DEVELOPING APPROPRIATE HOUSE DESIGNS FOR TRIBAL COMMUNITIES IN WAYANAD, KERALA

Department of Architecture and Planning, National Institute of Technology Calicut, Kerala

Project Team: Dr. Shyny Anilkumar, Dr. Chithra K, Dr. Deepthi Bendi

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Introduction

- Post flood damages on the housing and associated infrastructure in Kerala has called for disaster resilient eco-friendly housing reconstruction approaches.
- Govt follows conventional designs by Life mission for rebuilding efforts.
- Vulnerable sections like tribes lack technical knowledge to customize the design based on their cultural or socio economic characteristics.
- Geographically Wayanad, is one of the highly vulnerable districts in Kerala. Moreover, the districts also has the highest share in the adivasi population (about 38%).
- In the wake of the post flood damages in Wayanad, it has been realised that the future shelter redevelopment in the district, especially the housing for tribal community need to be given due consideration through evolving appropriate design solutions meeting their socio economic conditions as well as physical vulnerability.
- In this background, the current research project attempts to evolve disaster resilient sustainable housing design options customized for tribal communities, through a comprehensive participation of the community during various stages of the design process.
- The participatory design process customized for evolving appropriate housing solutions specifically for the tribal community would help to ensure community inclusion in planning and implementing housing styles appropriate to the community context.
- By executing this bottom-up approach for planning and designing housing options the tribal community would be able to acquire necessary knowledge and skills to perform the shelter construction on their own.

Aim

This research is aimed to develop a participatory design process as a standardized approach for shelter planning and design for tribal community and to develop appropriate housing options following participatory approach specifically for the tribal communities of Wayanad District

Objectives

1. To identify the critical issues and concerns of Tribal community in providing sustainable housing solutions
2. To evolve and implement a participatory planning and design process as a universal approach for shelter development in tribal areas
3. To develop disaster resilient sustainable housing solutions for the tribal community
4. To develop guidelines for cluster planning of housing units in tribal settlements

Phasing of the Project

- Phase 1- Identification of vulnerable community in need of appropriate housing solutions
- Phase 2- Documentation of indigenous housing styles of the tribal community
- Phase 3- Developing participatory design approach
- Phase 4- Executing the participatory design process to understand the socio economic status and cultural identity as well as the housing need of the community
- Phase 5- Documentation of existing housing typologies for the targeted communities
- Phase 6- Presenting the initial housing solutions satisfying the community characteristics and housing requirements
- Phase 7- Developing the final housing solutions appropriate to the community contexts minimizing the physical vulnerability

Methodology

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Methodology

Identification of vulnerable community/communities

- Literature Review
- Data collection of the demographics

With the help of Life mission & ITDP office, TEO, etc

- Investigation in the context of socio cultural attributes
- Taking stock of their current status

- Assess the vulnerability

- Field visits and discussions

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Methodology

DEVELOPING APPROPRIATE HOUSE DESIGNS FOR TRIBAL COMMUNITIES IN WAYANAD, KERALA
Criteria 1: Community characteristics

Adiya Community

- Believed to be slaves to the local landlords and had bonded labour to their families.
- They lived in groups called “kunt” and their household units were known as “kulu”.
- Most of the members worked as agricultural laborers.
- Adiyas used to live in thatched and mud walled houses with a single hall and few provisions for kitchen and living.
- There were no signs of any bathrooms or toilet usage.
- Currently the community lives in brick or laterite walled thatched, brick or laterite walled tiled, and small concrete houses.

Paniya Community

- The original inhabitants of wayanad and numerically the largest tribal community in the district (46% of the total tribal population).
- Originally labourers, and were sold as bonded labour along with plantations.
- Their huts were constructed with thatched roofs and mud plastered walls.

Criteria 2: Population distribution of tribal community

- The Major Tribes in the District are Paniyan, Kurichachan/Kurichian, Kurumans/ Mullu Kuruman/ Mulla Kuruman, Kattunayakan and Adiyan.
- Kattunaiaka, Adiya and Paniya tribes have the highest number of settlements in the district.

Block wise SC / ST Colonies and number of families

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of Block</th>
<th>No of ST colonies</th>
<th>No of families</th>
<th>ST Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vythiri</td>
<td>425</td>
<td>6846</td>
<td>29217</td>
</tr>
<tr>
<td>2</td>
<td>Mananthavady</td>
<td>614</td>
<td>10289</td>
<td>45122</td>
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<tr>
<td>3</td>
<td>Panamaram</td>
<td>550</td>
<td>8730</td>
<td>37158</td>
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<td>4</td>
<td>Sulthanbathery</td>
<td>535</td>
<td>9543</td>
<td>38434</td>
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<tr>
<td>5</td>
<td>Kalpetta</td>
<td>43</td>
<td>727</td>
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<td>District Total</td>
<td>2167</td>
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<td>152890</td>
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</tr>
</tbody>
</table>

Villages according to the proportion of ST population to the total population range

