Contemporary Vernacular Architecture

समकालीन स्थानीय वास्तुकला

Inspired by the Traditional Architecture of Assam

A STUDY INTO A MORE SUSTAINABLE BUILDING MODEL BASED ON THE VERNACULAR ARCHITECTURE OF ASSAM

Alexander M. Lorenz
Faculty of Architecture & the Built Environment, Delft University of Technology
Julianalaan 134, 2628BL Delft
A.Lorenz@student.tudelft.nl

ABSTRACT

This study explores the Vernacular Architecture of the northeastern Indian State of Assam to develop a sustainable building model tailored to modern societal demands. Over two months, field research was conducted, including analysis of traditional Assamese buildings and interviews with local residents. The research highlights the climate-responsive features of indigenous structures, such as natural ventilation and use of local materials like bamboo and clay. In contrast, contemporary constructions using concrete and steel often fail to address the region's climatic challenges, leading to increased environmental impact and inadequate living conditions. By integrating traditional practices with modern techniques and a more innovative utilization of local resources, the proposed model of Contemporary Vernacular Architecture (CVA) aims to create resilient, culturally relevant, and environmentally sustainable buildings, fostering a balance between nature and people.

KEYWORDS: *Vernacular Architecture, sustainability, circularity, contemporary Vernacular Architecture, Assam, Northeast India*

I. INTRODUCTION

Over centuries, Architecture was a portrait of one country's culture, climate, and landscape, but this changed in the 15th century with the colonization of Africa, Asia, and America. This hierarchy imposed the architectural style of the colonizer onto the colonized. By glorifying the foreign Architecture style through palaces, plantations, and government buildings, the general belief became that Vernacular Architecture is primitive, outdated and inferior to Western Architecture.
In the 20th century, globalization replaced colonialization and with it introduced new materials and technologies like steel, concrete, and air conditioning. These technologies promoted Architecture that no longer considered climate and landscape conditions.
This Architecture type was introduced in the Global South to promote economic growth and a fruitful future. However, this invasive Architecture type does not respond to the local climate and landscape, harms the environment, and misses cultural considerations. The lack of experience with this architectural type also leads to insufficient building quality, setting developing countries up to follow the same mistakes of the Global West but only worse.
Assam, a state in the northeast of India, is currently undergoing this transition.
This study focuses on creating a new sustainable building model by analysing the Vernacular Architecture and considering the modern societal demands of Assam.

II. METHODOLOGY

In order to answer the question of how a new building model based on the Vernacular Architecture of Assam can look like, a thorough analysis of the context will be necessary.
During a period of two months, a research trip to Assam is carried out to analyse the Vernacular Architecture, to interview locals and gather first-hand experiences of climate and landscape. Three case studies, as representatives of different historical periods, are chosen to examine the Vernacular Architecture of Assam and one as an example of the present building practice. To create a better understanding of the problems and desires of the local population several interviews were conducted.

A phase of reflecting and literature research follows the initial phase of discovering the context of Assam. This is important to achieve an objective and mature view of the situation, which is necessary to create a solution.

III. ASSAM AND ITS INDIGENOUS/TRADITIONAL ARCHITECTURE

Assam is renowned for its rich biodiversity, tea plantations and cultural diversity. The landscape is defined by low-lying plains and a network of rivers, with the Brahmaputra, one of the largest rivers in the world, running through the entire state. The monsoon climate of Assam and its geographical characteristics cause annual floods between April and October. Data indicates that 40% of Assam is prone to flooding (Sharma, 2022). The proximity of Assam to the Himalayas also makes the state a seismic active zone of level 5. In 1897 and 1950, Assam experienced devastating earthquakes (Assam State Disaster Management Authority, n.d.).

The Khasi house in Figure 1 represents an example of the indigenous Architecture of Assam in the period before the earthquake of 1897. Indigenous Architecture has evolved around a specific location, climate, culture, religion, and group of people in the time of multiple generations or centuries without colonial influence. The locally available material is harvested and manufactured in consent with nature. The act of building is a collective effort by a social group that has passed on the trade of building from one generation to the next.

From the ashes of the 1897 earthquake, the British colonial government introduced a new architectural typology, the Assam-type house (Assam-type house, Figure 5). In the following years, the Assam-type house quickly became the dominant architectural typology of Assam. The foreign influence in the design of the Assam-type house makes it an example of traditional Architecture. This style of Architecture is a reaction to local needs and the climatic context, using local or foreign resources under the influence of colonialism.

What separates indigenous and traditional Architecture is design through an evolutionary process over generations without global interventions.

From now on, to avoid misunderstandings between indigenous and traditional Architecture and due to the focus on context-orientated design solutions, Vernacular Architecture will be used as an umbrella term to describe both types.

3.1. Vernacular Architecture as a material physical substance

Vernacular Architecture has a variety of qualities that would greatly benefit the climate-responsive design of modern buildings. There are many other lessons to learn from Vernacular Architecture as well, concerning qualities of typological order, aesthetic fines, cultural-sociological intricacy, and anthropological phenomena. However, the research sets these topics aside and focuses on the harmony between material, environment, climate, and humans that Vernacular Architecture represents. Ali Asadpour, an Iranian researcher, elaborates in his work on some of the different lenses used to analyse Vernacular Architecture (Dabaieh et al., 2020). This research borrows the lens of Vernacular Architecture as a material physical substance to examine the case studies based on their material use, structure, climate responsiveness and user-building relationship. Both the Khasi house and the Assam-type house are a response to the climate and landscape of Assam manifested in locally available materials. One evolved around the experience acquired by generations living in the context of Assam, and the other is the fruit of Japanese and British ingenuity. During a side visit to both buildings, the homeowners provided knowledge about the building's upsides, downsides and how the building is holding up in the present day. A section and detail of the Khasi house (Section and detail of the Khasi house, Figure 2) are created based on the gathered information and photographs to present structural and material information. The analysis of the Khasi house, according to the previously mentioned parameters, is shown in Figure 3. The same information has been gathered for the Assam-type house and translated into drawings and an analysis (Section and detail of the Assam-Type house, Figure 6; Description of the Assam-Type house, Figure 7).

The analysis of the Khasi house and the Assam-type house revealed four practices that make the buildings so responsive to the landscape and climate of Assam:

1. Climate-responsive design in Assam embraces natural ventilation, large overhangs, and elevated foundations for rain and flood protection. Vegetation and nearby water bodies are utilized to regulate water, creating an environment that collaborates with the climate rather than opposing it.
2. Construction materials in Assam include abundant natural resources and secondary materials from agriculture, such as rice straw and cow dung. These materials are strategically employed based on their unique qualities: wood and bamboo for flexibility and strength, cane and clay for insulation, clay for moisture regulation and cow dung for waterproofing and insect repellence.
3. The joints in the case studies possess two necessary qualities: flexibility to withstand seismic stress and design for disassembly, facilitating maintenance and fostering an active user-building relationship.
4. An active user-building relationship plays a vital role in the lifespan of the building. In a cycle of five to seven years, the users must replace the straw on the roof and add a new layer of plaster on the walls. A fireplace in the center of the building helps to protect the wood and straw against moisture and insects.

These practices are the consequences of an everlasting exchange between people and nature, which sustains a sensitive balance with the ecosystem.
The low-lying landscape of Assam, with its many water bodies and monsoon climate, evolved mainly around the balance of water and humidity. Naturally, the landscape acts as the regulator of water. There are three distinguished zones to prevent flooding and damage from excessive rainfall. Smaller vegetation around the building works as a buffer, which helps control water coming down directly on the building. On the sides of the property, bamboo, trees, and bushes form a barrier that absorbs water on a more global scale. Rice fields or a small pond near the building function as water storage (Active implementation of Landscape in Vernacular Architecture, Figure 8).
This balance should not be seen as the exchange between two individual entities but rather as an evolution, which is much like the wheel of life, a continuous cycle of birth, life, and death. This cycle lies at the base of Vernacular Architecture (Vernacular Architecture and the wheel of life, Figure 9).

