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2019-20 to 2023-24

Criterion 3 – Research, Innovations and Extensions

Key Indicator 3.4 Extension Activities

3.4.1: Outcomes of Extension activities in the neighborhood community in terms of impact and sensitizing the students to social issues for their holistic development during the last five years.

SSR 2019-20 to 2023-24

Criterion 3 – Research, Innovations and Extensions



3.4.1: Outcomes of Extension activities in the neighborhood community in terms of impact and sensitizing the students to social issues for their holistic development during the last five years

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- 2. Example of Research in Architecture Project
- 3. Example of Final Year Architectural Design Project
- 4. Example of Career focussed on Community Work
- 5. Example of Competition: Project based on Societal concern

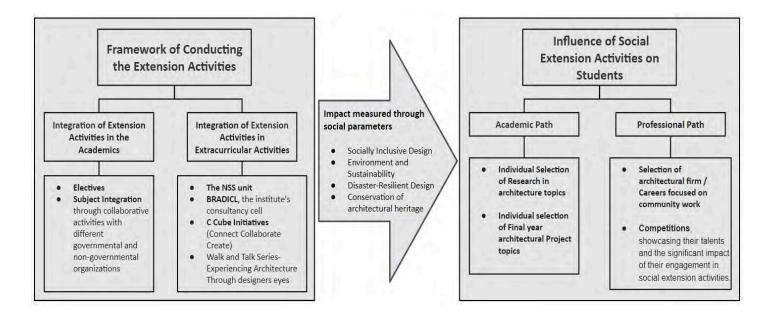


SSR 2019-20 to 2023-24

Criterion 3 – Research, Innovations and Extensions



3.4.1: Outcomes of Extension activities in the neighborhood community in terms of impact and sensitizing the students to social issues for their holistic development during the last five years



Outcomes of Extension activities in the neighborhood community in terms of impact and sensitizing the students to social issues for their holistic development

Impact and Sensitizing the Students to Social Issues: The impact and sensitization of students to social issues are mapped through their research topics, final-year architectural design projects, jobs, and competitions. These are evaluated based on criteria such as Socially Inclusive Design, Environment and Sustainability, Disaster-Resilient Design, and Conservation of Architectural Heritage.



Smef's Research Grant 2021-22

The Resistance: Shielding from Cyclones

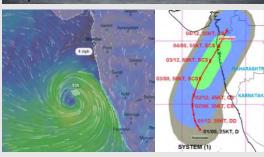
Achyut Vanarse

Atharva Sakore

Aditya Sawalkar

- Along with very strong winds, cyclones bring heavy rain, storm surges (coastal floods), and tornadoes.
- These cyclones damage the tree plantations, boats/ships, horticulture, mango production, houses/sheds, crops, etc.
- It affects the state's overall economy, and the deathinjury number rises for animals and local people.





CYCLONES



Cyclone Tauktae 2021

20+ houses were completely damaged and more than 13,000 suffered partial damage. More than 100 people died.



Cyclone Nisarga 2020

₹200 crore worth government properties such as schools, hospitals, offices, Anganwadis, electricity infrastructure etc. and 1.4 lakh houses were damaged in Konkan region.



Cyclone Vayu 2019

With wind speeds equivalent to those of a Category 1 hurricane. Almost 300,000 people were set to be evacuated to 700 shelter homes in Gujrat.



Cyclone Phyan 2009

569 houses were damaged in Ratnagiri, 102 in Raigad and 95 in Sindhudurg. Two villages in Palghar and five in Dahanu were evacuated. Several boats went missing.

FLOODS





LANDSLIDE





DEATH TOLLS FROM RECENT CYCLONES

	ARABIAN SEA		BAY OF BENGAL	
Year	Cyclones	Deaths	Cyclones	Deaths
2021	Tauktae	104		
2020	Nisarga	4	Amphan, Nivar, Burevi	90, 12, 9
2019	Hikka	13	Fani, Bulbul	64, 25
2018	Mekanu, Luban	26, 14	Titli	78
2017			Ockhi	110
2016			Vardha	6
2015	Chapala, Megh	5, 18		
2014			Hudhud	46
2013			Phailin	21
2012			Nilam	43
2011	Keila, Phet	14, 44		
2010			Laila	6

Places: Kelshi, Anjarle, and Murud villages, Ratnagiri, Maharashtra, India.

Aim: To study settlements in the Konkan region concerning natural calamities such as cyclones and to propose sustainable design and construction solutions.

Documentation format: Research journal/book, Video

Objectives:

- To study geography and understanding the context, climate, and culture of the villages, i.e. study of wind, planning, and how cyclones impact the structures.
- To explore what all measures were taken after the disaster.
- To propose a temporary or permanent cyclone-resistant design that can be used for multiple purposes.
- To spread awareness about strategic design solutions for natural disasters to reduce the impact of the disaster.
- To use sustainable solutions in cyclone-resistant design modules which will be proposed in the location.
- To come up with a flexible module that can be used in other cyclone prone zones.



Anjarle Village, Ratnagiri



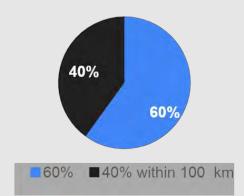
Murud Village, Ratnagiri



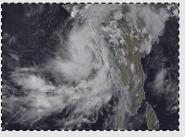
Kelshi Village Ratnagir

ANALYZING THE POST-CYCLONE CONDITION

WITHIN 100 KMS OF THE COAST



Around 40% of the population lives within 100 kms from the coast. Their lifestyle and jobs are mostly related to fishing, fish breeding, and selling coconut products.



Cyclone Tauktae



Timber piles





Nowadays people are using recycled materials in such regions which are strong and sustainable









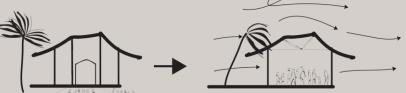
Climate change triggers calamities. Also, cyclones come with floods, landslides and heavy rains



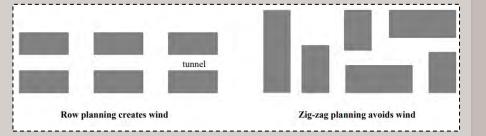


Regions below sea level are more prone to water logging and floods.

POSSIBLE DESIGN STRATEGIES



Shelters can act as multifunctional space like schools, hospitals and community centers when there is no calamity

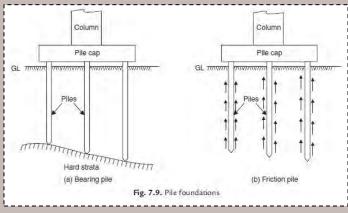


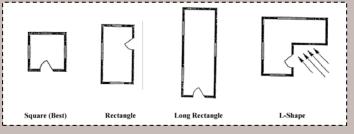
DESIGN STRATEGIES



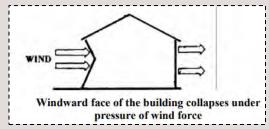


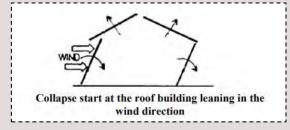
Foundation (too small for light weight building) pulled completely out of ground



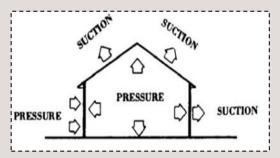


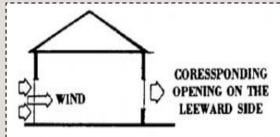




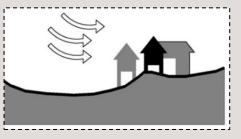


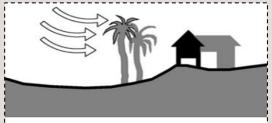
More than strong wind and rains the **strcutures explode from the inside** due to pressure difference alone





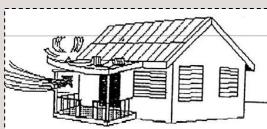
Shielding can be achieved with the help of tree plantations like mangroves and behind hills

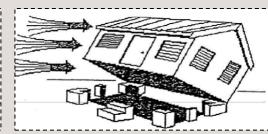




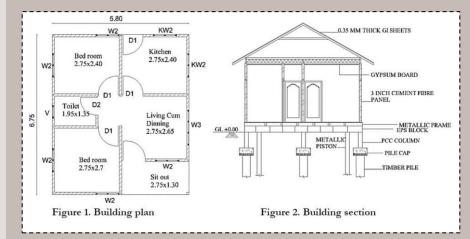


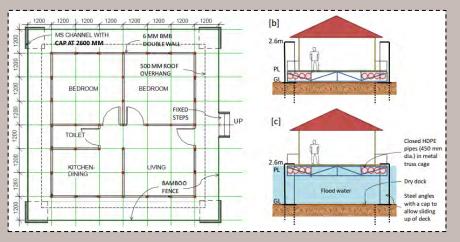






Improper connections and high wind pressure can blow the footings of the house





A team in Bangladesh they found out square structures are stable in such regions. And the houses can have closed HDPE pipes for floating in floods.

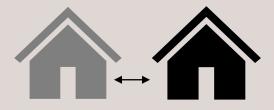
Roofs and then walls. Roofs of structures with extended verandahs are prone too high wind damage..



Providing a sense of security and safety



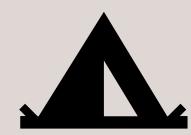
Bringing back the traditional experience of the village



The design module could function as multifunctional space



Natural solutions for natural disasters such as mangroves



In case of evacuation, temporary modules could also act as shelter homes



Increasing life of the structure



Reviving local flora-fauna



Reducing the massive damage caused due to natural disasters



Promoting sustainable local materials in construction



IMPACT OF THE RESEARCH

Expenses for 3 members	Travel Expenses (Rs.)	Stay Expenses(Rs.)	Food Expenses(Rs.)
Pune to Dapoli Travel	1500		
1D / 1N Stay at Dapoli		1300	1200
2D / 2N Stay at Anjarle		2500	2400
2D / 1N Stay at Kelshi		2000	2400
Dapoli to Pune Travel	1500		
Internal Travel	800		
Total	3800	5800	6000
Documentation and other	= 1000		
Travel + Stay + Food + Oth	ers = 3800 + 5800 + 6000 +	1000 = Rs 16,600	

	Pune to Dapoli travel (Around 7hrs travel)		
Day 1	Reach Dapoli and head towards Murud		
	Reach Murud and study and analyze the settlement		
	Stay at Murud / Dapoli		
Day 2	Reach Anjarle		
	Study and Analyze the settlement		
	Stay at Anjarle		
Day 3	Study and Analyze the settlement at Anjarle		
	Stay at Anjarle		
Day 4	Reach Kelshi		
	Study and analyze the settlement at Kelshi		
	Stay at Kelshi		
Day 5	Study and analyze the settlement at Kelshi		
	Head to Dapoli in the evening and travel to Pune		

Surveys with local people,

analyzing currently built

construction methods, studying the context and terrain, etc. are few methods for the research project.

Documentation format:

site experiments, etc.

Documentation methods:

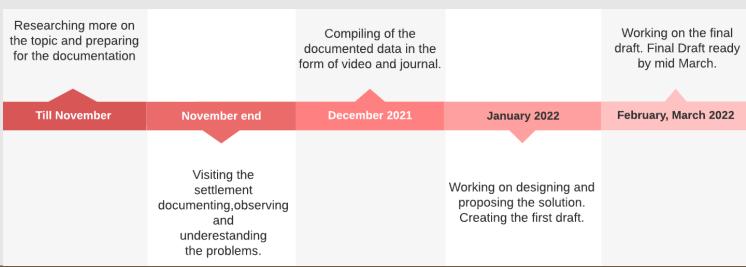
Research journal/book, Video

Sketches, notes, photographs,

videos, audio recordings, on-

structures and their





FUNDS DISTRIBUTION AND WORK FLOW

Research Papers:

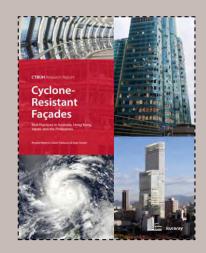
- Cyclone Resistant Facades CTBUH Research project by Angela Mejorin, Dario Trabucco & Ingo Stelzer
- Landslides in Kerala IEEE, Kerala section, Dr. Premler B
- Cyclone resistant building architecture Ankush Agarwal,
 Disaster Risk management Program March, 2007
- Multi-hazard disaster resilient housing with bamboo-based system - Sutapa Dasa, Parthasarathi Mukhopadhyay
- Design of a Sustainable flood resisting structure for Rebuilding resilient Kerala post floods, Kollam, Kerala-Sahana Hashim, Dr.M. Sirajjudin
- Multi Purpose Cyclone Shelters Addressing Social & Economic Risk - A Quest for Building Coastal Resilient India National Conference on Coastal Disaster Risk Reduction and Resilience, February 25 2020, Simanchal Patnaik Mahendra Raja Ram
- Guidelines for Design and Construction of Cyclone/Tsunami Shelters Gol-UNDP Disaster Risk Management Programme -Ministry of Home Affairs Government of India 2006
- BATTLING the storm- Study on cyclone resistant housing Ar. Bashirul Haq, Dr. Purnima Chattopadhayay Dutt

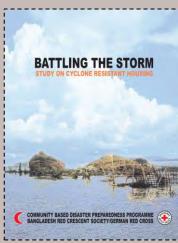
Our mentors:

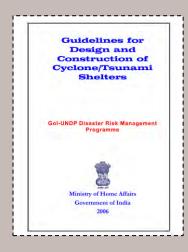
- Ar. Anmol Waychal
- Ar. Sharvari Rajvide
- Ar. Ramiya ma'am



Cyclone-resistant house:









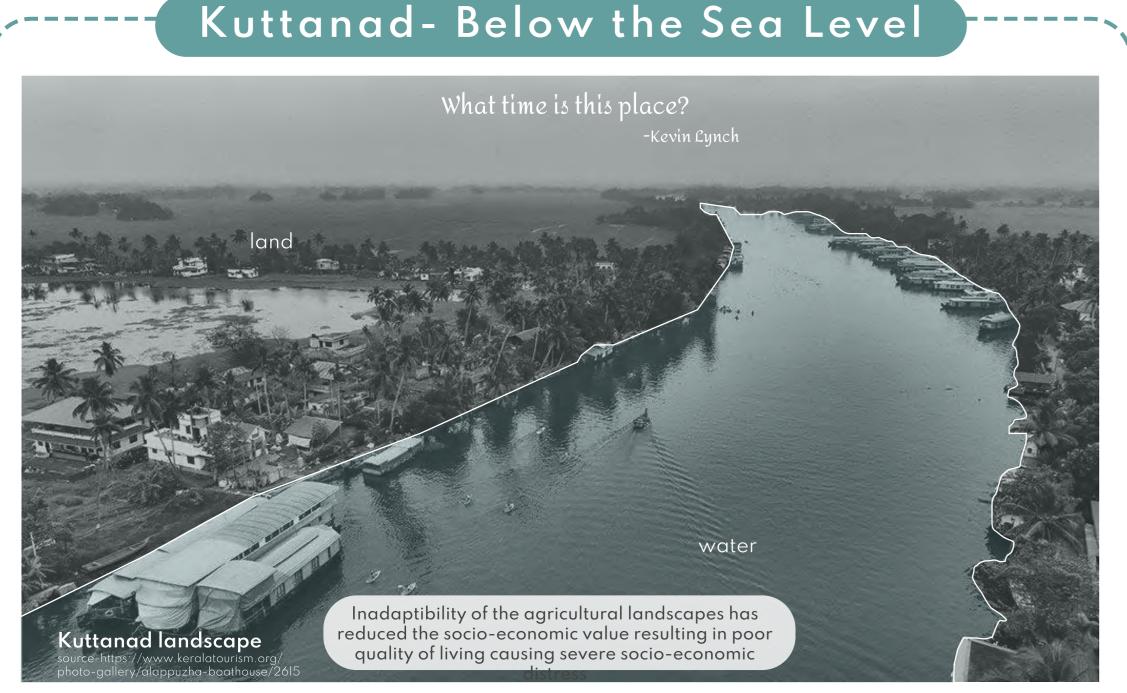




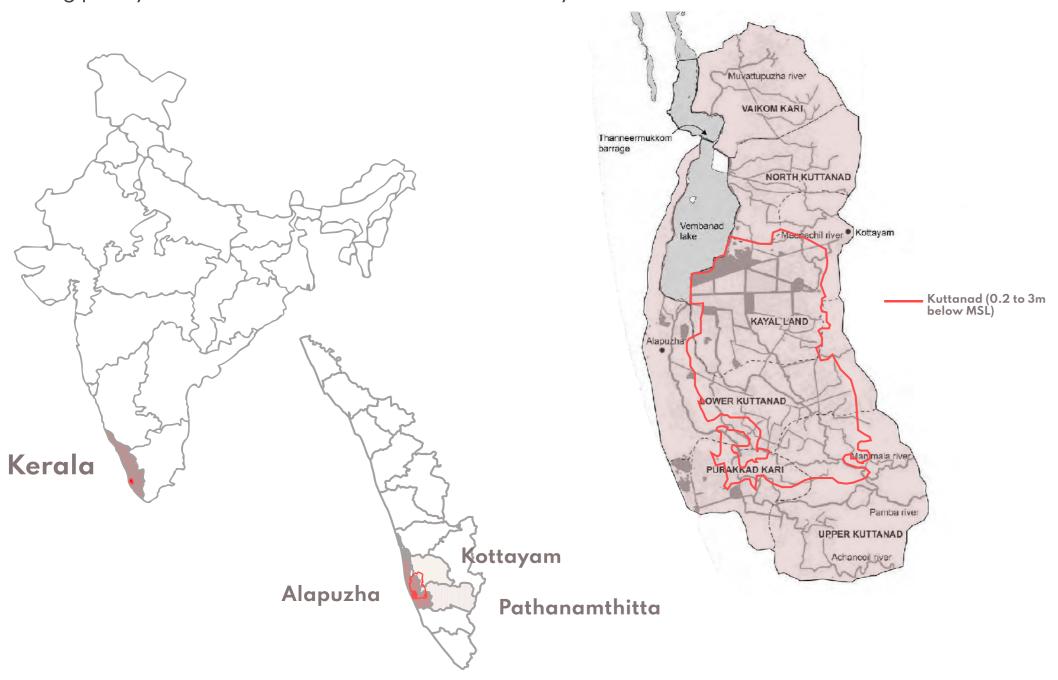
Below the Sea Level

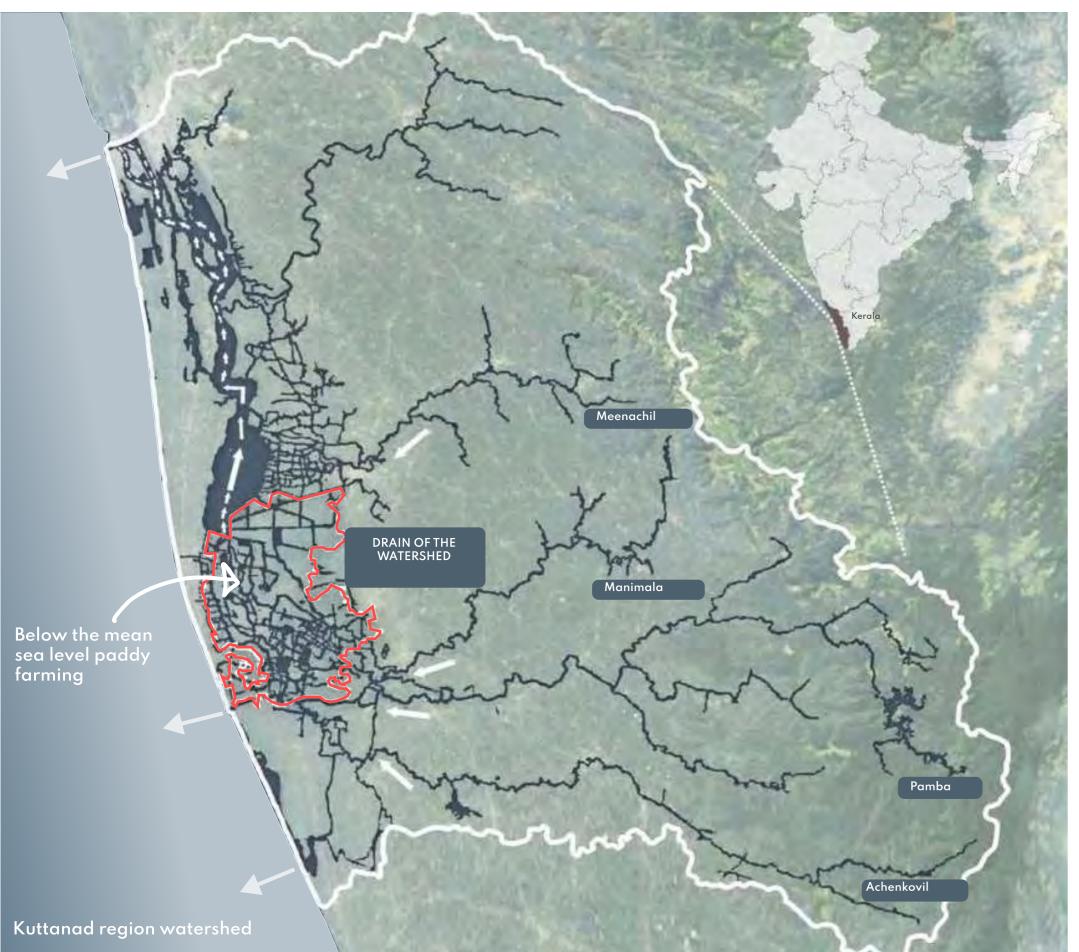
Circular CBT Model for the Kuttanad Community, Kerala

> Aashritha Jaladi Thesis guide- Ar. Prajakta Chakravarty SMEF's Brick School of Architecture



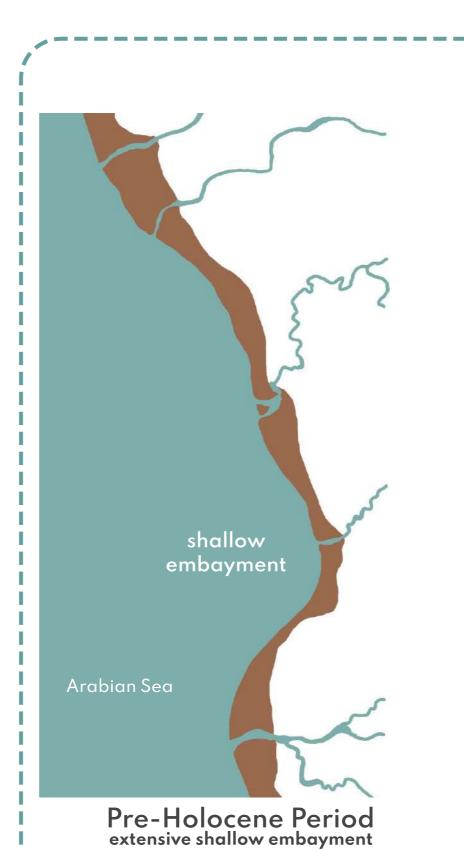
Kuttanad is a deltaic landscape south to the Vembanad Backwaters in the southern part of Kerala. It has been recognized as a Globally Important Agricultural Heritage System (GIAHS) by the Food Agricultural organization for its unique below the sea level faming system. Indigenous agrarian community has been cultivating paddy 0.2m to 3m below the MSL since the early 1880s.

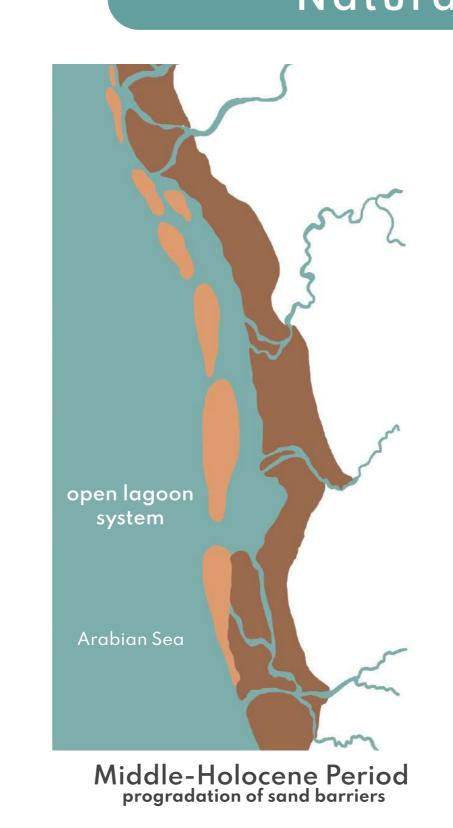


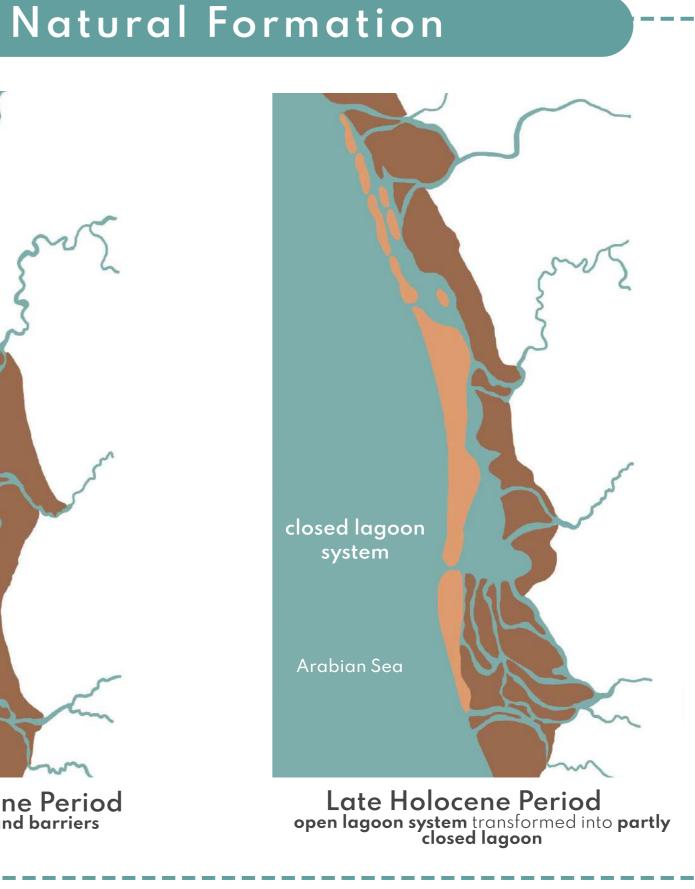


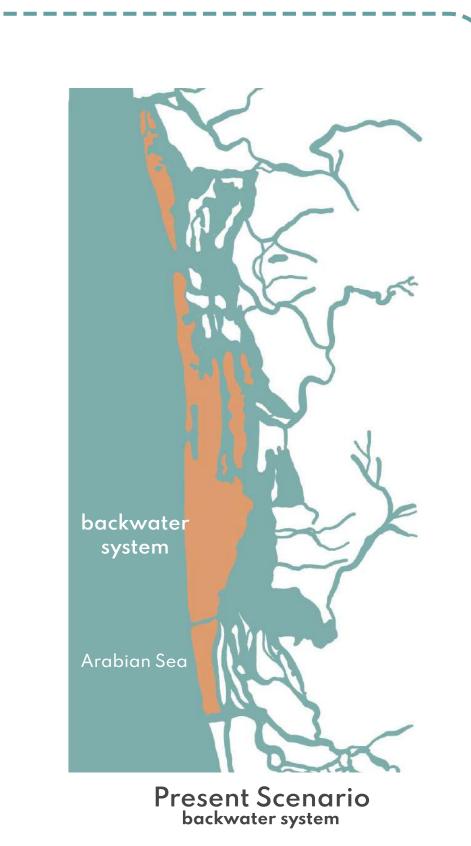
The aim of this thesis is to establish a self-sustaining community framework to enhance the economic resilience of local farmers in the Kuttanad region of Kerala amidst the agrarian challenges and the impact of climate change-induced sea level rise by studying the intricate relationship between the community and its natural surroundings to generate models for alternate sources of income generation that adapt to shifting climatic conditions.

