

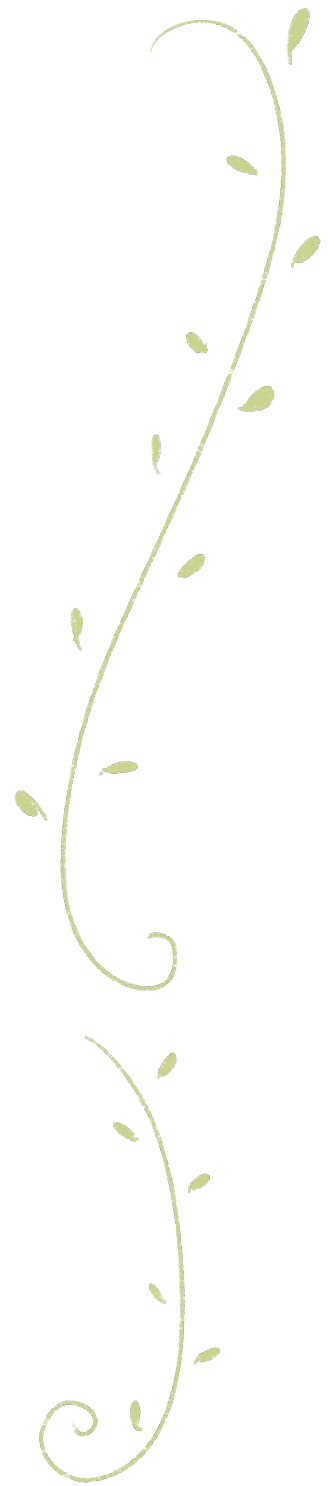
# LO-TEKTONICS

*A methodological framework of the design principles embodied in the building techniques of indigenous Lo-TEK wisdom and contemporary tectonic knowledge.*



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**RESEARCH PLAN**



**Personal information**  
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## Why aE studio?

I chose the Architectural Engineering Studio because of my positive experience with the MSc1 studio, Extreme Architecture, which was offered by the same department. My interest in both studios stems from their strong focus on the relationship between architecture, technology, innovation, and sustainability. Additionally, I was drawn to the creative freedom they provide in exploring an individual graduation topic.

## Key words

Indigenous wisdom | Vernacular architecture | Tectonic architecture | Lo-TEK design | Material knowledge

## Problem statement

Lo-TEK is a new design approach that refers to Local and Traditional Ecological Knowledge (TEK). It celebrates the wisdom of local communities passed down through generations, capturing technologies, material practices, and cultural values that are deeply intertwined with their natural environments. While famous historic indigenous achievements such as the Mayan structures of the Machu Picchu are often admired as relics of the past, many vernacular ways of building and living remain alive today. Especially in regions where strong ties to land and tradition remains.

Due to industrialisation, the modern Western world has come to prioritise efficiency, standardisation, and technological advancement. Although interest in the natural environment and building with local and bio-based materials is re-emerging, the deeper cultural understanding of where these materials and techniques come from remains superficial. In our pursuit of technological complexity, we have neglected forms of knowledge that are not only resilient and resourceful, but also rooted in place and community. Rather than endlessly reinventing what was once common sense to our ancestors, this thesis asks: What would it mean to build with wisdom, not just knowledge? (Watson, 2021).

The resourcefulness and the deep knowledge of material properties, structural performance and detailed joinery embodied in Lo-TEK building techniques can also be found in contemporary tectonic architecture: a design approach in which material honesty and structural expression are central to the architectural aesthetics. This thesis explores how the design principles embodied in the building techniques of indigenous Lo-TEK practices and contemporary tectonic thinking can contribute to an architecture that moves beyond high-tech solutions, and values centuries old wisdoms about ecological context, material honesty, structural performance and cultural embeddedness.

## **Objective**

The overall objective of this thesis is to develop a design framework that repositions the mindset Traditional Ecological Knowledge (TEK) as a valuable resource for contemporary architecture. TEK encompasses principles grounded in a deep understanding of local ecosystems, landscapes, cultural practices, material properties, and building techniques optimally refined and passed down through generations. By analyzing four indigenous Lo-TEK case studies alongside four examples of tectonic architecture, this research aims to identify the shared design principles embodied in the building techniques defined by ecological thinking, material intelligence, and cultural embeddedness in said approaches. These insights will contribute to a design methodology that moves beyond high-tech solutions and instead integrates manual techniques and local materials with respect for ecosystems and cultural context to ultimately offer an architecture rooted in wisdom, process, and place.