IV. Introducing the present-day Architecture practice in Assam

The modern architectural practice of Assam does not follow the circular balance of the Vernacular Architecture, but a linear and economical-driven process with a clear beginning and end (Linear Economy, Figure 10). This model promotes an accumulation of waste, or to stay in the analysis of the wheel of life, an accumulation of death.
Buildings with an RCC frame and masonry infill or entirely made from RCC are becoming the new normal in every village in Assam, replacing the Vernacular Architecture.
A house located near Guwahati in a village part of the Boro tribe serves as an example of the present-day architectural practice in Assam (Present-day Architecture practice in Assam, Figure 11). The building has a simple RCC frame with masonry infill, an RCC foundation and a tin roof. The modest home has no exterior or interior finish, the openings for windows are left blank, and rebars stick out of the concrete. Most homes in this or any other village look like this. Only the community leader has a finished home with plaster, interior and windows in this community (House of community leader, Figure 12).
The thermal mass of the RCC frame with masonry infill traps heat within the structure. The conductivity of the metal roof leads to an amplification of the indoor temperature. In present times, people often resort to air conditioning to deal with these effects. However, the financial situation of vulnerable communities makes this solution unattainable. A low-cost alternative would be to use natural ventilation. Yet, the openings are too small and not strategically placed to create enough cross-ventilation to bring in enough cool air.
In general, there is not much air movement in this region. Combining this with the high humidity levels and low quality in construction causes rapid wear and tear of the buildings.

4.1. Government subsidies and long-term thinking

Prime Minister Modi launched the Pradhan Mantri Awas Yojana in 2015 to provide affordable housing (Bajaj Financial Limited, 2021). In 2023, this initiative works as a one-time government subsidy of around 200.000 INR, equivalent to 2,200 EUR, to financially vulnerable families to build a new home. The government has calculated the subsidy to be sufficient to build a small home for a family. While it is a great effort to support the more unprivileged, it also has problems.

Firstly, the costs of building a house were estimated according to the material prices present at the initiation of this program, which were much lower than the present-day costs. The subsidy does not reflect the current prices for materials.

Secondly, the calculation does not consider the cost of transportation, which is a disadvantage for communities living remote from any bigger city.

Thirdly, the subsidies are for government-standardized homes, which leaves the user without decision-making.

Fourthly, among the people who receive the subsidy, a reoccurring problem is the lack of long-term decision-making, which results in the misuse of the government subsidy for other needs that are subjectively more urgent.

These different factors are responsible for all the unfinished buildings in the villages.

4.2. Building against the context

The practice that has evolved around materials like concrete and steel did not only change the character of buildings but also the relationship between them and the context they are in. The landscape and vegetation, which were responsible for keeping the balance between people and water are no longer needed to do so. Materials like steel and concrete are strong enough to resist wind, water, and sun.

This lack of sensitivity causes the environment to pivot, leading to extreme conditions in a region already vulnerable to flooding. The consequences create a downward spiral, demanding more and more resistance to the landscape and climate to live comfortably. Everyone who is not strong or rich enough can no longer survive in this system.

Figure 13 shows how low-lying fields and shallow water bodies are dried out and filled with soil to build on top of them, destroying reservoirs for excessive water during monsoon periods. This development means the water must retreat to new places that lay lower. This land is often used by financially disadvantaged communities, increasing the risk of flooding and social injustice. The lack of vegetation makes this development even worse.

4.3. The new normal

The RCC home in Assam has emerged rapidly in the last few decades. To understand why this development happened several interviews were conducted.

First, villagers who recently changed to an RCC home or are in the process of building one gave their first-person view on the reason for their change.

Second, Hirokjyoti R. K., a former employee of the Indian Housing Federation who was involved in developing new social housing solutions using bamboo, gave an inside into the bureaucracy of social housing and how it is viewed in society.

A sentence often repeated by many villagers was: "I love my vernacular building, the RCC home is too hot we can not stay inside". A statement like this caused more confusion about why people built these types of homes in the first place. After a while of more targeted questions, people started to mention some issues they have with vernacular buildings, the maintenance, the cost, the lack of available materials and of safety issues. However, only the conversation with Hirokjyoti R. K. brought more clarity to the issue. He believes that the biggest driver of this development is admiration.

For centuries, outsiders condemned the vernacular practice to be primitive. Colonialism introduced a seemingly more comfortable lifestyle, which sparked a desire and led to abolishing the vernacular practice. In times of globalisation, the gap between wealth and poverty seems to grow even bigger. However, the difference is the omnipresence of a life beyond the physical and financial struggle, which makes the divide so much more present. For many, RCC homes have become the metaphoric bridge to a better future for them and their descendants. It became apparent that RCC homes are not just concrete and steel, they became a symbol of hope. Looking back at what people said to me, made me realise that even when they talk badly about RCC homes, they still felt proud for owning one. I then understood that People got fixated on this one path to a better future and became blind to the actual problems, staying unaware of all the other possibilities that their land and history offers them.

4.4. Takeaways from the present-day Architecture practice in Assam

The way modern construction is executed in Assam brings a lot of harm, but the fact remains that society is in constant evolution, changing the desires and needs buildings need to fulfil. As the focus lies more and more on economic factors and the aspiration of comfort visible on a global stage, buildings must address that to appeal to people.
The biggest improvements we can witness today are thanks to a few simple techniques.

1. comfort: created by a lot of natural light, big spaces and a pleasant temperature.
2. quicker building time: created by prefabrication and standardization of materials.
3. less frequent maintenance: created by advanced materials that are more resilient.
4. more accessible for workers: created by modular building systems that follow one principle that can be easily thought and executed.
5. multi-story construction: created by advanced materials that are more resilient.

To sum up, the most crucial factor to take into consideration is global admiration. Colonialism and Globalisation dictated an idea of what sophisticated and desirable is, which limits the possible alternatives for construction in Assam. However, using established techniques can help to appeal to people and make the transition easier but also show how to improve Vernacular Architecture to make it viable.

V. CONTEMPORARY VERNACULAR ARCHITECTURE

The different practices and the circular approach found in Vernacular Architecture evolved centuries ago, but their importance could not be more relevant in our present time of extreme climate change. The circular economy (CE), which aims to design out waste and pollution, has become a cornerstone of the fight against climate change, especially after the European Union introduced its vision of the circular economy in 2014 (Asadpour, 2020). Design for disassembly, use of secondary materials in the construction value chain and design for repair and manufacturing are some practices following the CE principle (Leipold, 2021).
The 10R strategies, defined by former sustainable entrepreneurship professor in Utrecht Jaqueline Cramer in 2017 (R-strategies, Figure 14), are a vital pillar of the CE (Cramer, 2022). It is a model that applies ten strategies ranked by their impact on circularity: Refuse, Reduce, Redesign, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle and Recover.
Seeing all these new practices and strategies unfold, it becomes clear that Vernacular Architecture was not a primitive practice, but a sensitive understanding of the balance between nature and people that is only now understood.
Instead of inventing new ways of construction, we should pick up where our ancestors stopped and take it from there. Our society has evolved rapidly in the last hundred years, so it is not advisable to go back to the past and copy it without any intervention. We must consider this evolution to create a lasting change. The Industrial Revolution left Vernacular Architecture behind, unable to keep up with our changing society. The time has come to evolve the vernacular practice and reveal its potential.