<table>
<thead>
<tr>
<th>Range of ST population</th>
<th>Location code number</th>
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<tbody>
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<td>21 – 30</td>
<td>627295</td>
<td>Payyampilly</td>
</tr>
<tr>
<td>21 – 30</td>
<td>627298</td>
<td>Periya</td>
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<tr>
<td>21 – 30</td>
<td>627299</td>
<td>Thodernad</td>
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<td>21 – 30</td>
<td>627303</td>
<td>Cherukottur</td>
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<td>21 – 30</td>
<td>627304</td>
<td>Panamaram</td>
</tr>
<tr>
<td>21 – 30</td>
<td>627305</td>
<td>Anchukunnu</td>
</tr>
<tr>
<td>31 – 40</td>
<td>627294</td>
<td>Thissilery</td>
</tr>
<tr>
<td>51 - 75</td>
<td>627293</td>
<td>Thirunelly</td>
</tr>
</tbody>
</table>

Population details of Scheduled Tribes

<table>
<thead>
<tr>
<th>State/ District / Taluk</th>
<th>% of ST Population</th>
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</thead>
<tbody>
<tr>
<td>Kerala State</td>
<td>1.5</td>
</tr>
<tr>
<td>Waynad District</td>
<td>18.5</td>
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<tr>
<td>Mananthavady Taluk</td>
<td>21.6</td>
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<td>Sulthanbathery Taluk</td>
<td>19.3</td>
</tr>
<tr>
<td>Vythiri Taluk</td>
<td>14.6</td>
</tr>
</tbody>
</table>

Facts identified:

1. Poothadi panchayat in Sulthanbathery Taluk & Thirunelli Panchayat in Mananthavady Taluk have highest number of tribal settlements belonging to Kattunaika community. (77 settlements in Poothadi and 71 in Thirunelli)

2. Panamaram village in Mananthavady Taluk has the highest number (126 settlements) of Paniya community colonies followed by Noolpuzha village (112 settlements) in Sulthanbathery Taluk

3. Thirunelli and Mananthavady village panchayaths as well as Padinjarethara in Vythiri Taluk is found to be having higher number of Adiya Tribal colonies when compared to other villages in various taluks. (75,55 and 60 settlements respectively)

Criteria 3: Impact due to the flooding and landslide 2018

- Study conducted by IIA → houses with area under 500 sq. ft was most affected , mostly owned by the tribal people.
- 50% of the flood affected houses were recently built ones.
- Panamaram and Mananthavady-highest number of Kachcha houses, mostly in flood plain which makes them highly prone to floods.

- Panamaram village → highest number of flood affected residential as well as institutional and public buildings.
- Most of the affected buildings are within the flood plain zone.

No of affected buildings in various Panchayaths

<table>
<thead>
<tr>
<th>LSGD</th>
<th>Commercial</th>
<th>Institutional</th>
<th>Public</th>
<th>Residential</th>
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<td>Edavaka</td>
<td>18</td>
<td>2</td>
<td>4</td>
<td>408</td>
</tr>
<tr>
<td>Kalpetta</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>524</td>
</tr>
<tr>
<td>Kaniyambetta</td>
<td>2</td>
<td></td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Kottathara</td>
<td>41</td>
<td>4</td>
<td>11</td>
<td>380</td>
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<td>Mananthavady</td>
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<td>16</td>
<td>799</td>
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<tr>
<td>Meenangadi</td>
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<td></td>
</tr>
<tr>
<td>Meppadi</td>
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<td></td>
</tr>
<tr>
<td>Mullankolli</td>
<td>1</td>
<td></td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>Muttil</td>
<td>1</td>
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<td>178</td>
<td></td>
</tr>
<tr>
<td>Nemmeni</td>
<td>8</td>
<td></td>
<td>49</td>
<td></td>
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<tr>
<td>Noolpuzha</td>
<td>8</td>
<td></td>
<td>343</td>
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<tr>
<td>Padinjarethara</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>343</td>
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<tr>
<td>Panamaram</td>
<td>25</td>
<td>10</td>
<td>16</td>
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<tr>
<td>Poothadi</td>
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<tr>
<td>Pozhuthana</td>
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<td>5</td>
<td>201</td>
<td></td>
</tr>
<tr>
<td>Pulpally</td>
<td>2</td>
<td></td>
<td>34</td>
<td></td>
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<tr>
<td>Sulthanbathery</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Tharayod</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>232</td>
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<tr>
<td>Thavijal</td>
<td>4</td>
<td>1</td>
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<td>296</td>
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<tr>
<td>Thirunelli</td>
<td>2</td>
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<td>Thodernadu</td>
<td>1</td>
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<tr>
<td>Vellamunda</td>
<td>5</td>
<td>2</td>
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<tr>
<td>Vengappalli</td>
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<td>2</td>
<td>7</td>
<td>170</td>
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<tr>
<td>Vythiri</td>
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<td>3</td>
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<tr>
<td>Total</td>
<td>170</td>
<td>36</td>
<td>82</td>
<td>5672</td>
</tr>
</tbody>
</table>

Source: District Census Handbook, 2011

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Phase II: Documentation of indigenous housing styles of the tribal community

General Layout

- **Raised Verandah**
  - Most of the day time is spend here.
  - Place of all mainstream household activities

- **Small Door**
  - Not used as an access way.
  - Used mostly as a window opening
  - It is also used to monitor the movement of wild animals and to get inside the house immediately in case of an attack.

- **Kitchen**
  - Kitchen is made outside of the house in such a way that it is easily accessible from the main housing unit
  - They have a unique attic which is built on top of the walls
  - These are used for storing farm products and other household items.