This methodology will be tested and applied in a site-specific design proposal for the Rijnhaven in Rotterdam. Once a working harbor central to the maritime industry, Rijnhaven is now undergoing significant urban transformation. Beyond its industrial past, the harbor also served as a point of arrival for many migrants during and after the war, embedding it with a rich cultural history. This multi-layered narrative of geographic change, shifting land use, and cultural movement enriches the site with both historical and contemporary relevance. These conditions offer fertile ground to explore how Lo-TEK principles and tectonic thinking can contribute to a sustainable, context-sensitive, and culturally meaningful architecture for the future.

The central design question that emerges from this reads: How can the shared design principles embodied in the building techniques of indigenous Lo-TEK wisdom and contemporary tectonic thinking inform an architectural intervention in the Rijnhaven, Rotterdam?

## **Relevance**

In the face of accelerating climate change, material scarcity, and cultural homogenization, architecture is being challenged to rethink its methods, materials, and responsibilities. While contemporary practice often looks to innovation through high-tech systems and globalized solutions, there is a growing recognition of the value embedded in traditional, local, and craft-based ways of building. Traditional Ecological Knowledge (TEK) represents not only a repository of sustainable techniques, but also a worldview that understands architecture as inherently tied to landscape, culture, and resource cycles. At the same time, a renewed interest in tectonic expression and material honesty in contemporary architecture signals a shift toward more grounded, process-oriented approaches. By bridging indigenous ecological wisdom with contemporary tectonic strategies, this thesis positions itself within a dialogue that seeks to reframe architecture into a meaningful practice rooted in ecological, material and cultural wisdom.

# Lo-TEKTONICS



**DESIGN QUESTION** 'How can the shared principles of indigenous Lo-TEK design and contemporary tectonic thinking inform an architectural intervention in the Rijnhaven, Rotterdam?'



**Lo-TEK**  
*indigenous*

**Tectonic**  
*Contemporary*

## CASE STUDIES

- 1 **Fisherman floating village**  
*Ha Long Bay, Vietnam*
- 2 **Ma'dan Reed Islands**  
*Iraq*
- 3 **Inca City**  
*Macchu Pichu, Peru*
- 4 **Samoa Fale houses**  
*Samoa Islands*

- 5 **Centre Pompidou Metz**  
*Shigeru Ban*
- 6 **METI Handmade School**  
*Anna Heringer*
- 7 **Nest We Grow**  
*Kengo Kuma, UCL Berkeley*
- 8 **Twister Brick Shell Library**  
*HCCH Studio*