Reflecting on the research up until this point led to the creation of a new model of thought called Contemporary Vernacular Architecture (CVA).
Contemporary, as the Cambridge dictionary defines, "is the existing or happening now, and therefore seeming modern". In this context, contemporary serves the purpose of a variable. It expresses a changing entity without a predefined value. The value is given to it by the current state and the needs

of the local society. This allows CVA to be a flexible response to a current situation and not a strict answer for a specific problem. In an ever faster-changing world, to respond on a local level, it is the flexibility that creates lasting solutions.
Vernacular Architecture by itself is a symbol of the past, but also of a circular way of building that responds to the climate and landscape with resources found in the context.
Contemporary Vernacular Architecture is a timeless practice that is only defined by the location of its application. It combines principles found in the local Vernacular Architecture with contemporary building techniques, but at the base lays the innovative utilisation of whatever resources are available in that specific location (Contemporary Vernacular Architecture, Figure 15).
The goal of this practice is to create a balance between nature, resilience, comfort, and user needs.
To achieve this goal, CVA focuses on four pillars:

1. Identifying needs and desires in the present society to implement suitable building principles. It is important to understand first what people need before a response can be determined. However, this does not mean that what people think they need is the right choice.
2. Identifying serving principles found in the local Vernacular Architecture. Vernacular Architecture has developed over centuries as a response to a specific context. Generations of adapting and fine-tuning specific practices gave birth to principles that are simple and effective. With the current environmental crisis, this knowledge has become more valuable than ever.
3. Identifying serving techniques found in the modern construction industry. There are clear advantages of modern construction techniques, especially when it comes to economic incentives. It is to determine what techniques provide the necessary benefits without any or with minimal harm.

4. A more innovative definition of local resources. The resources found in our environment are no longer only provided by nature. Waste has become an omnipresent part of any ecosystem, seemingly regrowing. Considering waste as a natural resource, like wood, makes it possible to see it in a different light, with potential rather than vanity.

5.1. A pioneer of contemporary Vernacular Architecture redefining local resources

The following case study serves as an example of the innovative use of local resources within the model of CVA.
Not far from the main gate of the North-Eastern Hill University Shillong, in Meghalaya, just down the street, behind some concrete homes, barely visible, there hides a treasure. A house coloured as the earth it stands on in a dark red tone (Shillong tin house, Figure 16). A young man built the house for his wife's family. The building sits on several pillars cut from natural stone to protect it from floods and to allow better ventilation. Wooden posts and beams nailed shut with wooden planks make up the body of the house. A simple tin roof creates a head for the house (Section and detail of Shillong tin house, Figure 17).
What makes the house special is, how it combines principles found in Vernacular Architecture with the implementation of secondary materials. Old tin cans, that have been cut open and flattened, cover the outside of the house creating a skin like the scales of a snake. Implementing secondary or waste materials like in this case, is a perfect example of how materials that have seemingly reached the end of their lifespan can become a potential resource. To rethink waste as a resource is vital to tackling our linear waste economy and therefore a pillar of contemporary Vernacular Architecture.

5.2. Application of contemporary Vernacular Architecture in Assam

The rapid growth of an invasive and harmful architectural practice in Assam comes from the lack of awareness of the harm caused by modern Architecture and from a sense of global admiration for Western standards. This is why before CVA can be applied the lack of awareness needs to be addressed. For this purpose, an Assessment Guide was created to equipe the applicant of CVA with a holistic view of the context (Assessment Guide, Figure 18). The Assessment Guide is composed of 6 stages:

1. The assessment of climate and landscape helps to understand the characteristics of the context and the impact of the different seasons.
2. The assessment of contemporary desires and problems suggests the path forward. It is important to listen but not to get clouded by the judgment of people and what they think it is they want.
3. The assessment of natural resources shows what is available and how a potential loop can be closed. It is important to avoid getting carried away by the fascination of green materials, each material has its purpose and limitations. The challenge is to find out how far these limitations can be pushed.
4. The assessment of vernacular building principles demonstrates how buildings can respond to the climate and landscape conditions through design and material use. It also reveals where the limitations of Vernacular Architecture lie.
5. The assessment of the active implementation of landscape and vegetation in the past teaches the importance and value of using nature to deal with climate hazards.
6. The assessment of contemporary building techniques clarifies what advances are essential in modern construction and which cause more harm. It is important to remember that innovation is best found in simplicity.

The Assessment Guide as a tool to analyse the context is the most important result of this research because it breaches the gap between the theoretical model of Contemporary Vernacular Architecture and the knowledge needed to apply it.
Assam served as the initial context of creation for CVA as a model and the Assessment Guide as a tool, which led to a universal method that finds a possible implementation in any context.
Every location or context has a unique set of problems and therefore it is unreasonable to hope for a singular solution for every context. CVA presents a way of thinking that is based on a general concept, but its purpose is to make the user rethink the concept of building and help to achieve enough awareness to create his own solution.

VI. Conclusions

Over the period this research has been conducted, it became clear that to build sustainably or, in other words, responsive to one's context, the solution is not a new building system, even if it seems sustainable. A singular solution dictates a singular way, and this limitation can not lead to long-lasting change.
For the initial phase of discovering the context, it was crucial to accept the role of receiving and accepting information from local people without preconceptions. This willingness to receive unfiltered information made it possible to receive and later reflect on the experience from a mutual standpoint. Over time, the reflection created a level of sensitivity and maturity that led to the development of the model of contemporary Vernacular Architecture and the Assessment Guide as a tool.
What is to take away from this work is the importance of awareness and mindfulness, which can detect harmful and beneficial practices from the present and the past but is also able to spot opportunities. The model of contemporary Vernacular Architecture can be applied at any time and in any context. It is supposed to be a way of thinking that guides the user to a more responsive building practice, with the Assessment Guide as a tool to achieve more awareness and mindfulness about the context.
I believe that: "If you give food to a hungry man, you only satisfy his needs for a short period, but if you teach him how to farm, he will be able to feed himself, his family and all the generations to come."

REFERENCES

1. Sharma, K. (2022) *Why assam gets flooded every year*. Business Insider. https://www.businessinsider.in/science/environment/news/why-assam-gets-flooded-every-year/articleshow/91828506.cms, last exist on 23.01.2024.

2. Assam State Disaster Management Authority (n.d.) *Hazard and vulnerability profile.* https://www.asdma.gov.in/hazardous.html, last exist on 23.01.2024.

3. Dabaieh, M., Maguid, D., & El-Mahdy, D. (2021). Circularity in the new gravity—re-thinking Vernacular Architecture and circularity. *Sustainability*, *14*(1), 328. https://doi.org/10.3390/su14010328

4. Bajaj Financial Limited (2021) *A complete guide about Pradhan Mantri Awas Yojana in Assam.* https://www.bajajfinserv.in/insights/pmay-pradhan-mantri-awas-yojana-assam, last exist on 23.01.2024.

5. Asadpour, A. (2020). Defining the concepts & approaches in Vernacular Architecture studies. *Nature: National Academic Journal of Architecture*, *7*(2), 241. https://doi.org/10.24252/nature.v7i2a8

6. Leipold, S. (2021). Transforming ecological modernization 'from within' or perpetuating it? the circular economy as EU environmental policy narrative. *Environmental Politics*, *30*(6), 1045–1067. https://doi.org/10.1080/09644016.2020.1868863

7. Cramer, J. (2022). *Building a Circular Future, Ten Takeaways for Global Changemakers*. A publication of the Amsterdam Economic Board in cooperation with Holland Circular Hotspot.