Materials and methods of construction

**Materials**

- Locally available materials like blackwood, bamboo, soil, valavari grass, wild twigs, rice straw, reeds, etc. are used for the construction.
- A special type of bamboo known locally as “kalandula” is used for walls and roof frames. This bamboo is larger in diameter and is denser.
- They are cut in the right time (“pakkam”), and then soaked in water for a month for seasoning.
- Naturally available colors from soil, leaves, firewood, clay, etc. were used for coloring.

**Methods**

- **Bricks**
  - Bricks are locally made from clay using wooden moulds
  - The walls are usually 20-25 cm thick, which helps in load bearing.
  - The walls are left to dry before roof construction.
  - The walls are then plastered, which is very important as it protects the mud walls from direct exposures to atmospheric changes.
  - The walls are also naturally colored and decorated using hand patterns.

- **Roof**
  - Roof is constructed using bamboo.
  - The ridges, rafters and purlins all are made from bamboo.
  - The roof is then thatched using rice straw, mountain grass, coconut leaves, ragi husk, etc. according to the availability.
  - These days the roof structure is covered using tarpaulin.

- **Foundation**
  - Foundation is created above Earth surface in two layers to avoid erosion.
  - The lower layer is 20-30 cm high and is beaten up thoroughly and compacted.
  - Upper layer is also made similarly by beating mud for a height of 60 cm.
  - Walls are built load bearing using sun dried bricks, mud mortar as well as a cob.

- **Floor**
  - Floors are also plastered using cow dung, rice husk ash and sand in 3 to 4 layers
  - Doors are made by weaving split bamboo pieces across frames made of bamboo.

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**Phase II: Documentation of indigenous housing styles of the tribal community**

**Swaminathan foundation housing project**
- The M.S. Swaminathan Research Foundation has built some houses post flood in the year 2007, in the Kairali tribal colony of muppainad panchayath.
- The houses, each of 357 sq ft area, were constructed at a cost of Rs.4.24 lakh.
- Locally available mud was the major material used in the construction.
- These houses were built based on sustainable housing concept.
- Rammed earth construction technology was used for the basement and foundation and cob construction for the walls.
- Hard wood was used for the construction of windows and doors.
- Matured coconut palms were used as rap tors.
- The houses were plastered with different colour mud available in the area.
- Its roofing frame was done using wood and was covered using manglore tiles.
- Local people were trained for the same and was involved in the construction of these houses.

**Issues**
- These houses are an example that proves that mud housing is not a sustainable solution for housing.
- This is mainly due to the fact that mud gets easily disintegrated when exposed to continuous rain and other atmospheric changes.
- Also the knowledge transfer of these type of housing is very difficult and is almost impossible since the new generation prefers to educate themselves and get more secure jobs.
- Maintaining these houses is also a tedious task, which is not possible because of lesser time available to the working age people in the house.
- The houses are already deteriorating with sagging roofs, disintegrating plaster, cracks, etc.

**Sustainability aspects of traditional tribal housing**
- Use of locally available materials and local skills for the construction of traditional houses makes it sustainable.
- Limited use of main housing unit (i.e only for sleeping and storage), results in very low usage of energy.
- Thick mud walls of these houses regulate the temperature within the house and always keeps it in a moderate level.
- Thick walls and lesser openings also protects the interior walls from direct exposure to atmospheric conditions.
- The roof is also made in such an angle that rain is kept away from the walls.

**Critical concerns of traditional Tribal housing**
- Raw materials used( soil and clay) becomes highly vulnerable when exposed to water.
- Mud has low tensile strength and develops cracks easily.
- Compressive strength of the wall reduces with time thus affecting strength and stability of the super structure.
- Roof materials also becomes highly vulnerable after exposure to rain.
- Walls are damp due to soaking of water.
- There are moulds on the walls due to moisture which affects the health of the dwellers and also the aesthetic beauty of the house.
- Moreover these houses require regular up-keeping and maintenance.
- Lesser number of openings result in inadequate air circulation and lighting.
- In short it is realised during the study that the tribal community generally aspire to live in housing units made of modern building materials mainly due to disadvantages as highlighted.

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Phase III: Developing participatory design approach

Definition
“process by which people are enabled to become actively and genuinely involved in defining the issues of concern to them, in making decisions about factors that affect their lives, in formulating and implementing policies, in planning, developing and delivering services and in taking action to achieve change” (WHO, 2002)

Steps for implementing
• assessment of current social, economical and environmental reality.
• determination of community needs through close consultation.
• audit of available resources, skills and capacities.
• identifications issues and concerns.