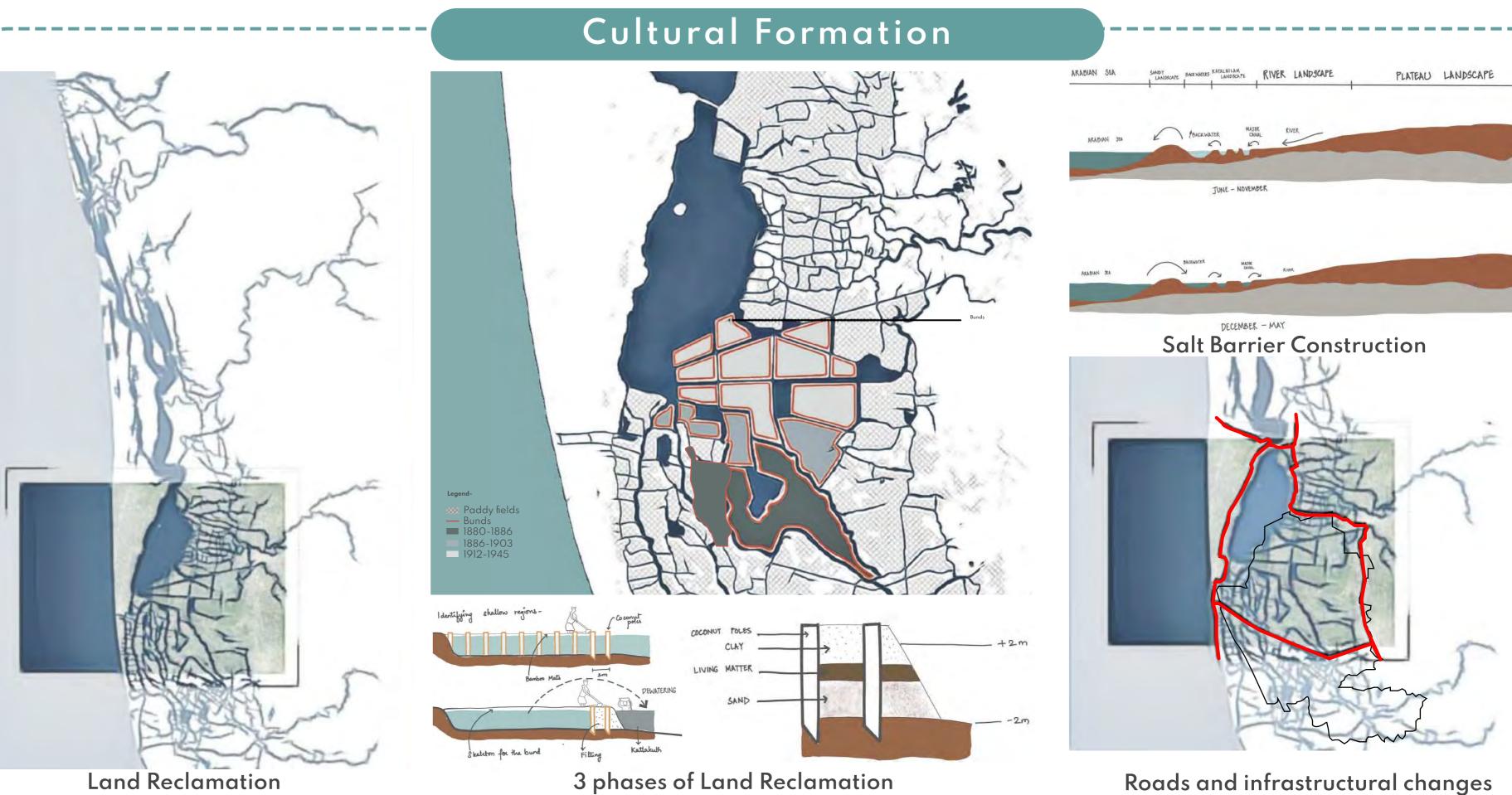


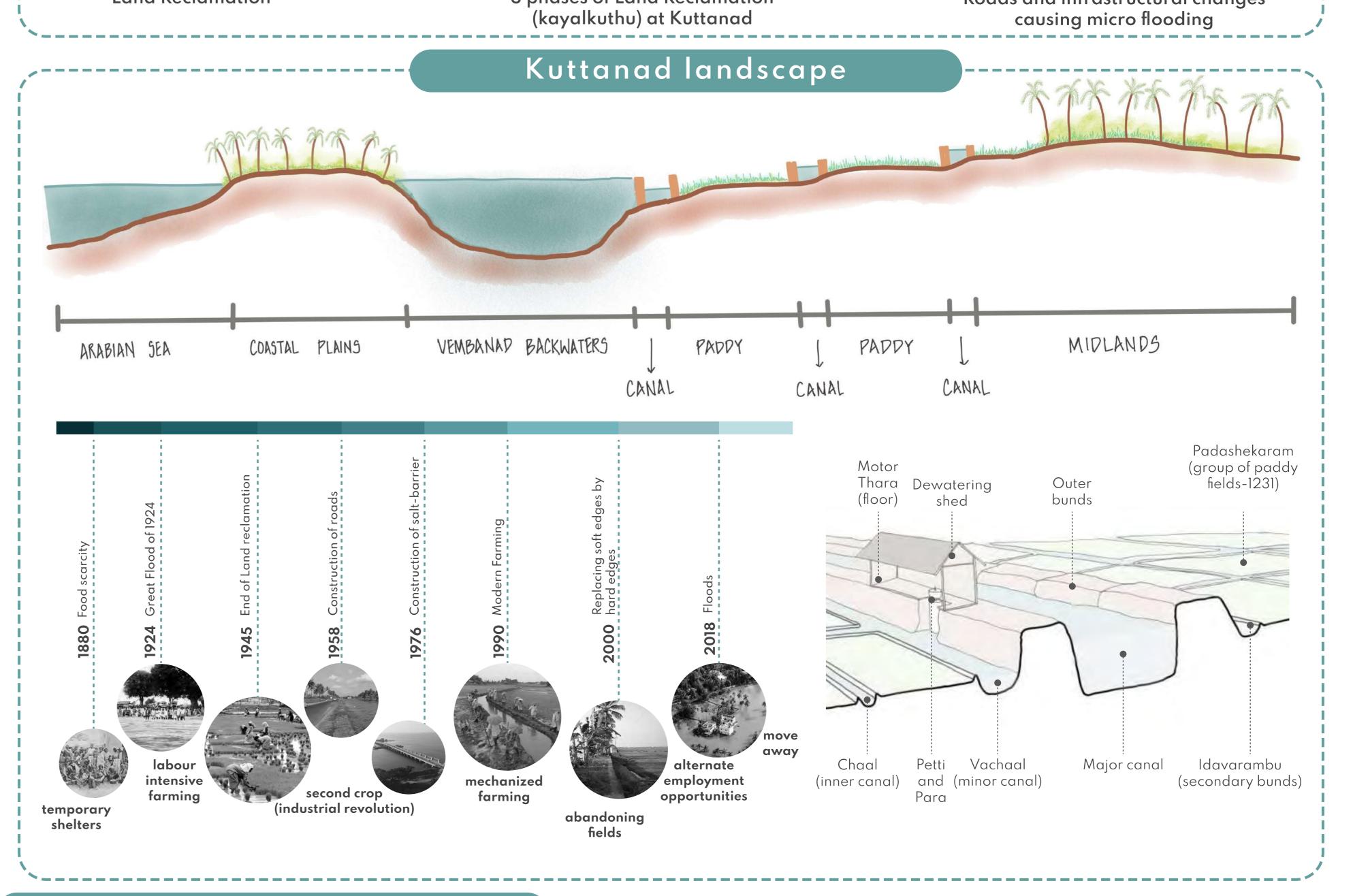


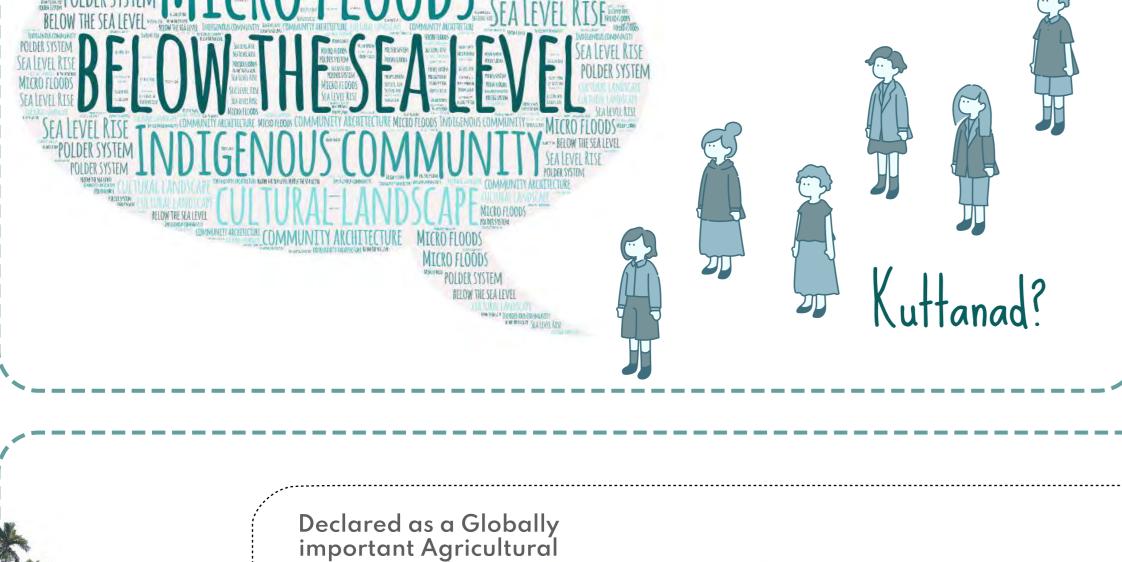


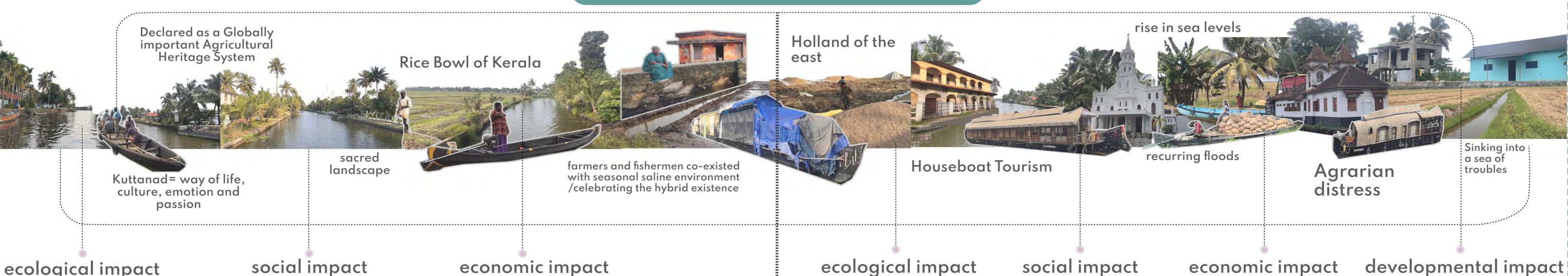












Life below the sea level

ecological impact

- 1. biodiverse ecotones
- 2. riverine and sea life migration
- 3. formation of ecological islands

social impact

- 1. home of indigenous marginalized agrarian Kuttanad community
- 2. community workshipped the landscape
- 3. dependency and
- attachment to land 4. cultural consciousness while dealing with flood

economic impact

- 1. agrarian and fishing
- community
- 2. clam mining and duck rearing

eco-centric society —

3. coconut farming and coir industry

ecological impact

- 1. Ecological diversity got 1. livelihood distress reduced.
- 2. breeding grounds for
- mosquitoes
- 3. Acquatic macrophytes 3. Seasonal replaced by aquatic weeds
- 4. reduction population of migratory birds due to decrease in
- water canals

social impact

- 2. Industrial revolution resulted
- mechanization migration affected 3. fishermen lost
- fishing industry the 4. cross to the northern side of the salt barrier to procure

→ anthropocentric society

daily catch 5. Sewage enters the 5. Intimacy with the landscape disappearing

economic impact 1. need for alternative

- employement 2. Hydrological
- carrying capacity reduced
- livelihood
- 4. Agricultural yield reduced
- 5. additional crop due to salt barrier

micro flooding due to development of roads

2. Soft edges(earthen bunds) were replaced with hard edges

Traditional living

Change in relations between man and nature 1976-present

Kainakary is a newly reclaimed Kayal with padashekarams recently constructed. It is taking in all the villagers whose homes have been washed away in floods at Lower Kuttanad. It is extremely scenic with backwaters interlacing through the paddy fields with all major tourist attractions around in good distances.

Kainakary



Pallathurthy suffers with a lot of micro flooding as the road network disrupts with the water capillary network and hence the development and paddy cultivation is haphazard. It is well-connected to the districts around as it is along a national highway.

Pallathuruthy



Chennamkary, the island village is amidst the scenic paddy fields with a central geographic location near most tourist attractions. It connects the Moncompu regions with Kainakary and has a strong water network. It has great tourist potential and also a high density settlements that require attention with flood management.

Chennamkary



With scenic vistas and high paddy yield, Nedumudi has a good tourist potential reflecting vernacular Kuttanad architecture. It faces micro flooding occasionally due to which there's a lot of mobility and accessibility challenges. However, the national highway divides the region in 2 halves.

Nedumudi



Moncompu houses agricultural researches and the rice research station allowing the farmers to get exposed to latest innovation and machinery. However, modern development is seen in the region and drastic reduce of paddy fields and farmers is also evident with alternate income sources.

Moncompu



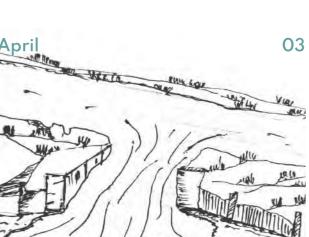
Champakulam has a good potential due to the scenic vistas and density as well as the landform but its geographic location is a disadvantage as it comes with some challenge in accessing the region. The

Champakulam

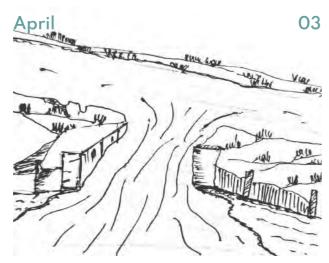
Comparative analysis legend







Flooding the fields
Saline water enters the fields

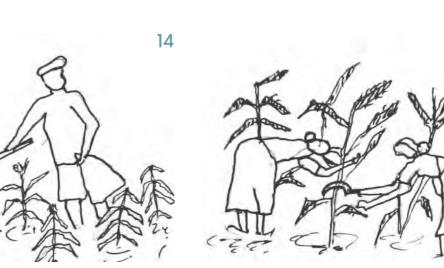




Duck Rearing Duck waste increases soil fertility

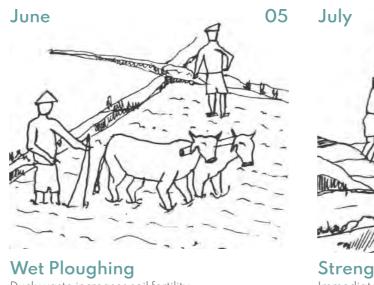
Native vegetation

13 December



Regional Plan 🖍

Harvesting plants are cut close to the ground



Strengthening the bunds
Immediately after the rains

below the sea level farming

CBT projects Caselets



Connectivity

Transporting the sheaves threshing ground in bundles



Unemployement

By allowing it to grow and decay



Sanitation & sewage

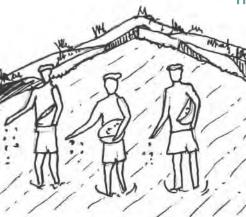
Drinking water





20

Economic distress



First round of Ploughing



Lime Shell Application

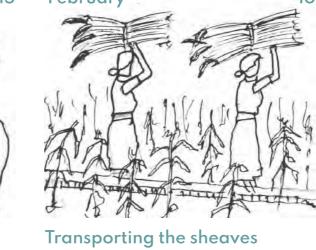
To neutralize the acidity of the soil





















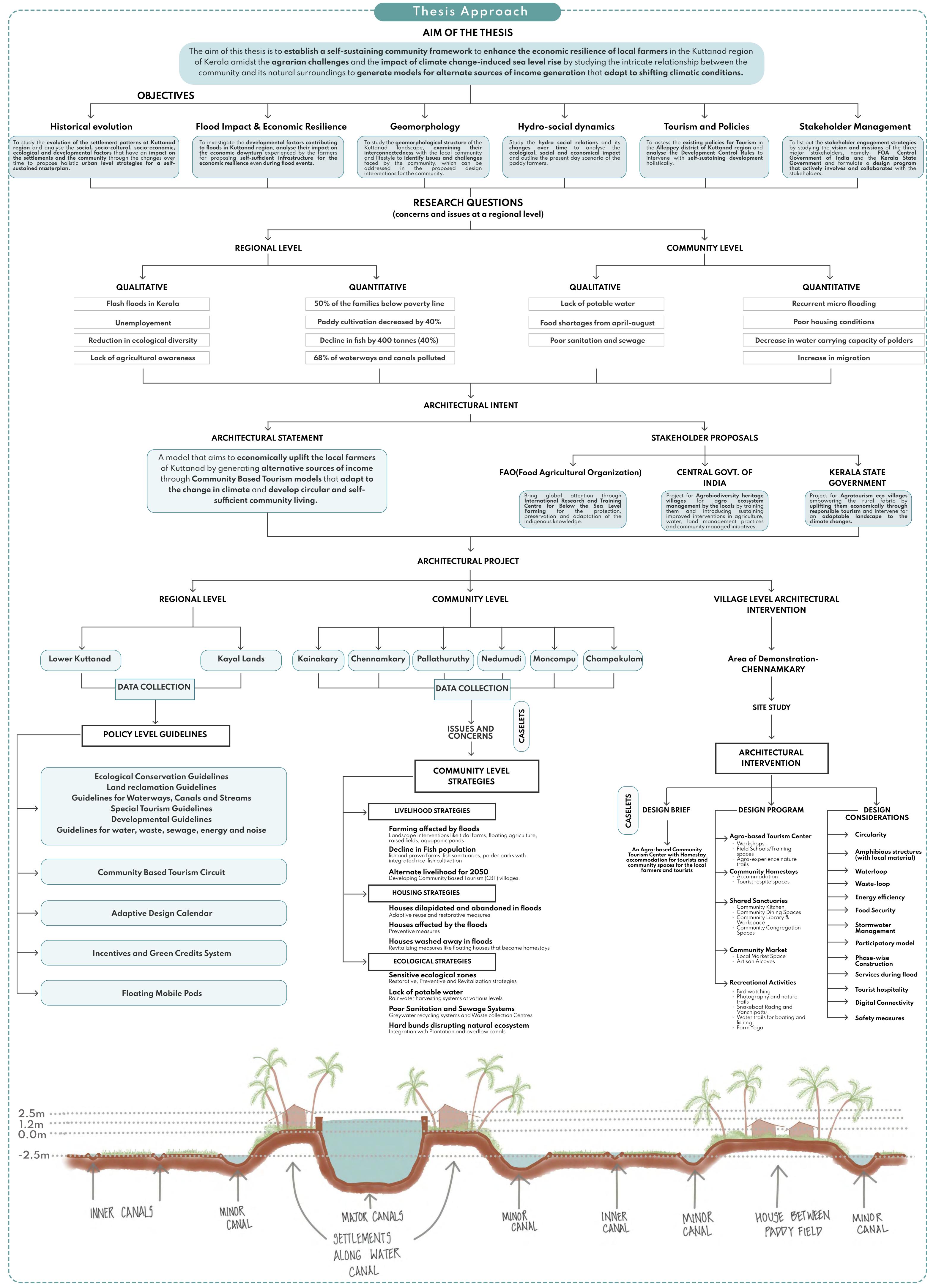




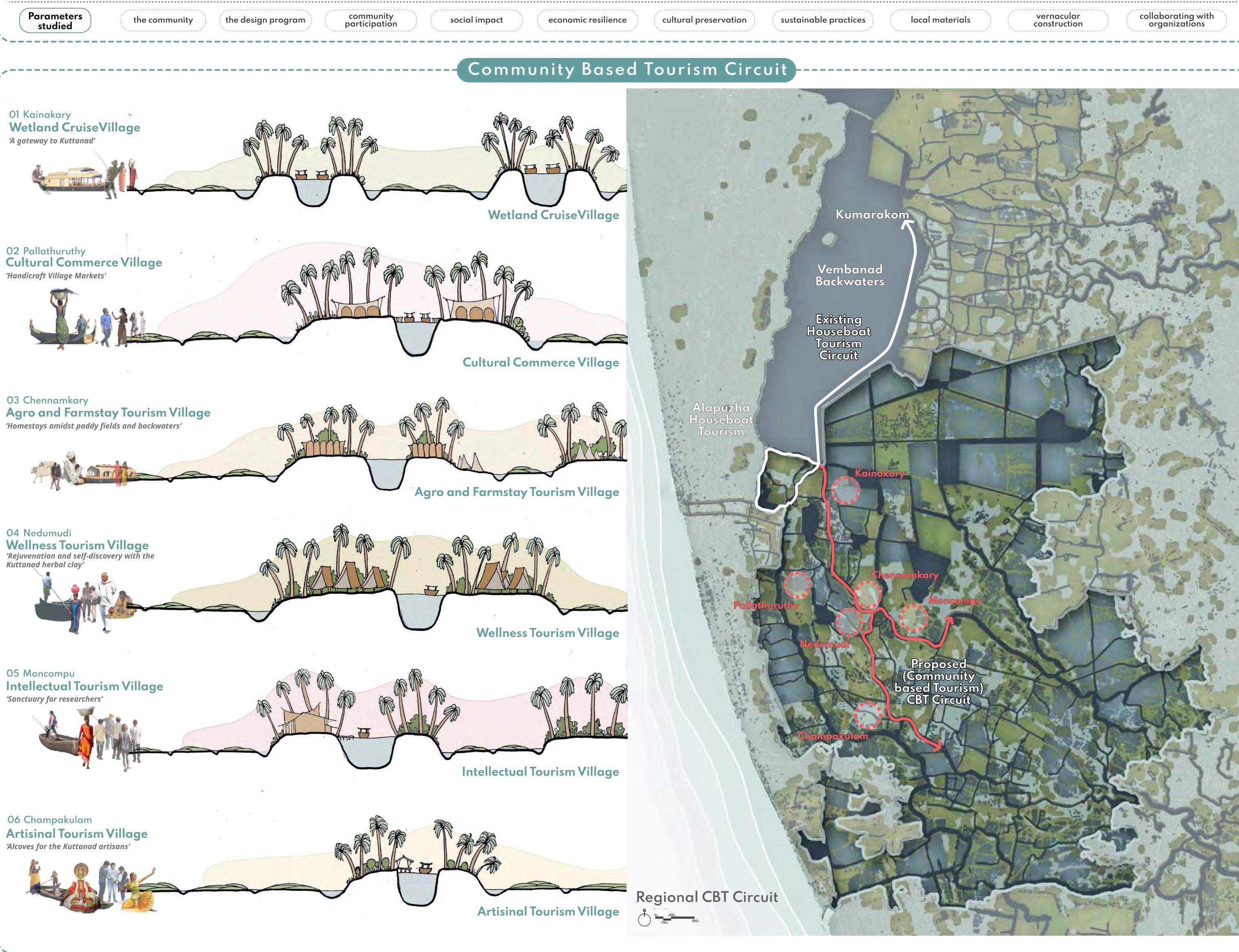




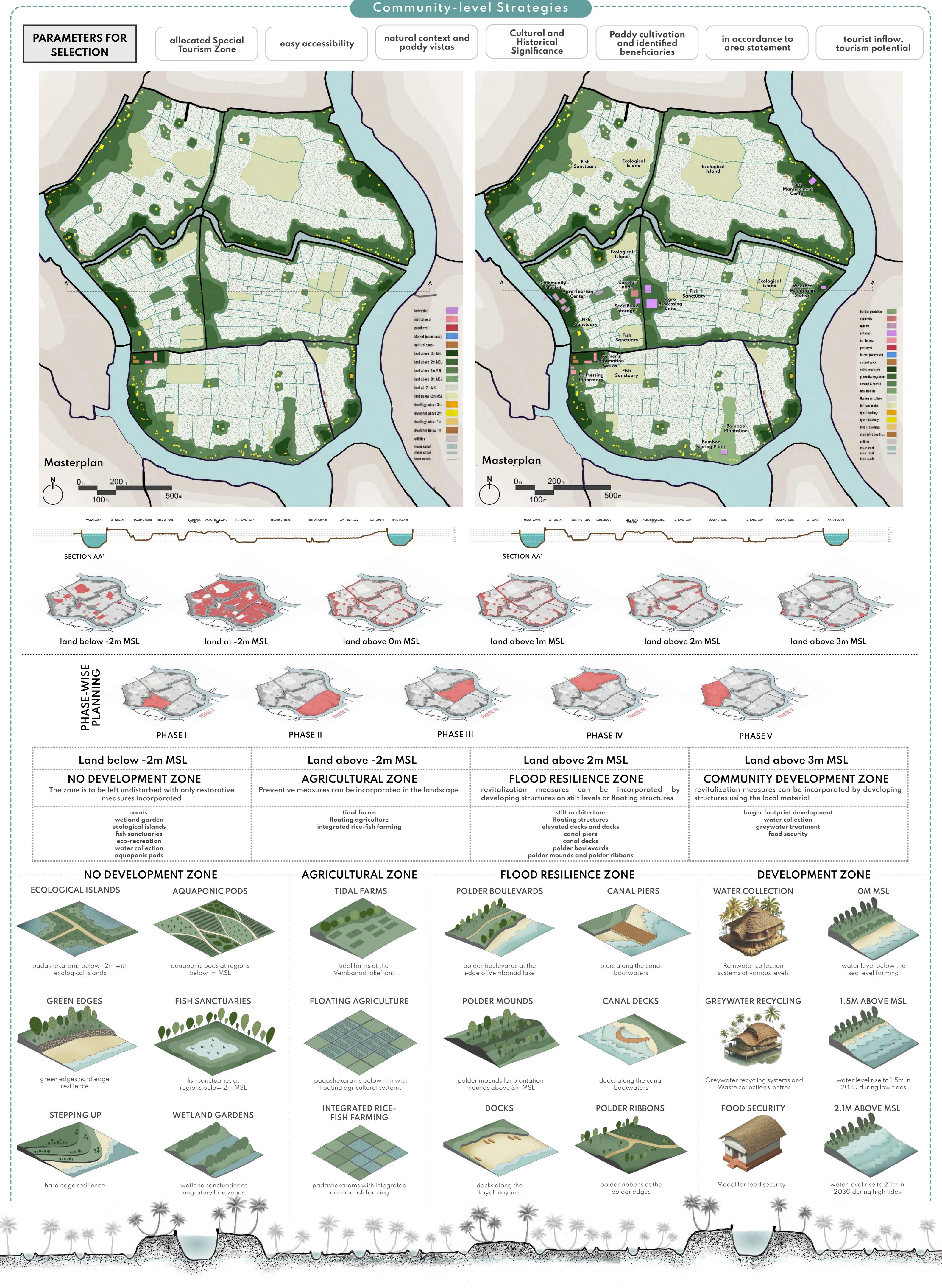




CBT projects Caselets Shaam-e-Sarhad Village Resort, Kutch MPTB Homestays, Madhya Pradesh Farmer Innovation Center, Nagaland Biome Environmental Solutions Hunnarshala Foundation Ar. Jayesh Ganesh sir and Uday Goswami The Community Based Tourism at Kutch aims to promote new and innovative approaches to A project where the **Program wasn't imposed** but was rather arrived at together with the community. MP is a state rich in rural attractions with 72% of the state's population residing in rural contexts. Designed for Better Life Foundation (BLF), this is a space for the identification, promotion, development Madhya Pradesh Tourism Board(MPTB) planned out Community based tourism projects in various build livelihood opportunities in rural areas through community action. Endogenous villages of Madhya Pradesh which would amplify the culture of the community across the region and Tourism Project, with the Rural Tourism Scheme, is to develop the culture, craft and and dissemination of grassroots innovations by farmers and inventors of the region. It is envisaged as sustainable dimensions of rural life, as a means to viable livelihood opportunities. a collaborative space for the local community with access to a global resource network. also generate employment. MP Homestays project is envisioned with the complete involvement of architects, social workers and A pastoral community nestled in the grasslands of Banni was initially against any Built by and for the local community in response to a pertinent social need and in celebration of the the community. 100 villages of various communities of MP were chosen and 8 homestays are to be local culture and using locally available materials with traditional bamboo construction techniques, community tourism initiative. The tourism initiative which could have easily turned into an proposed in each village. The design organization is the TSO that supports technically by providing individualized profit making space, has been retained, amplifying the culture of the the design is a celebration of the context. homestay drawings while the PSO are identified NGOs for each village that constantly support in the **community** across the region. execution. bhunga houses community vernacular building as an participatión beneficiary participatory construction identity participation construction exploring the local lifestyle incrementality homestays a self-expression architecture as an responding to local culture incentives expression local construction participatory construction methods program arrived at local material community participation vernacular inclusivity construction tourists explore local cuisine reflection of a beacon phase-wise development community based collaborating with NGOs and locals tourism projects local construction methods collaborating with NGOs and locals local material vernaculrar bhunga houses community participation *c*limate responsive vernacular structures







Agro Tourism Initiative

Architectural Project

A model that aims to economically uplift the local farmers of Kuttanad by generating alternative sources of income through Community Based Tourism models that adapt to the change in climate and develop circular and selfsufficient community living.

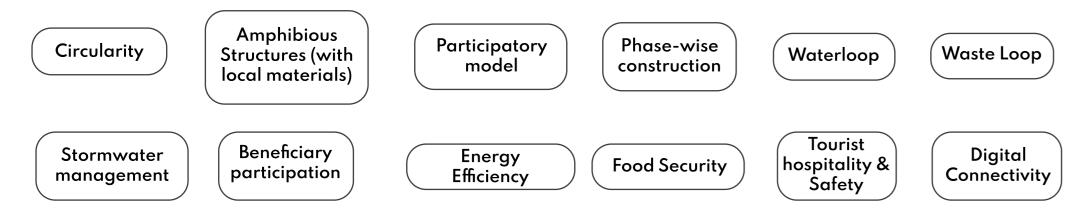
Design Brief

A Community-based Tourism (CBT) model that celebrates the rich agricultural heritage of the region. Nestled amidst panoramic vistas of paddy fields interlaced with backwater canals, the center offers farmstays and immersive experiences tailored to various sizes of tourist groups. With a minimum tourism program duration of 2 days, the project endeavors to become a focal point destination in the proposed CBT tourism circuit, uplifting local farmers economically while showcasing the ecological sensitivity of the area's farming practices.

The primary aim of the Agro & Farmstay Tourism Village model is to create a sustainable and immersive tourism experience that celebrates the agricultural heritage of the region. By offering opportunities for tourists to engage with local communities, participate in traditional activities, and learn about cultural practices, the project aims to promote environmental conservation, cultural exchange, and economic resilience.

The objectives of the model are to provide comfortable and authentic homestay accommodations that blend with the agricultural landscape, catering to diverse tourist preferences and group sizes. The model also revolves around developing infrastructure and facilities for agricultural experiences, cultural immersion, and communal activities, ensuring accessibility and minimal environmental impact promoting sustainable and responsible tourism.

Design Considerations



Phase-wise model

1200 farmers to be uplifted in 5 phases (10 years)

1200 farmers	tourist inflow	Phase I	<u>_</u>		
Phase I- 160 farmers Phase II- 300 farmers Phase III- 650 farmers Phase IV- 900 farmers Phase V- 1200 Farmers	100-120 250 500 750 1000	160 farmers 50 homestays 120 tourists	Tourist Groudynamics	10% single occupancy 50% double occupancy 25% family of 4-5 15% dorm occupancy	5 single occupancy homestays 25 double/triple occupancy 12 family homestays 8 dorm stays

Design Program

	Spaces	Toto	al Area (sqm)
Α	Community Market		150 sqm
В	Agro Tourism Center		4650 sqm
С	Field Schools		300 sqm
G	Recreational Spaces	Bird watching, Photography and nature trails, Snakeboat Racing and Vanchipattu, Water trails for boating and fishing, Farm Yoga, Polder Parks, Fish Sanctuaries, etc as per Community level Design Strategies	as per design

Н	Community Dwelling/Homestays	No. of units	No. of people per unit	Area per unit (sqm)	Total Area (sqm)
	Dwelling + Single Occupancy	5	2+1= 3	40	200
	Dwelling+ Double/Triple Occupancy	25	3+3= 6	60	1500
	Dwelling + Family Occupancy	12	3+4= 7	85	1020
	Dorm Occupancy	8	8	90	720
					2440

Total 8540 sqm 20% circulation 1108 sqm

TOTAL BUILT UP AREA 9648 sqm

Where land meets water

Circularity Project Caselets

ReGen Village, Netherlands

EFFEKT Architects

Regen has been developed in response to some of the world's most pressing environmental, social and economic issues. It integrates energy positive homes, renewable energy, energy storage, doorstep high-yield organic food production, vertical farming, water management and waste-toresource systems.



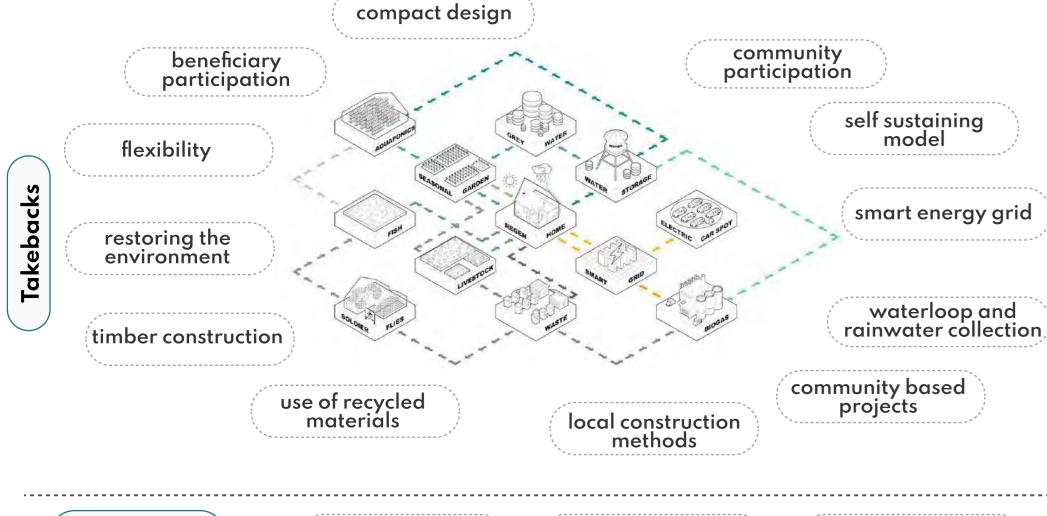
Parameters

studied





By minimizing the footprint of the food production and housing units, space is freed up to create biodiversity. Regen becomes a fully self-sustaining village model that does not deplete nature but restores it.



the community

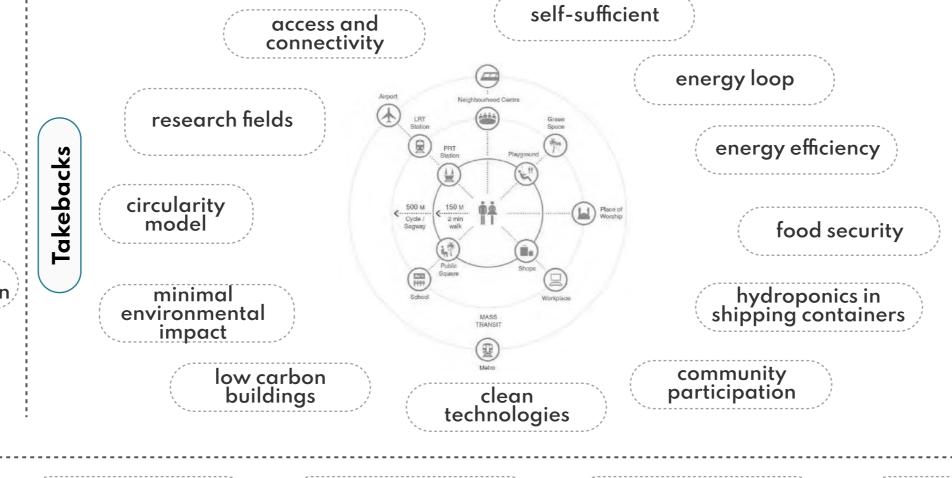
Masdar City, Abu Dhabi

Foster & Partners

The mission of Masdar City is to create a desert community that is carbon neutral and zero waste. It has an aim of advancing a national industry of clean-technology alternatives to petroleum. A mixed-use, low-rise, high-density development, the city includes the Masdar Institute and the headquarters for the International Renewable Energy Agency



Masdar City has hosted many 'firsts' for innovation since it was founded in 2006. This urban community acts as an incubator for the development of clean technologies and low-carbon buildings in Abu Dhabi and the wider region. The principles of designing urban architecture with minimal environmental impact are reflected throughout Masdar City.