*Comparative analysis*



## ANALYTIC THEMES

1. Geographical context
2. Cultural believes
3. Material resources
4. Structural expression
5. Details and joinery

*↓ conclusion*

## METHODOLOGICAL FRAMEWORK

Design principles

*↓ translation*

## DESIGN CONTEXT

Pasting the principles onto original design context of The Rijnhaven, Rotterdam

*↓ application*



Design project

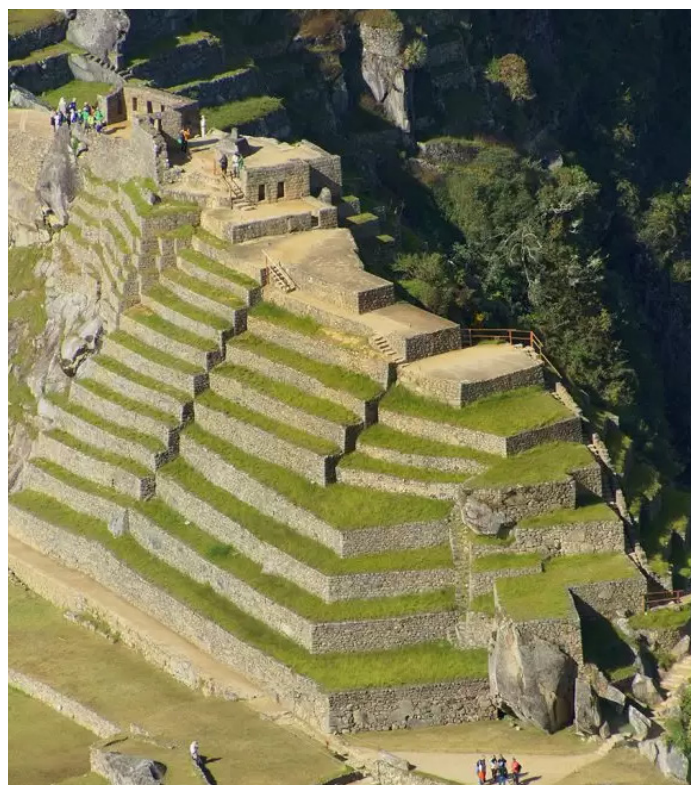
Lo-TEK indigenous casestudies



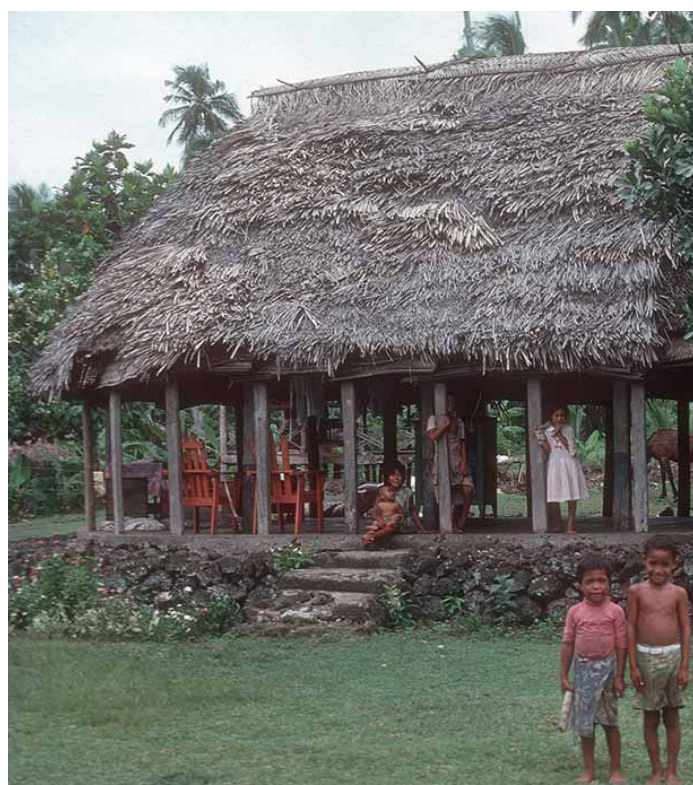
Gurunsi, Burkina Faso



Ma'dan Reed Islands, Iraq



Inca city, Macchu Pichu, Peru



Samoa Fale Houses, Samoa Islands

contemporary casestudies



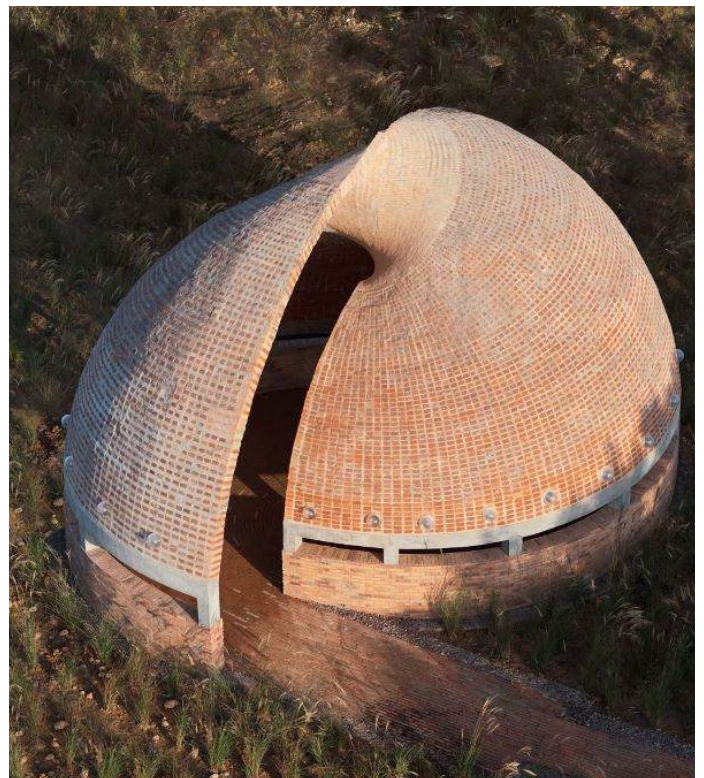
Shigeru Ban, Centre Pompidou, Metz



Anna Heringer, METI School, Bangladesh



Kengo Kuma + UCL Berkley, Nest We Grow



Library, HCCH Studio, China

## **Thematic Research Objective**

This thesis is guided by the hypothesis that architecture grounded in local traditional ecological knowledge and architecture grounded in tectonic thinking have overlapping design approaches and when integrated can offer context-sensitive and resilient responses to contemporary environmental and cultural challenges. To explore this, the research is structured around a set of thematic questions:

Main thematic research question:

- How can the integration of indigenous Lo-TEK wisdom and contemporary tectonic thinking expressed through building techniques inform an architectural design methodology that is rooted in ecological wisdom, material knowledge and cultural embeddedness?

Thematic subquestions:

- What design principles emerge from the building techniques used in indigenous Lo-TEK settlements that reflect an intimate relationship between material, landscape, and culture?
- What design principles emerge from the building techniques used in contemporary Tectonic architecture that reflect an intimate relationship between material, landscape, and culture?
- How do contemporary tectonic practices represent or contrast the Lo-TEK principles?
- In what ways could a new architectural design for the Rijnhaven in Rotterdam serve as a bridge between the worlds of indigenous Lo-TEK wisdom and contemporary tectonic knowledge?

In this research the term 'building techniques' will be unfolded into the following aspects:

- material recourcing
- craftsmanship and use of tools
- structural- and material performance
- details and joinery
- climate adaptiveness
- spatial organization

These aspects will be analysed through analytical drawing and supporting literature that will reveal the embedded knowledge systems, ecological logic and cultural narratives inherent in the case study's.

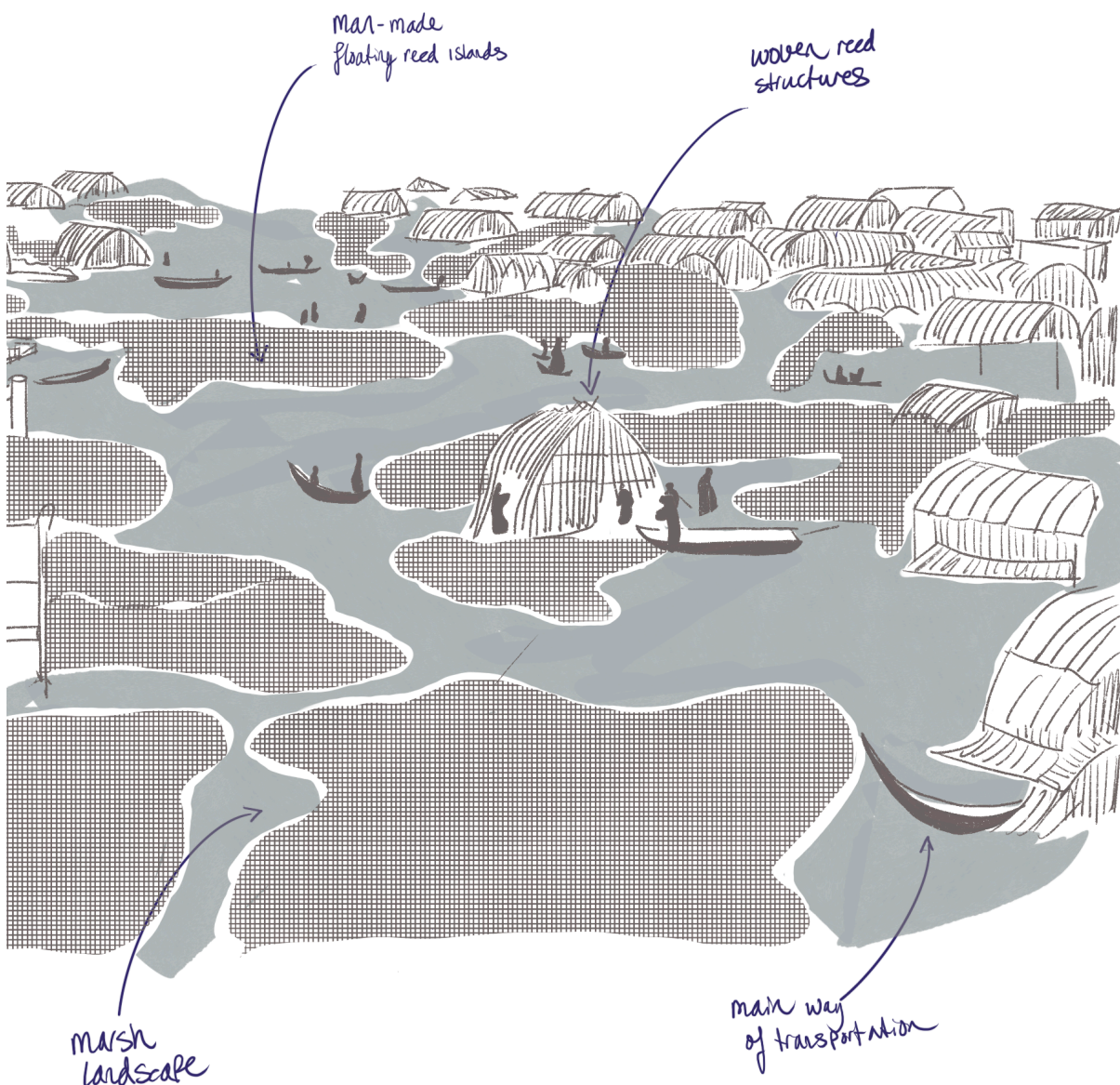
By framing these themes comparatively, the research aims to reveal shared values across time and culture that can inform a contemporary design methodology rooted in traditional wisdom, material knowledge, ecological thinking, and cultural embeddedness which will ultimately found the design methodology for an architectural intervention in the Rijnhaven, Rotterdam.