Methodology
• Semi structured interviews
• Household survey using Structured questionnaire
• Community Group Presentations
• Consultation with Community liaison groups

Stage I: Key informant consultation

Form Community Coalition
Problem Identification
Understanding Community Profile

Their adaptability to new circumstances
Transect walks
To observe/listen & identify critical settlement conditions and ask relevant questions to identify solutions
Different kinds of activities carried out and Spatial connotation of their social activities
Community Activity chart

Participatory Appraisal
Village mapping

Stage II: Consultation with Household through structured questionnaire survey

Mapping the preferences & aspirations on future housing
Preference Analysis
Household Survey
Daily Activity Analysis
Socio, economic information for design
Current Condition Building Materials Methods of construction
Acceptability & Satisfaction
Mapping of Housing Condition
Housing Typologies, Their spatial organisation and adequacy
Mapping the pattern of activities carried out in one day and its Spatial connotation

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Mapping of Housing Condition
Housing Typologies, Their spatial organisation and adequacy
Mapping the pattern of activities carried out in one day and its Spatial connotation

• Local resources available
• Community preference on materials and methods
• Preference on mode of construction

• Inventory of Resources

• Adaptable to the current housing style
• Acceptability of modern materials and methods
• Appraisal of proposed housing

Feedback

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Phase IV: Executing the participatory design process

Initial site exploration

Observations: Transect walk

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Phase IV: Executing the participatory design process

Observations: Transect walk

Housing pattern | Extensions | Incomplete construction

- Housing pattern
- Repairs & Maintenance
- Kitchen spaces & Utility
- Damages

Change in lifestyle

Initial site exploration

Incomplete construction

- Change in lifestyle
Phase IV: Executing the participatory design process

Adiya Community (Chaligadha Tribal Settlement, Mananthavadi)

- Settlement falls under village Payyampally, near Mananthavadi Taluk, in Wayanad district.
- The settlement is more than 80 years old and has a current population of 197 people in 52 families in 43 houses.
- Average household size of the settlement is 5.
- Majority of the members are engaged in agricultural labour in nearby farms and fields.
- Majority of the houses in the settlement are semi-Pucca houses.
- Nearest Anganwadi is 1.5 km away, School is 2.5 km away, and the nearest college is at Mananthavady which is 12 km away.
- Nearest PHC is 2.5 km away (Kurukkanmoola) and the nearest Taluk Hospital is 12 km away (Mananthavady).
- The community has two public wells which act as their source of drinking source.
- There are no community facilities such as community meeting place, playground available.
- Unlike most of the other tribal settlement, there is no temple or any religious buildings found in the settlements.
- The settlement is easily accessible from the Chaligadha – Kuruvadweep road.
- The location is highly vulnerable to flooding or low lying inundation.

Site plan of the settlement and general features

- Payyampally Village Mananthavadi Taluk
- Walking distance (800m) from Chaligadha – Kuruvadweep road.
- More than 80 years of existence

Stage 1: Key Informant consultation

- Agricultural labourers
- Average HH size - 5
- Domestication of animals Cow & hen

Housing Typology Trend

- Change in lifestyle
  - Agricultural labourers → Farmers
  - Recognized the importance of education
  - Conscious about health – Regular vaccination & Hospital visits
  - Katcha House → Pucca House
  - No religious spaces within the community
  - Open to Change

PANIYA TRIBAL COMMUNITY - Basthipoyil Panamaram

- Payyampally Village, Mananthavadi Taluk
- More than 80 years of existence

Infrastructure Availability

- Water Supply – three community well Jalanidhi water supply connection available
- All houses are electrified
- No Playground/ play area within community
- Aganwadi – Kolathara settlement – 1 km away
- School – 1 to 4 – Alternative school @ kolathara 5 to 8 – UP School 3 km away (Gotrasaradhi available)
- High School – Panamaram 5 km away
- College – Mananthavady – 10 km away

Spatial attribution of Activities

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Phase IV: Executing the participatory design process
Stage 1: Key Informant consultation

Kattunaika Community (Vattapady Tribal Settlement, Sulthan Bathery)

Traditional Techniques

- The community is located in a small village called Irulam, 3km from mananthavady town.
- There are sacred groves in the centre / origin of the community.
- The settlement is distributed in the radial pattern.
- There are 25 houses in the colony.
- They also have a community centre at the origin of the settlement.
- The approach to the settlement is by a narrow road that I approximately 2.2m wide which is paved using interlocking tiles.
- The inner roads are unpaved and unfinished.
- Individual units are approached by muddy footpaths varying in size.
- There are mainly three shrines, and two are situated deep with the forest.
- There is no well defined pattern of houses due to the terrain.
- Most of them does not have a patta to their land, but has a right to possess the land.
- Main cultivation of the community is coffee.
- For room partitions and openings temporary materials.
- Used for temporary solutions
- Additional living spaces
- Storage of wood or other goods
- Community prefer large open spaces which act as living space during day

Common spaces

- The road to the settlement is paved with interlocking tiles.
- Inner roads are incomplete cement roads.
- The roads to the homes are muddy roads.
- The community is located in a small village called Irulam, 3km from mananthavady town.
- The settlement is distributed in the radial pattern.
- There are sacred groves in the centre / origin of the community.
- They also have a community centre at the origin of the settlement.
- The approach to the settlement is by a narrow road that is approximately 2.2m wide which is paved using interlocking tiles.
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- There is no well defined pattern of houses due to the terrain.
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- Main cultivation of the community is coffee.
- For room partitions and openings temporary materials.