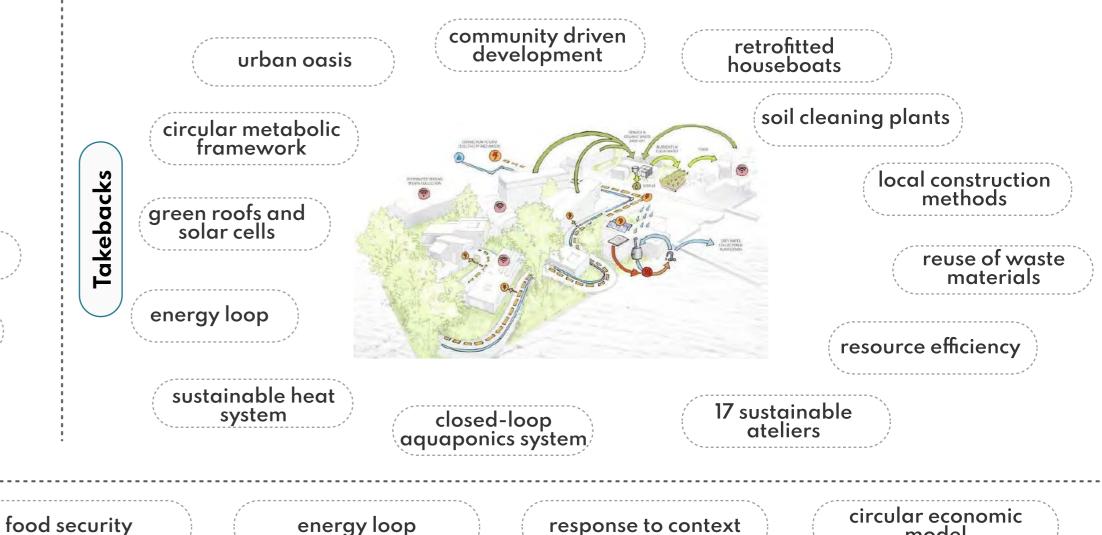


De Ceuvel Park, Amsterdam

A polluted plot in Amsterdam was transformed into an urban oasis thorough a community driven development. Retrofitted houseboats placed on the land, surrounded by soil-cleaning plants and connected through a winding jetty.



The site is conceptualised as a circular, metabolic framework in order to reuse waste materials and improve resource efficiency and productivity.



Local Materials

circular construction



Laterite Stone Commonly used in foundations, most vernacular houses are constructed in load bearing techniques with isolated footing



the design program

Kuttanadan Clay and bushes Clay of Kuttanad is a key resource for the people, not only for building land but also making bricks for their housing



participation

Bambusa Bambos, Bambusa Balcooa, Bambusa Polymorpha, Bambusa Tulda, Dendrocalamus Stocksii are locally abundant in the region and Bambusa Bambos is used for weaving mats



materials

Half and whole culm bamboo walls, wattle and daub walls. weaved bamboo walls are commonly seen.



waterloop

Thatch roofs are widely seen in the



Various clay tile roofs are seen like mangalore tile, pot tiles, etc due to abundant clay found in



model

Stone Stone is widely used in foundations and it is found in abundance in the eastern part of Kuttanad

Design Vision

The design focuses on creating a selfsufficient agro-tourism center in Chennamkary, a picturesque island village nestled amidst the backwaters of Kerala. Embracing the ethos of community-based design, the approach has been rooted in active participation from the local residents every step of the

Concept Note

seamlessly integrates with its natural drawing inspiration from local wisdom and utilizing traditional techniques familiar to the villagers. The floating homestays, crafted from local bamboo withstand the region's periodic floods. These structures offer visitors a unique opportunity to immerse themselves in the serene ambiance of the backwaters while championing sustainable living.

The design embodies a holistic approach, incorporating elements such as the water loop, waste loop, energy grid, and food security measures. By embracing these principles, efforts are made to minimize center's long-term self-sufficiency. construction technology

This project is a testament to the values of community collaboration, environmental consciousness, and cultural heritage Through this work, strategies are made to empower local communities, cultivate sustainable tourism practices, and nurture a harmonious coexistence between humanity and nature in the enchanting landscapes of Chennamkary.



community-centric design







around the trees

01 Community Market the aroma of fresh produce, clay mingles with the chatter of tourist and locals amidst a community weekly market and artisan all empowering the local artisans.

02 Visitor's Center

Tourists and villagers come together in the congregative spaces, where architecture serves as a backdrop to cultural interactions. Panchayat meetings and tourist orientation takes place. The design encourages a sense of community, with every nook telling a story of shared experiences.

03 Agro Tourism Center

surrounded by greenery, and spaces that spill over to the outdoors where landscape to decode the sustainable agricultural practices, where the architecture itself becomes a learning

04 Field Schools

Semi-open structures on stilts in the middle of the paddy fields that open up to the vast expanses of lush green fields for tourists to participate in the farming. The structure becomes a field school in the off-season.



togetherness

05 Homestays

Bamboo homes carved out of bamboo allowing the beneficiaries to add more spaces with the money











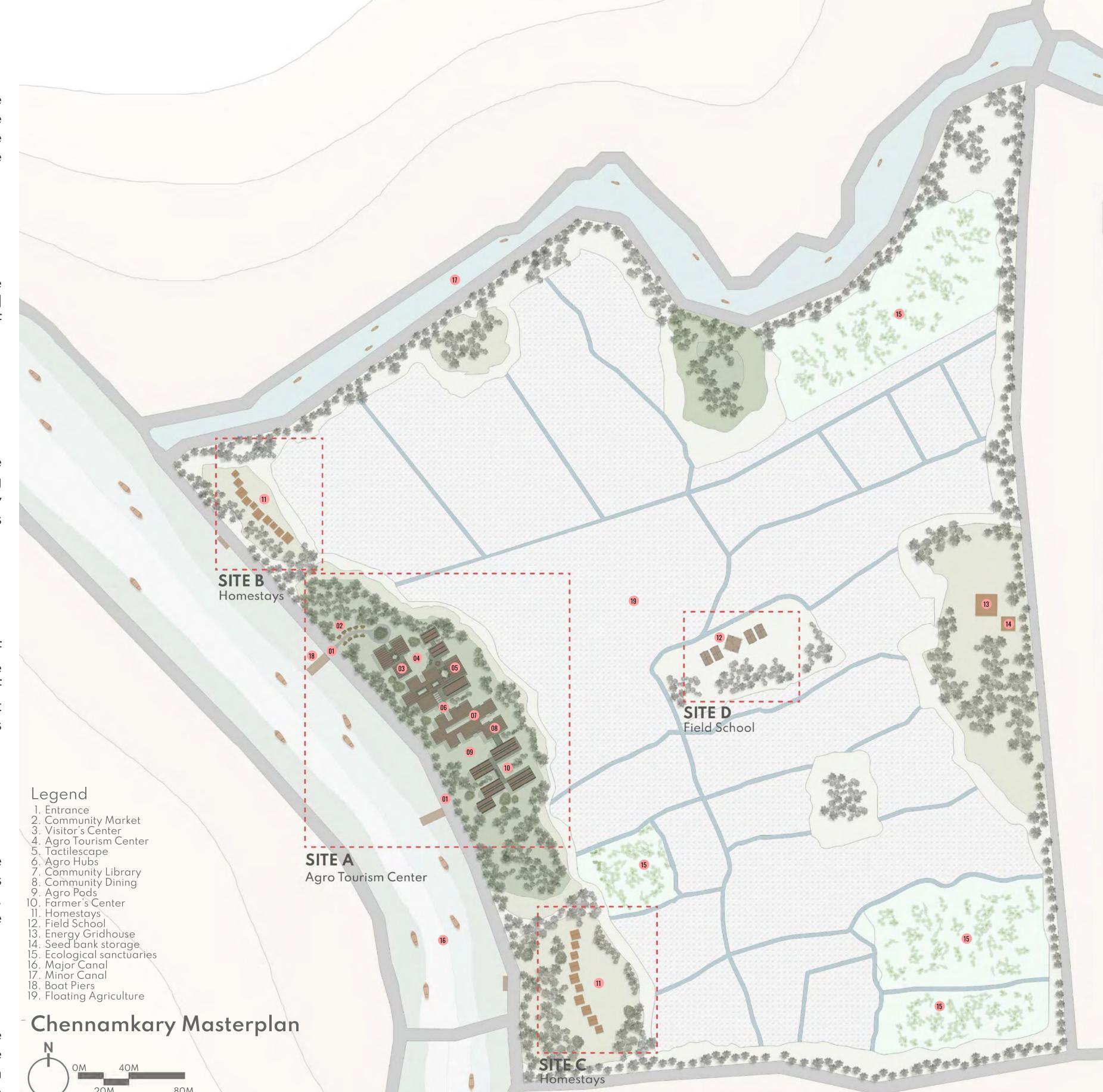
Painting the Site

The trees and the contours on the site are to be maintained so as to not affect the 二 ecosystem with drastic changes. The Adaptive Water Calendar can ensure the protection of the ecology.

F farms that allow for alternative source of income while ensures the maintenance

 $\overline{\underline{\cup}}$ The agricultural lands are to follow the preventive measures by introducing floating agricultural practices that allow for the crops to float on water in the events of floods

The site is flanked by native vegetation of Kerala with coconut trees reaching up the skies, banana trees with bunches of bananas, Bamboo plantations, Jackfruit and tamarind trees. The denser patches are untouched.



Future at Chennamkary

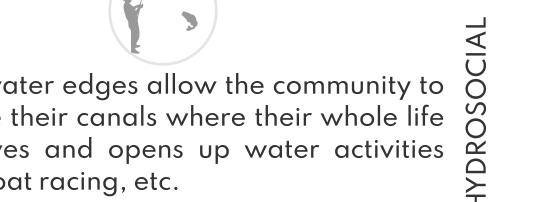
Chennamkary becomes the model village or agro tourism interventions uplifting the whole village in 5 years and uplifting the CBT circuit in 8 years.

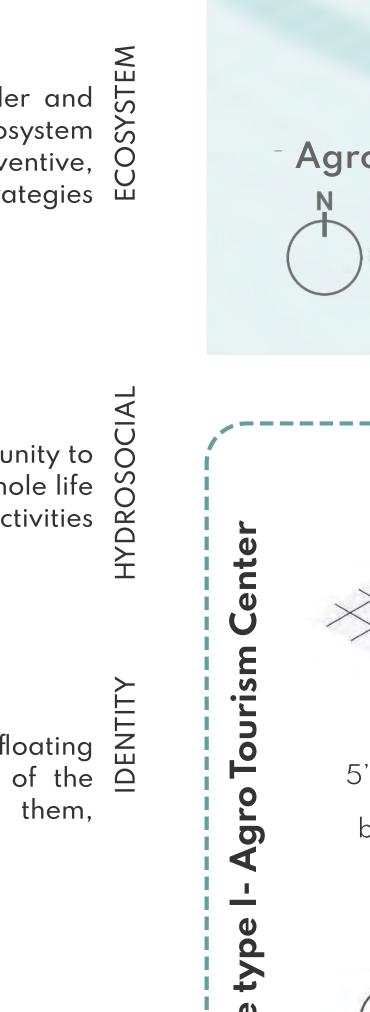
With floating architecture and floating agriculture initiatives, the recurrent of floods get addressed while not decomposing the lices and economy of the

Local Activities are like duck rearing, toddy tapping and clam collecting that are a source of income for the community can get amplified

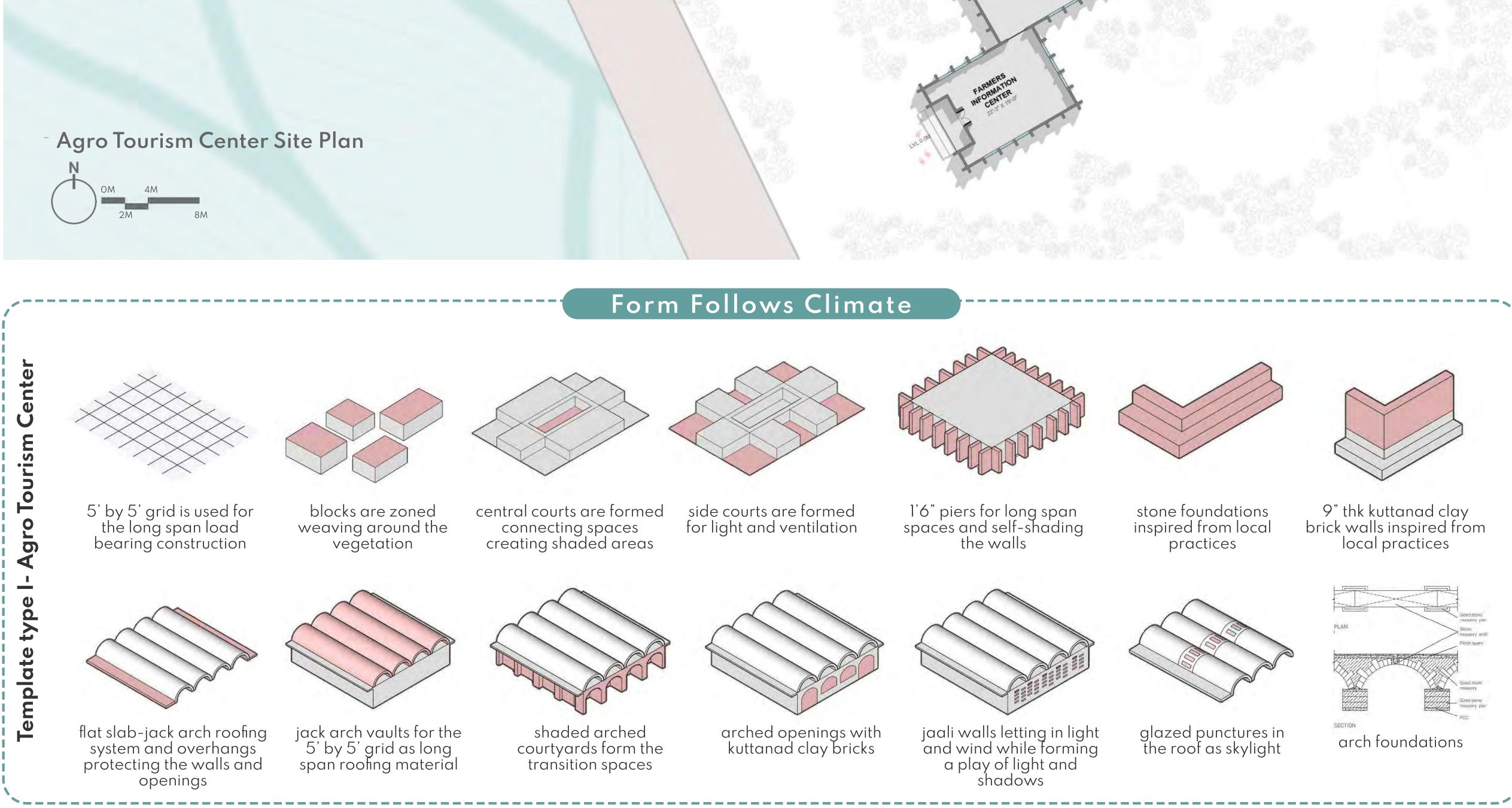


With the adaptive water calender and $\frac{1}{6}$ the ecological strategies, the ecosystem is restored and maintained. Preventive, restorative and revitalization strategies are to be reflected.