8. Contemporary | english meaning - cambridge dictionary. (n.d.). https://dictionary.cambridge.org/dictionary/english/contemporary

9. *Vernacular Architecture*. Oxford Reference. (n.d.). https://www.oxfordreference.com/display/10.1093/oi/authority.20110803115517898

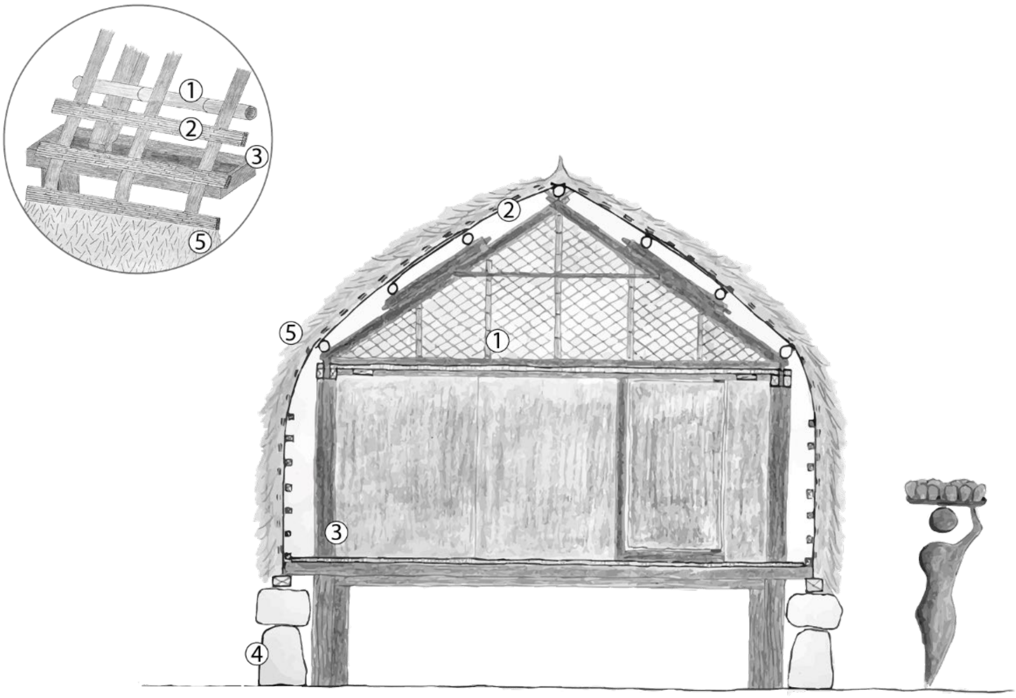
10. Sen, R., & Datta, S. (2021). *Indigenous Habitat, vestiges of ancesteral life in india's northeast*. The North Eastern Council, Shillong, Meghalaya.

11. Singh, R., & Pal, S. (2023). *Why waste management in Northeast India needs an urgent overhaul*. Down To Earth. https://www.downtoearth.org.in/blog/waste/why-waste-management-in-northeast-india-needs-an-urgent-overhaul-91377

12. Lainé, N., & Subba, T. B. (2012). Effects of the 1996 Timber Ban in Northeast India: The Case of the Khamtis of Lohit District, Arunachal Pradesh. In *Nature, environment, and Society: Conservation, governance, and transformation in India* (pp. 73–89). essay, Orient Blackswan.

APPENDIX

Figure 1. Khasi house



Khasi house
Location: Nowhet, Meghalaya
Build approx. in 1880

Materials	1. bamboo, 2. cane, 3. Wood (from jackfruit, wild litchi, teak and sal tree), 4. Stone, 5. local thatching leaf, 6. Forest creeper as rope to tie materials together

Figure 2. Section and detail of the Khasi house

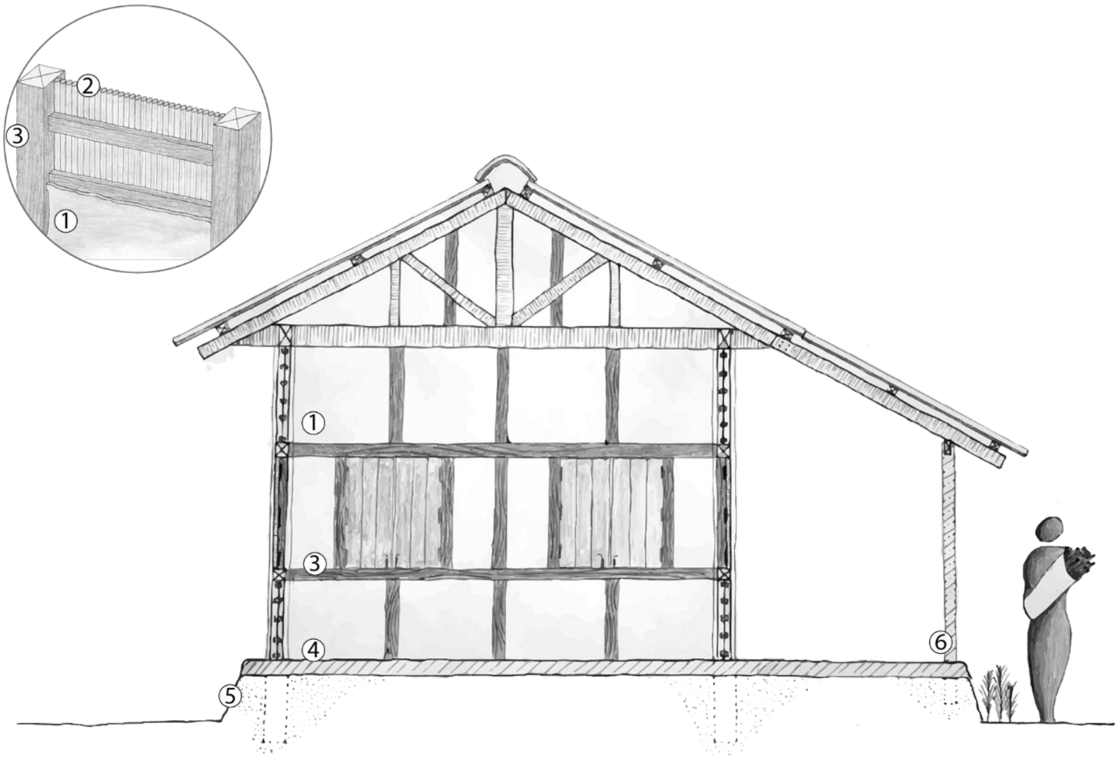
The Khasi house (fig. 1) is an example of Vernacular Architecture in Assam. Around 1880, the house was constructed in the small village of Nowhet. The Khasi house represents a way of building that has evolved over centuries, making use of whatever was around while keeping a balanced relationship with nature.
Figure 2 shows that the main structure of the Khasi house is a wooden frame made from jackfruit, wild litchi, teak and sal trees. Different types of carved joints are used to join the wooden elements. A cocoon-like structure made from bamboo, canes, and straw sits over the wooden frame. This shell protects the building from rain, wind, and heat. Everything is tied together using forest creepers. The connections allow the house to be strong but also flexible which helps to balance seismic forces during an earthquake. The entire building sits on top of a natural stone foundation to protect it from ground moisture. The elevation from the ground also allows for ventilation that cools the building during the hot summer months. During the winter months, the shell of straw helps to keep the heat in the building.
The user-building relationship is vital to ensure the long lifespan of the building. Active maintenance must be part of the user behaviour. The smoke created by a fireplace in the centre of the house treats the wood and straw, increasing the water and insect resistance of the material. The thatched straw roof must be replaced every 5 to 8 years to ensure sufficient water protection.

