maintained, repaired, and adapted to changing needs. This flexibility is evident in the portable yurts of the Mongolian people and in the Maasai's ability to repair their homes after extreme weather. These construction practices, passed down through generations, result in building traditions that are not only enduring over time but also closely attuned to their environmental and cultural contexts. Lastly, indigenous architecture shows that limitations such as the availability of local materials and tools, or the need to respond to environmental threats, as in the case of the Korowai's dangerous forest floors, can drive innovation and adaptability. Altogether, the insights found in indigenous building techniques offer a powerful source of inspiration for contemporary architecture, especially for practices that seek to move away from standardized industrial models toward more context-sensitive, resilient ways of building.

The complementary contemporary case studies show how the four main constructional principles Stack, Wrap, Fill, and Scaffold, as used to define the indigenous practices, remain relevant to modern architecture. The Armadillo Vault and the Shell Library demonstrate that technologies embedded in vernacular logics can result in structures that are both expressive and innovative. The METI School and the Paper Log Houses, conversely, show how modern technologies can enhance vernacular architecture and contribute to the local knowledge of remote communities.

The prototypes developed for each constructional theme demonstrate how resourcefulness, material intelligence, and structural logic, drawn from the case study research, can inform tectonic architectural systems. By sourcing components directly from Rotterdam's urban landscape, the prototypes embody the material sensibility found in indigenous architecture and propose an alternative approach to material sourcing that operates outside standardized industrial systems. Through this translation, the research reframes the city itself as a local material resource, reflecting the deeply site-specific strategies central to Lo-TEK traditions.

Ultimately, this paper advocates for a shift in architectural thinking. It highlights an approach that moves beyond industrial conventions by learning from the ingenuity of indigenous building practices. By translating their material logic and environmental responsiveness into contemporary tectonic systems, the research opens new possibilities for construction that is environmentally responsive, locally sourced, structurally expressive, and grounded in both ancient wisdom and contemporary innovation.

7. References

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