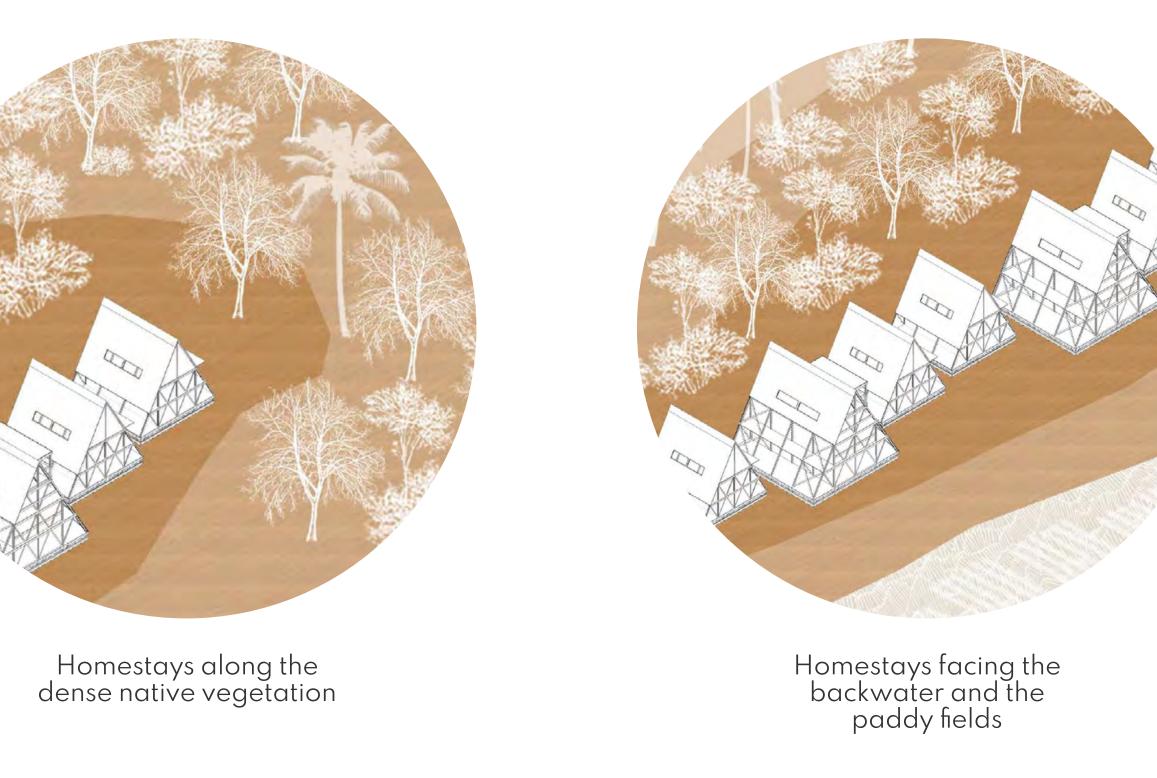


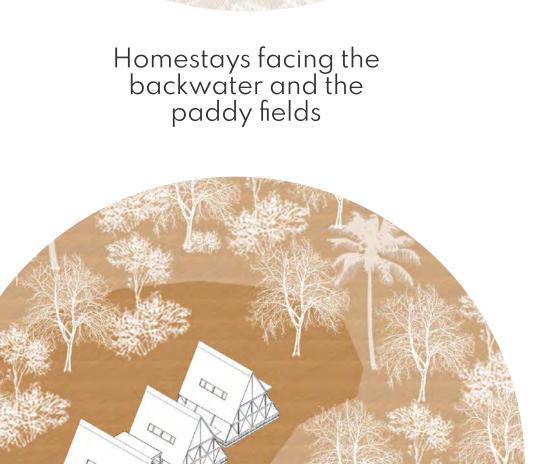


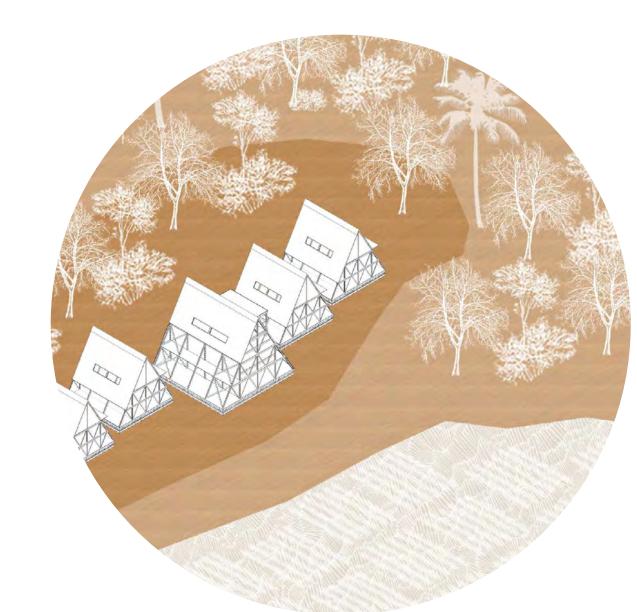


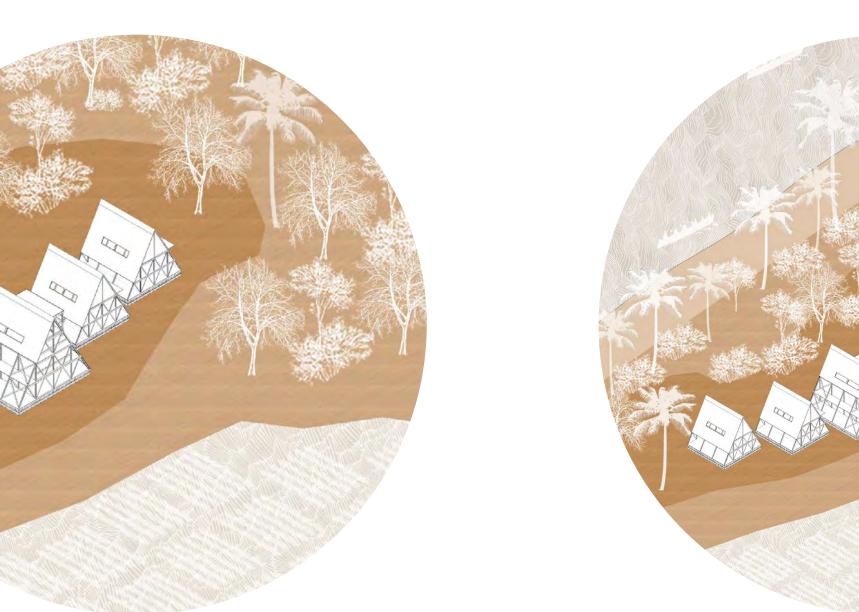


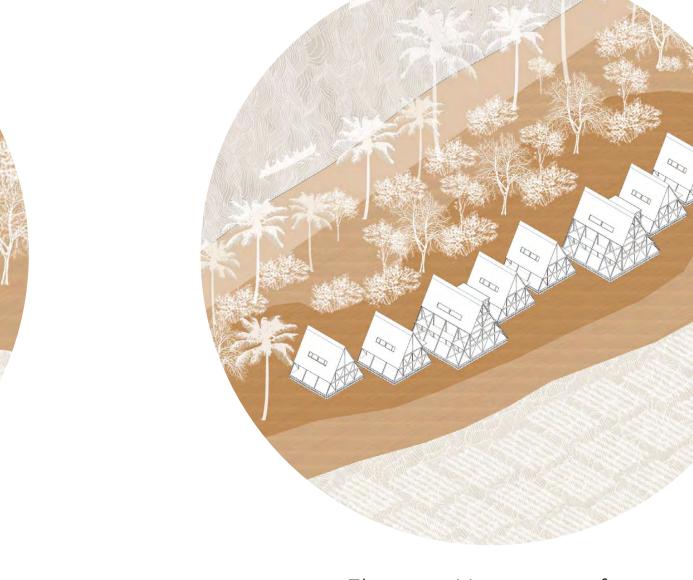


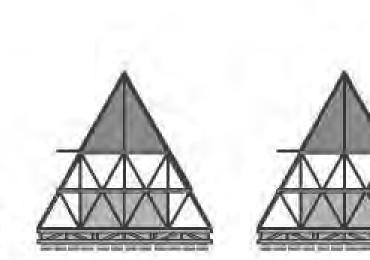


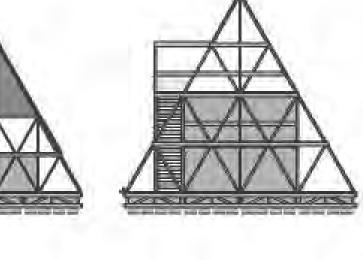


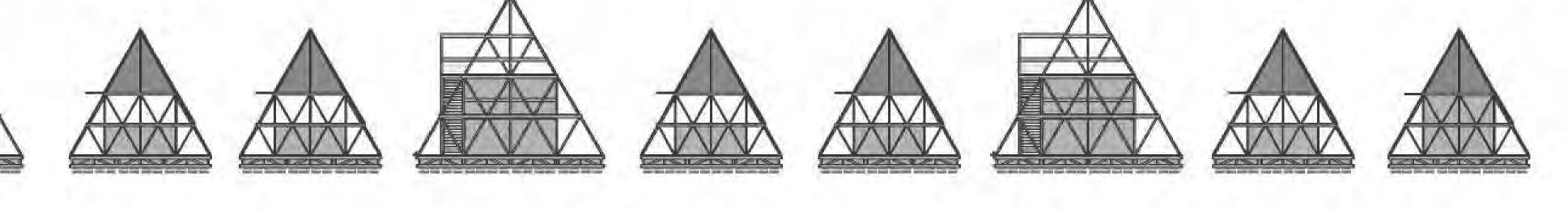


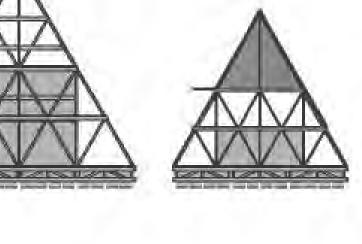




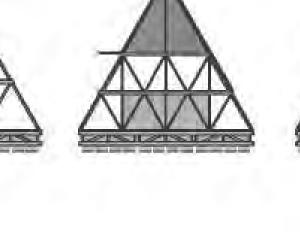


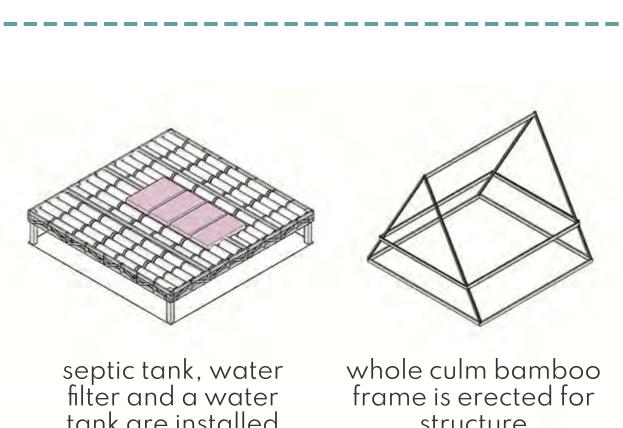


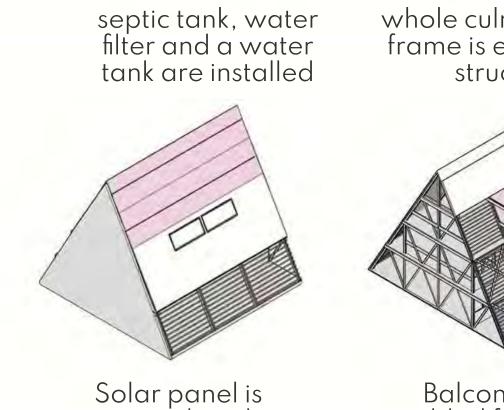




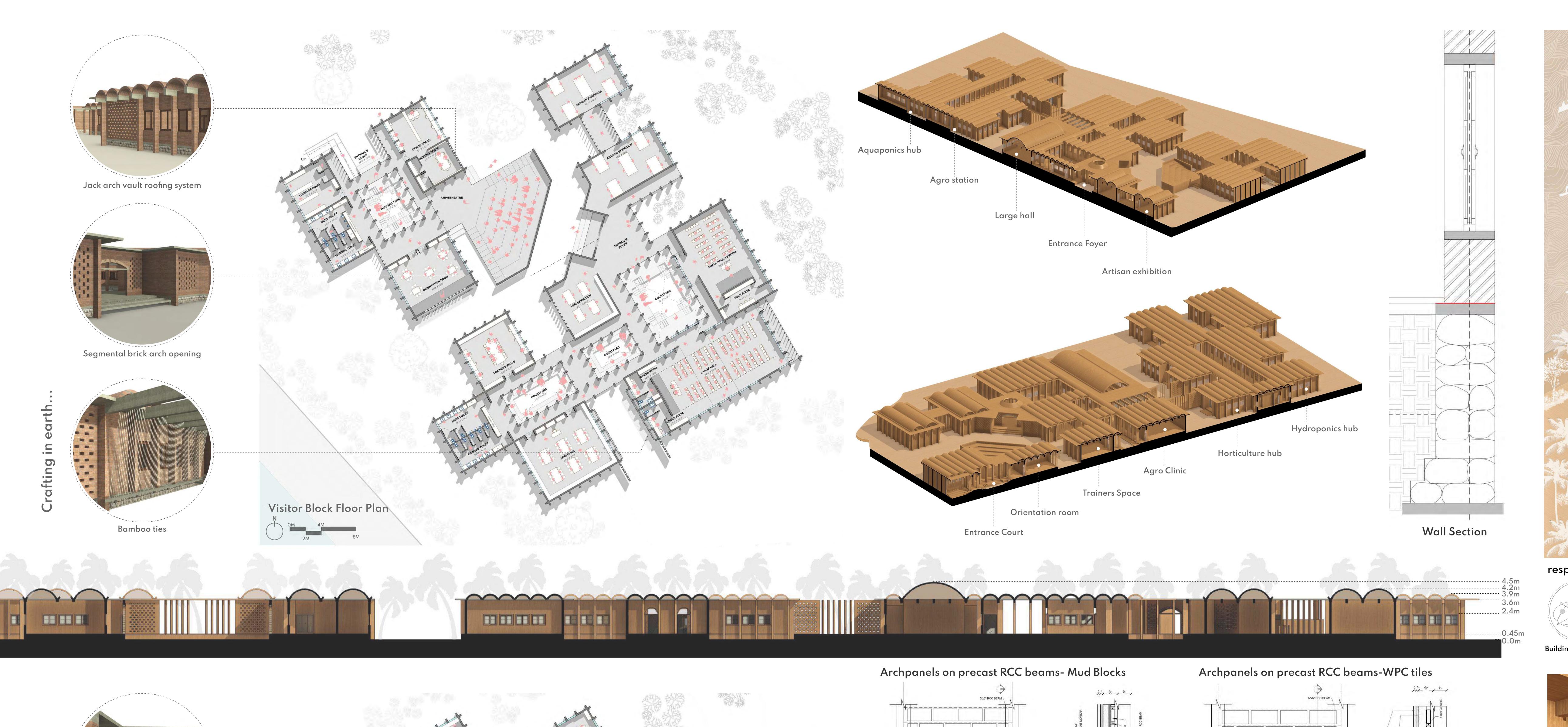
Homestays connected to the major canal



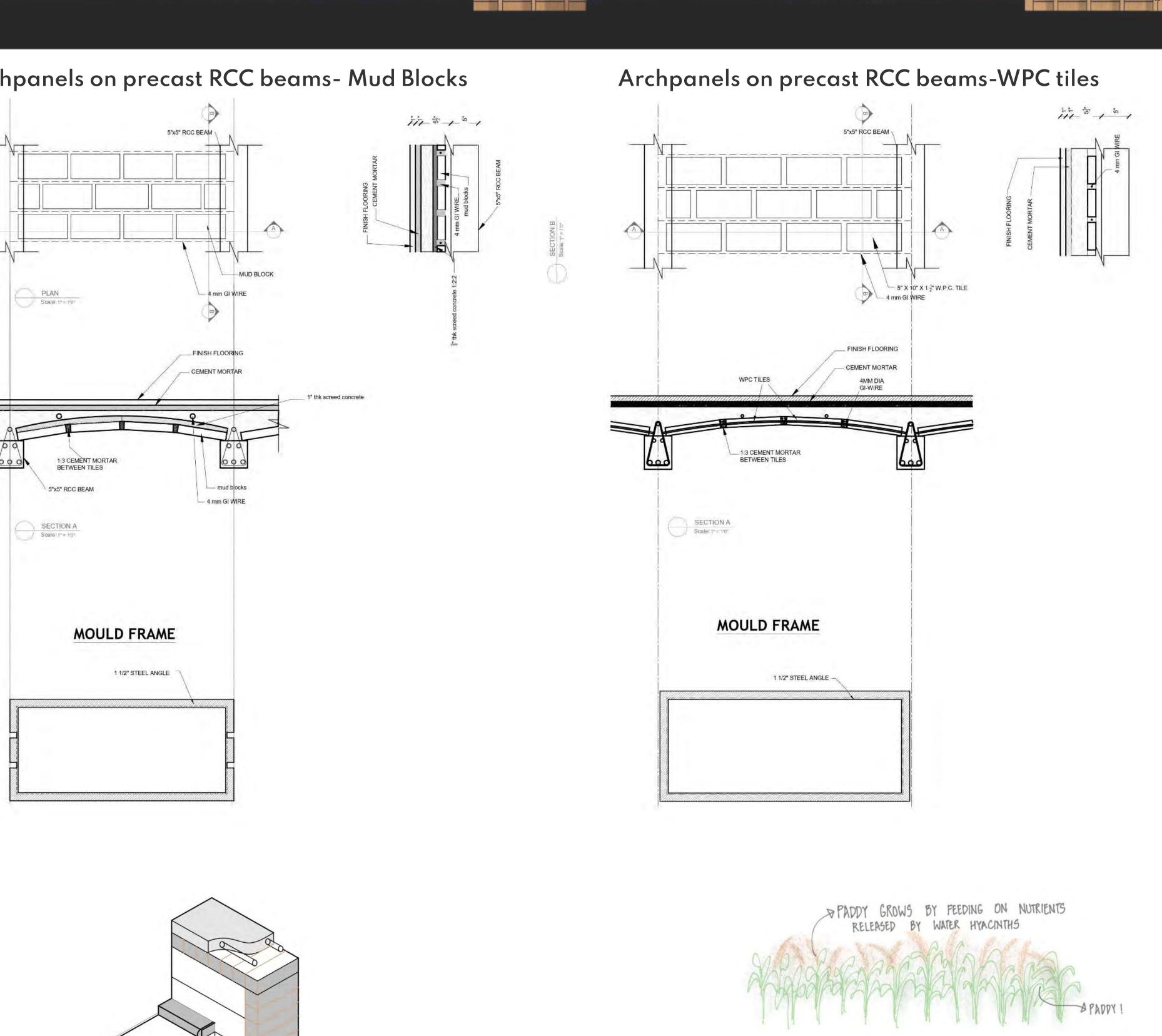




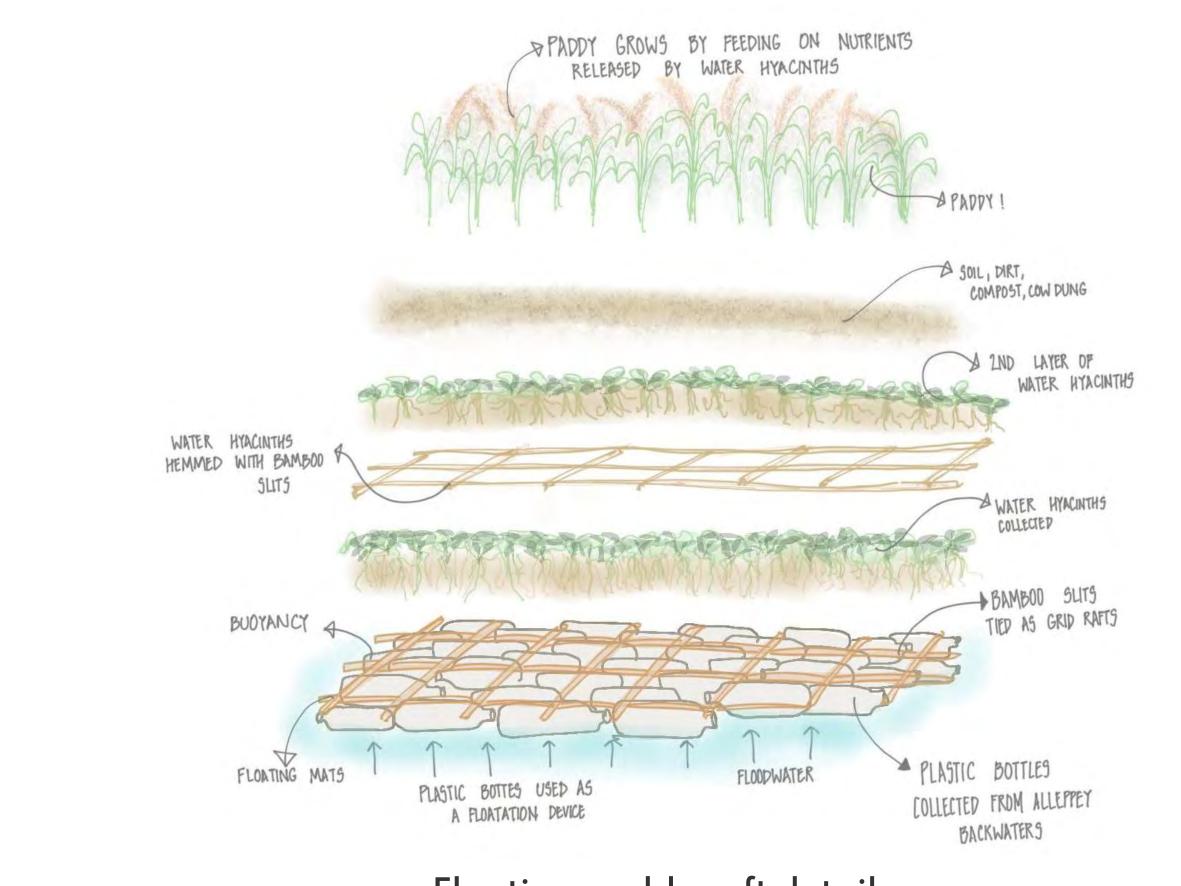




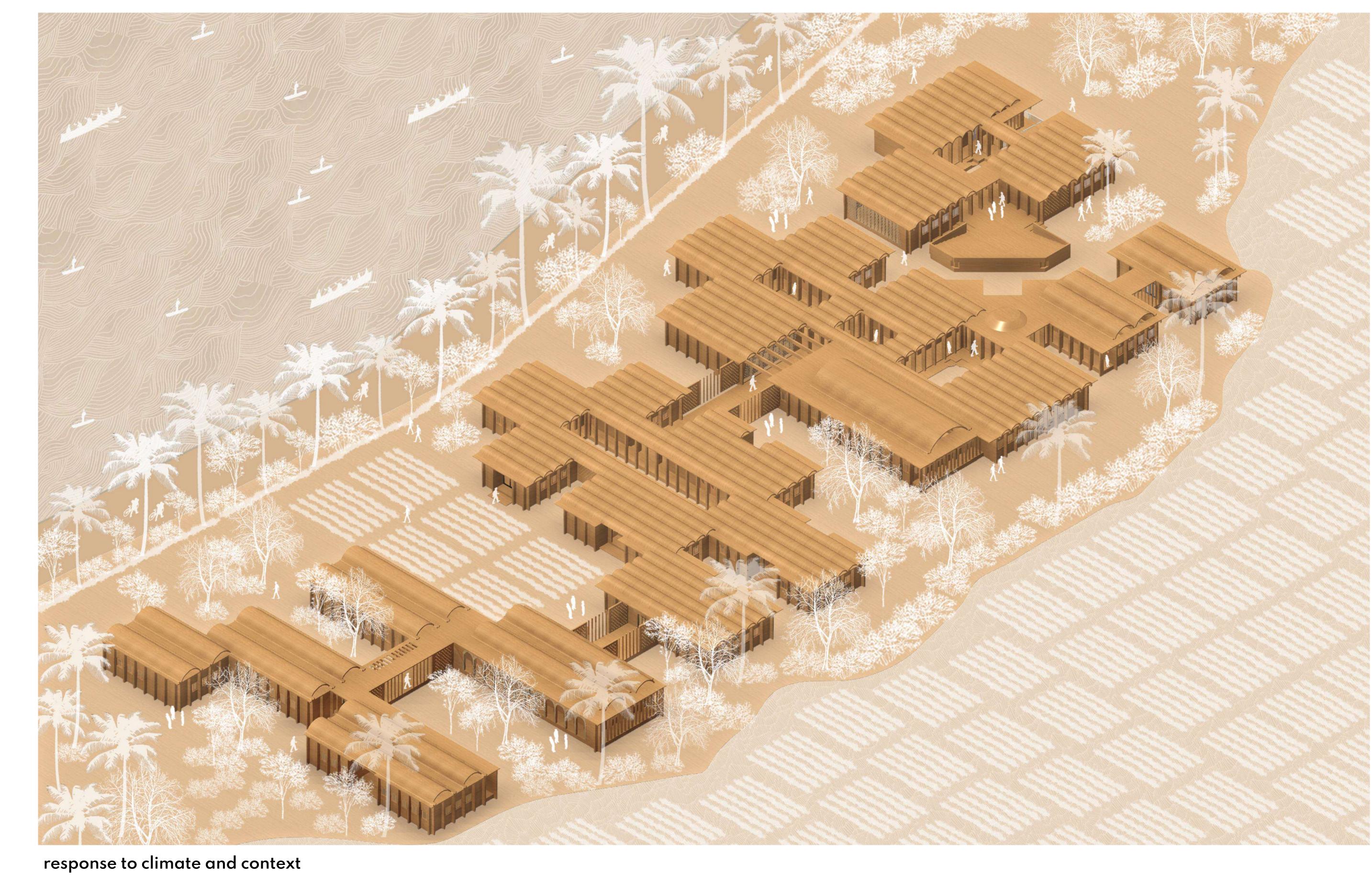


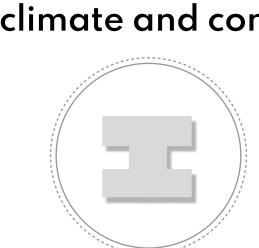


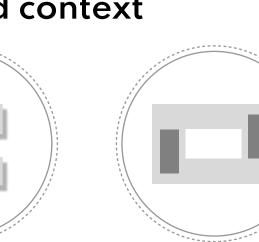
Construction of walls

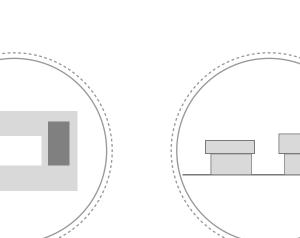


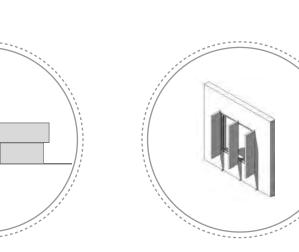
Floating paddy raft detail

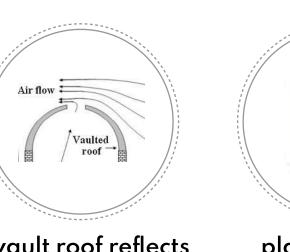


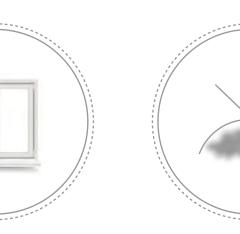


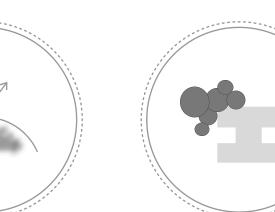


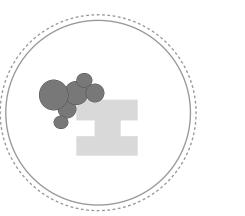




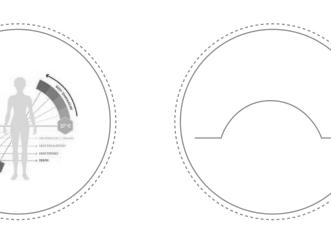








vegetation shading the structure

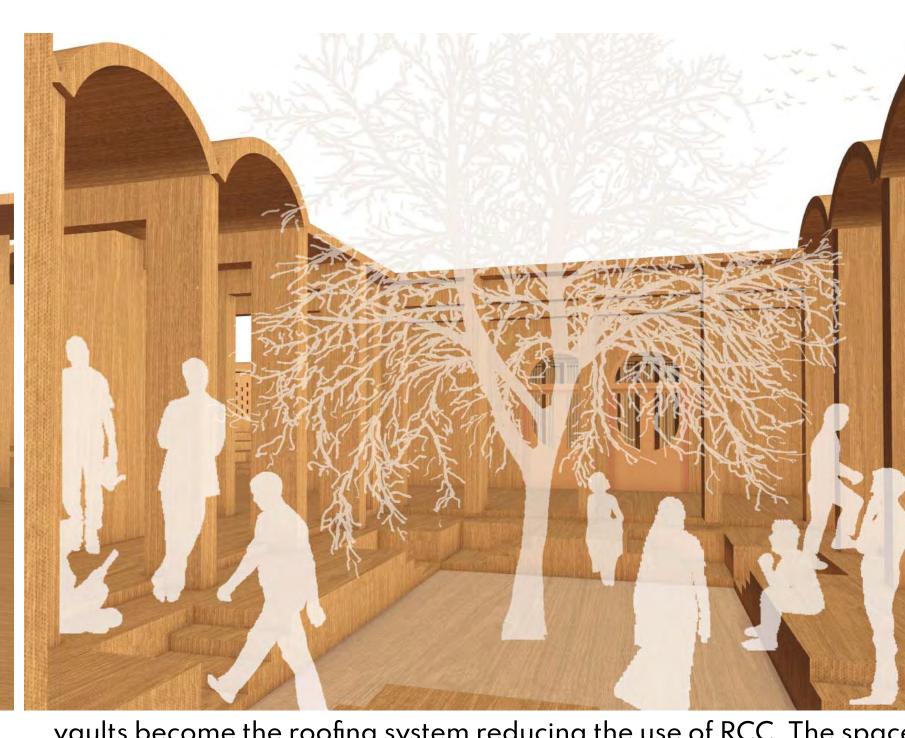










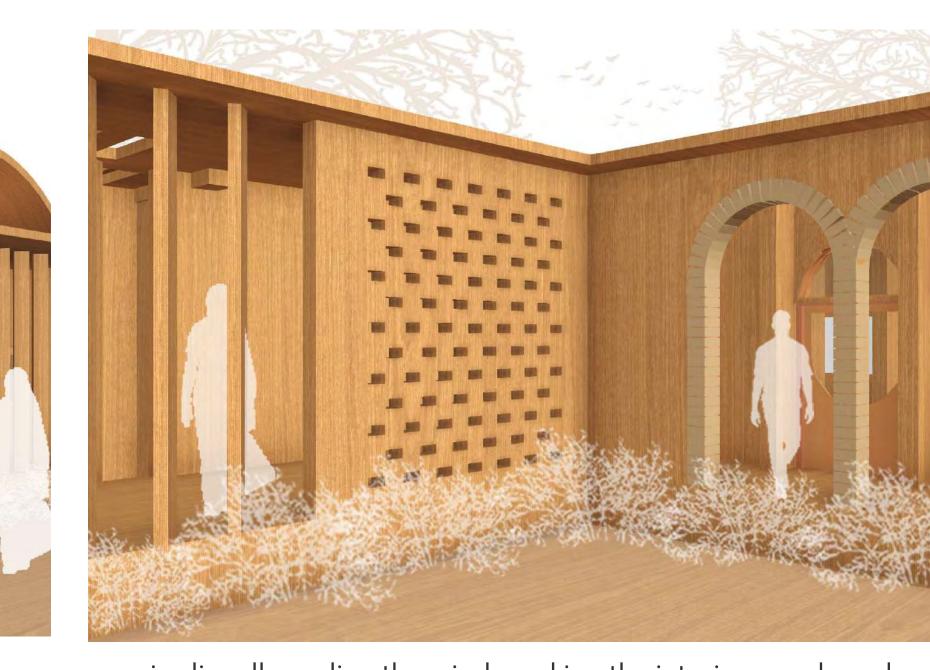


vaults become the roofing system reducing the use of RCC. The spaces with larger number of people have bigger vaults increasing the volume with larger number of people have bigger vaults increasing the volume



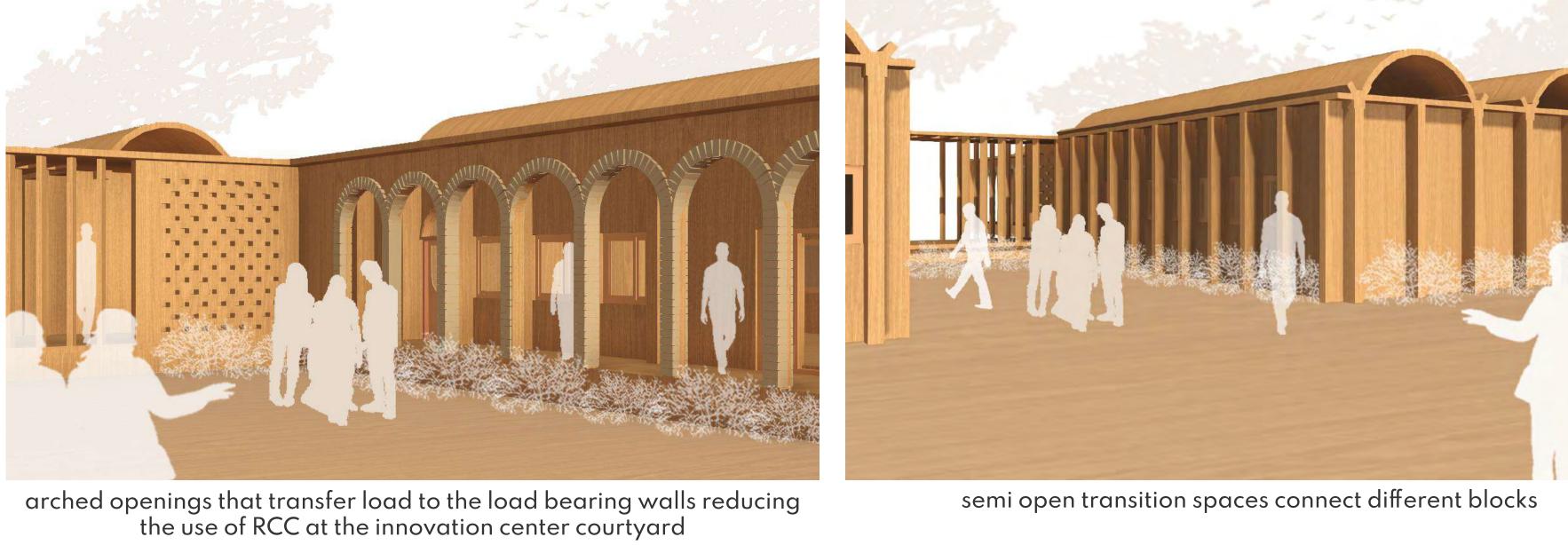
Jack arch vault roofs for column free long span spaces, the curved surface reduces heat gain

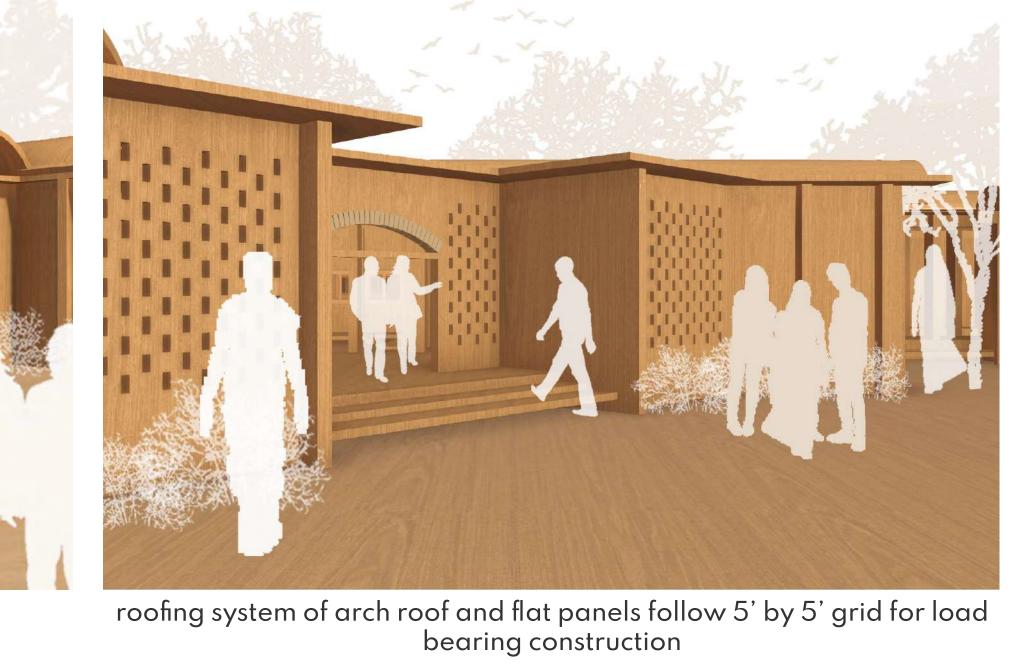




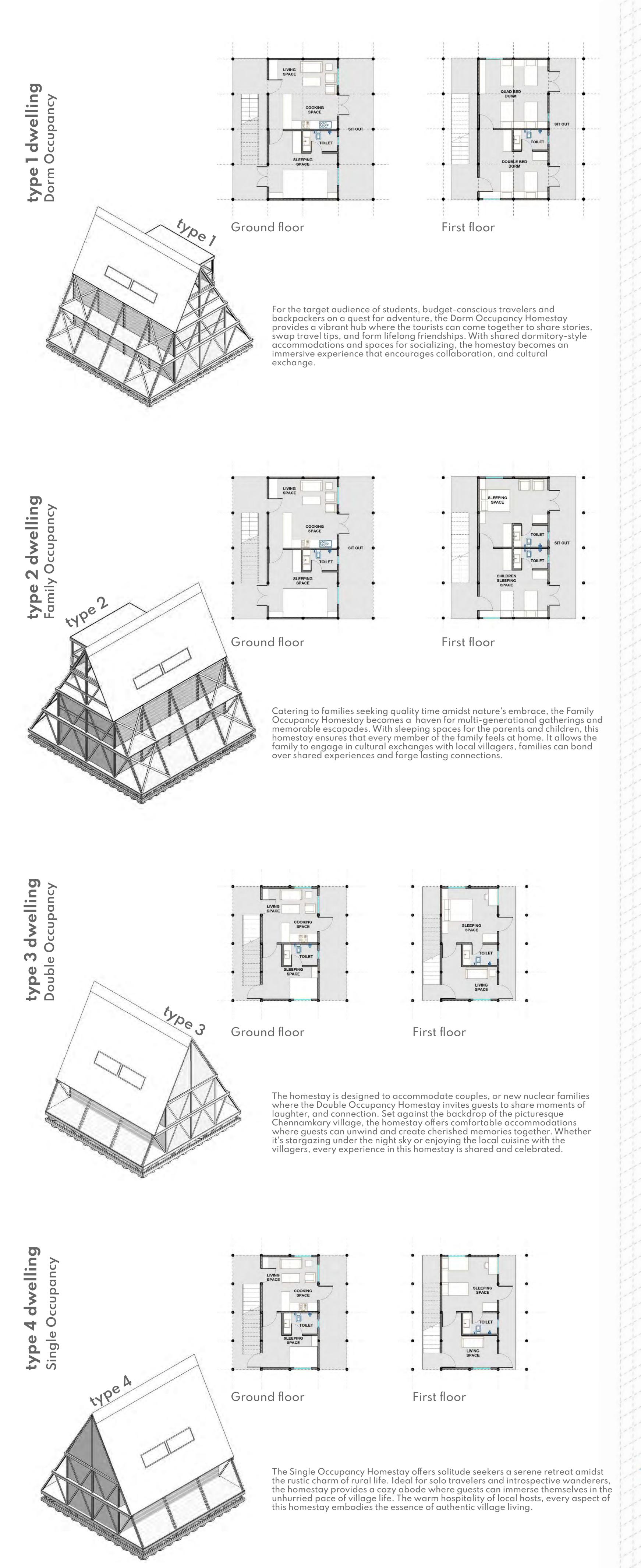
vertical shading devices protecting the openings jaali walls cooling the winds making the interiors much cooler

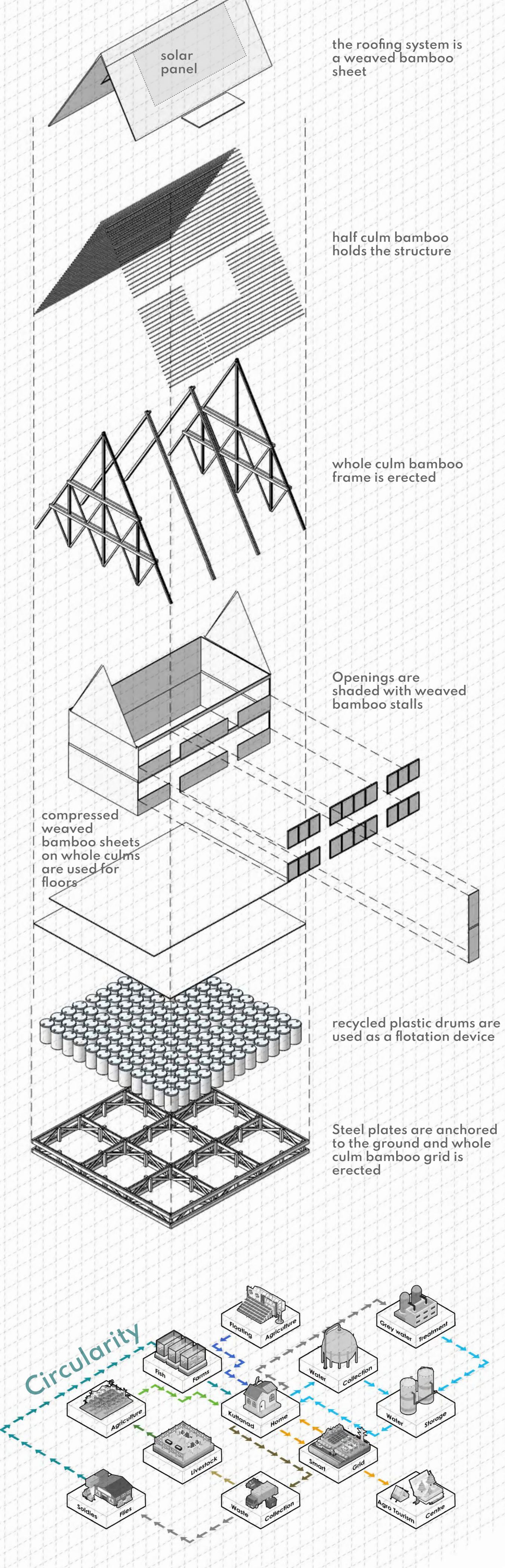






Brick arch openings







Final Design Report April 2023

Name of Institute: Brick School of Architecture

Team Name: Samakrut

Competition Division:

Community Resilience Structure













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REVIEWERS' COMMENTS

Section	Reviewer's Comments Reviewer I	Our Response	
Energy Performance	Expected electrical load details are missing	Electrical leads and percentage reduction in energy demand added in this section	
Water Performance	A lot of work has been done in this area to provide and conserve water in this drought prone village	Details of water requirement, water procurement, and water recycling has been added in the appendix	
Embodied Carbon	Use of locally and naturally available material is contributing to a significantly lower carbon tootprint	Embodied Carbon calculations have been taken from Design Builder rather than the provided Carbon Tool due to lack of materia source information	
Resilient Design	Multi pronged approach to increasing resiliency is good	Resilience section now has a list of businesse which will prop up the economy of the village	
Engineering and Operations	Low on engineering details of electrical and cooling systems, but for the type of building it is acceptable	We have added basic electrical and plumbing layouts in this section as well as in the appendix. This has been done keeping in mind the scale of the building and therefore are tentative.	
Architectural Design	The design concept and materials used are well suited for the project	Greenhouse and seed banks are added. Thi forms a part of economic generation aspec of the project	
Affordability	Interest costs very high % of the project cost. Effort is needed to avail low cost funds or grants to make the project affordable	Several government grants and their application has been looked into	
Innovation	Details of mobile pods on how water treatment using solar cooker will work is sketchy.	Details added into the innovation section	
Health and Well Being	While there are many aspects of health and well being taken up in the project, the articulation seems to be limited to thermal comfort	CFD analysis is shown in this section and also an exploded isometric view shows different strategies along with materials being used. Comfort Hours simulation is alson given in energy performance section.	
Value Proposition	Well articulated value proposition with focus on water and economic activity to create the impact	New additions of Smartphone Application and Construction Manuals have been made in Value Proposition. This section shows a glimpse of the above. We will be providing hard copies of same during the jury presentation.	
	Reviewer 2		
Energy Performance	Would be good to calculate the quantity of energy generated for hydro and biogas and compare it with detailed energy consumption	Energy generation through various resources have been explored and relooked into. Energy demand reduction is done through efficient fixtures and energy generation has been laken care through solar panels.	
Water Performance	It would be useful for the feam to calculate the amount of water saved through these strategies including the quantity of water that will be recycled and reused	These issues have been addressed in the water performance section	
Embodied Carbon	Interesting (non building) strategies are used to affset carbon. A breakup of embodied carbon according to the different structures proposed would be useful	A breakup of embodied carbon has been	
Resilient Design	The response to the problems need to be quantified. Solutions need to be more nuanced so that one can quantitatively assess	All the resilience pointers have been quantified and the solutions have been worked on further	
Engineering and Operations	Macro planning services need to be further elaborated in terms of how they work, energy consumption, energy generation. At building scale electric, plumbing and cooling services needs more detailing and quantification	All the services have now been given in detail	
Architectural Design	Toilets provided can be rethought of taking into account the rural contect and the end users	Architectural Design has been relooked into	
Affordability	Well thought out phasing of the project to ensure savings in construction cost and usage of low cost strategies make this project aftractive	Further availability of funds and breakup of project costs has been shown in cost estimation. Several government grants have been considered and a large part of the project will be done in collaboration with NGOs. Names of these NGOs with the part they play in the project has also been mentloned.	
Innovation	Think about operators of mobile pods and their maintenance. Detailed costing of the same. Include costing of all innovations, including operation and maintenance cost and a narrative about how if will be maintained in the long run	Operation and maintenance of all innovations have been provided	
Health and Well Being	Interesting strategies for natural cooling and passive design elements. It would help do the analysis for all the built up spaces in the proposed design	CFD analysis is shown in this section and also an exploded isometric view shows different strategies along with materials being used. Confort Hours simulation is alson given in energy performance section.	

Table 1. Response to Reviewer's Comments





1.0 EXECUTIVE SUMMARY

Community resilience shelters are an important component of disaster preparedness and response, as they help to ensure that people have access to necessities and support services during times of crisis. Community resilience shelters are also designed to be flexible and adaptable to changing needs of the community. They can be quickly set up and expanded as needed, depending on the size and scope of the disaster. The primary goal of a community resilience shelter is to provide a safe and secure environment for people who have been displaced from their homes due to natural disasters, such as hurricanes, floods, or wildfires, or man-made disasters, such as fires, chemical spills, or terrorist attacks. These shelters provide necessities, such as food, water, and sleeping accommodations, as well as medical care and counseling services to help people cope with the trauma of their displacement.

Team Samakrut from SMEF's Brick School of Architecture and Vishwakarma Institutes, Pune is proposing the resilience shelter for a drought-prone region in Veluk located in the Thane district in Maharashtra. The design process was developed with a data-driven, integrated design approach by a multidisciplinary team from building science, architecture, and engineering disciplines along with technical support from industry partners. The term "Community Resilience Shelter" is typically associated with a shelter that provides temporary housing for residents during natural disasters like floods. Community resilience is the potential of a group of people to withstand and recover from adverse situations. We interpret this resilience in terms of people themselves rather than natural disasters.

Drought-prone resilience refers to the ability of individuals, communities, and ecosystems to withstand, adapt to, and recover from the impacts of drought. Drought is a prolonged period of abnormally low precipitation that can have significant impacts on agriculture, water availability, and natural resources. The project was envisioned by the group for not only drought management but to enhance the lifestyle for a better future. Our design for community resilience shelter involves a range of strategies and approaches that focus on reducing vulnerability and enhancing adaptive capacities such as Water conservation and management. Diversifying livelihoods, Enhancing soil health, Climate-resilient crop varieties, and Social safety nets. Our vision comes into being when we bifurcate the rejuvenation plan into a three-pronged approach where strategies are put in place through Macro planning, Micro planning, and a Mobile network of adaptive pods.