Current state:
I visited the Khasi house on the 9th of September 2023. It is in good condition. The thatched roof has approximately two years left before replacement. The owners are currently constructing a new RCC house on the right side of the Khasi house (fig. 4). For the construction of this new building, the owners demolished a traditional house of more recent descent (fig. 1, on the left side).

Figure 3. Description of the Khasi house

Figure 4. Construction of new RCC house next to Khasi house

Figure 5. Assam-Type house



Assam-Type house
Location: Outscirts of Guwahati
Build approx. in 1920

Materials	1. mud-lime plaster, 2. Reed (ikra), 3. Wood (from jackfruit, wild litchi, teak and sal tree), 4. Mud-lime floor, 5. Natural stone, 6. Metal sheets, 7. Reinforced concrete

Figure 6. Section and detail of the Assam-Type house

The Assam-type house (fig. 4) is located on the outskirts of Guwahati. It was built approximately in 1910. The Assam-type house evolved during the occupation of the British. After the earthquake of 1879, the British wanted homes that were more earthquake-resilient but also offered a higher level of comfort. Together with Japanese engineers, they developed the Assam-type house, a new type of construction that uses local materials to build more earthquake-resilient. Since the Assam-type house has not evolved naturally through experience with local materials and climate it is categorized as traditional but not Vernacular Architecture.

The structure of the Assam-type house (fig. 5) is a wooden frame structure. The wooden posts are buried in the ground 60-90 cm. A locally available reed, called Ikra, is used to make panels, which make the infill between the wall frame structure. The absence of rigid joints in the entire wall frame system is one of the reasons for the better performance of the Assam-type house during severe earthquakes. The Ikra wall infill significantly improves the lateral strength, stiffness, energy dissipation and the overall lateral load behaviour of the Assam-type house. The wall finish is a mixture of clay, cow dung and lime. Adding cow dung and lime increases the resistance against water and insects. A bitumen solution is applied to the wooden frame to protect it from humidity and insects. Traditionally, the Assam-type house had a thatched roof, using locally available straw from rice harvesting or other plants. The introduction of corrugated aluminium sheds replaced the traditional thatched roof. Typically, buildings were constructed on natural elevations to cope with the risk of flooding. If the side did not have a natural elevation people used new soil to elevate the building ground. To finish the building ground a clay-lime mixture was used to seal and smoothen the surface. Later examples of the Assam-type house used RCC stilts to elevate the building.

Essential to the Assam-type house is the ability to respond to climate conditions through material use and design. The clay-lime-cow dung mixture used for the wall finish regulates the humidity level and keeps a balanced temperature in the house. Clay can absorb excess moisture and release it into the air when dry again. The positioning of the openings allows for cross ventilation, which helps to cool the building on a hot summer day. The build-up of the wall with clay and reed adds thermal mass which helps to regulate the temperature.

The user-building relationship is vital to ensure the long lifespan of the building. Active maintenance must be part of the user behaviour. The wall finish must be checked regularly for damages. Every 5 to 7 years a new layer must be applied.

Current state:

On the 2nd of September 2023, I visited the Assam-type house. It is in good condition, only the plaster will require a new layer in the next dry season. It is to point out that over generations of family members, new buildings made from concrete have been built around the Assam-type house, creating a courtyard. During my visit, most people stayed in the Assam-type house.