## **Relevance**

Understanding the shared principles between indigenous ecological knowledge and contemporary tectonic architecture is increasingly relevant in a time of ecological crisis, homogeneous design practices, cultural disconnection, and material overconsumption. By exploring these connections, this research responds to a growing need for architectural approaches that are not only sustainable in a technical sense, but also deeply rooted in place, process, and cultural continuity. This inquiry offers a meaningful counterpoint to high-tech, globalized design narratives by highlighting the enduring value of local materials, manual techniques, and ancestral wisdom in shaping the built environment. The Rijnhaven in Rotterdam, as a former working harbor now in transition, provides a layered and symbolically charged context for reimagining architecture as a mediator between cultural heritage, ecological renewal, and urban transformation.

## Theoretical methodology

This research follows a comparative case study methodology, combining architectural analysis with material and culture studies. The structure of the research consists of two main parts. The first examines four indigenous Lo-TEK settlements, selected for their strong integration of ecological knowledge, material intelligence, and cultural embeddedness. The second part examines four contemporary tectonic architectural projects that display material honesty, structural expression and craftsmanship. Each case is first analyzed on their individually interesting contexts through literature and is then analysed by the author on a technical level through handmade drawings that show the related 'building techniques' - unfolded as explained in the previous chapter- and their relationship to the landscape, available resources and cultural beliefs. The findings drawn from this analysis are incorporated into a design framework which will show a set of principles that will inform an meaningful architectural approach that is rooted in ecological, material and cultural wisdom. The final stage of the thesis applies this architectural approach to the original design context of the Rijnhaven in Rotterdam, forming the base for a well grounded design proposal.



Example for analytical drawing style (By author).

## Relevance of case studies to design proposal

The ultimate design proposal that will lead from this research thesis is an architectural intervention that expresses the value of ancient wisdom on building techniques reimagined through the lens of contemporary tectonic architecture. The design context will be the urban situation of the waterfronts of the Rijnhaven in Rotterdam to express the relevance of Lo-TEK techniques to inner-city's. The lense that will be used to approach the design context is one that shifts its view from looking at the ecological context of Rotterdam as the landscape that was once there, and instead accepts the reality that the industrial layers of the city and its urban material are in today in fact our 'indigenous landscape'. The materials that will be used for the design will thus be those industrial materials that we can recourse from our local environment such as components of buildings that are to be demolished, construction waste or other available sources. The hypothesis that connects the thematic research to the design proposal is that the mindset of -and the connection to landscape, materials and culture that is used in- indigenous architecture is a valueble recourse to this modern approach. All of the chosen indigenous case studies that will be researched will individually bring insightfull building technologies and constructional idea's that together will frame a mindset that will lead the original design.

Hypothetically there is something interesting to learn from every indigenous case study that can be found. This research tries to find at least four examples from all over the world that deal with different landscapes, climates, materials, building techniques, cultural believes and societal structures to create a versitile ground of techniques that might inspire the design. For the tectoinc case studies, four examples are chosed based on their diversity in material use, structural realisation and cultural embededness. In the following pages the expected interesting findings on environmental, social and technical level of all the case study's will be summarized.