Community Centre Seating in front of the community centre Sacred grove

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Phase IV: Executing the participatory design process

Stage 2: Consultation with Household through structured questionnaire survey

Adiya Community at Challigadha, Payyampalli Village

Housing Characteristics

- **Household Size Distribution**
  - Household size: 1, 2, 3, 4, 5, 6, 7
  - Distribution: 0, 1, 2, 3, 4, 5, 6, 7

- **Length of Occupancy**
  - 0 to 25 Years: 54%
  - 25 to 50 Years: 23%
  - 50 to 75 Years: 8%
  - > 75 Years: 15%

- **Level of completion of house**
  - Complete: 52%
  - Incomplete: 48%

- **Type of the house**
  - Kachcha: 18%
  - Pucca: 41%
  - Semi-Pucca: 41%

- **Family composition**
  - Aged couple living alone (age > 55 years)/Couples beyond reproductive age: 8
  - Couples with children in the age group of 0 to 6: 3
  - Couples with School going children (age 7 - 15): 1
  - Couples with mature children: 5

**HIGHLIGHTS**

- 71% of the community have a household size ranging from 4 to 6.
- Length of occupancy of more than 50% of the families is greater than 75 years.
- Average daily income per person in the community is Rs. 375.
- Higher percentage of the family with growing or matured children

**DEVELOPING APPROPRIATE HOUSE DESIGNS FOR TRIBAL COMMUNITIES IN WAYANAD, KERALA**

**Project Team:**
- Dr. Shyny Anilkumar
- Dr. Chithra K
- Dr. Deepthi Bendi

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• More than 70% of the houses have their walls, floor, roof and foundation made with modern construction materials like laterite, cement, RCC and Granite.
• The community has an open drainage facility
• The community as a whole faces shortage in water supply.
• Drinking water is available from a well which is more than 100m away.
• The community has adequate supply of electricity, and 88% reported adequate lighting and ventilation too.
• 76% of the dwellers reported that they have an adequate open space.
• There is no deity worshipping in any of the houses in this community.
• 94.2% of the people surveyed does not own a vehicle.
• 31% of the people reported low privacy levels in their home.

Details of basic amenities

- Lighting and ventilation
  - Adequate: 6%
  - Inadequate: 94%

- Availability of adequate open space
  - Adequate: 69%
  - Inadequate: 31%

- Level of privacy
  - High: 29%
  - Moderate: 24%
  - Low: 35%

- Nature of Contract of construction
  - Fully owner driven: 12%
  - Owner driven through contractor: 29%
  - Agency driven: 59%

- Housing Schemes availed
  - EMS: 53%
  - Panchayat Scheme: 12%
  - Tribal Housing Scheme: 35%

• 88% reported adequate lighting and ventilation too.
• 76% of the dwellers reported that they have an adequate open space.
• There is no deity worshipping in any of the houses in this community.
• 94.2% of the people surveyed does not own a vehicle.
• 31% of the people reported low privacy levels in their home.

Material used in construction

- Floor
  - Cement: 76%
  - Red Oxide: 18%
  - Black Oxide: 6%

- Roof
  - RCC: 82%
  - Sheets/ RCC: 18%

- Foundation
  - Granite: 71%
  - Laterite: 29%

- Walls
  - Laterite: 76%
  - Brick: 24%
Kattunaikka Community, Vattappadi Settlement, Poothadi Village

**Socio Economic Characteristics**

- 46% of the community have a household size of 6.
- Length of occupancy of more than 50% of the families is greater than 75 years.
- Average daily income per person in the community is Rs. 400
- All the houses surveyed were pucca houses
- The houses were all completely constructed.
- Everyone surveyed owns the house they live
- Average no of rooms: 3.5
- Average size of housing unit: 640 sq. ft
- Average size of plot: 33.5 cents
- All the houses surveyed were having tap water facility, and 89% had drinking water available within the house.
- 97% of the interviewees reported a shortage in water supply.
- 67% of the people have toilet outside of their housing unit.
- The houses were all equipped with pour flush system in toilets.
- The community is having an open drainage system.
- All the houses were reported as having adequate lighting and ventilation.

**Family composition**

<table>
<thead>
<tr>
<th>Aged couple living alone (age &gt; 55 years) / Couples beyond reproductive age</th>
<th>Coupes with children in the age group of 0 to 6</th>
<th>Couples with School going children (age 7 - 15)</th>
<th>Couples with mature Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

**Phase IV: Executing the participatory design process**

Stage 2: Consultation with Household through structured questionnaire survey

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**Phase IV: Executing the participatory design process**

**Stage 2: Consultation with Household through structured questionnaire survey**

**Paniya Community at Basthipoyil and Kolathara Settlement, Panamaram**

### Socio Economic Characteristics

**HIGHLIGHTS**

- 52% of the community have a household size ranging from 2 to 3.
- 30.43% of the community have a household size ranging from 5 to 6.
- Length of occupancy of 41% of the families is between 25 and 50 years.
- Average daily income per person in the community is Rs. 340.
- 22% of the houses are still Kachcha and 13% of the families live in hut.
- More than half of the community own land, and 56% of the dwellers own their house (i.e., not along with the family).
- 66% of the land owners possess a patta to their property.
- Construction of more than half of the houses are still incomplete.

### Housing Characteristics

#### Household size Distribution

- 52% of the community have a household size ranging from 2 to 3.
- 30.43% of the community have a household size ranging from 5 to 6.
- Length of occupancy of 41% of the families is between 25 and 50 years.