Figure 7. Description of the Assam-Type house

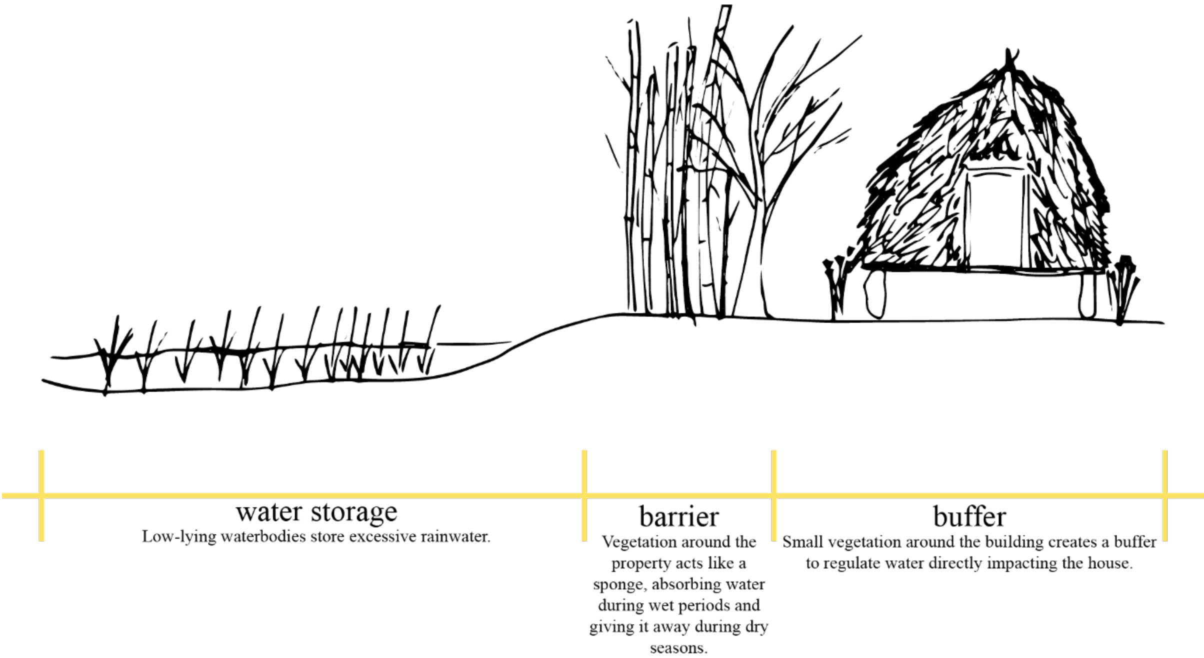


Figure 8. Active implementation of Landscape in Vernacular Architecture

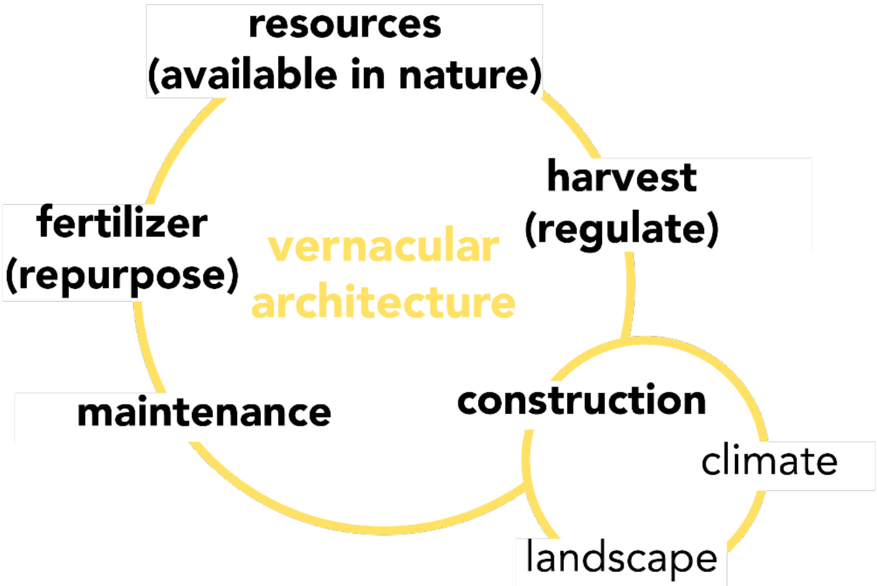


Figure 9. Vernacular Architecture and the wheel of life

Figure 10. Linear economy

Figure 11. Present-day Architecture practice in Assam

Figure 12. House of community leader

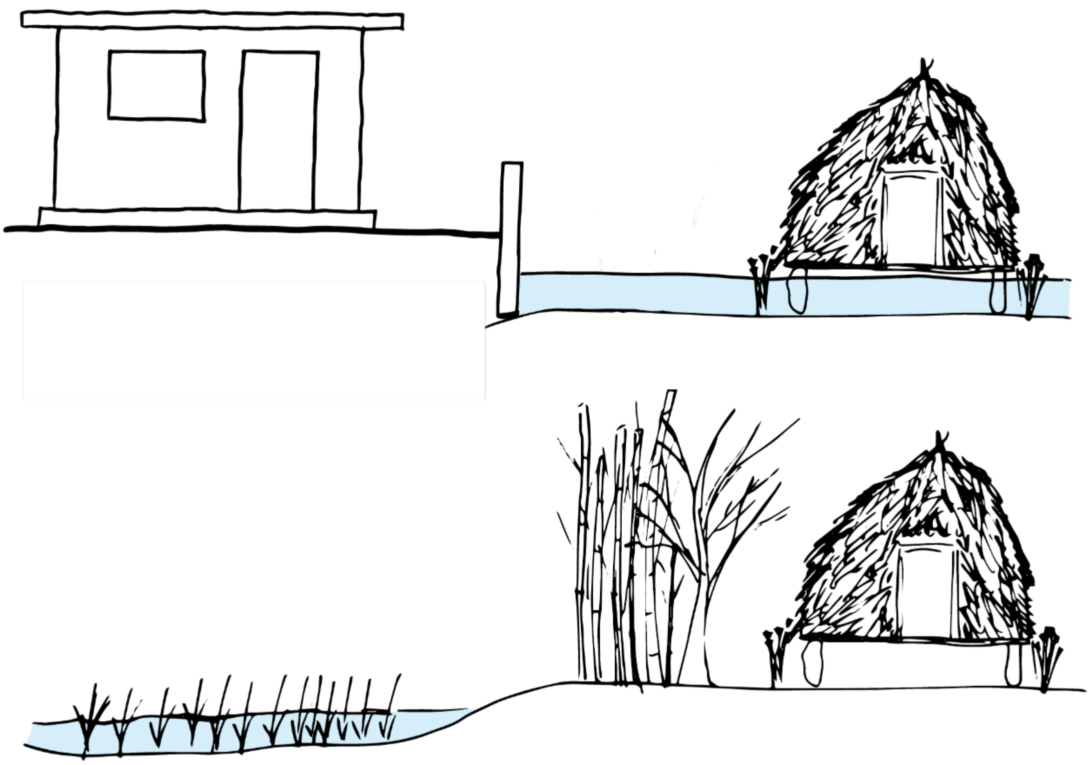


Figure 13. Building against the context

Goal	Strategy	Description
Smart product use and manufacture	R0 - Refuse	Make product redundant by abandoning its function or offering same function with radically different product.
	R1 - Rethink	Make product use more intense (e.g. product-sharing, multi-functional product).
	R2 - Reduce	Increase efficiency in product manufacture or use by consuming fewer natural ressources and materials.
Extend lifespan of product and its part	R3 - Reuse	Reuse of functional discarded product by another consumer.
	R4 - Repair	Repair and maintenance of defective product to restore its original function.
	R5 - Refurbish	Restore an old product to bring it up to date
	R6 - Remanufacture	Use product or parts in a new product with its original function.
	R7 - Repurpose	Use product or parts in a new product with a different function.
Useful application of materials	R8 - Recycle	Process the materials to obtain the same (high grade) or lower (low grade) quality.
	R9 - Recover	Incinerate materials to recover energy.

Figure 14. R-strategies

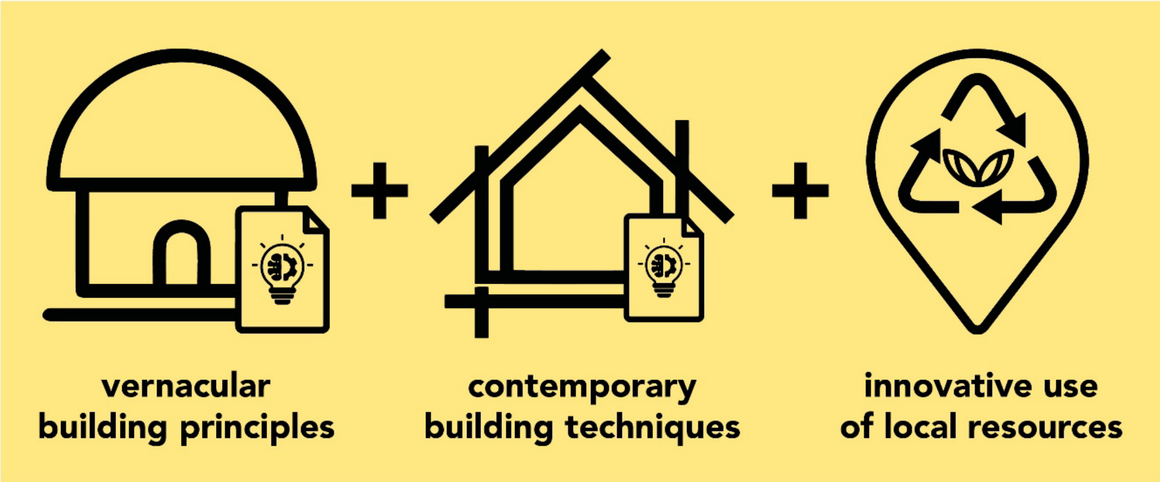
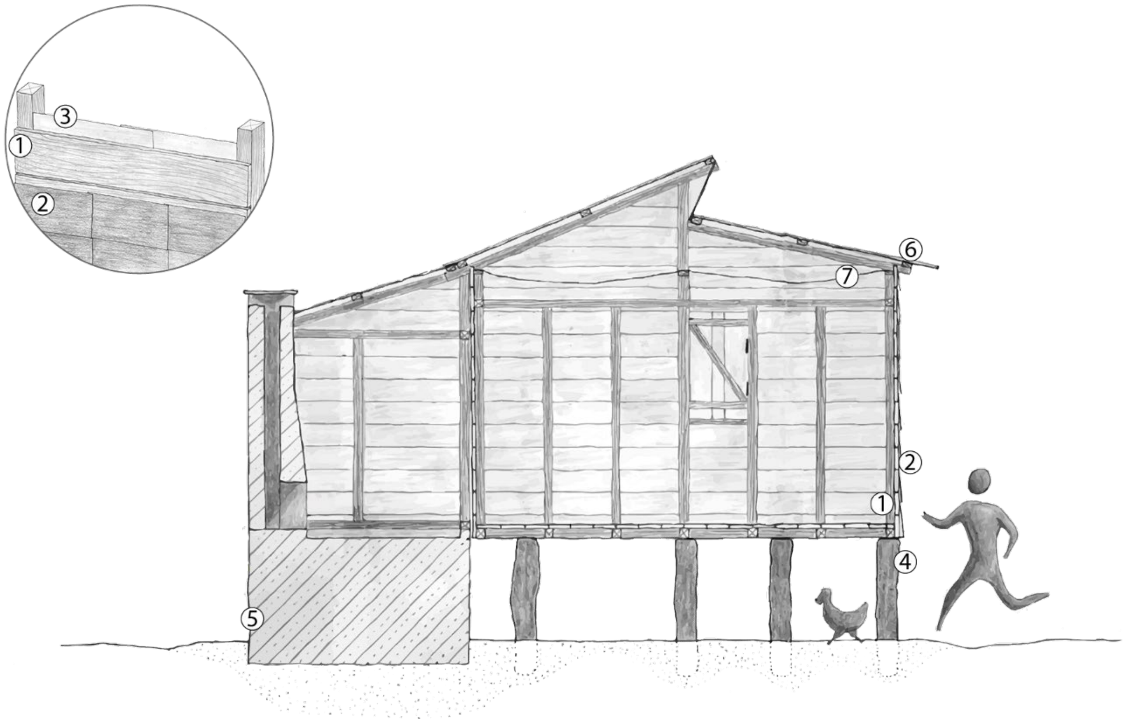