Designing for the village of Veluk with a population of 747 people, macro-level analysis was done with the site visit. Mapping the existing contours, hydrology study, and slope analysis were done, which resulted in to map of the potential stream to collect water and built the natural reservoir. The site with an area of 2500 sq.m. is conected by a local village road. Considering the built-up of 460 sq.m as given in the detailed area statement, the Community Resilience shelter building is designed to host 230 people at once. Thus the project will be focused on lifetime sustainable output from this proposal.

As mentioned before, the design proposal is divided into 3 parts namely; Macro planning which will host the reservoir, stepwells, and afforestation drive; Micro planning which is the actual Community Resilience Shelter; and Mobile Pods. The Macro planning holds a large reservoir near the village which wil be constructed over a period of 10 to 15 years and will cater to the water requirements of the village and the Community Resilience Shelter. It wil also have stepwels which are constructed uniquely according to their use. The areas surrounding these stepwells will be used for multi layered plantation which will evoke the essence of Devrai while holding shrines. Some of this vegetation will be dedicated to a concept called memory forest where people can plant trees and dedicate them to their loved ones. This part of the project is what will be the major driver of resilience of this community. It wil be then supplemented by Micro planning. This holds the actual Community Resilience Shelter. It is designed keping in mind the climate and affordability of the region. A minimal palette of materials consisting of wattle and daub, basalt, and bamboo has ben selected and is procured from the site itself. Wattle and daub will be used for construction of walls; it is made out of a plant called Karvi which is readily and abundantly available in the site surroundings, and the soil wil be procured from the excavation which wil be done for construction of reservoir. Basalt is also used in wall construction and is procured from the same excavation done for the reservoirs. Bamboo is used for structural framing and is procured from the farming proposed in the macro plan along the green valleys (shown in the report). Before the Shelter is set up, a mobile network of pods will be deployed to cater to the basic needs of the surrounding villages. This is a part of our innovation and expreses the scalability of our design.

The EPI benchmark achieved for this Comunity Resilience shelter is 20.61 kWh/m2, which is a 54.75% reduction from its base case of 45.55 kWh/m2 and a 62.52% reduction from its benchmark of 55kWh/m2 provided for typology of CRS. Embodied Carbon of proposed case is reduced by 67.30%. Equivalent CO2 of proposed case is reduced by 59.29%. These are further offsetted by procuring materials on site itself and existing RCC structures have been retrofitted and repurposed into working spaces. Furthermore, the plantation in macro planning will act as a carbon sink in a few years. Also we have achieved an energy demand reduction of 71% from base case by using efficient lighting fixtures and it is further offsetted by 20% through energy generation by solar panels. Water demand for CRS and village is met by rainwater harvesting, stepwells and reservoir. Greywater is further recycled through a 3 stage reed bed system which offsets the water demand by 55.55% for Community Resilience Shelter as well as the village. Thus, 55% of used water is recycled and reused to achieve the sustainable goals of the design.





2.0 TEAM INTRODUCTION

Team Name: Samakrut

Institution Name: SMEF's BRICK School of Architecture

Division: Community Resilience Shelter

2.1 TEAM MEMBERS



ATHARVA SHINDE Team Leader 4th year B. Arch [Water Performance]



AKSHITA SATHE
Design Team
4th year B. Arch
[Water Performance]



AANCHAL MUGDIYA Graphic Team 4th year B. Arch [Affordability]



ASHUTOSH GAWARE Simulation Team 4th year B. Arch [Innovation]



ATHARVA VANJARI Design Team 4th year B. Arch [Embodied Carbon]



NEHA PATIL Simulation Team 4th year B. Arch [Energy Performance]



STUTI BHAGWAT Graphic Team 4th year B. Arch [Value Proposition]



PARTH SABLE Design Team 4th year B.Arch [Architectural Design]



KUNAL CHOUGULE Calculation Team 4th year B. Arch [Resilience]



KOMAL KONDALKAR
Design Team
4th year B. Arch
[Engg. and Operations]



VAISHNAWI HUNACHAGI Simulation Team 4th year B. Arch [Health and Well Being]



HRUGWED HIRVE Structural Team 3rd yr B.Tech Civil Engg. [Communication]

2.2 FACULTY LEADS



AR. VINITA LULLA
Faculty Lead

Ar. Vinita has a flair for sustainable architecture, chases creativity minutely and adds aesthetics in everything she perceives.



AR. SHREYA MIRPAGAR
Faculty Advisor

Ar. Shreya is creative and conscientious environmental architect passionate about design inclusive research towards

sustainability.



Faculty Advisor
Dr. Poorva is an architect
and director of VK:e,
environment designer,
quality manager, educator
and author of numerous
articles on the practice of
environment design.



Faculty Advisor

Ar. Sharvari is a young graduate of architecture, she has deep interest towards sustainable cities and communities. As an IGBC AP,LEED GA and well AP credential

holder.





2.3 EXPERT ADVISORS



AR. AMRUTA NAIDU Founder and Principal Architect **URVEE Public Trust** [Project Partner]



JOSEPH Architect at Stapati, Calicut under Ar. Tony Joseph. Worked on vernacular material palette and Abari-Bamboo & Earth foundation in Nepal.



AR. PRASANNA Dr. Prasanna has completed his PhD in marine corrosion from Nanyang Technological University, Singapore. He has done his Masters from UEA.



VINAY KOLTE He has more than 20 years of bamboo farming experience and owns "The Bamboo Nursery" in Bhor, Maharashtra. The farm produces 35 bamboo species and native

2.4 LEAD INSTITUTION

At SMEF's Brick Group of Institutes, education is not limited to classrooms, textbooks, and exams. It goes beyond conventional learning and teaching techniques to encompass a global approach. The learning opportunities are endless, which students can take advantage of during extracurricular activities, research projects, or while working on social causes. This multidimensional approach to academics provides students with the necessary skills to become better designers and creators of the future.



Fig. 1. Brick School, Pune

2.5 INDUSTRY PARTNER

VK:e Environmental, Pune.

Passionately Promoting sustainabilty

This firm is founded by Ar. Vishwas Kulkarni. This company provides customized solutions for your project's CAPEX, OPEX, and sustainability goals through an Integrative Process. Their philosophy is to encourage business leaders to rethink their sustainability approach and take steps in that direction.



Fig. 2. Logo: VKe

2.6 DISCUSSIONS WITH PRAKASH BABA AMTE AND INDUSTRY PATNER









Fig. 3. Discussion with Expert Advisor's

2.7 SOFTWARES

Following tools and softwares were explored and used in the design process and finalisation of project for drawing, modeling, rendering and calculations.









Fig. 4. Tools used





3.0 PROJECT BACKGROUND

3.1 INTRODUCTION

Project Name: EKYAM

Project Partner: URVEE Public Trust

Key Individual: Ar. Amruta Naidu

Designation: Founder and Principal Architect

URVEE Public Trust was established in November 2020 by Ar. Amruta Naidu. URVEE's work began with a vision to provide safe, eco-friendly and sustainable house construction methods to Indian villages so that villages can become self-sufficient in the construction sector. At the same time, work is done to provide hands-on experience to the budding designers guiding them in rational construction methods we practice.

3.2 CASE OF VELUK VILLAGE

Veluk is a village in Thane district, where the community is struggling with two major issues - drought and the practice of polygamy. Our proposed project, the Community Resilience Shelter, aims to address both of these problems while fostering economic growth and providing basic amenities to the surrounding villages at a macro level. It is a phased out project where the first step is to build a reservoir, which will provide a sustainable water source for the village. This will enable farmers to cultivate native crops and create a stable source of income for the community. The second phase is to launch a campaign to educate the villagers about the negative impacts of polygamy on their social and economic development, and provide them with alternative methods to sustain their families. To support the community's economic growth, we will establish a training center for skills and vocational training, providing workshops and retail shops to promote local businesses. This will create new employment opportunity, increase income, and help the village become self-sufficient. Finally, we will set up a mobile network of modules that will provide basic amenities to surrounding villages. This will create a well-connected network of communities, where people can access basic necessities, socialize, and exchange ideas. To summarize, our Community Resilience Shelter project offers an integrated solution to the pressing issues of drought and polygamy in Veluk. By investing in economic growth, sustainable water supply, and basic amenities for surrounding villages, we hope to create a more resilient and self-sufficient community, where everyone can thrive.

3.3 NEWS ARTICLES

Water Scarcity Leads To Polygamy In This Maharashtra Village



Fig. 6. News Article 1

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Global warming making India vulnerable to extreme weather events



Fig. 7. News Article 2

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Drought-like conditions likely, Fadnavis tells Maharashtra Cabinet

Fig. 5. URVEE Logo



Fig. 8. News Article 3

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3.4 COMMUNITY VOICE

Mr. Bhoir

I've been living here for 17 years and the situation hasn't changed at all. The government has attempted installing piplines to resolve water scarcity but it is of no

up. Your help would mean a lot to us. Failure of Governmet Approach

use. The pipelines are all dried

Mrs. Shanti

My husband travels 40 kms everyday for work as we don't have any scope of employment nearby. It is very hectic for him to travel so much everyday at this old age. Even a small economic facility would help us a lot in our small papad business.

No employment opportunity nearby

Mr. Vishwas

I've my own farmland in the village itself but lack of water affects the crop production to an extent that we've to be dependent on others' farms that are outside the village, Except for 2 months of monsoon, there is no water in the village.

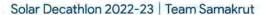
Affected crop production

Mrs. Janabai

I walk 3 kilometers every day to collect 2 matkas of water, taking about 3 hours each trip under the sun. Despite the exhaustion, I have to repeat this several times a day for my family's survival.

Health Issues







3.5 SITE

Project Typology: Community Resilience Shelter

Location: Veluk, Shahapur Taluka, Thane District, Maharashtra

Altitude: 254m Site area: 2200 sq.m.

Permissible built-up area: 2200 sq.m. (FSI = 1)

Permissible ground coverage: 60% Estimated built-up area: 460 sq.m.

No. of floors: G+1 Operation hours: 14 hours Climatic Zone: Warm and Humid

Nearest Water Reservoir: Bhatsa Reservoir

Purpose: Build-own-operate Stage of Project: Unbuilt

Profile of occupants: Locals, Artisans, Tourists, NGO workers



Fig. 9. Site

3.6 SITE DOCUMENTATION



Fig. 10. Landscape around Village



Fig. 11. Vernacular houses beneficial of climate



Fig. 12. Failed water pipeline



Fig. 13. Bamboo Market



Fig. 14. Single well in the village



Fig. 15, Bhatsa - Dried river



Fig. 16. Grampanchayat office



Fig. 17. Existing use of Wattle and daub

STRENGTHS

Strong context to address the issue at hand. Contours will help in better water storage and catchment.

Climate Potential -

WEAKNESSES

No government water supply, therefore water needs to be generated and recycled on site.

Soil doesn't hold the water for longer period of time leading to low to none ground water.

Poor economy and very less sources of income.

SWOT

A great opportunity to upskill and uplift the lifestyle of people through vocational and conventional education.

Rejuvenation of this village by providing social services will help in prospering other villages In the proximity.

Market Potential -

OPPORTUNITIES

Water scarcity on site might hamper the process of any future construction.

Lack of resources other than water makes it difficult to attract economy to the site.

Social structure of the village is difficult to penetrate and thus demands utmost care.

THREATS





4.0 GOALS

4.1 PRIMARY GOALS

Water Performance

60% Water savings, 30,000,000 L water reservoir for human consumption through strategies like water efficient plumbing fixtures, dual plumbing system, water metering, drip irrigation (bamboo shoots), bioswales, terraced trenches, surangam(catchment sumps), Panam Keni, zabo, crop rotation, etc.



Resilience

Job employment for 350+ people (70% of the total population), through resilient to withstand droughts and calamities and creating job apportunies in the CRS.



Energy Performance

Target EPI of 55, energy savings of 50% through integration of passive design strategies, reduce heat gain, solar panels, peloton wheel energy generation, building orientation, fenestration design, lighting, plug loads, cooling loads.



Architectural Design

Modular design, community gathering spaces, cultural hub, thermally comfortable environment, spatial planning according to orientation, vegetative shading, cluster planning, and daylight potential to achieve a minimum of 90% of the area throughout the year.



Affordability

Cradle-to-cradle systems; local materials (bamboo, wood), reduced construction and maintenance cost, modular design and flexibility over large scale. Material specifications, modular construction, local labour, self-sustainable.



4.2 SECONDARY GOALS

Social Stability

Cultural hub, community gathering space, employment generation for men and women in fields, construction, networking with



Innovation

To innovate on-site water generation sector to offset the water demand, peloton wheel, water filtration, water collection system (an amalgamation of traditional methods and local material), water filtration through canals(macro and micro level) used.



Value proposition

Phase-wise design to cater to user needs, strategies like modular design, flexible modules, expandable design as a future provision. Rejuvenation of village through employed design strategies.



Health and well-being

Ensuring indoor environmental quality (indoor air quality, natural paints) by using mud as a material, air purifying plants, and shaded pathways with climbers over bamboo shade to maintain indoor environmental quality.



4.3 TERTIARY GOALS

Communication

Collaborate with NGOs to increase awareness of water conservation and efficient agriculture practices. Focus on afforestation and conduct learning and teaching seminars to address the current situation.



Engineering and Operations

Minimize material waste and energy consumption during construction & operation.



Embodied Carbon

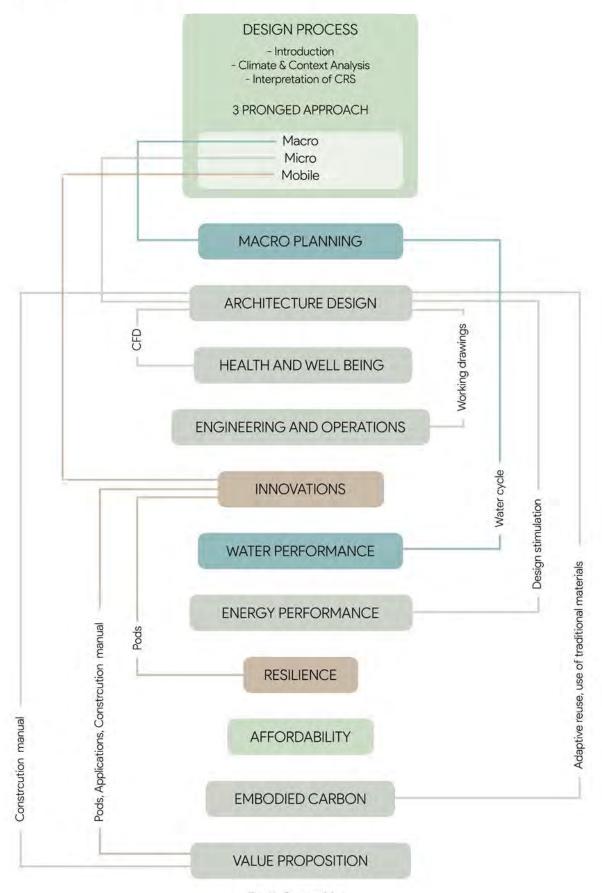
Reducing embodied carbon as much as possible by using local materials for construction. Cutting transportation costs. Innovations in material design and use to reduce cooling loads and efficiently reduce waste.







5.0 DESIGN DOCUMENTATION 5.1 CONTENT









5.2 DESIGN PROCESS

Veluk faces drought and polygamy issues. Despite receiving 600-700 mm of rainfall during monsoons, the rocky terrain prevents water from seeping into underground reservoirs, resulting in a shortage of water outside the monsoon season. To address the water scarcity issue, they practice polygamy, where men have multiple wives. The women devote a significant portion of their day to collect water, while the men often work in nearby industries.

We followed the process below to solve these issues and rejuvenate the village over a period of time.



5.2.1 CLIMATE ANALYSIS



Fig. 20. Relative Humidity (Source of climate data: QGIS Software)

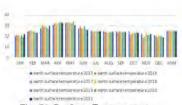


Fig. 21. Surface Temperature

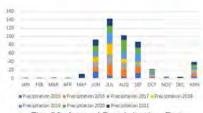


Fig. 22. Annual Precipitation Data

The region experiences a hot and dry climate with temperatures ranging from 13°C to 40°C. The average temperature is 27°C, and high humidity is observed during monsoon months (80% to 100% in August, lowest in January) while low humidity is observed during summer months (40% to 60%). The region experiences considerable rain during monsoon months, but May is prone to drought conditions due to dryness.



Fig. 23. Wind rose diagram Summer winds: north-west to South-east Winter winds: north- west and north-east to south Monsoon winds: south - west to north - east

5.2.2 CONTEXT ANALYSIS



Fig. 24. Veluk with surrounding terrain

Village: VELUK

Grampanchayat: Veluk village Block / Tehsil: Shahapur

District: Thane State: Maharashtra

National Highways Reachable To Veluk:

- National High Way :NH61
- National High Way :NH160

Rivers Near Veluk:

- -Bhairangi
- -Kalu

Veluk is a small village/hamlet in Shahapur Taluka in Thane District of Maharashtra State, India. It comes under Veluk Panchayath in the Konkan region, which is a part of the Konkan Division. It is situated 81 KM east of Thane, the district headquarters, 20 KM from Shahapur, and 106 KM from Mumbai, the state capital. The village is situated on rocky terrain and has a population of 747. Igatpuri is nearest town to Veluk for all major economic activities, which is approximately 34km away.

5.2.3 CRS INTERPRETATION AND APPROACH

The term "Community Resilience Shelter" is typically associated with a shelter that provides temporary housing for residents during natural disasters like floods. Community resilience is the potential of a group of people to withstand and recover from adverse situations. We interpret this resilience in terms of people themselves rather than natural disasters.

Our vision comes into being when we bifurcate the rejuvenation plan into a three-pronged approach where strategies are put in place through Macro planning, Micro planning and a Mobile network of adaptive pods.





5.2.4. MACRO PLANNING

In Macro planning we are proposing multiple step-wells which will serve different purposes like Domestic chores, seepage of water, and water storage. Another reservoir is proposed which will cater to the water needs of the whole village and farming in the long run. These constructions are done in different phases as the rejuvenation plan advances. The first three years will be dedicated to stepwell construction and bamboo farming. These will form a base for the construction of a Community Resilience Shelter. Afforestation is proposed in the form of Devrais which are scattered throughout the landscape. The bamboo farming proposed will be given as a certain percentage of farms and will be harvested by the end of 3 years.



5.2.5 MICRO PLANNING

The harvested Bamboo will then be used in Micro planning where we are building the Community Resilience Shelter. There are 2 existing RCC structures on site which are repurposed as Administration spaces and a medical facility. The main structure is taken under a single roof and is constructed as an extension to the administrative space. Shops and training spaces used for community congregation are planned under this roof. A bamboo curing plant is placed at the southeast end of the site, a major economic generator for the village. Multiple community spaces are also planned and landscaped on site.







Fig. 35. Micro Planning

5.2.6 MOBILE NETWORK

The mobile network pods will uplift the quality of life in the village. A number of other villages in the surrounding region go through the same problems of drought and other social ailments. These problems can be catered to by providing essential services (like medical services, transportation goods, upskill,ing and vocational programs for employment) in some form

Therefore we have created a network of 8 villages which will be connected through mobile pods. For this, a significant amount of the the footprint of Community Resilience Shelter is made mobile and now caters to about 8900 people instead of just the population of Veluk. Without this move, Community Resilience Shelter will stand as a stagnant structure but with mobility pods, we form a sustainable network of villages who go through a similar life. This will help in fostering a sustainable community of people with social awareness and community participation.



Fig. 37. Market Potential and Scalability

5.2.7 PHASE WISE CONSTRUCTION TIMELINE

Phase 1 - Pipe line to bhatsa Phase 3 - Construction Rockfill Phase 5 - Construction of Phase 7 - Large scale reservoir to village (kusum Dams and few stepwells, terra preta Community Resilence landscaping and tourism structure (CRS) saur yojana) and bamboo plantation in green spots valley 0-1 Years 6-6.5 Years 7-10 Years O Year 1-6 Years 6.5-7 Years 10-12 Years Phase 6 - Construction of Phase 2 - Construction of green house Phase 4 - Construction of and seed bank, and rejuvenation of soil bamboo curing plant and main reservoir network of mobile Pods with tere prata and organic manure

Fig. 36. Construction Timeline





5.3 MACRO PLANNING

KUSUM SOLAR YOJNA

Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyaan (PM-KUSUM). With the help of this scheme the central government provides solar pumps which are operated by solar panels. This saves the fuel cost, mechanical energy and

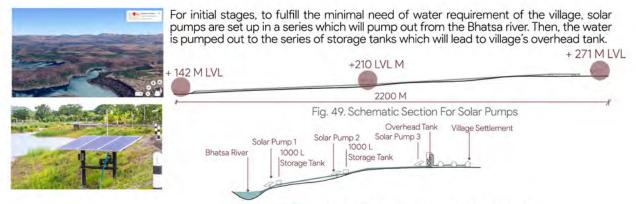
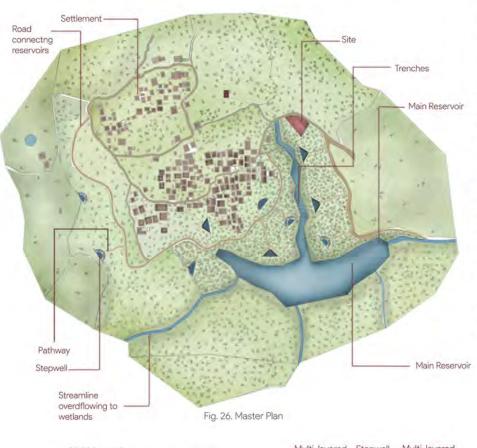


Fig. 25. Section From Bhatsa River to the village settlement



The master plan envisages 10 reservoirs to collect the runoff. The overflow of each reservoir goes eventually into a senes of wetlands along the periphery of the site. It is projected that the wells outside our site will benefit from this recharge and their water levels increase. This overflow is expected to help recharge wells outside of the site and raise the water levels in those

The decision to build numerous small reservoirs instead of a few large ones reflects a commitment to democracy and diversity. Since small reservoirs are easier and less expensive to construct in an earthquake-prone zone, they can be built incrementally over time. Additionally, building a reservoir promotes a stronger sense of social connectivity and a shared sense of ownership among the affected families.

200

50 100

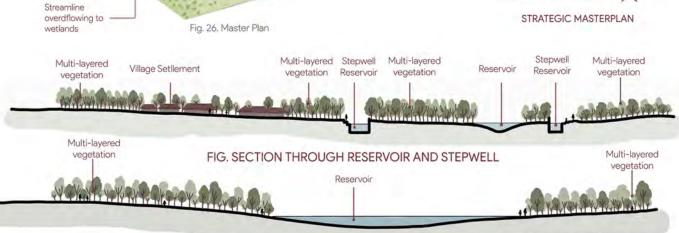
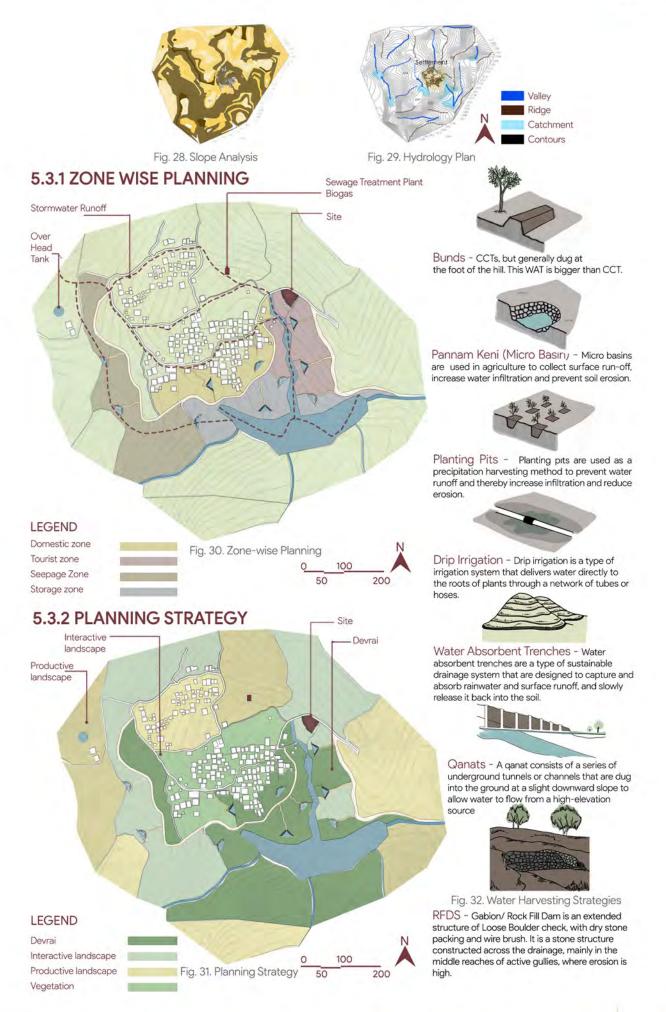


FIG. SECTION THROUGH RESERVOIR
Fig. 27. Sections









5.3.3 MULTI-LAYERED PLANTATION GRID

The aim of multilayered plantation is to optimize the use of available land, increase the productivity of the system, and create a sustainable and diversified agricultural system. The plantation grid is inspired from the concept of Devrais.

Divided into square grids of 3×3 M.
At the centre of the land adjacent to which is a 20 × 20 ft pond of water (can be water body like well, baoli).

· On the remaining area, a sapling is planted in each square of the grid. The same species of saplings are planted in four adjacent squares so that they grow well with each other's support.

The drip system of irrigation is used and saplings are watered 2 3 times a week.

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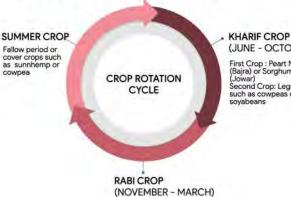
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Table 2. Multi-layered plantation planning

Table 3. List of species of trees

MULTI-LAYERED PLANTATION SPECIES

MULTI-LAYERED PLANTATION GRID



(JUNE - OCTOBER)

First Crop : Peart Millet (Bajra) or Sorghum (Jowar) Second Crop: Legumes such as cowpeas or

Amla Tree

Arjun Tree



Kadipatta



Mango



Phanas



Ramphal

Lentils Second Crop: Mustard or Sesame Fig. 33. Crop rotation cycle

First Crop : Chickpeas or

Fig. 34. Trees Species

5.3.4 STEPWELLS

The gabion reservoirs collect rainwater without mortar, allowing it to seep slowly into the ground for trees to use. The alluvium carried by the water fills the gaps in the stones and grows plants, making the structure blend into the landscape over time.



Fig. 35. Domestic Stepwell

Domestic well - The circular shape allowed for a greater surface area, providing more space for people to access the water and draw it out. The well will be used for domestic purposes like washing, cleaning, cattles.

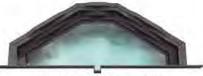


Fig. 36. Tourist Stepwell 1.0

Tourist Stepwell 1.0 - The octagonal shape creates more corners, which allows for more points of entry and exit for people drawing water. This is particularly useful when multiple people need access to the well at the same time, as it reduces congestion and waiting times.



Fig. 37. Tourist Stepwell 2.0

Tourist Stepwell 2.0 - The stepwells will be mostly used for gatherings, seating space and recreational spaces The V shape allows the stepwell to follow the contours of the providing a more stable foundation and reducing the risk of soil erosion and also maximizes the use of space, allowing for more water storage capacity in a smaller area.





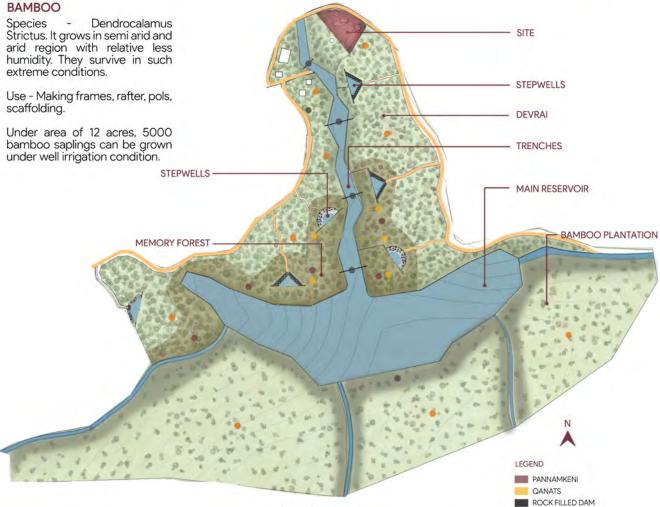
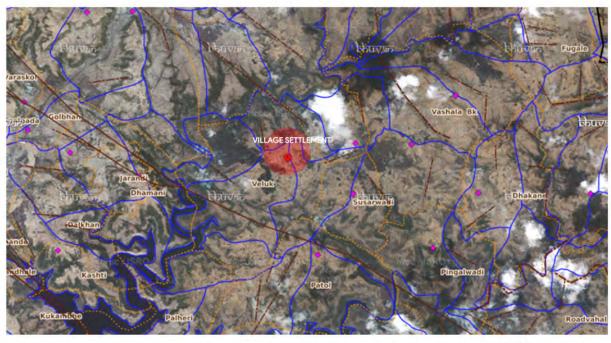


Fig. 38. Masterplan







DRIP IRRIGATION





5.4 ARCHITECTURAL DESIGN

Site for CRS was selected next to the water reservoir we are constructing, the site is along the prime road which connects the village with outer world.

According to needs of villagers four spaces were identified, daily shops, community space, medical facility and bamboo curing plant for creating opportunities.

The whole primary structure which comprises of community space and shops is taken under single continuous roof, which acts as extension to existing structure which is repurposed. Existing structure is repurposed for administration department. The market space has four shops and at the back side there is storage for them. The walls are made of carvi. Which is a low maintenance low price natural material.

For forming a market space four shops have been planned where different vendors can sell their goods. They are provided with storage at the back side and ramp access is given to shops for loading and unloading of goods. Larger roof overhangs are planned for these spaces which acts as buffer spaces and protects the wall materials from weathering effects. Vegetable vendors, fruit vendors, barber shop, tailor shop, agricultural products shop, grocery vendors, dairy products vendors can come and set up their shops in provided market places.

Community space is designed as a multipurpose space with different activities such as community gatherings, training activities and workshops. The space is provided with larger openings with the help of sliding folding doors, it opens up into outdoor community spaces from front side as well as the back side. On the southern facade space is provided with sandwich carvi panels for ensuring minimum heat gain. The louvres are provided above the sliding folding doors for ensuring maximum ventilation and air flow. The roof height is elevated from northern side in order to ensure the maximum diffused natural light penetration inside the spaces







5.4.1 VIEWS



Fig. 41. Mobile Pods parked at Community Resilience Shelter



Fig. 42. Recreational Community Space inside CRS



Fig. 44. Image showing Character of CRS



Fig. 43. Workshop/Training Space

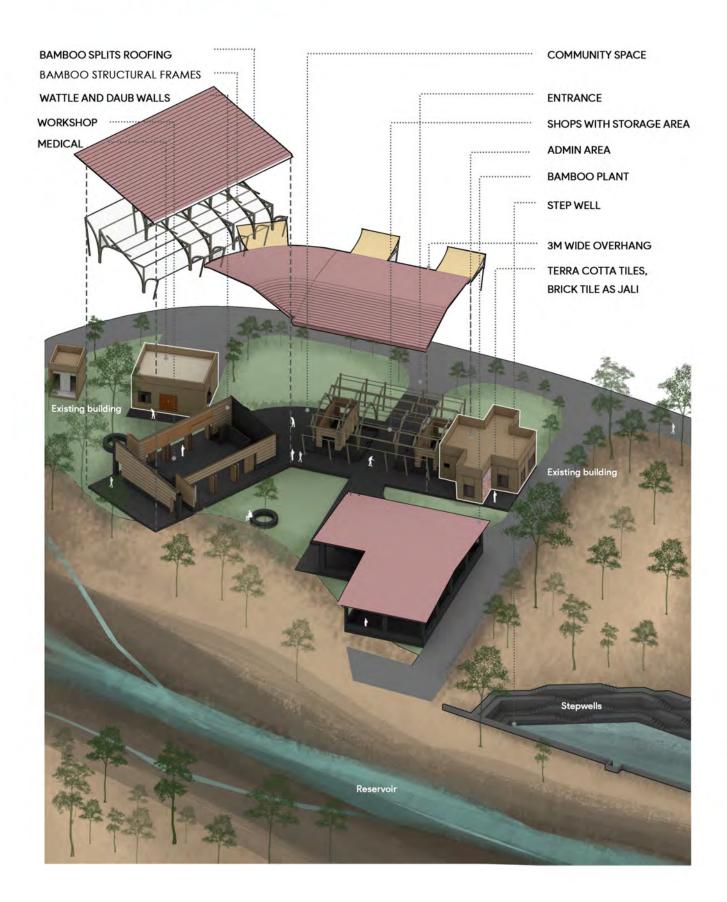


Fig. 45. Elevation showing Material Palette





5.4.2 EXPLODED ISOMETRIC VIEW







5.5 HEALTH AND WELL BEING

5.5.1 THERMAL COMFORT

The walls on the southern and western sides consist of 4 panels of bamboo, wattle and daub with a cavity in between, which acts as an insulator.