#### Type of the house

- Kachcha: 13%
- Pucca: 22%
- Semi-Pucca: 30%
- Hut: 35%

### Housing Characteristics

- Phase IV: Executing the participatory design process

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**DEVELOPING APPROPRIATE HOUSE DESIGNS FOR TRIBAL COMMUNITIES IN WAYANAD, KERALA**
The community has an open drainage facility.
Only 17% of the households have drinking water availability within house, while 48% of them have to travel more than 100m for drinking water.
Most of the dwellers depend on well water and tap water and less than 10% of them use hand pump.
70% of the households have toilet outside their house.
62% of them use pour flush system.
More than half of the interviewees reported adequate lighting and ventilation.
There is no proper solid waste management system.
74% have adequate electric supply.
39% have complaints on privacy in their home.
70% of the houses have provisions for alterations or expansion of the current unit.
78% reported of not having a deity or divine place in their premise or house.
In this community, 20% of the houses are constructed using mud.
52% of the houses have mud flooring, while 26% of them have foundation made with mud.
Even though majority of the houses have RCC or tiles for roofing, 14% are still thatched roofs.
Majority houses have cement frames for doors and PVC panels, while majority houses have wooden windows.

**Material used in construction**

- **Mode of construction**
  - Fully owner driven: 13%
  - Owner driven through contractor: 14%
  - Agency driven: 73%

- **Housing Schemes availed**
  - VKY: 2%
  - Block Panchayat Scheme: 13%
  - NGO: 40%
  - IAY: 45%

- **Roof**
  - RCC: 38%
  - Sheets: 43%
  - Thatch: 5%
  - Tile: 2%

- **Windows**
  - Aluminium: 9%
  - Bamboo: 4%
  - Cement: 26%
  - Cement/Aluminum: 9%
  - Cement/wood: 4%
  - Metal: 4%
  - Sheets: 4%
  - Wood: 35%

- **Walls**
  - Laterite: 35%
  - Brick: 5%
  - Mud: 20%
  - Bamboo: 5%
  - Sheet: 35%

- **Floor**
  - Cement: 52%
  - Mud: 26%
  - Tile: 22%

- **Doors**
  - Cement/PVC: 7%
  - Bamboo: 4%
  - Wood: 3%
  - Others: 7%
  - Cement/wood: 32%

- **Foundation**
  - Granite: 13%
  - Laterite: 62%
  - Mud: 26%
Phase V: Documentation of existing housing typologies of the targeted communities

Adiya Community (Chaligadha Tribal Settlement, Mananthavadi)

**Housing Pattern**
- There are 52 households settled in 43 housing unit.
- Most of the houses are pucca or semi pucca in nature, but incomplete in many respects.
- It consists of two halls, one bedroom, kitchen and toilet.
- Toilet is accessed from outside the housing unit.

**Housing Schemes availed**

<table>
<thead>
<tr>
<th>Scheme</th>
<th>2006-07</th>
<th>2013</th>
<th>2016</th>
<th>2007-08</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMS</td>
<td>29%</td>
<td>24%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panchayat Scheme</td>
<td></td>
<td></td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Tribal Housing</td>
<td></td>
<td></td>
<td></td>
<td>25%</td>
</tr>
<tr>
<td>IAY</td>
<td>12%</td>
<td>17%</td>
<td>8%</td>
<td>25%</td>
</tr>
</tbody>
</table>

**Flood in 2018 & 2019**
- 4 houses damaged in 2018
  - Kabani – changed course
- 17 houses damaged in 2019
  - Eight - Inhabitable

Kattunaika Community (Vattapady Tribal Settlement, Sulthan Bathery)

**Housing Pattern**
- There are 25 houses in the community. Many are built in the year 2014 – 15.
- The house units are basically pragmatic design.
- In design they provided ample space to sit outside
- Very few openings are provided.
- Majority of the houses have two rooms in addition to a living room and a kitchen.

**Housing Schemes availed**

<table>
<thead>
<tr>
<th>Scheme</th>
<th>2008</th>
<th>2012-13</th>
<th>2010-14</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tribal Housing</td>
<td>25%</td>
<td></td>
<td></td>
<td>25%</td>
</tr>
<tr>
<td>PVTG</td>
<td></td>
<td>17%</td>
<td></td>
<td>8%</td>
</tr>
<tr>
<td>HUDCO</td>
<td></td>
<td></td>
<td></td>
<td>17%</td>
</tr>
<tr>
<td>IAY</td>
<td>35%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pattern Of Housing**
- Incomplete/Unplastered walls
- House in poor condition
- House under construction

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Phase V: Documentation of existing housing typologies of the targeted communities

**Paniya Community (Basthipoyil and Kolathara Tribal Settlement )**

**Housing Pattern**
- The settlement is more than 80 years old
- There are 71 Household in 43 units
- Most of the houses are with two bedroom and hall as well as kitchen.
- Toilet is attached to the housing unit, but with access from outside.