Figure 15. Contemporary Vernacular Architecture

Figure 16. Shillong tin house



Shillong Tin House
Location: Shillong, Meghalaya
Build approx. in 2010

Materials	1. Wood (from jackfruit, wild litchi, teak and sal tree), 2. Flattened tin cans, 3. Cardboard, 4. Natural stone, 5. Reinforced concrete, 6. Tin roofing sheets, 7. Water-resistant tarp

Figure 17. Section and detail of Shillong tin house

CVA Assesment & Implementation Guide

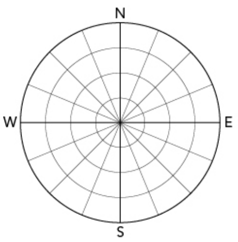
I want to build a .... in ....

▢ 1. Look at your local climate and landscape characteristics

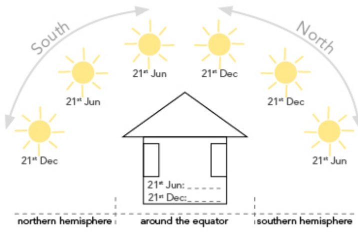
Other points can be added according to the climate and landscape conditions

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dez
temp. max	[°C]												
avg. temp. max	[°C]												
avg. temp.	[°C]												
avg. temp. min	[°C]												
temp. min	[°C]												
avg. rainy days	[/]												
avg. rainfall	[mm]												
avg. humidity	[%]												
avg. daily sunshine	[h]												
avg. wind speed	[m/s]												
max. wind speed	[m/s]												
min. wind speed	[m/s]												
	[ ]												
	[ ]												
	[ ]												
	[ ]												
	[ ]												

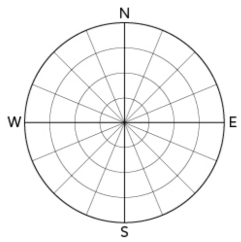
Sunpath diagramme



Solar angle

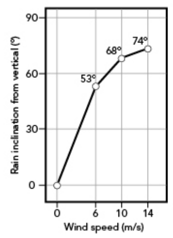


Wind directions

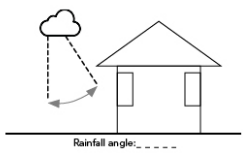


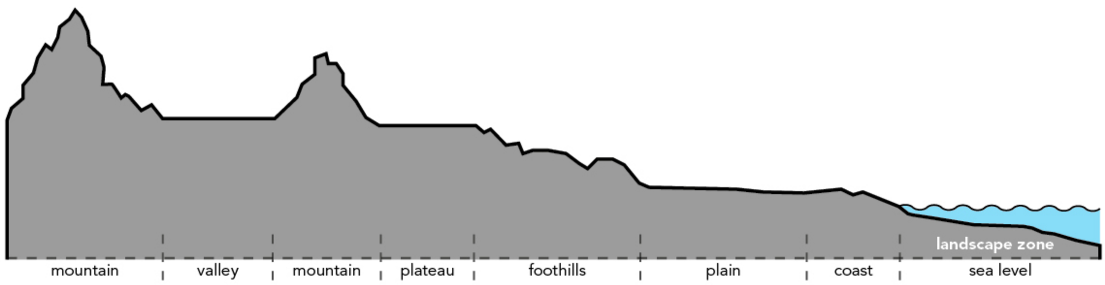
Weathersite

Rain inclination diagramme



Rainfall angle





Notes for any other landscape specific charecteristics or hazards:

(E.g. earthquakes, huricanes, floods, landslides, zunamis, draughts, wild fires, ...)

▢ 2. Look at the needs, wants and desires of whom you are building for

This mainly applies when you are designing for someone else, in particular when the person has a different cultural or social background than yourself, but it can be also a helpful tool to reflect and establish a hierarchy for your own project.
To distinguish between needs, wants and desires will ultimately help you to identify what is really important for the project.

Who is the user:

The user can be any potential person that uses or takes advantage of the building.
If necessary, you can distuingish between primary and secondary user.

Needs:
Those things that are essential for our survival and well-being

Wants:
Enhance the quality of life but are not essential

Desires:
Things we crave but may not be able to afford

3. The assessment of „natural resource"

▢ 3.1. Look at the available resources on your site and around your site

The focus lies particularly on natural materials that can regrow in a short period but also on waste materials like byproducts from agriculture and industries as well as household and industry waste.
An already existing structure can be also seen as a resource, either as a material bank or a new beginning of a building.

Resources available on site

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
9. ______________________
10. ______________________

Resources available close to the site (Ø = 15 km)

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
9. ______________________
10. ______________________

Resources available in the region (Ø = 50 km)

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
9. ______________________
10. ______________________

▢ 3.2. Look at strengths, weaknesses and what potential each resource holds

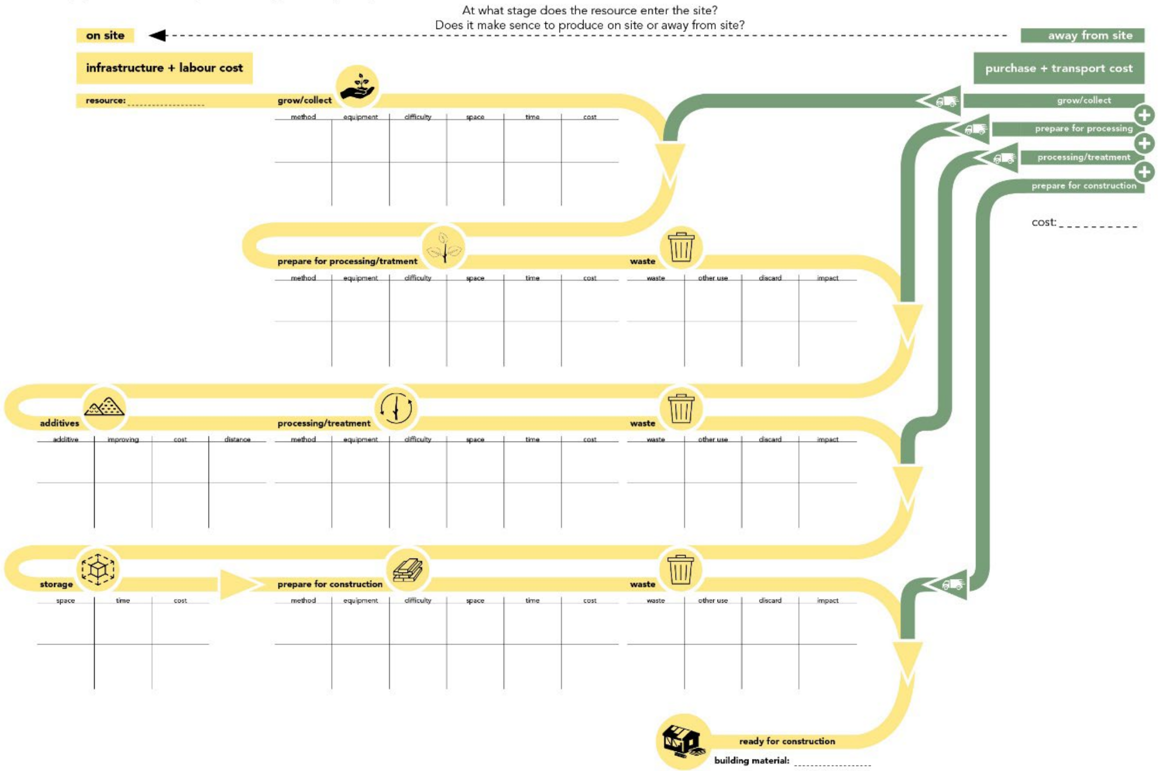
You might not be able to fit all your available resources on this page, print this page as many times you need it.