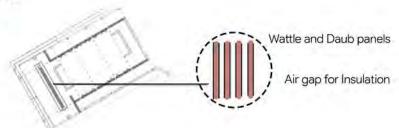


Fig. 47. Plan of Community Space

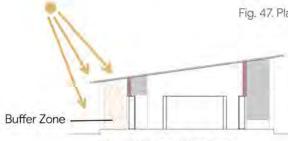


Fig. 48. Thermal Comfort 1

The roof slope angle is designed to allow maximum daylight to enter the building from the north while minimizing direct sunlight from the south.



Large overhangs are provided which helps in protecting the walls from direct sun radiation A shaded buffer is created outside the space.

Fig. 49. Thermal Comfort 2

5

Fig. 50. Thermal Comfort 3

To provide a comfortable visual and thermal environment, the roof angle on the southern side is kept low, allowing sunlight to enter only during the evening hours when the sun is at a lower angle. This results in lower sunlight intensity, which helps reduce glare and heat gain.

5.5.2 VENTILATION

Planning of the structure is done so that there is good Cross ventilation.

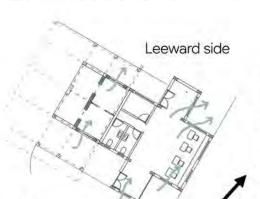


Fig. 52. Cross Ventilation 2

The air inlets are placed on the windward side of the structure. The size of the inlet openings are kept smaller compared to the outlets so as to cool the air entering the spaces.

Fig. 51. Cross Ventilation

The outlets are provided on the leeward side with a larger opening size.

As warm air rises upwards, it escapes through the higher openings, creating a flow of air that helps to regulate the temperature inside the space.

entilation, visual and promote

Bamboo slits in walls provide natural ventilation, visual connection with the outdoors and promote sustainability as it is a local material. They are an easy way to enhance comfort, aesthetic appeal and regulate temperature and humidity levels in hot and humid climates.

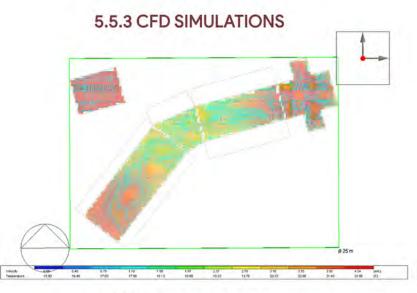


Fig. 53, Bamboo Slits



Windward side





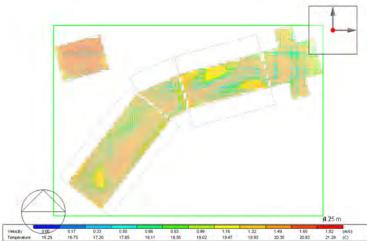


Fig. 54. CFD Simulation at 1.5m height in cut plan

Fig. 55. CFD Simulation at 2.8m height in cut plan

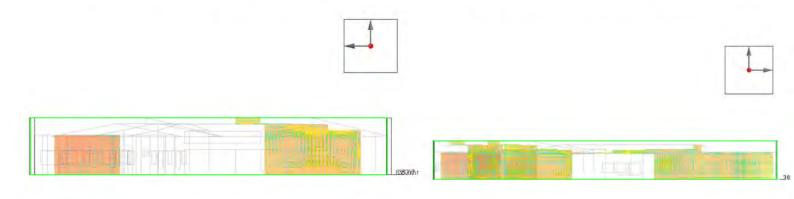




Fig. 56. CFD Simulation at in cross section

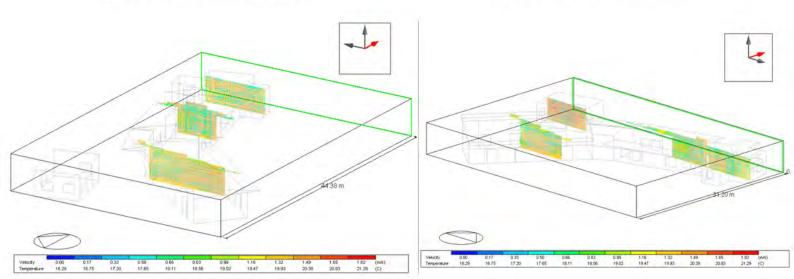


Fig. 58. CFD Simulation showing location of cross section above

Fig. 59. CFD Simulation showing location of cross section above

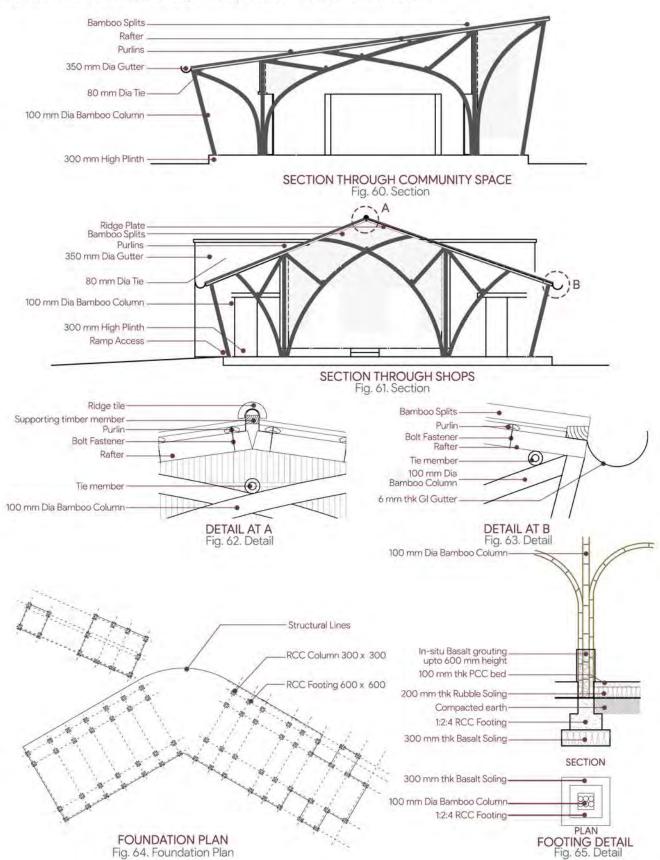
Fig. 57. CFD Simulation in cross section





5.6 ENGINEERING AND OPERATIONS

The structural design of our community resilience shelter is done using locally available materials such as bamboo and basalt rocks. Bamboo is used as primary load carrying member throughout the structure. Use of basalt rock is limited to foundation works and bamboo lining. Cement is used in places where in-situ grouting is mandatory. Mangalore tiles are used for roof covering. The design employs isolated footing of bamboo columns.







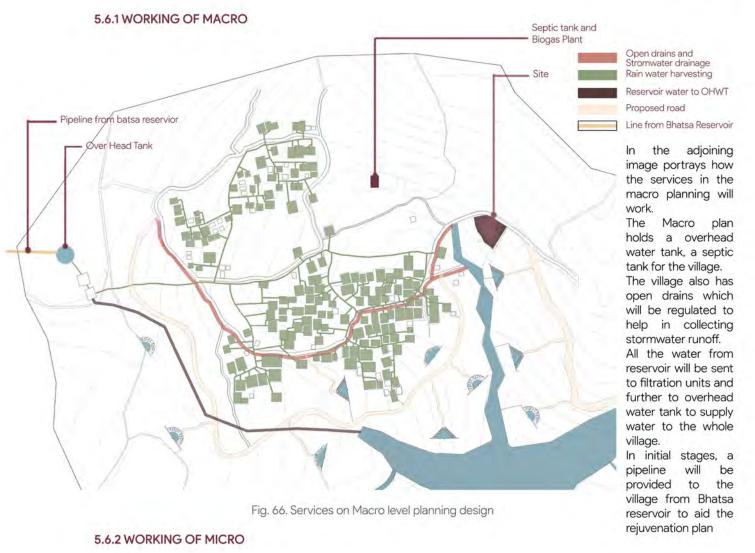




Fig. 67. Water Supply and Drainage Layout

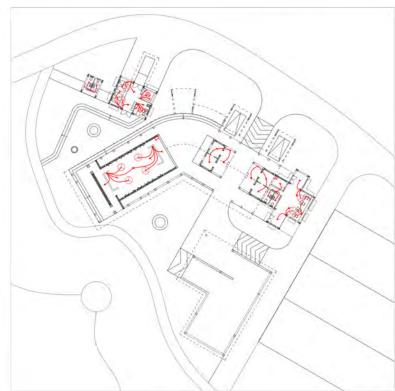


Fig. 68. Electrical Layout





5.7 INNOVATIONS

5.7.1 PODS

Following is the demographics of villages identified for setting up a mobile network

DHAKANE PINGALWADI PATOL The area of village is 1840.12 hectares with total population of 747 people (male = 388, Female = 359). The literacy rate of the village is 68.54% (male = 81.70%, 54,32%). There are about 159 houses in The area of village is 1123.46 hectares with total population of 1882 The area of village is 1464 hectares with total The area of village is 1207.88 hectares with total population of 162 population of 1857 people (male = 949, Female = 908). The people (male = 1036, Female = 846). The people (male = 87, Female = 75). The literacy rate of the village literacy rate of the village is 56.70% (male = 63.80%, 47.99%). There literacy rate of the village is 42.65% (male = 51.42%, 33.48%). There is 56.17% (male = 65.52%, 45.33%). There are about 159 houses in are about 296 houses in are about 337 houses in are about 37 houses in Veluk village. Dhakane village. Pingalwadi village. Patol village. SUSARWADI **KOTHALE** DENGANMAAL **PADA** The area of village is 1734.04 hectares with total population of 1233 The area of village is 432.26 hectares with The area of village is The area of village is 561.37 hectares with total population of 1044 432.26 hectares with total population of 432 1490.36 hectares with total population of 1691 people (male = Female = 481). people (male = Female = 644). people (male = 868, Female = 823). The people (male Female = 22 563, 589, 212, = 220). The The literacy rate of the village is 52.87% (male = 60.39%, 44.07%). There literacy rate of the village literacy rate of the village is 34.95% (male = 45.39%, 23.94%). There literacy rate of the village is 25.37% (male is 33.33% (male = 9.56%, =50.02%, 29.98%). There 27.64%). There are about are about 156 houses in 261 houses in Kothale are about 265 houses in are about houses in Pada Susarwadi village. Dengalmaal village. village.

Fig. 69. Villages

Given below is the map of connected villages. These villages have been grouped around 3 hotspot villages. These villages will act as bases to deploy mobile pods to nearby villages and settlements. A calendar for the same has been given later in the report which will provide information on location of the pods.

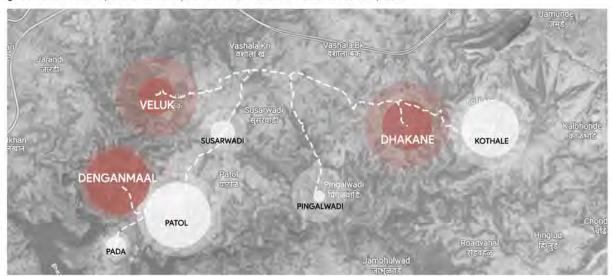


Fig. 70 Map of Connecting villages





5.7.2 MOBILE PODS-PRODUCT INNOVATION

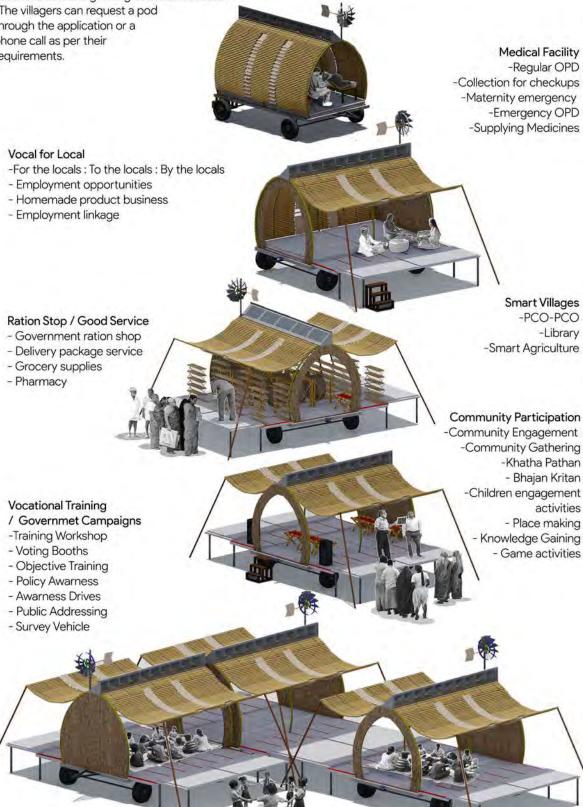
By using CSR and the government policies/yojna, who aims with similar approach and objectivities we can manage more flexiblity in funding.

Market potential and Scalability.

-We can create various versions of a module that can be utilized for diverse functional purposes like medical services, transportation goods, upskill and vocational programs for employment.

-The structure of the module is designed to allow for expansion by adding more space and walls on the sides to accommodate the growing needs of its users.

-The villagers can request a pod through the application or a phone call as per their requirements.

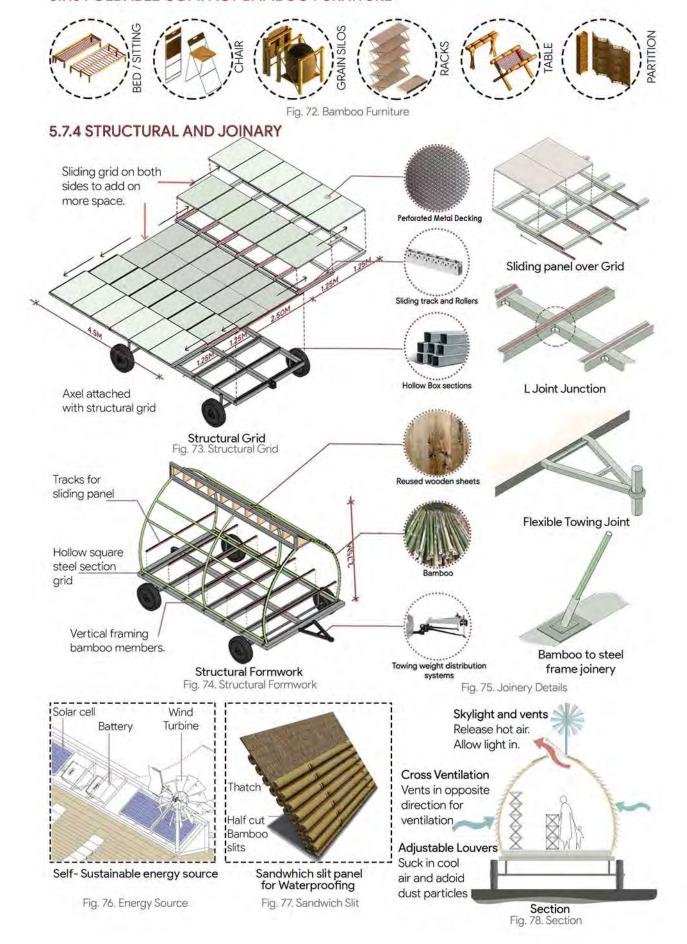








5.7.3 FOLDABLE COMPACT BAMBOO FURNITURE







The Mobile pods will be operated by the villagers on build and own basis.

These pods will provide basic daily amenities to the nearby villages.

Vocal for Local

Medical

Monday

Tuesday

Wednesday

Thursday

Friday Saturday

Sunday

Ration

JUNEजून VELUK वेळुक 🤶

			Sunday स्विवार	Monday स्रोमवार	luesday मंगळवार	Wednesday बुधवार	hursday गुरुवार	rriday शुक्रवार	Saturday शनवार
r	Vocat Training	Comunity					1	2 Vocational Training	3
								शक्षिणीक ज्ञान	
			4 Medical द्वाखाना	5 Ration Shop रेशन दुकान	6 Vocal for Local लोकल	7 Medical द्वाखाना	8 Ration Shop रेशन दुकान	9 _{Vocational} Training থাক্বিদ্দীক দ্বান	10 _{Community} Engagement समाज एकत्र
		Hotnale	॥ Medical द्वाखाना	12 Ration Shop रेशन दुकान	13	14	15	16	17
		Dhakane							
	Kothale Dhakani	Veluk Susarwadi Pingalwadi	18 Medical द्वासाना	19 Ration Shop रेशन दुकान	20 Vocal for Local लोकल	21	22	23 _{Vocational} Training शक्षिणीक ज्ञान	24 _{Community} Engagement समाज एकत्र
	Veluk Susarwadi Pingalwadi	Denganmal Patol Pada	25 Medical	26 Ration Shop	27	28 Medical	29 Ration Shop	30	darde
	Denganmal Patol Pada		द्वासाना	रेशन दुकान		द्वाखाना	रेशन दुकान		

Table 4. Mobile Pods Calendar for 8 villages

Table 5. Mobile Pods Calendar for 1 village

These pods will circulate between these villages to cater to their basic needs.

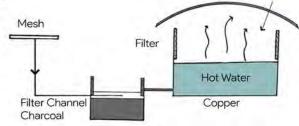
The calendar beside shows the dates during which the pods will be present in Veluk village. Each villager will have access to this calendar for their particular village and all the other villages. This will help them in planning there resources.

Some emergency pods will be permanently stationed at 3 villages and will cater to the nearby villages on call.

5.7.5 INNOVATION FOR WATER FILTERTION

Aim - To innovate on-site water generation sector to offset the water demand.

Strategies- Peloton wheel, water filtration, water collection system (an amalgamation of traditional methods and local material), water filtration through canals (macro and micro level).



Solar Cooker

Fig. 79. Water filteration

Water purification supply system towards CRS:

The water collected from rainwater harvesting tank and reservoirs needs to filter to make it usable for human consumption. Thus, first layer of mesh cleans the hard impurities of water. Passing through bamboo canal which has layers of charcoal is pumped to Copper solar cooker which stores the water. The solar cooker has filter candles within, whereas the sunlight incident on copper vessel kills the bacteria in water. Hereafter, the water is supplied to shelter for human consumption.



Fig. 80. Water purification supply system





5.8 WATER PERFORMANCE

The water cycle is divide into two: Macro water cycle and micro water cycle. Macro water cycle caters to all the water need of the village, farms, as well as economic use; whereas, micro water cycle caters to reuse of water in specific sectors namely, human consumption, farming irrigation, and bamboo curing.

Water calculations for village

No. of people in village = 747 Water requirement per person per day = 135 L/day Total water requirement per day = 747* 135 L= 100,845 L/day

Annual water requirement = 100,845L X 365= 36,808,425 L

Annual water storage requirement for village = 36,808,425 L

Consider 3 months of extra water storage

- = 36,808,425 + 9,076,050
- = 45,884,475 L/year

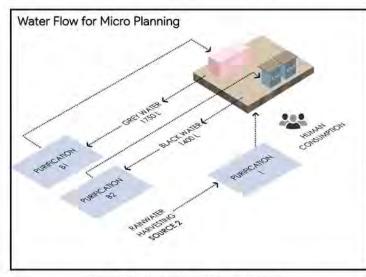


Fig. 81. Water Cycle for Micro Planning

Water calculation for CRS Population capacity of CRS= 230 No. of people using CRS daily= 70 Water requirement = 70 X 135 = 9450L With a factor of safety of 1.2 Total water storage capacity required= 1.2X9450 = 11,340 L Annual water requirement of CRS = 11,340X365 = 4,139,100 L

Water calculation for Stepwells

Water holding capacity of one stepwell = 200,000 L

No. of stepwells used provided = 10 Total water stored in stepwells

- = 10X200,000
- = 2,000,000L

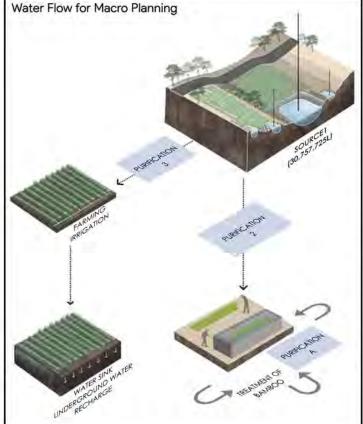


Fig. 82. Water Cycle for Macro Planning

Rainwater Harvesting Tank Capacity

= mean annual rainfall (mm) x area(sq.m) x runoff factor =1439 × 2529.5 Roof area = 2529.5m2, Land = 945m2

Run off factor Roof = 0.9 Land = 0.3

Harvestable rainwater = mean annual rainfall (mm) \times area(sq.m) \times runoff factor = 1439 \times ((2529.5 \times 0.9)+(945 \times 0.3)) = 36.83,911.95L

Total volume of harvestable rainwater = 3700 cu.m

Almost 50% rainwater should be reused and remaining water is allowed to seep into the soil to recharge underground water table.1850



Fig. 83, Water Demand Reduction Graph





5.8.1 STORM WATER MANAGEMENT:

- -The object of storm water drainage is to collect and carry, the rainwater collected within the premises of the building, for suitable disposal.
- -Surface drain channels are been laid
- -A catch basin is provided to drain out rain water free from silt, grit, debris in to a combined sewer. This should be provided along the sewer line
- -Using paving tiles with open joints which enable water to percolates as it flows on it.
- -Pervious pavement used to allow maximum discharge of the rainwater to flow directly or indirectly to permeate into the ground for enabling the ground water to be recharged.

CHAUKAS:

A Chauka, meaning 'square' in Hindi, are a series of interconnected water dykes, built across a gently sloping area to collect maximum rainfall runoff. Dykes are built on three sides on the periphery of the rectangle and the other side is connected to the main water channel that is meant for overflow. With an aim to utilize every drop of rainfall, the chaukas are dug on bare land which replenish aquifers due to increased infiltration and maintain soil moisture.

ULTRA LOW FIXTURES:

- -Large quantities of water are saved by the use of plumbing fixtures that are designed to operate with less water.
- -For instance, toilets were once made to operate using 7 gallons per flush, but are now available using only 1.3 gallons (a savings of over 80%).
- -Water-saving plumbing fixtures are required in many areas by building and plumbing codes.
- -There are several general approaches to the design of water-saving fixtures: low flow, dual-flush, waterless, and automatic sensor-type.

ROOT ZONE TREATMENT:

Root zone treatment is an engineered method of purifying waste water as it passes through artificially constructed wetlandarea. It is considered as an effective and reliable secondary and tertiary treatmentmethod. The pollutants are removed by various physical, chemical and iogeochemical processes like sedimentation, absorption, and nitrification as well asthrough uptake by wetland plants.

The root zone wastewater treatment undertakes the following steps:

The essential components of the systems are:

- (i) The reed type of wetland plants.
- (ii) The soil bed.
- (iii) Micro-organisms of different type.

SMART METER:

- -Smart meters are connected through a web-based monitoring system which will help to reduce commercial losses of utilities, enhance revenues and serve as an important tool in power sector reforms.
- -Save money with smart meters



















Fig. 84. Storm Water Management

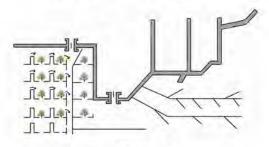


Fig. 85. Chaukas



Fig. 86. Ultra Low Fixtures



Fig. 87. Root Zone Treatment



Fig. 88. Smart Meter





5.9 ENERGY PERFORMANCE

Aim: to generate more energy on-site to offset the grid source energy consumption which reduces environmental footprint. Net Positive Perfromance: Generating more offset energy on-site than required. To maximize the energy performance of building, there are two components reducing energy consumption and simultaneously increasing energy generation

U VALUE: WALL 1 SR NO MATERIAL THICKNESS THERMAL COR = t/k 1 BASALT 0.2 0.1667 WATTLE AND 2 DAUB 0.05 0.05 1.0000 3 EXTERIOR 0.0400 0.1300 WATTLE AND 5 DAUB 0.05 0.05 1.0000 6 AIR 0.02 0.024 0.8333 3.1700 0.3155 WALL 2 SR NO MATERIAL THICKNESS THERMAL CO R = t/k 1 BASALT WATTLE AND 0.3750 0.05 1.0000 0.05 3 EXTERIOR 0.0400 4 INTERIOR 0.1300 WATTLE AND 5 DAUB 0.05 0.05 1,0000 WATTLE AND 6 DAUB 1.0000 7 AIR 0.02 0.024 0.8333 4.3783 0.2284 FLOOR SR NO MATERIAL THICKNESS THERMAL CO R = t 1 BASALT 0.6 0.5000 0.2 0.35 0.5714 3 COWDUNG 0.01 0.2000 4 BAMBOO 0.2 0.35 0.5714 1.8429 0.5426 SR NO MATERIAL KNESSTH 1 TILES 0.02 1.00 0.020 2 ATTIC SPACE 0.05 0.11 0.455 3 BULK INSULATION 0.015 0.01 1.500 4 BAMBOO 0.01 0.35 7 AIR 0.02 0.024 0.8333 2.8365

WWR:

WINDO W NO.	SILL	LINTEL	WIDTH	HEIGHT	SIZE (LxB)	AREA	OPENABLE AREA	TOTAL WINDOW AREA	NO. OF WIND OWS	TOTAL WINDOWS AREA
EAST										
W1	0.6	2.1	2	1.5	2 x 1.5	3	80%	2,4	6	14.4
W2	0.6	2.1	1.2	1.5	1.2 x 1.5	1.8	100%	1.8	1	1.
W3	0.6	2.1	1.5	1.5	1.5 x 1.5	2.25	80%	1.8	1	1.
D5	0	2.1	2,55	2.1	2.55 x 2.1	5.355	80%	4.284	1	4.28
D6	0	2.1	3	2.1	3 x 2.1	6,3	80%	5.04	1	5.0
										27.32
WINDO W NO.	SILL	LINTEL	WIDTH	HEIGHT	SIZE (LxB)	AREA	OPENABLE AREA	TOTAL WINDOW AREA	NO. OF WIND OWS	TOTAL WINDOWS AREA
SOUTH										-
W1	0.6	2.1	2	1.5	2 x 1.5	3	60%	1,8	2	3,
W2	0.6	2.1	1.2	1.5	1.2 x 1.5	1.8	80%	1,44	3	4.3
W3	0.6	2.1	1.5	1.5	1.5 x 1.5	2.25	60%	1.35	1	1.3
D4	0	2.1	2	2.1	2 x 2.1	4.2	100%	4.2	1	4.
					-					9.8
WINDO W NO.	SILL	LINTEL	WIDTH	HEIGHT	SIZE (Lx8)	AREA	OPENABLE AREA	TOTAL WINDOW AREA	NO. OF WIND OWS	TOTAL WINDOWS
WEST									-	
W1	0.6	2.1	2	1.5	2 x 1.5	3	60%	1,8	2	3.
W3	0.6	2.1	1.5	1.5	1.5 x1.5	2.25	60%	1.35	2	2
D1	0	2.1	1.5	2.1	1.5 x 2.1	3.15	100%	3.15	1	3.1
D3	0	2.1	1.6	2.1	1.6 x 2.1	3.36	100%	3.36	1	3.3
D5	0	2.1	2.55	2,1	2.55 x 2.1	5.355	80%	4.284	2	8.56
D6	D	2.1	3	2.1	3 x 2.1	6.3	80%	5.04	1	5.0
										26,41
WINDO W NO.	SILL	LINTEL	WIDTH	HEIGHT	SIZE (LxB)	AREA	OPENABLE AREA	TOTAL WINDOW AREA	NO. OF WIND OWS	TOTAL WINDOW!
NORTH										
MUKIM					2 x 1.5	3	60%	1.8	2	3.
W1	0.6	2.1	. 2	1,5	231.3				- 6	
	0.6				2 x 2.1	4.2		3.36	1	3.3

EAST SOUTH 13.70% 27.40% WEST

Table 6. U- Value calculation of materials

Table 7. WWR Calculation

5.9.1 CONSTRUCTION ELEMENTS AND DESIGN STRATEGIES USED TO REDUCE HEAT







5.9.2 ENERGY CONSUMPTION

-	SY CONSUMPT	ION						
SE	CASE	APPLIANCE			NO.OF HOURS	Daily energy consum	Annual energy consumption	Kilowatt-hours
	LEGEND	S	Fixtures	WATTAGE	USED	ption	(Whr/yr)	per year
-	LIGHTING	LED BULB				1008	2/7020	367.9
- 1	LIGHTING	LED BULB	14		8	864	367920 315360	367,9
		LED BOLB	. 9	12	8	864	315360	315.3
2	FANS	FAN	22	45	8	7920	2890800	2890.
_	17410	7.744				7,20	2070000	2070.
3	PUMPS	OHWT	2	150	0.4	120	43800	43.
		bamboo curi			0.3	45	16425	
_		120,11520 531)		14.0		- 23	19.183	1
4	EQUIPMENTS	Laptop	3	55	4	660	240900	240.
		printer	1	40	0.3	12	4380	4.3
		refrigerator	1	50	24	1200	438000	43
	TOTAL					11829	4317585	4317.58
	TOTAL					11.000	4317585 kWhr/day	4317.58
OPO	TOTAL OSED CASE					11.829	100000	4317.58
OPO	10 = 20/34	APPLIANCE S	No. of Fixtures	WATTAGE	NO.OF HOURS USED	11.000	100000	
	DSED CASE	S	Fixtures		HOURS USED	11.829 Daily energy consum ption	Annual energy consumption	Kilowatt-hours
	OSED CASE	S LED BULB	Fixtures 7	9	HOURS USED	11.829 Daily energy consum ption	Annual energy consumption	Kilowatt-hours per year
	DSED CASE	S	Fixtures	9	HOURS USED	11.829 Daily energy consum ption	Annual energy consumption	Kilowatt-hours per year
1	DSED CASE	S LED BULB	Fixtures 7	9	HOURS USED 4	11.829 Daily energy consum ption 252 240	Annual energy consumption	Kilowatt-hours per year 91.5
1	LEGEND LIGHTING FANS	LED BULB LED BULB	7 5 10	9 12 45	HOURS USED 4 4	11.829 Daily energy consum ption 252 240	Annual energy consumption 91980 87600	Kilowatt-hours per year 91.9 87
1	LEGEND LIGHTING	LED BULB LED BULB FAN	7 5 10 2	9 12 45	HOURS USED 4 4 2	11.829 Daily energy consum ption 252 240 900	Annual energy consumption 91980 87600 328500	Kilowatt-hours per year 91.5 87 328
1	LEGEND LIGHTING FANS	LED BULB LED BULB	7 5 10 2	9 12 45	HOURS USED 4 4	11.829 Daily energy consum ption 252 240 900	Annual energy consumption 91980 87600 328500	Kilowatt-hours per year 91.9 87 328
2	LEGEND LIGHTING FANS PUMPS	LED BULB LED BULB FAN OHWT bamboo curi	7 5 10 2 1	9 12 45 150	4 4 2 0.4 0.3	11.829 Daily energy consum ption 252 240 900 120 45	Annual energy consumption 91980 87600 43800 16425	Kilowatt-hours per year 91. 87 328 43 16.43
2	LEGEND LIGHTING FANS	EED BULB LED BULB FAN OHWT bamboo curi	7 5 10 2 1 1 3	9 12 45 150 150	4 4 4 0.3	11.829 Daily energy consum ption 252 240 900 120 45	Annual energy consumption 91980 87600 43800 16425	Kilowatt-hours per year 91.3 87 328 43 16.42
2	LEGEND LIGHTING FANS PUMPS	EED BULB LED BULB FAN OHWT bamboo curi	7 5 10 2 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9 12 45 150 150	4 4 4 2 0.4 0.3	11.829 Daily energy consum ption 252 240 900 120 45	Annual energy consumption 91980 87600 43800 16425 240900 4380	Kilowatt-hours per year 91.9 87 328 43 16.42 240 4.3
2	LEGEND LIGHTING FANS PUMPS	EED BULB LED BULB FAN OHWT bamboo curi	7 5 10 2 1 1 3	9 12 45 150 150	4 4 4 0.3	11.829 Daily energy consum ption 252 240 900 120 45	Annual energy consumption 91980 87600 43800 16425	Kilowatt-hours per year 91.9 87 328 43 16.4 240 4.3

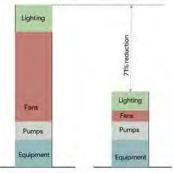
Table 8. Energy consumption table

The EPI of base case is 45.55 kWh/m2

The EPI of proposed case is 20.61 kWh/m2

That is 45.24% reduction in the **Energy Performance Index**

There has been a 71% reduction in energy consumption itself by using more efficient electrical appliances than the base case which is then coupled with using passive design strategies to maximize the natural daylighting that the number of appliances required will be less.