**General Issues and concerns on Housing Schemes**
- Housing units constructed under various schemes are observed to be of short life, due to poor quality of construction.
- There is no centralized mechanism to implement the housing schemes available at various levels of govt and by other departments.
- Certain housing schemes have very strict rules that limit the area of construction and restrict any future expansion.
- Programmes like projects from Nirmithi Kendra directly go for implementation of the projects.
- Increase in the financial assistance in these schemes are not proportional to the increase in the cost of construction.
- Stringent conditions

- Many of these dwellers do not have a proper Patta for their land which makes it difficult for the processing of schemes
- Even though many schemes are available their implementation is mostly irregular due to various political interplays.
- For certain schemes, construction of the house has to reach a particular stage before the availing next installment.
- This is troublesome for most of the beneficiaries since most of them unable to bear the seed money.
- This results in incomplete houses being constructed.
- Community’s lack of knowledge, awareness and empowerment also results in the failure of most of the schemes.
Phase VI: Presenting the initial housing solutions satisfying the community characteristics and housing requirements

Stage 3: Community consultation and appraisal

Vattappady settlement (Kattunaika)

Basthipoyil settlement (Paniya)

Chaligadha settlement (Adiya)

Feedback
Elicited opinion on the following

1. Whether the community has adapted to the new housing style with modern materials and methods
   → Yes, the community have adapted to the new construction methods and built environment, and are fine with using modern materials.

2. Whether the community is satisfied with the spatial organisations in the current housing typologies
   → Yes, the community is satisfied with the new proposed spatial organisations and housing typologies.

3. Whether do they prefer more number of small size rooms or min number of spacious rooms
   → They prefer spacious rooms even though they are less in number.

4. Whether do they prefer dedicated space in the housing unit for worship
   → Most of them did not prefer a dedicated space except some female interviewees in Paniya community and Adiya community.

5. Willingness to get involved in the housing construction
   → They are willing to participate in construction work, if given proper training, but they prefer to give the works to a trusted agency even more.

6. Local resources available and community preference on building materials
   → Burnt mud blocks are available at a nearby site called Panamaram.

DEVELOPING APPROPRIATE HOUSE DESIGNS FOR TRIBAL COMMUNITIES IN WAYANAD, KERALA

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UNDP
Conditional Grants
Wayanad, Kerala

Dr. Shyni Anilkumar
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Phase VII: Developing the final housing solutions appropriate to the community contexts minimizing the physical vulnerability

Household Composition

The present life style

Daily activity pattern

Current Housing Pattern

Existing topography of the settlement

Aspirations

External Conditions

Potential factors

Design Philosophy

- Housing Typology based on basic family composition
- The design must ensure healthy living environment by providing potable water, adequate sanitary facilities and cooking facilities within the housing unit.
- The establishment of habitable, stable and socially and culturally adaptable residential environment.
- Permanent residential structures ensuring internal and external privacy and adequate safety.
- Scope for incremental development
- Disaster Resilient design and construction

Category of Households

- Single Persons / aged couple
- Parents + Adolescent Boy- Boys more than 15 years of age / Adolescent Girl -girls more than 12 years of age

Service / Utility Core Unit

- Sit out + Kitchen + Toilet cum bathroom

General features of the proposed housing units

Every proposed unit basically has a Service core unit, consisting of a kitchen, bathroom and a sit out.

The size of the main hall room is adjusted in each unit type, according to the size of the household that was considered.

The hall can be converted to another bedroom or a study room according to the changes in purpose by providing a screen or even a wall.

The whole structure is constructed in an incremental manner so that in future expansions or alterations can be made.

The space under the staircase can be used as a storage space in case of rain.

The bathroom is provided along with the unit but with an entrance from outside.

Housing typologies proposed

<table>
<thead>
<tr>
<th>Type</th>
<th>Type of Family</th>
<th>Facilities</th>
<th>Plinth Area (Sq. Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Single Person/Aged couple beyond reproductive age without children</td>
<td>S C U + Multipurpose Hall</td>
<td>345-395</td>
</tr>
<tr>
<td>B</td>
<td>Parents + Children less than 6 years of age</td>
<td>S C U + 2BR + Hall</td>
<td>395-489</td>
</tr>
<tr>
<td>C</td>
<td>Parents + School going Children</td>
<td>S C U + 2BR + Hall</td>
<td>395-489</td>
</tr>
<tr>
<td>D</td>
<td>Parents + Adolescent Children / ( Married Son / daughter)</td>
<td>S C U + 2BR + Hall</td>
<td>395-489</td>
</tr>
</tbody>
</table>

Material palette for normal housing units

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Item</th>
<th>Material used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foundation</td>
<td>Normal rubble masonry</td>
</tr>
<tr>
<td>2</td>
<td>Walls</td>
<td>Interlocking mud blocks</td>
</tr>
<tr>
<td>3</td>
<td>Plastering</td>
<td>Cement mortar</td>
</tr>
<tr>
<td>4</td>
<td>Door frame</td>
<td>Concrete /wood</td>
</tr>
<tr>
<td>5</td>
<td>Door shutter</td>
<td>Pressed wood / wood</td>
</tr>
<tr>
<td>6</td>
<td>Window frame</td>
<td>Concrete</td>
</tr>
<tr>
<td>7</td>
<td>Window panel</td>
<td>Glazed glass</td>
</tr>
<tr>
<td>8</td>
<td>Roof</td>
<td>RCC slab</td>
</tr>
<tr>
<td>9</td>
<td>Staircase</td>
<td>RCC</td>
</tr>
</tbody>
</table>

Material palette for flood resilient housing unit (Ground floor)