distance to site: close ↑ … ↓ far

resources	**strengths** ✔	**weaknesses** ✘	**treatmnet** how can the weaknesses of the resource be improved	**potential** what could be made from this resource	**weather conditions** can it help to mitigate the impact of local weather conditions	**natural disasters** can it help to mitigate the impact of natural disasters

▢ 3.3. Look at the production chain your resource has to undergo before it can be used for construction

There might be no or just a very small industry around the resource you want to use, be aware of what it takes to make your resource usable.
The best way is maybe not to grow or collect the resource yourself but to think about at what stage of the production chain you should enter.
Print this page for each material that you consider using and as many times you need it.



▢ 4.1. Look at the beneficial principles found in vernacular architecture

The vernacular architecture was built as a response to the local climate and landscape with locally available materials, leading to increased well-being of inhabitants and buildings.
Try to find and understand the principles that were applied back in the day.
Other points can be added according to the vernacular architecture present in your region.
Look also at other examples of vernacular architecture that were built with similar resources or in regions that have similar climate and landscape characteristics as in your location.

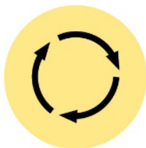
natural ventilation
helps to cool the inside but also helps to dry materials in humid climates to prevent mould growth

active integration of landscape
can be used to control/balance natural hazards

use of local resources
provides affordable materials and creates local identity

longevity through design
(for humid climates)
elevated from the ground and big overhangs to protect from the rain

flexibility
allows buildings to cope better with seismic forces



reuse/rethink
allows materials to find a new purpose, maximises material function and minimizes waste

build for disassembly
makes maintenance, disassembly and potential reuse easier

comfort through material choices
takes benefit of imminent material attributes (clay as a natural humidity controller)

Notes for any other beneficial principles found in vernacular architecture:

method:
benefits:

method:
benefits:

method:
benefits:

method:
benefits:

method:
benefits:

method:
benefits:

method:
benefits:

method:
benefits:

!

After answering more questions and reflecting on them you might get new ideas for previous points, feel free to go back and add more information at any point.
Contemporary vernacular architecture takes time and requires you to reflect on each decision you take, but only through this process you will be able to reach the necessary maturity and understanding you need to practice contemporary vernacular architecture.

▢ 4.2. Look at the limitations of vernacular architecture

While vernacular architecture has a variety of qualities that would greatly benefit the well-being of inhabitants, sustainability goals and climate-responsive design of modern buildings it does not adequately represent the contemporary desires and needs of people.
Try to identify the limitations.
Other points can be added according to the vernacular architecture present in your region.

the necessity of frequent maintenance

vulnerable to fire

lack of contemporary comfort
(natural light/big spaces)

does not align with contemporary desire and needs

can not be built higher than one story

regulations make the necessary resources harder to get

lack of experienced craftsmen

lack of safety

Notes for any other limitations of vernacular architecture:

limitation:

limitation:

limitation:

limitation:

limitation:

limitation:

limitation:

limitation:

5. The assessment of a responsive landscape use

☐ 5.1. Look at how an active implementation of vegetation and landscape can benefit your project

The vernacular architecture was built with a balance of nature and people in mind.
Try to find and understand the principles that were applied back in the day.
Other points can be added according to the climate and landscape conditions.

active implementation of waterbodies
helps to regulate heavy rainfalls and droughts but also keeps the property cool

vegetation as a barrier
protection from wind, air pollution, sound, sun and creates privacy

vegetation as a sponge
plants absorb excessive water during heavy rainfall preventing floods and releasing water in a dry period

vegetation as reinforcement
the roots of plants help to reinforce the ground around them, which helps against erosion and earthquakes

Notes for any other benefits:

method: ______
benefits: ______

method: ______
benefits: ______

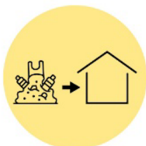
method: ______
benefits: ______

method: ______
benefits: ______

☐ 5.2. Look at what benefits the circulation of waste products back into the production chain could have for your project but also on the ecosystem on site and around the site

Other points can be added according to the locally available waste and its environmental impact

cheap resource
wast is often perceived with no potential or value, which makes it cheap and full of potential



beneficial construction applications
industrialized materials like plastic waste can find beneficial applications in your project (e.g. damp barrier)

environmental benefits
less waste that would end up in landfills, be burnt or pollute the oceans
it passively creates an awareness of pollution

support of local economy
it can become a viable resource, creating a new market with new job opportunities

Notes for any other benefits:

method: ______
benefits: ______

method: ______
benefits: ______

method: ______
benefits: ______

method: ______
benefits: ______

☐ 6.1. Look at the contemporary architecture practice and understand how it has a negative impact on the well-being of its inhabitants and the environment

The introduction of industrialized materials and advanced technologies in contemporary architecture promotes a practice that no longer considers the climate and landscape but exists despite these conditions. A perfect example is air conditioning, which makes concrete structures without natural ventilation suitable to a hot climate.
Other points can be added according to the contemporary architecture, climate and landscape present in your region.

harmful industry
manufacturing of materials like cement and steel plays a major part in the pollution of the planet

resisting the local context
safety only comes from the strength of the materials because it has to resist the context, making safety a privilege to the rich while promoting more hazards for others

high initial investment
the high cost leaves financially disadvantaged people behind, expanding the gap between rich and poor

comfort depends on technology
well-being and comfort depend on technologies like airconditioning making it a question of wealth

Notes for further reasons how the current contemporary architecture has a negative impact:

negative impact: ______

negative impact: ______

negative impact: ______

negative impact: ______

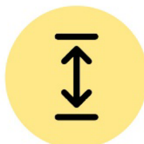
☐ 6.2. Look at the contemporary architecture practice and understand what techniques could have a positive impact on the resilience of your project and could help to achieve contemporary needs

Construction is in constant evolution but the biggest improvements we can witness today are thanks to a few simple techniques. Understanding what these modifications are and why they are possible, will help you to make your project more efficient and resilient.
Other points can be added according to the contemporary architecture, climate and landscape present in your region.

comfort
created by a lot of natural light, big spaces and a pleasant temperature

quicker building time
created by prefabrication and standardization of materials

less frequent maintenance
created by advanced materials that are more resilient



multi-story construction
created by advanced structural and material compositions

Notes for further techniques in the current contemporary architecture that could have a positive impact:

positive impact: ______
why: ______

positive impact: ______
why: ______

positive impact: ______
why: ______

positive impact: ______
why: ______

Figure 18. Assessment Guide