Base case (Whr/day)

Proposed case (Whr/day)

Fig. 92. Energy consumption graph

5.9.3 ENERGY GENERATION

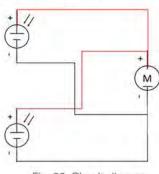




Fig. 94. system of solar trackers panels

Total Energy [kWh] Energy Per Total Building Area [kWh/m2] Aut Sta Energy 11203.69 20.61 35482,08 65.28 otal Source Energy 35482.08 al Energy (kWh) Energy Per Total Bu h/m2] Total Site Energy 24760.20 24760.20 45.55 Not Site Energy Net Source Energy 78415.54 144.26

Fig	93. Circuit diagram	1
- 5	or solar trackers	

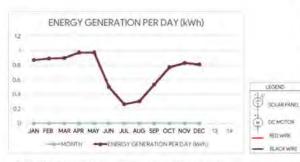


Fig. 95. Energy generation per day graph

MONTH	SUNHOURS	ENERGY(100 W) GENERATION OF PV PANEL IN 1HR	ENERGY GENERATION (kWh) per month	ENERGY GENERATION PER DAY (kWh)
January	270	27000	27	0.87
February	250	25000	25	0.89
March	280	28000	28	0.90
April	290	29000	29	0.97
May	300	30000	30	0.97
June	150	15000	15	0.50
July	80	8000	8	0.26
August	90	9000	9	0.30
September	160	16000	16	0.53
October	240	24000	24	0.77
November	250	25000	25	0.83
December	250	25000	25	0.81
TOTAL	2610	261000	W	8.61
		261	kW	

Table 9. Energy generation from solar panel calculation





5.9.4 ILLUMINANCE SIMULATIONS (BASE CASE, PROPOSED CASE)

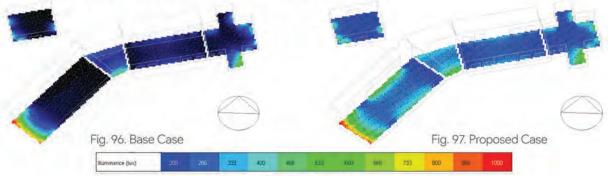


Fig. 98. Legend

5.9.5 DAYLIGHT SIMULATIONS (BASE CASE, PROPOSED CASE)

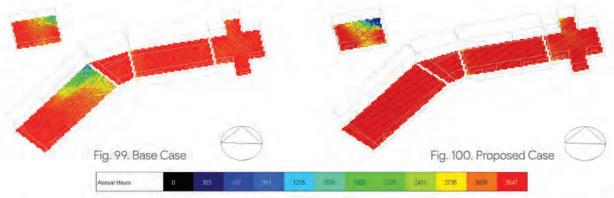


Fig. 101. Legend

Daylight autonomy benchmarks for percentage hours exceeding 300lux for building typologies office and healthcare is averaged, to 35% Daylight Autonomy Annual Analysis Hours Benchmarks (refernce GRIHA 10.1 Appraisal)

5.9.6 THERMAL COMFORT AND THERMAL COMFORT HOURS SIMULATION (PROPOSED CASE)

The graph below has been simulated in Design Builder and shows a Comfort and Setpoint Not Met Summary number of parameters from air temperature to relative humidity. Table alongside shows number of comfort hours NOT MET i.e. Total number of comfort hours achieved adds up to 5110 out of 5110 hrs., for the occupancy of 8am to 9pm for 365 days.

	Facility [Hours]
Time Setpoint Not Met During Occupied Heating	0.00
Time Setpoint Not Met During Occupied Cooling	0.00
Time Not Comfortable Based on Simple ASHRAE 55-2004	2817.00

Fig. 102. Comfort hours NOT MET

SR. NO.	SPACE	DESCRIPTION	AREA (SQ.M.)	NO.	TOTAL AREA	NO. OF PEOPLE		AIR CHANGE PER HOUR (NBC)
		SHELTER A						
	Trai	ning and Economic Hub of CRS						
i	Administrative Space* [with toilets and record room)	Existing RCC structure repurposed Toilets of 4.5 sq.m. area Record room 9 sq.m. area	72	1	72	-6	0.08	8
2	Shops (with storage)	Retail front for mobile supply chain	15 4	4 60	10	0.17	4	
.3	Multipurposé Space	Community Center/ Workshops/ Training Space	125	Y	125	40	0.32	10
4	Congregation Space	Gathering Space for all seasons, festivities and cultural activities	60	4	60	30	0.50	10
		SHELTER B						
		Medical Facility*						
.5	Waiting Area*	Existing RCC structure	Designated	1				-
6	Out patient Department*	retrofitted with equipments.	10	1	10	-4	0.40	10
7	General Ward*	partitions, and 4 beds to	30	T	30	6	0.20	22
8	Medical Shop*	fuention as a medical facility	8	1	- 8	4	0.50	8

Table 10. Ventilation calculations showing air changes per hour

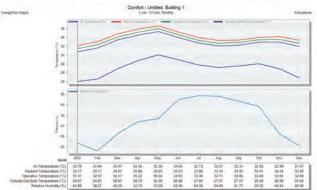
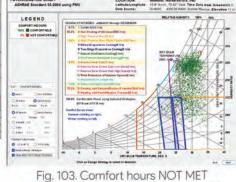


Fig. 104. Thermal comfort simulation graph



WORKSHOP OCC 1

Fig. 105. Thermal comfort simulation graph





5.10 RESILENCE 5.10.1 POTENTIAL RISK

Climate change leads to rising temperatures, water evaporation, droughts, vegetation loss, soil erosion, and lower crop yields, affecting livelihoods. Women in the village experience health problems such as joint pains, degrading bone densities, and spine conditions due to long and strenuous trips on rocky terrain to fetch water. Water scarcity in the village has led to men marrying multiple times to collect more water and a loss of occupation due to sustained droughts, resulting in social and educational challenges for the community.







Fig. 107. Potential Risk

1. Water

P: Water scarcity is caused by the drought in the region, and the lack of awareness and conservation techniques. Villagers do not harvest rainwater or provide storage facilities.

S:To address water scarcity, villagers can use rainwater harvesting techniques and traditional methods such as zabo, surangam, and panam keni. Innovative systems for water management can also be implemented, and proper education facilities can promote social stability.



Fig. 108. Water Map

2. Food Security

P: Water scarcity leads to food security issues in the village, with dry crops cultivated after the monsoon season. Main sources of food include rice, root vegetables, and forest vegetables from the nearby ghat terrain.

S: Crop rotation can conserve water, maintain soil fertility, and control pests and diseases while improving economic returns. Villagers' nutrition cycle can be incorporated into communal food-sharing spaces for events and activities.



Fig. 109. Food Security

3. Network Establishment Through Pods

P: Lack of resources and water creates a blockade, with basic needs requiring long travel. Lack of management skills and daily living skills adds to the complexity. Healthcare, education, ration supplies, and gathering places are also lacking.

S: A network of pods can connect villages and people, increasing community participation and understanding, and providing access to basic amenities.



Fig. 110. Mobile Pods

4. Waste Management

P: No drains, garbage or sewage management in the village. Waste is mixed with soil, polluting it.

S: Septic tanks, reed bed system and Bio-Gas plant provided in the project.



Fig. 111. Reed Bed

5. Economy

P: Lack of business and employment opportunities in the village, leading to most men working as farm laborers for minimum wage. Absence of cattle farming due to water shortage and limited farming activities.

S: The design will contribute to the community's improvement by creating jobs for women through medical facilities and the development of small-scale enterprises for bamboo items, for men through farming and employment possibilities, and for kids through vocational training and education.



Fig. 112. Economy





5.10.2 BUSINESS

- The production of bamboo in the village will create numerous employment and economic opportunities.



Bamboo Artifacts
Bamboo slits are used to
make such artifacts,
which then can be sold
in commercial as well as
online market. Products
like baskets, pots, and
decorative artifacts are
in demand these days
for home decor.



Bamboo Construction Providing training to masons for constructing sustainable buildings using bamboo. Traditional methods are used to join bamboo poles or slits together to create durable, cost-effective, and aesthetically pleasing structures.



Bamboo Weaving
Bamboo weaving is the
process of using
bamboo strips or slits to
create various products.
It involves weaving or
braiding the bamboo
strips together using
various techniques to
form intricate patterns
and designs.



Bamboo Charcoal Production of bamboo charcoal which can be then expanded to target larger markets for sale. bamboo charcoal has a huge market for tandoor and barbque pits in restaurennts. making a chain of production will generate profit.



Home Business
Women in village have a
hobby to make things
at home such as pickle,
papad, dried products,
and different types of
eateries. These
products have a large
market in cities from
which they can earn.



Sewing
Women have a skill in
themselves of sewing.
They collectively can form
a startup for production
of fabric, can sell their
products on E-cart and
commercial market. Such
skills are in demand and
audience like handmade
fabric products.



Seed Bank
A seed bank stores and preserves seeds of various plant species for future use, protecting genetic diversity and endangered species while providing a source of seeds for research and agriculture.



Pod
A mobile network of pod
will help in providing daily
essentials such as daily
products and vocal for
local: local small scale
businesses can be
circulated in villages
which can help in
generating small revenu
and marketing of product



Pottery Artisans
There are few people in
village which have their
own built up skills while
using mud. They can
provide workshops,
training secession to
create ceramic objects
using molding, throwing,
glazing, and firing
techniques.



Bamboo Artisans
Bamboo artisans create
art and craft items using
bamboo, including
furniture, decor, and
household items. They
use weaving, bending,
and carving techniques
and bamboo's
sustainability makes it an
eco-friendly choice.





5.11 EMBOIDED CARBON

Embodied carbon reduction strategies in our design proposal are methods that reduce the carbon footprint of building materials and construction processes. Embodied Carbon of proposed case is reduced by 67.30%. Equivalent CO2 of proposed case is reduced by 59.29%. These are further offsetted by procuring materials on site itself and existing RCC structures have been retrofitted and repurposed into working spaces. Furthermore, the plantation in macro planning will act as a carbon sink in a few years.

Here are some strategies which reduce embodied carbon in the built environment:

MATERIAL SELECTION

Choose building materials with a lower carbon footprint. Bamboo, wattle and daub, mangalore tiles, basalt, vernacular materials locally available on-site reduces the carbon footprint for design.

DESIGN FOR RESUSE AND RECYCLE

Community Resilence Shelter is designed with the goal of making materials reusable or recyclable at the end of their useful life. This will reduce the need for new materials to be produced. Basalt erected durinf during foundation is usde in walls till plinth level. Recycling waste from village, such as broken mangalore tiles are used in panels with water drip system to cool the space.

USE RENEWABLE ENERGY SOURCE

Design proposed with the Use renewable energy sources, such as solar, wind, to power construction activities and building operations. Whereas, installing solar PV panels with solar tracker to maximize the solar gain incident on panels, installing the wind turbine on mobile pods.

OPTIMIZE CONSTRUCTION PROCESS

We have optimized construction processes to minimize material waste and energy use. This is achieved through efficient project planning, use of vernacular materials, and construction techniques, labours cost reduction by training the villagers and other strategies.

Constructions Embodied Carbon and Inventory	Area (m2)	Embodied Carbon (kgCO2)	Equivalent CO2 (kgCO2)
ROOF	428.0	119340 7	119631.8
External floor - Energy code standard - Medium weight	170.4	1326.6	1378.1
115mm single leaf brick (plastered both sides)	75.5	3991.6	4178.4
Wooden door	14.7	0.0	0.0
WALL WATTLE N DAUB	331.6	12799.6	12996.2
Roof Attic & Other Steel Joists R-35 (6.2) U-0.037 (0.21)	122.0	0.0	0.0
Ground floor slab - Energy code standard - Medium weight	373.1	10083.4	12708.4
Sub Total	1515.2	147541.93	150892.85

Glazing Embodied Carbon and Inventory	Area (m2)	Embodied Carbon (kgCO2)	Equivalent CO2 (kgCO2)
Sgl Cir 6mm	211 B	38128	38128
Local shading		0.0	0.0
Window shading		0.0	0.0
Sub Total	211.8	3812.8	38128
Building Total	1727.1	151354.7	154705.6

lab	le 11.	Base of	case	Emt	poided	carb	on	estin	nation	on	design	builder
-----	--------	---------	------	-----	--------	------	----	-------	--------	----	--------	---------

Constructions Embodied Carbon and inventory	Area (m2)	Embodied Carbon (kgCO2)	Equivalent CO2 (kgCO2)
Clay tiles (25mm) on air gap (20mm) on roofing felt (5mm)	428.0	11815.9	12243.9
External floor - Energy code standard - Medium weight	170.4	1326.6	1378.1
Lightweight 2 x 25mm gypsum plasterboard with 100mm cavity	75.5	407.5	441.5
Wooden door	52.8	0.0	0.0
Brick/block wall (insulated to 1995 regs)	333.7	20775.9	27624.8
Flat roof U-value = 0.25 W/m2K	122.0	1985.7	5484.4
Ground floor slab - Energy code standard - Medium weight	373.1	10083.4	12708.4
Sub Total	1555.5	46395.04	59881.06

Glazing Embodied Carbon and Inventory	Area (m2)	Embodied Carbon (kgCO2)	Equivalent CO2 (kgCO2)
Sgi Cir 6mm	171.6	3088.9	3088.9
Local shading		0.0	0.0
Window shading		0.0	0.0
Sub Total	171.6	30889	3088.9
Building Total	1727.1	49483.9	62969.9

Table 12. Proposed case Emboided carbon estimation on design builder

IMPLEMENT CARBON OFFSETTING

Offset embodied carbon emissions by investing in carbon offset projects, such as reforestation and renewable energy projects. Converting the drought prone region to the green lush vegetation by plantation in 15 years. Renewable source of water is reserviour and macro level planning of village to conserve and store water.

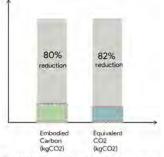


Fig. 112. Emboided carbon graphs





5.12 VALUE PROPOSITION

5.12.1 SUMMARY OF VALUE PROPOSITIONS

- 1. Water Conservation and rejuvenation of the village A significant water reservoir and staged stepwell development have been proposed in order to provide year-round water needs. The bigger reservoir will help in the village's revitalization even further.
- 2. Economy generation especially for women Training spaces and many home business opportunities have been proposed that will act as catalyst for boosting there economy and promoting there skills to world via local distributers and e-commerce shopping website.
- 3. Vocational and skill improvement courses The multipurpose spaces in CSR will be used by villagers and visitors for vocational training and educational activities are proposed for all user groups.
- 4. Catering to the basic needs of surrounding villages From a no. of 852 to 8756 people, Mobile Pods will serve to a network of 8 villages surrounding Veluk to provide them with basic amenities. Which are currently 12 km's away from their village.
- 5. Converting this village as a tourism spot in the future A great tourist attraction has a large water feature, an active community centre, and a positive storyline, hence this can set an example and model village for other villages around Maharashtra to come up with similar solutions suitable for their condition.
- Collaboration with PAANI foundation for macro planning will encourage the villagers to put thier hands together for better quality of life.
- 7. Government policies that are implemented in the project will allow government participation and make effective use of their policies. This could help in lowering direct project cost and covering it under such Government Policies.

5.12.2 GOVERNMENT POLICIES



Fig. 113. Government Policies





5.12.3 MOBILE APPLICATION

Given below are some images of a smartphone application which will help the villagers in tracking the mobile pods and their availability. The app will have a feature to send in a call for any particular type of pod from a nearby base village. Villagers will also have access to a calender which will show the timetable of pods for the month of that particular village and other villages too. The app will also provide information on different businesses that the villagers own and will be able to get in contact with them. It will also feature a progress tracking service which will hold necessary information about all the villages that this project will undertake.



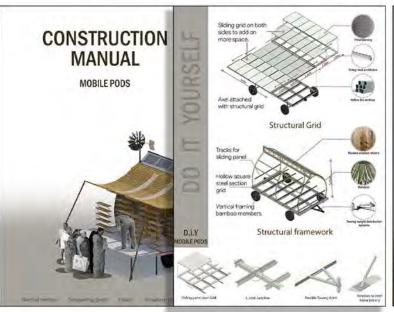




Fig. 114. SmartPhone Application to be used for Pod tracking, Businesses, and Vocational training courses

5.12.4 CONSTRUCTION MANUALS

Given below are the constructon manuals which will be provided to the villagers so that they can build the Mobile Pods and the Community Resilience Shelter on their own. The manuals will contain all the information regarding basics of construction technology to the intricate details of joineries, equipments, skills required, and alternatives.



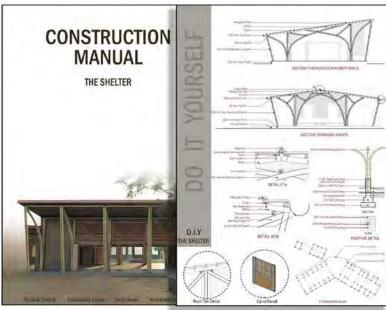


Fig. 115. Construction Manuals for Mobile Pods and Community Resilience Shelter





5.13 AFFORDABILITY

MINIMIZING CONSTRUCTION COST

2 Existing structures that were present on sit are reused and repurposed thus reducing construction cost and saving on materials

- Locally available materials like basalt and bamboo are used in order to reduce construction cost and there by

reducing the overall cost of the project
- To Minimize the use of Mechanical ventilation, strategies like cross ventilation, optimum opening sizes which allow fresh air inlet are provided.

Louvers and bamboo slits have also been used to make spaces more breathable and allow good air flow in the space - Maximum use of the available daylight has been done by providing larger openings on northern side for diffused light

- Karvi panels: Bamboo panels with wattle and daub have been used for walls. It a low cost and low maintenance construction technique which makes it affordable and eco friendly.







Fig. 116, Plan

Fig. 117. Basalt Rock

118. Bamboo

Fig. 119. Wattle and Daub

5.13.1 PROPOSED BAMBOO FARMING

A policy has been proposed by the project partner where bamboo farming will be given as a certain percentage of a farmland. This will include all people from the village who own a farm.

Bamboo takes 3 years to grow fully and be ready for harvest. This will be around the same time as the reservoirs begin to thrive and construction of CRS can start.

Thus, a sustainable bamboo farming will be made and that same bamboo will be used for construction of CRS which will effectively bring the material cost of bamboo to ZERO.



Fig. 120. Proposed Bamboo Farming

5.13.2 COST ESTIMATION

Project Information					
MONTH STATE OF THE	Samakrut				
Division:	Community resilience		Land Cost:	2.5	Million INR
	Site Area (sqm)	2,500	City:	Veluk	
	Built-up Area (BUA) (sqm)	460	State:	Maharashtra	
	Ground Coverage (Plinth Area) (sgm)	460			

S.No.	S.No. Particulars	Definition	Baseline Estimate (Project Partner / SOR basis)			Proposed Design Estimate		
3.140.	rarticulars	Definition	Amount (Million INR)	%	Amount (INR per sqm)	Amount (Million INR)	96	(INR pe
1	Land	Cost of land purchased or leased by the Project Partner	2.50	9,5%	5,435	2,50	15.6%	5,435
2	Civil Works	Refer Item A, Civil works in Cost of construction worksheet	1,68	6.4%	3,646	0.80	5.0%	1,731
3	Internal Works	Refer Item B, Civil works in Cost of construction worksheet	0.50	1.9%	1.078	0.07	0.5%	159
4	MEP Services	Refer Item C, Civil works in Cost of construction worksheet	0.36	1.4%	793	0.10	0.6%	218
5	Equipment & Furnishing	Refer Item D. Civil works in Cost of construction worksheet	0.00	0.0%	3.1	0.00	0.0%	1
6	Landscape & Site Development	Refer Item E, Civil works in Cost of construction worksheet	0.58	2.2%	1,251	0.55	3,4%	1,190
7	Contingency	miscellaneous expenses.	0.16	0.6%	338	0.09	0.5%	189
	TOTAL HARD COST		5.8	22%	12,542	4.1	26%	8,921
8	Pre Operative Expenses	Cost of Permits, Licenses, Market research, Advertising etc	0.05	0.2%	117	0.05	0.2%	117
9	Consultants	Consultant fees on a typical Project	0.13	0.5%	274	0.13	0.5%	274
10	Interest During Construction	Interest paid on loans related to the project during construction	20.25	77.3%	44,031	11.72	44.7%	25,483
	TOTAL SOFT COST		20.4	78%	44,422	11.9	45%	25,874
	TOTAL PROJECT COST		26.2	100%	56,964	16,0	100%	34,795
	TOTAL PROJECT COST (With out)	nterest during Construction)	5.95	0.23	12,933.02	4.28	0.26	9,312.21

S.No.	Particulars	Definition	Quantity	Rate (Rs)	Amount (Million INR)
Î	New construction	This will involve the construction of Community Resilience Shelter along with all the services and land costs.			4.3
2	Renovation	Existing building in CRS will need renovation for repurpose			1.76
3	Mobile Pod	8 mobile pod to cater villages around the veluk	8	0.276	2.1
4	Devrai Plantation	17.6 acre of plantation around the reservoir and stepwells	17.6	120000	2.1
5	Stepwell	10 stepwells for domestic chores, seepage of water and	10	250000	2.5
6	Water Harvesting	includes reservoir and check dams to cater to the water			6.8
	TOTAL PROJECT COST				19.6

Table 13. Cost Estimation





5.13.3 FUNDING OF THE PROJECT

Funding of the project is planned through Corporate Social Responsibility (CSR) and collaboration with a variety of NGOs which will provide funding for different parts of the project depending on the area of their expertise, no loans will be taken up and therefore there will be no interest costs will be beared upon the project partner, the village, or any other parties involved.

5.13.4 CSR AND COLLABORATION

RESERVOIR AND STEPWELL CONSTRUCTION

Construction of reservoir and the stepwells will be done by URVEE Public Trust in collaboration with PAANI foundation. PAANI foundation was set up by the core team of 'Satyamev Jayate' TV show. Their work is geared towards creating a people's movement to tackle generational crisis of drought in Maharashtra.

CONSTRUCTION OF COMMUNITY RESILIENCE SHELTER

This will involve the construction of Community Resilience Shelter along with all the services ans land costs, and mobile pods.

- Village rejuvenation and development: This will be done in collaboration with TATA Motors CSR funds. TATA
 Motors CSR Initiative has been helping underdeveloped villages with rejuvenation and development process. URVEE
 Public Trust plans on collaborating with them for a major part of this project.
- Material Technology and Execution: COSTFORD is a voluntary organization which provides technological assisstance for rural development.
- Contracting and Execution: This part of the project will be overlooked by URVEE Public Trust in collaboration with COSTFORD.

PLANTATION AND SEED BANKS

URVEE Public Trust will be collaborating with the following organisations for afforestation;

- The Bamboo Nursery, Bhor: This organisation was set up by Er. Vinay Kolte. They have been in close contact with URVEE Public Trust and will be collaborating for Bamboo Farming around the region.
- Sahyardi Devrai: This organisation was set up by Marathi Cinema Actor Sayaji Shinde; they currently have 29 Devrais, 2 Vruksha banks, Bio-diversity parks, Butterfly Gardens, and rock Gardens. They will be collaborating for Multi-Layered Vegetation planting around the reservoir.
- -14 Trees Foundation: It is a charitable organization dedicated to building sustainable, carbon-footprint-neutral eco-systems through re-forestation.

S.No.	Particulars	Definition	Quantity	Rate (Rs)	Amount (Million INR)
1	New construction	This will involve the construction of Community Resilience Shelter along with all the services and land costs.			4.3
2	Renovation	Existing building in CRS will need renovation for repurpose			1.70
3	Mobile Pod	8 mobile pod to cater villages around the veluk	8	0.276	2.1
4	Devrai Plantation	17.6 acre of plantation around the reservoir and stepwells	17.6	120000	2.1
5	Stepwell	10 stepwells for domestic chores, seepage of water and	10	250000	2.5
6	Water Harvesting	includes reservoir and check dams to cater to the water			6.8
	TOTAL PROJECT COST				19.6

Table 14. Total Project Cost





6.0 APPENDIX

6.1 DETAILED AREA STATEMENT

* Spaces with asterisk mark are repurposed RCC structures and will not be added in the builti up area

		added in the builti up area			
		MICRO PLANNING			
SR. NO.	SPACE	DESCRIPTION	AREA (SQ.M.)	NO.	TOTAL ARE
		SHELTER A			
	Trai	ning and Economic Hub of CRS			
	Administrative Space* (with toilets and record room)	Existing RCC structure repurposed Toilets of 4.5 sq.m. area	72	1	70
	Shops	Record room 9 sq.m. area Retail front for mobile supply	12	- 1	72
	(with storage)	chain	15	4	60
	Multipurpose Space	Community Center/ Workshops/ Training Space	125	1	125
		Gathering Space for all seasons, festivities and cultural			
	Congregation Space	activities	60	1	60
		SHELTER B			
		Medical Facility*	L		
	Waiting Area*	Existing RCC structure	Designated	1	
	Out patient Department*	retrofitted with equipments,	10	1	10
	General Ward*	partitions, and 4 beds to	30	1	30
	Medical Shop*	fucntion as a medical facility	8	j.	8
		SHELTER C			
		Bamboo Treatment Plant			
	Loading/ Unloading Area	Outdoor space	35	1	35
	Stacking Space	Storage for to be treated bamboo	40	5	40
		Space for preparing bamboo			
	Preparation Space	and borax for treatment 2 pools of dimensions	40	1	40
	Treatment Pools	6X1.5X1 M	75	1	75
	Air Drying Area	Outdoor semi open space	25	1	25
			TOTAL BUILT UP A	AREA OF CRS =	460
		MOBILE NETWORK PODS			
		Bamboo Treatment Plant			
	Medical Facility Pod			3	
	Medical Facility Pod Vocational Pod			3	
		Pods of size 2.5mX4.5m towed			
	Vocational Pod Ration Shop Pod	Pods of size 2.5mX4.5m towed with available vehicles		i	
	Vocational Pod Ration Shop Pod Library Pod	Pods of size 2.5mX4.5m towed		1	
	Vocational Pod Ration Shop Pod	Pods of size 2.5mX4.5m towed with available vehicles		1 1	
	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network		1 1	
	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod	Pods of size 2.5mX4.5m towed with available vehicles		1 1	
SR. NO.	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network	NO.	1 1 1	
	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MAGRO PLANNING AREA (SQ.M.)	NO.	1 1 1	TOTAL ARE (SQ.M.)
SR. NO.	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE Water reservoir (avg depth: 6m)	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MAGRO PLANNING AREA (SQ.M.)		1 1 1	TOTAL ARE (SQ.M.)
-1-	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE Water reservoir (avg depth: 6m) Total Storage (45,884,475 L/year)	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MAGRO PLANNING AREA (SQ.M.)	NO. 1	1 1 1	(SQ.M.)
2	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE Water reservoir (avg depth: 6m) Total Storage (45,884,475 L/year) Stepwell Water Purification System (3 Stage	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MAGRO PLANNING AREA (SQ.M.)	NO.	1 1 1	
2	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE Water reservoir (avg depth: 6m) Total Storage (45,884,475 L/year) Stepwell Water Purification System (3 Stage Reed Bed System)	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MACRO FLANNING AREA (SQ.M.) 300 North West of village	NO. 1	1 1 1	(SQ.M.)
2 3 4	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE Water reservoir (avg depth: 6m) Total Storage (45,884,475 L/year) Stepwell Water Purification System (3 Stage Reed Bed System) Bamboo Plantation	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MACRO PLANNING AREA (SQ.M.) 300 North West of village Green Valleys	NO. 1	1 1 1	(SQ.M.) 3000
1 2 3 4 5	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE Water reservoir (avg depth: 6m) Total Storage (45,884,475 L/year) Stepwell Water Purification System (3 Stage Reed Bed System) Bamboo Plantation Septic Tank	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MACRO PLANNING AREA (SQ.M.) 300 North West of village Green Valleys 60	NO. 1	1 1 1	(SQ.M.)
1 2 3 4 5 6	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE Water reservoir (avg depth: 6m) Total Storage (45,884,475 L/year) Stepwell Water Purification System (3 Stage Reed Bed System) Bamboo Plantation Septic Tank Biogas Plant (optional)	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MACRO PLANNING AREA (SQ.M.) 300 North West of village Green Valleys 60 -	NO. 1 10	1 1 1	3000 60
1 2 3 4 5 6 7	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE Water reservoir (avg depth: 6m) Total Storage (45,884,475 L/year) Stepwell Water Purification System (3 Stage Reed Bed System) Bamboo Plantation Septic Tank Biogas Plant (optional) Overhead Water Tank (1,51,267,5L) Multi Layered Vegetation and	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MACRO PLANNING AREA (SQ.M.) 300 North West of village Green Valleys 60 - 72 71224.67	NO. 1 10 10	1 1 1	3000 60 72
1 2 3 4 5 6	Vocational Pod Ration Shop Pod Library Pod Community Engagement Pod Tourism Pod SPACE Water reservoir (avg depth: 6m) Total Storage (45,884,475 L/year) Stepwell Water Purification System (3 Stage Reed Bed System) Bamboo Plantation Septic Tank Biogas Plant (optional) Overhead Water Tank (1,51,267,5L)	Pods of size 2.5mX4.5m towed with available vehicles throughtout the village network MACRO PLANNING AREA (SQ.M.) 300 North West of village Green Valleys 60 - 72	NO. 1 10	1 1 1	3000 60

Table. 2. Area Statement





6.2 ARCHITECTURAL DRAWINGS



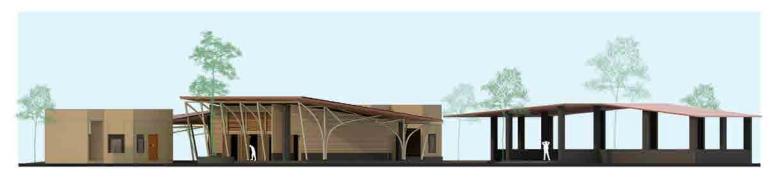




South Elevation



North Elevation



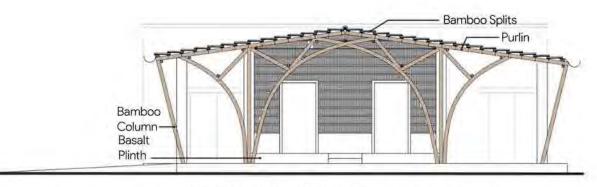
South West Elevation



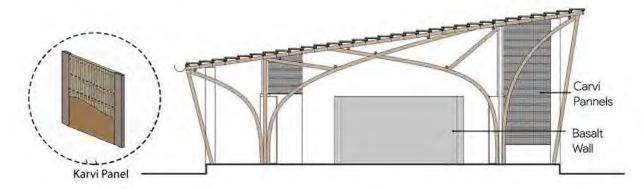
North East Elevation







Section through shops showing design and structural system
Plinth 1= IvI +0.3m, Plinth 2= IvI +0.6m, Basalt Parapet= IvI +1.2m, Wall height= IvI +4.4m