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Item</th>
<th>Material used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foundation</td>
<td>Normal rubble masonry</td>
</tr>
<tr>
<td>2</td>
<td>Walls</td>
<td>Cement blocks</td>
</tr>
<tr>
<td>3</td>
<td>Plastering</td>
<td>Cement mortar</td>
</tr>
<tr>
<td>4</td>
<td>Door frame</td>
<td>Wood</td>
</tr>
<tr>
<td>5</td>
<td>Door shutter</td>
<td>Pressed wood</td>
</tr>
<tr>
<td>6</td>
<td>Window frame</td>
<td>Aluminium</td>
</tr>
<tr>
<td>7</td>
<td>Window panel</td>
<td>Glazed glass</td>
</tr>
<tr>
<td>8</td>
<td>Staircase</td>
<td>Steel</td>
</tr>
<tr>
<td>9</td>
<td>Stilts</td>
<td>Concrete</td>
</tr>
</tbody>
</table>

Material palette for flood resilient housing unit (First floor)

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Item</th>
<th>Material used</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Walls</td>
<td>Cement fiber boards/ V Panels</td>
</tr>
<tr>
<td>3</td>
<td>Plastering</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>Door frame</td>
<td>Wood</td>
</tr>
<tr>
<td>5</td>
<td>Door shutter</td>
<td>Pressed wood</td>
</tr>
<tr>
<td>6</td>
<td>Window frame</td>
<td>Aluminium</td>
</tr>
<tr>
<td>7</td>
<td>Window panel</td>
<td>Glazed glass</td>
</tr>
<tr>
<td>8</td>
<td>Roof frame</td>
<td>Steel truss</td>
</tr>
<tr>
<td>9</td>
<td>Roof covering</td>
<td>Mangalore tiles</td>
</tr>
</tbody>
</table>

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DEVELOPING APPROPRIATE HOUSE DESIGNS FOR TRIBAL COMMUNITIES IN WAYANAD, KERALA

Final housing design

Flood resilient Basic unit I

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Final housing design

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The tribal community generally prefers to settle as self-contained groups along with their family or relatives. They also found to be highly bonded each other socially and culturally. Hence the settlement pattern must be promoting their community living as well as must be socially and culturally adaptable. The following sections highlight the approaches for planning settlements for tribal community followed by guidelines for flood resilient planning.

**Type of Housing Cluster**

- A cluster is defined as Plots or dwelling units or housing grouped around an open space.
- Ideally housing cluster should not be very large. In ground and one storeyed structures not more than 20 houses should be grouped in a cluster. Clusters with more dwelling units will create problems in identity, encroachments and of maintenance.
- By considering the distinct socio-cultural characteristics of tribal community the study proposes “Interlocking Cluster” as an appropriate housing cluster as shown in figure below.
- Interlocking clusters are formed when the dwelling units are joined at back and on sides with at least one side of a cluster common and having some dwelling units opening onto or having access from the adjacent clusters will be considered as interlocking clusters. Dwelling units in such clusters should have at least two sides open to external open space. Houses in an interlocking cluster can have access, ventilation and light from the adjacent and cluster and also cater for future growth of the settlement.

![Typical cluster planning](image)

**Guidelines for siting housing in flood prone areas**

Kerala being a multi hazard prone state the infrastructure reconstruction must incorporate standards and design provisions, stipulated by various international and as well as national agencies for siting and design and construction of buildings and structures. However, in the wake of largescale damage due to flooding, housing in the flood prone areas need to be constructed following the flood resistant design provision as per the code for Flood Resistant Design and Construction, as well as National Disaster Management Guidelines-Management of Floods by National Disaster Management Authority, India. New construction and substantial improvements shall be designed and constructed, to resist flotation, collapse, or permanent lateral movement resulting from the action of hydrostatic, hydrodynamic, wind, and other loads during design flood. The basic approaches and guidelines for settlement planning in flood prone areas have been explained below.

**Dry flood proofing**

- Dry flood proofing is advised for the houses where depths of inundation is potentially high.
- Dry flood proofing uses levees, door seals and walls to stop water from entering the house as given in above figure. This can be achieved by raising the house on earthen fill or embankments as shown in the figure above.
- Fill can be shaped to optimise the flow of floodwater around the building. In either case, earthworks or fill and the house building shape should be planned to divert floodwater away from buildings. ASCE 24 limits dry flood proofing to areas where flood velocities are less than or equal to 5 feet per second.

**Building Siting and Orientation**

- Orientating the house across the flow can reduce the clearance between houses, which increases the local velocity around the house. Hence orientating the house as the shorter wall faces the water flow.
- It is always ideal to build houses according to the natural topography of the plot. It is also advised to streamline the corners, as these are likely to be mostly damaged due to impact of debris and turbulence.
- If the length of the house is more in one direction, then the house should be oriented in such a way that the shorter wall faces the direction of flow to minimize the damage.
- New houses should be constructed in such a manner that evacuation route is clear. Access roads to settlements should be designed in such a way that evacuation in case of flood events is easy.
- The houses should not be constructed along the path of drainage of flood water. In an area which is likely to be hit by floods, the land-use planning regulations should clearly define at what distance from riverbeds would it be safe to locate the settlement. The figure above explains the best possible ways of building orientation in flood prone areas.

**Layout of buildings**

The layout of buildings in the settlement should be in such a way that, there is adequate spacing between the buildings. This is to ensure that the velocity of the water flowing between the buildings does not increase and thus cause more damage to the buildings. It is most ideal to construct square shaped buildings as they are proved to be more stable. It is ideal to construct circle shaped structures or houses with their sides inclined to the flow of water thus to reduce the damage due to flow of water.