### LO-TEK

#### **Gurunsi, Burkina Faso**

- Dessert
- Massive clay/ cow dung structures
- Man & female roles in collective building
- Facade cladding as water resillience and cultural expression

#### **Ma'dan Reed Islands, Iraq**

- Marshlands
- Light reed structures
- Handmade floating structures
- Cultural and structural embeddednes of local material

#### **Inca city, Macchu Pichu, Peru**

- Forest
- Heavy, masonry stone structures
- Architecture based on astrological knowledge
- Advanced water drainage systems

#### **Samoa Fale Houses, Samoa Islands**

- Beach coastal area's
- Light, wooden structures covered with straw
- Wide spans and complex structures
- Cultural meaningful joinery techniques

### TECTONIC

#### **Shigeru Ban, Centre Pompidu, Metz**

- Urban
- Open bend timber structure
- Inspired by chinese woven hats
- Large span due to material optimalisation

#### **Anna Heringer, METI School, Bangladesh**

- Rural alluvial
- Light bamboo, clay structure
- Enrichement of local vernecular architecture
- Community participation

#### **Kengo Kuma, Nest We Grow, Japan**

- Urban
- Glulam timber structure
- Combination of two different local building techniques
- Ecological mindset

#### **HCCH studio, Library, China**

- Rural grasslands
- Brick structure
- Mix of modern technology and historic building techniques
- Local shell as inspiration for design

# Planning

	February			March			April			
<b>Week</b>	<b>3.1</b>	<b>3.2</b>	<b>3.3</b>	<b>3.4</b>	<b>3.5</b>	<b>3.6</b>	<b>3.7</b>	<b>3.8</b>	<b>3.9</b>	<b>3.10</b>
<b>Dates</b>	10.02 /16.02	17.02/23.02	24.02/02.03	03.03/09.03	10.03/16.03	17.03/23.03	24.03/30.03	31.03/06.04	07.04/13.04	14.04/20.04
<b>Deadlines</b>						Draft research plan	Feedback			P1 (Final Research Plan)
<b>RESEARCH</b>				Developing Research Plan			PHASE I. Creating framework of Lo-TEK + contemporary case study's			
<b>DESIGN</b>	Lecture Julia Watson, Lo-Tek						Chosing context			
<b>TOOLS</b>										
	May			June						
<b>Week</b>	<b>4.1</b>	<b>4.2</b>	<b>4.3</b>	<b>4.4</b>	<b>4.5</b>	<b>4.6</b>	<b>4.7</b>	<b>4.8</b>	<b>4.9</b>	<b>4.10</b>
<b>Dates</b>	21.04/27.04	28.04/04.05	05.05/11.05	12.05/18.05	19.05/25.05	26.05/01.06	02.06/08.06	09.06/15.06	16.06/22.06	23.06/29.06
<b>Deadlines</b>										P2 (Final research Paper)
<b>RESEARCH</b>	Writing Research Paper			PHASE II. Analysing case study's (one per week)			PHASE II. Conclusions			
<b>DESIGN</b>	Choosing location		Location visit					Conclusions		
<b>TOOLS</b>										

## Glossery of key terms

### Traditional Ecological Knowledge (TEK)

Knowledge developed by indigenous and local communities over generations, encompassing sustainable practices, ecological awareness, building techniques, and cultural relationships to land and resources.

### Lo-TEK

A term popularized by Julia Watson, referring to low-tech, indigenous systems that are adaptive, resilient, and ecologically attuned. Lo-TEK highlights the ingenuity of traditional knowledge systems and their relevance for sustainable futures.

### Tectonic Architecture

A philosophy that emphasizes the expression of construction and materials in architecture. Tectonics reveal how buildings are assembled and focusses on the structure, joinery, and material honesty.

### Low-Tech Architecture

Design approaches that rely on simple, accessible, and often manual techniques rather than complex technologies. It emphasizes adaptability, repairability, and often draws from traditional methods.

### Cultural Embeddedness

The degree to which a building or system reflects and is shaped by the values, practices, rituals, and worldviews of the community that produces it.

### Ecological Thinking

A design mindset that considers buildings as part of broader ecosystems, emphasizing interdependence, resource cycles, and environmental responsiveness.

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