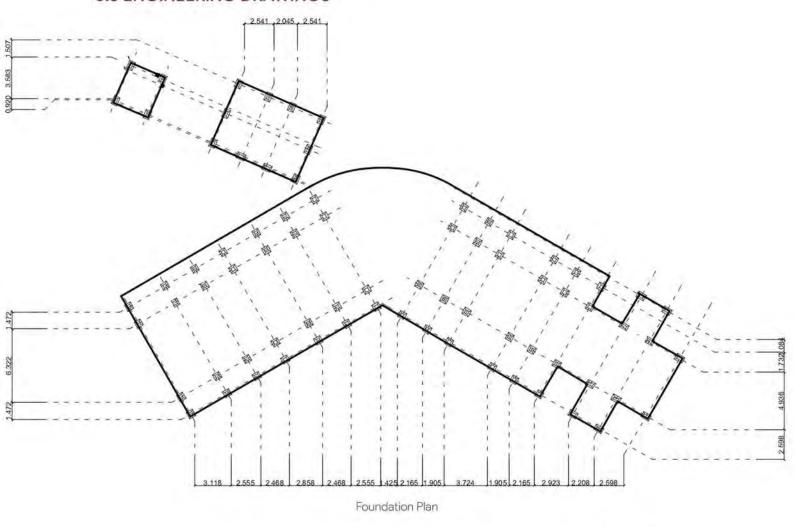


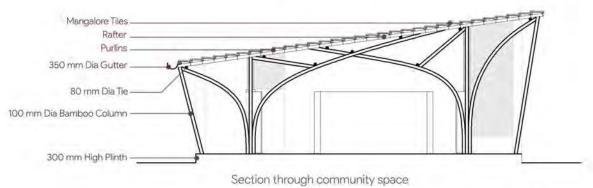
Section through training and workshop space Plinth 1= IvI +0.3m, Basalt Parapet= IvI +0.9m, Wall height (left)= IvI +3.3m, Wall Height (right)= 4.8m

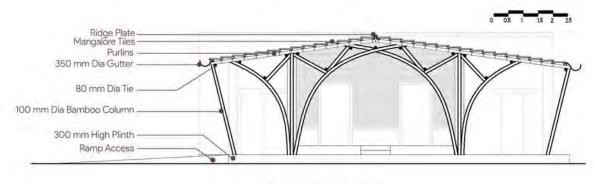




6.3 ENGINEERING DRAWINGS













6.4 ENERGY SIMULATION INPUT AND OUTPUT PARAMETERS

Input Parameters	Units	Proposed Design Values
General		
Building Area	m²	460 sq.m.
Conditioned Area	m²	-
Electricity Rate	INR/kWh	6.09
Natural Gas Rate	INR/GJ	
Building Occupancy Hours	-	8 a.m 10 p.m.
Average Occupant Density	m² / person	100
Internal Loads		
Interior Average Lighting Power Density	W/m²	5
List of Lighting Controls	-	Basic Lighting Controls
Average Equipment Power Density	W/m²	12
Minimum OA Ventilation (Building Average)	l/sec.m ²	0.02
Envelope		
Roof Assembly U value	W/m².K	0.35
Roof Assembly SRI		0.3
Average Wall Assembly U value	W/m².K	0.265
Window to Wall Area Ratio (WWR)	%	19.725
Windows U value	W/m ² .K	1.4
Windows SHGC		4
Windows VLT	%	+
Infiltration Rate	ac/h	+
Describe Exterior Shading Devices		3m Overhangs at periphery
HVAC System		
HVAC System Type and Description	-	-
Describe Mixed mode strategy in operation/controls of AC and windows	-	
Heating Source	-	÷
Heating Capacity	kW	-
Heating COP		-
Cooling Source	2	-
Cooling Capacity	kW	-
Cooling COP		
Operation Hours		
Heating Set Point	°C	+
Cooling Set Point	°C	-0
Relative Humidity Setpoint		4)





Service Hot Water		1_	
SHW Type and Description	-	**	

Output Parameters	Units	Proposed Design Value	ues		
Proposed EUI (Total)	kWh/m²/ yr	20.61			
EUI Breakdown by End Use					
Heating	kWh/m²/ yr	3			
Cooling	kWh/m²/ yr	-			
Fans	kWh/m²/ yr	9.			
Pumps	kWh/m²/ yr	*			
Heat Rejection	kWh/m²/ yr	9			
Service Hot Water	kWh/m²/ yr	=			
Lighting	kWh/m²/ yr	13.18			
Equipment	kWh/m²/ yr	7.51			
Total Envelope Heat Gain (Peak)	W/m²	岩			
Cooling Load of Conditioned Area	SF/ Tr	~			
Building Electric (Peak)	W/m²	•			
Annual Operating Energy Cost	INR/m²	×			
Annual Unmet Hours	*	0			
Cooling Capacity	Tr	~			
Annual Hours of Comfort without Air Conditioning		5160			
Monthly Energy Performance		Generation	Consumption		
Jan	kWh	27	97.7		
Feb	kWh	25	97.7		
Mar	kWh	28	108.8		
Apr	kWh	29	104.7		
May	kWh	30	108.2		
Jun	kWh	15	104.7		
Jul	kWh	8	108.8		
Aug	kWh	9	97.7		
Sep	kWh	16	87.7		
Oct	kWh	24	87.7		
Nov	kWh	25	97.7		
Dec	kWh	25	97.7		





6.5 NET ZERO WATER CYCLE DESIGN

The water cycle is divide into two: Macro water cycle and micro water cycle. Macro water cycle caters to all the water need of the village, farms, as well as economic use; whereas, micro water cycle caters to reuse of water in specific sectors namely, human consumption, farming irrigation, and bamboo curing.

WATER REQUIREMENTS

Water calculations for village

No. of people in village = 747 Water requirement per person per day = 135 L/day Total water requirement per day = 747* 135 L= 100,845 L/day

Annual water requirement = 100,845L X 365= 36,808,425 L

Annual water storage requirement for village = 36,808,425 L

Consider 3 months of extra water storage

= 36,808,425 + 9,076,050

= 45,884,475 L/year

Water calculation for CRS

Population capacity of CRS= 230
No. of people using CRS daily= 70
Water requirement = 70 X 135 = 9450L
With a factor of safety of 1.2
Total water storage capacity required= 1.2X9450 = 11,340 L
Annual water requirement of CRS = 11,340X365 = 4,139,100 L

WATER PROCUREMENT

Water calculation for Stepwells

Water holding capacity of one stepwell = 200,000 L No. of stepwells used provided = 10

Total water stored in stepwells = 10X200,000 = 2,000,000L

Water calculation for reservoir

The proposed reservoir will hold around 50,000,000 L of water. The current area of the reservoir shown will be expanded upon to procure the required amount of water.

Rainwater Harvesting Tank Capacity

= mean annual rainfall (mm) x area(sq.m) x runoff factor =1439 x 2529.5 Roof area = 2529.5m2, Land = 945m2 Run off factor Roof = 0.9 Land = 0.3

Harvestable rainwater = mean annual rainfall (mm) x area(sq.m) x runoff factor = $1439 \times ((2529.5 \times 0.9)+(945 \times 0.3))$ = 36,83,911.95L

WATER RECYCLING

Water requirement of the Vilage

Population of village= 747
Daily water consumption= 45L/person
Total Daily water consumption= 747 X 45 = 33,615L

Amount of Blackwater generated = 747 X 20= 14,940L This Blackwater is sent to Septic Tank through drainage lines.

Amount of **Greywater generated** = 70X25= **18,675L**This Greywater is sent to 3 stage reed bed system located near septic tank and is then reused in washrooms.

Dual Plumbing Systems will be used to separate blackwater and greywater.

Note: Plumbing system may seem to show only blackwater lines as the dual plumbing lines are laid one above another, but actually signify both blackwater and greywater. These will then change course just before the blackwater line enters into the septic tank.

Total volume of harvestable rainwater = 3700 cu.m

Almost 50% rainwater should be reused and remaining water is allowed to seep into the soil to recharge underground water table 1850 Dimension of tank: Height = 5 m Radius = 11 m

Water requirement of Community Resilience Shelter

Population capacity of CRS= 230
No. of people using CRS daily= 70
Daily water consumption= 45L/person
Total Daily water consumption= 70 X 45 = 3150L

Amount of Blackwater generated = 70 X 20= 1400L This Blackwater is sent to Septic Tank through drainage lines.

Amount of Greywater generated = 70X25= 1750L

This Greywater is sent to 3 stage reed bed system located near septic tank and is then reused in washrooms.







6.6 SUMMARY OF COST ESTIMATION

Project Information					
CONTRACTOR	Samakrut				
Division:	Community resilience		Land Cost:	2.5	Million INR
	Site Area (sqm)	2,500	City:	Veluk	
	Built-up Area (BUA) (sqm)	460	State:	Maharash	tra
	Ground Coverage (Plinth Area) (sqm)	460			

CNA	Bushawan	B-6-W	Baseline Estimate (Project Partner / SOR basis)			Proposed Design Estimate		
S.No.	Particulars	Definition	Amount (Million INR)	%	Amount (INR per sqm)	Amount (Million INR)	%	Amoun (INR pe
1	Land	Cost of land purchased or leased by the Project Partner	2.50	9.5%	5,435	2.50	15.6%	5,435
2	Civil Works	Refer Item A, Civil works in Cost of construction worksheet	1.68	6.4%	3,646	0.80	5.0%	1,731
3	Internal Works	Refer Item B, Civil works in Cost of construction worksheet	0.50	1.9%	1,078	0.07	0.5%	159
4	MEP Services	Refer Item C, Civil works in Cost of construction worksheet	0.36	1.4%	793	0.10	0.6%	218
5	Equipment & Furnishing	Refer Item D, Civil works in Cost of construction worksheet	0.00	0.0%	-	0.00	0.0%	- +
6	Landscape & Site Development	Refer Item E, Civil works in Cost of construction worksheet	0.58	2.2%	1,251	0.55	3.4%	1,190
7	Contingency	miscellaneous expenses.	0.16	0.6%	338	0.09	0.5%	189
	TOTAL HARD COST		5.8	22%	12,542	4.1	26%	8,921
8	Pre Operative Expenses	Cost of Permits, Licenses, Market research, Advertising etc.	0.05	0.2%	117	0.05	0.2%	117
9	Consultants	Consultant fees on a typical Project	0.13	0.5%	274	0.13	0.5%	274
10	Interest During Construction	Interest paid on loans related to the project during construction	20.25	77.3%	44,031	11.72	44.7%	25,483
	TOTAL SOFT COST		20.4	78%	44,422	11.9	45%	25,874
	TOTAL PROJECT COST		26.2	100%	56,964	16.0	100%	34,795
	TOTAL PROJECT COST (With	out Interest during Construction)	5.95	0.23	12,933.02	4.28	0.26	9,312.21

Fig. 51. Cost Estimation Summary of Community Resilience Shelter Only

S.No.	Particulars	Definition	Quantity	Rate (Rs)	Amount (Million INR)
1	New construction	This will involve the construction of Community Resilience Shelter along with all the services and land costs.			4.3
2	Renovation	Existing building in CRS will need renovation for repurpose			1.76
3	Mobile Pods	8 mobile pods to cater villages around the veluk	8	0.276	2.1
4	Multi Layered Plantation and Memory Forest	17.6 acre of plantation around the reservoir and stepwells	17.6	120000	2.1
5	Stepwell	storsge.	10	250000	2.5
6	Water Harvesting	Includes reservoir and check dams to cater to the water needs.			6.8
	TOTAL PROJECT COST				19.6

Fig. 51. Break up of Cost Estimation of the WHOLE PROJECT

NEW SHEETS HAVE BEEN ADDED IN THE EXCEL WORKBOOK TO PROVIDE FURTHER BREAKUP OF THE COST ESTIMATION OF ELEMENTS SHOWN ABOVE. ALSO A NEW SUMMARY TABLE (BOTTOM) HAS BEEN ADDED.

THE PROJECT WILL BE FUNDED USING CSR (CORPORATE SOCIAL RESPONSIBILITY) FUNDS AND THEREFORE NO LOAN CALCULATIONS WILL BE APPLICABLE THEREBY EFFECTIVELY DRIVING FINANCIAL COSTS TO ZERO.

KINDLY REFER TO THE TABLE AT THE BOTTOM AND NEWLY ADDED SHEETS TO THE WORKBOOK FOR ACTUAL COST ESTIMATE OF THE PROJECT (ESTIMATION INCLUDES ALL 3 ASPECTS OF THE PROJECT).





6.7 SUMMARY OF EMBODIED CARBON

THE EMBODIED CARBON CALCULATIONS AND ANALYSIS HAS BEEN DONE IN DESIGN BUILDER.

GIVEN CARBON TOOL COULD NOT BE USED DUE TO LACK OF GWP INFORMATION ON REQUIRED MATERIALS EVEN

AFTER LOOKING THROUGH NUMEROUS RESEARCH PAPERS.

GIVEN BELOW ARE SCREENSHOTS FROM DESIGN BUILDER SIMULATIONS SHOWING BASE CASE (LEFT) AND PROPOSED CASE (RIGHT).

THESE FIGURES WILL BE FURTHER OFFSETED DUE TO REUSE OF EXISTING STRUCTURES AND CREATION OF CARBON SINKS AROUND THE STRUCTURE IN THE NEAR FUTURE

Constructions Embodied Carbon and Inventory	Area (m2)	Embodied Carbon (kgCO2)	Equivalent CO2 (kgCO2)
ROOF	428.0	119340.7	119631.8
External floor - Energy code standard - Medium weight	170.4	1326.6	1378.1
115mm single leaf brick (plastered both sides)	75.5	3991.6	4178.4
Wooden door	14.7	0.0	0.0
WALL WATTLE N DAUB	331.6	12799.6	12996.2
Roof Attic & Other Steel Joists R-35 (6.2) U-0.037 (0.21)	122.0	0.0	0.0
Ground floor slab - Energy code standard - Medium weight	373.1	10083.4	12708.4
Sub Total	1515.2	147541.93	150892.85

Constructions Embodied Carbon and Inventory	Area (m2)	Embodied Carbon (kgCO2)	Equivalent CO2 (kgCO2)
Clay tiles (25mm) on air gap (20mm) on roofing felt (5mm)	428.0	11815.9	12243.9
External floor - Energy code standard - Medium weight	170.4	1326.6	1378.1
Lightweight 2 x 25mm gypsum plasterboard with 100mm cavity	75.5	407.5	441.5
Wooden door	52.8	0.0	0.0
Brick/block wall (insulated to 1995 regs)	333.7	20775.9	27624.8
Flat roof U-value = 0.25 W/m2K	122.0	1985.7	5484.4
Ground floor slab - Energy code standard - Medium weight	373.1	10083.4	12708.4
Sub Total	1555.5	46395.04	59881.06

Glazing Embodied Carbon and Inventory	Area (m2)	Embodied Carbon (kgCO2)	Equivalent CO2 (kgCO2)
Sgl Cir 6mm	211.8	38128	3812.8
Local shading		0.0	0.0
Window shading		0.0	0.0
Sub Total	211.8	38128	3812.8
	110000	100	1000000
Building Total	1727.1	151354.7	154705.6

Glazing Embodied Carbon and Inventory	Area (m2)	Embodied Carbon (kgCO2)	Equivalent CO2 (kgCO2)
Sgl Clr 6mm	171.6	3088.9	3088.9
Local shading		0.0	0.0
Window shading		0.0	0.0
Sub Total	171.6	3088.9	3088.9
Building Total	1727.1	49483.9	62969.9





6.8 GOALS

6.8.1 PRIMARY GOALS

Water Performance

Aim

To achieve 60% Water savings. Provide 30,757,725 L of water reservoir for human consumption. Irrigation and economic use calculations will be done later.

Strategies

Followin are the strategies applied to achieve the aim: Water efficient plumbing fixtures, dual plumbing system, water metering, drip irrigation using bamboo shoots, bioswales, terraced trenches, surangam (catchment sumps), Panam Keni, Zabo, crop rotation, vegetative filter strips, rainwater harvesting.







THE METER REGISTERS WATER USE



THE METER TRANSMITS THE DATA



THE DATA CAN BE VIEWED BY COUNCIL AND YOU



ANY LEAKS CAN BE IDENTIFIED QUICKLY AND REPAIRED



WATER AND MONEY SAVED!

Fig. 11. Process of water metering

Resilience

Aim

Designing climate resilient structure. Creating job employment for at least 350 people (70% of the total population).

Strategies

Resilient structure to withstand drought and natural calamities, adapt the changes in climate and maintain thermal comfort. Function, cluster planning. Resilience in terms of people will be buit up by setting up bamboo curing plant, cottage industries for women like weaving clothes and mats, health and hygiene,

nursing, vocational.



Energy Performance

Aim

To achieve target EPI of 55 with energy savings of 50%.

Strategies

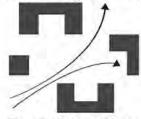
This aim will be achieved by integration of passive design strategies (mutual shading, thermal mass, natural ventilation, daylight (diffused), reduce heat gain (thermal mass), solar panels, peloton wheel energy generation, building orientation, fenestration design, lighting, plug loads, cooling loads.



Architectural Design

Strategies

Modular design, community gathering spaces, cultural hub, thermally comfortable environment, spatial planning according to orientation, vegetative shading, cluster planning, and daylight potential to achieve a minimum of 90% of the area throughout the year.





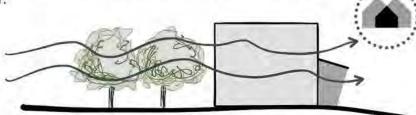


Fig. 13. Evaporative cooling

Affordability

Aim

Cradle-to-cradle system of material design.

Strategies

Local materials (bamboo, wood), construction cost reduced, less maintenance cost, modular design repetition, flexibility for the replicable module over a large scale. Material specifications, modular construction, labour cost (local labour), self-sustainable,







6.8.2 SECONDARY GOALS

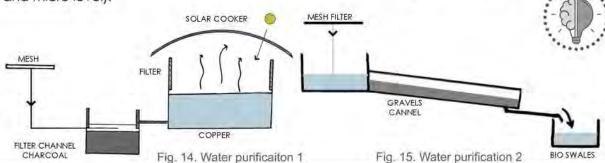
Innovation

Aim

To innovate on-site water generation sector to offset the water demand.

Strategies

Peloton wheel, water filtration, water collection system (an amalgamation of traditional methods and local material), water filtration through canals (macro and micro level).



Value proposition

Aim

Phase-wise design to cater to user needs over time.

Strategies

Modular design, flexible modules, expandable design as a future provision. Rejuvenation of village through employed design strategies.



Health and well-being

Aim

Ensuring indoor environmental quality (air quality, visual, thermal & acoustical comfort), indoor air quality, natural paints.

Strategies

Mud is used as material, air purifying plants, and shaded pathways with climbers over bamboo shade. Indoor lighting of 300 - 400 LUX, indoor temperature range between 20 - 24 deg C, (Air Quality Index) AQI<50, no VOC materials, good ventilation (stack and cross), Humidity between 30% to 50%.









Social Stability

Social stability of the village can be sustained by providing congregational spaces like a cultural hub, community gathering space, and employment generation for men and women in fields, construction, networking with different NGOs for educating people and setting up vocational upskill programs.





6.8.3 TERTIARY GOALS

Communication

Aim

To increase awareness about water conservation and gain a better understanding of efficient agriculture practices.



Strategies

Collaboration with NGOs, Learning and teaching seminars to tackle the current water and agricultural situation. Targeting NGOs that will help in the afforestation of the environment.

Engineering and Operations

Aim

Minimize material waste and energy consumption during construction & operation.



Strategies

Optimising the structural system definition and service function of modules through proper channels. Using construction techniques which will be energy efficient.

Embodied Carbon

Aim

Reducing embodied carbon as much as possible.



Strategies

Using local materials for construction. Cutting transportation costs. Innovations in material design and use to reduce cooling loads and efficiently reduce waste.

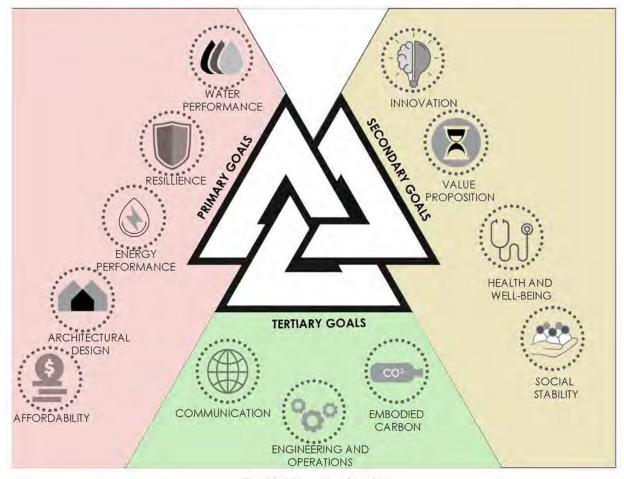


Fig. 16. Hierarchy of goals





6.9 WATER SUPPLY AND DRAINAGE LAYOUT

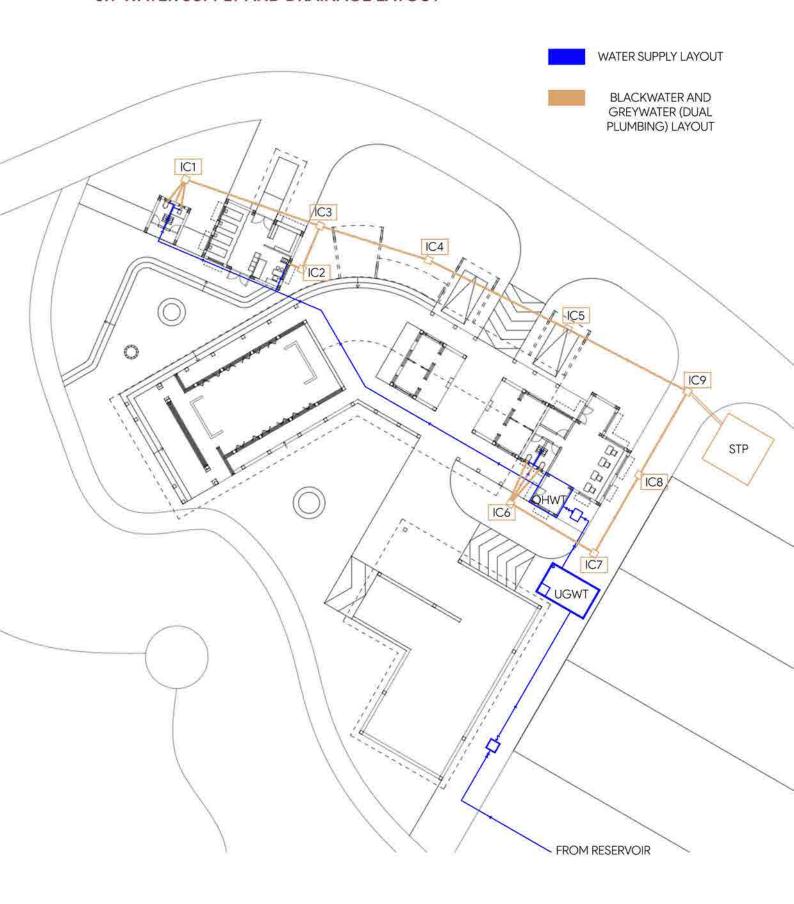


Fig. 23. Water Supply and Drainage Layout





6.10 ELECTRICAL LAYOUT

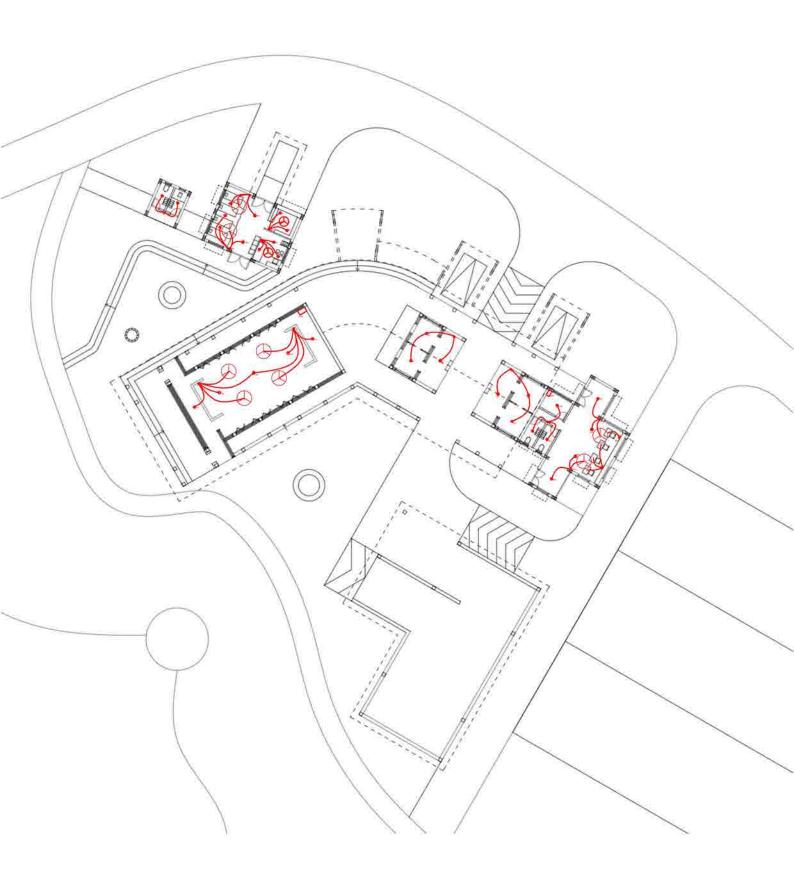
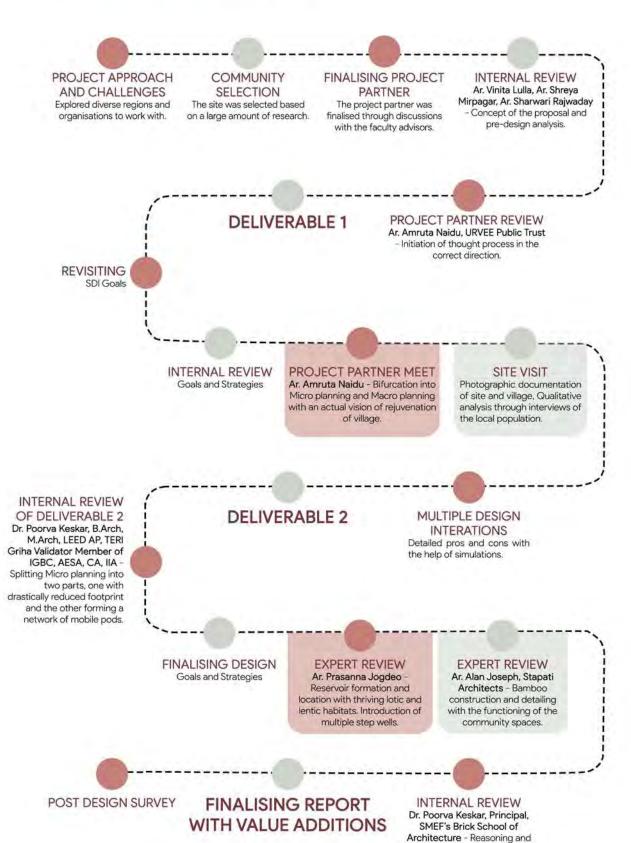


Fig. 23. Electrical Layout





6.11 DESIGN MANAGEMENT PROCESS

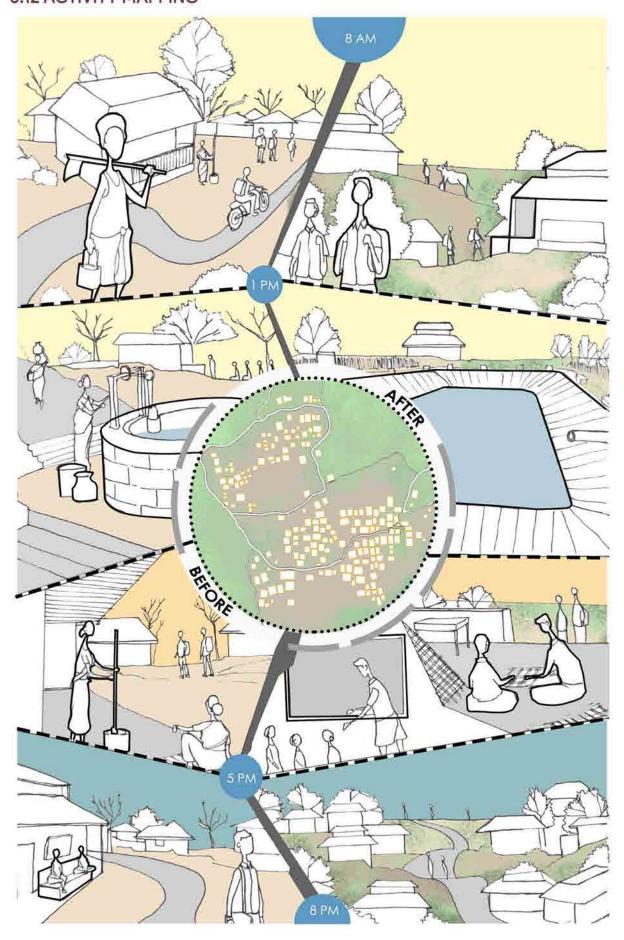




mitigation of technical problems, advice on compilation and juries.



6.12 ACTIVITY MAPPING





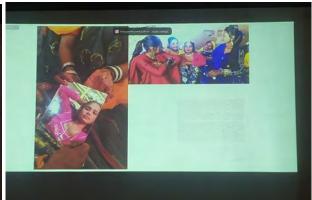


Innovation and Enrichment in teaching

The teaching included group activities which imbibed values of peer learning. It also helped address the diverse background of each student, which was respected and everyone's strengths were taken advantage of for group activities. This brought in professional ethics and human values of respecting each individual.

Guest lecture on "Community Participation" by Brick Alumnus "Ar. Shreya Kothawale", who is a part of an NGO called "Abhat" and facilitating community-led design and advocacy and contributing towards rural development activities. She talked about her experiences regarding socio economic conditions of the remote villages, the challenges faced by them and how a designer can interact with them in a constructive manner and offer sustainable solutions for living. Her input helped the students to interact well with the villagers and find out appropriate solutions.





Shreya Kothavale's online discussion session







Brick Students interacting with the villagers

Report on Community Participation:



For the Community participation, we visited the primary school in that village and took some fun activities.



The school had approximately 40-45 students from 1st-4th std. All students were from the same village. i.e., Thapewadi.



Fun activities for students

We indulged the children in fun games and activities in the play area. All students participated in the activities with full enthusiasm. Gifts were given to all the students for active participation.

Also, we had conversation with the school teacher for holding such activities for the kids.





Students introducing themselves



Photograph with School kids



Photograph with a few villagers who we interviewed

Brick Students interacting with the village children

As a subject enrichment activity, the students were suggested to visit the Gav Bhraman exhibition on March 26th and 27th, 2023. This exhibition was organized by an NGO 'Urvee' in Pune city to

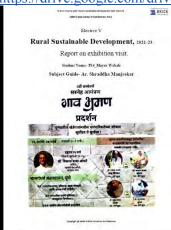


demonstrate the positive side of vernacular architecture. The exhibition aimed to raise awareness about the importance of conserving village history, traditions, local food, and festivals-their importance and lifestyles in our village, and showcased the efforts of local organizations and volunteers in preserving our community's cultural heritage.

The exhibition was a documentation of 20 villages. 40 traditional houses were documented and showcased. The main motive of this exhibition was to highlight the village lifestyle and its identity. In this exhibition, some arts and crafts were presented by the residents of the documented villages. Those crafts are one of the income sources of those villagers. In this exhibition, documented houses were presented on the panels. The design of the house, and construction techniques, materials used, passive strategies used, relation with nature. All these things were presented in one section. One section focused on historic buildings and their architectural features, while another showcased photographs and artifacts from local historical sites. There was also a section dedicated to the work of volunteers and community organizations in preserving the village's cultural heritage. Dr. Vikas Baba Amte was the chief guest of the exhibition.

The learnings from this exhibition were very well taken by the students. Following link contains the learnings of the students from Gav Bhraman Exhibition.

https://drive.google.com/drive/u/2/folders/1ers_bfxiiFQt1npB4r6nTsfbJlE6ve20







The initiative helps to improve the living standards of individuals in rural communities by providing access to essential services such as healthcare, education, and housing. Empowering rural communities through sustainable design practices can promote economic growth and encourage local entrepreneurship by collaborating with local communities, architects can help preserve cultural heritage and identity, while also respecting the environment and promoting sustainable development. This approach can create a sense of ownership and pride among community members, leading to a more resilient and self-sufficient community. The initiative made me understand that architects have a unique opportunity to play a crucial role in empowering rural communities through thoughtful design and engagement with local stakeholders.