Case 2: Residential Hut for salt farmer

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Introduction:

Traditionally, salt farmers have to work and spend most of their life in agar (salt farms) only, they make small makeshift huts to sleep, keep some of their luggage and to set their local kitchen, the education facilities are not available for the children.There is a shortage of drinking water and basic facilities. The main focus initially was understanding the lives of the salt farmers, including socio economic demographics and focussing on their tradition, culture and constraints and living to formulate further what can be done to improve their standards of living.

Design Process

SALT FARMER'S HUT

PROJECT SELECTION

STEP 01

Team decided to work on the project as it addressed the unmet need of one of the most disadvantaged community known as 'Agariyas'.

LITERATURE REVIEW

STEP 02

Preliminary literature review was conducted to Study the community and their challenges through web articles and reports.

INTERVIEW AND DISCUSSION

STEP 03

To understand the community and their place more deeply interview and discussion were conducted on a call with farmers and students of past projects.

PROBLEM IDENTIFICATION

STEP 04

After Interviewing and Preliminary Mindmaping problem statement was concievd .

PRIOR ART SEARCH

STEP 05

Extensive search was conducted on the existing solutions and scope of improvement and innovation was identified.

MINDMAPPING AND IDIEATION

STEP 06

Extensive mindmapping was done to map all the parameters and aspects concerning the problem

SITE AND MATERIAL ANALYSIS

STEP 07

Site context and Usable Materials were analysed keeping in mind the aspects of affordability, availability, climatic needs and safety parameters.

CONCEPT SKETCHING AND PHYSICAL MODEL

STEP 08

FEEDBACK AND VALIDATION

STEP 09

Feedback and Suggestion from users and Mentors were Seeked and workability of Ideas was validated.

ITERATION AND APPROPRIATION

STEP 10

Based on feedbacks and suggestion, Ideas were modified and appropriated to develop an improvised solution.

Limitations and Scope of improvement were identified for a way ahead.

THE WAY AHEAD

Target Audience

The Agarias, whose hardships are well documented, yet they are not receiving the adequate aid. The Agariyas earn a paltry sum of Rs. 60 ($0.90) per ton, a poor fraction of the industrial price. With no money, less resources and an unforgiving climate, we look to ease the Agarias' problems by designing a house which they will be able to build on their own, while also better protecting them from the elements.

Brainstorming

Initial Mind Map

Initial Literature Review

Daily Life of a Salt Farmer

They start at 5 a.m. with black tea and bajra rotlo (pearl millet flatbread). After work in the salt pans, they have an early lunch at 11

a.m. consisting of khichdi, buttermilk and sometimes potato or brinjal curry. After a break, they head back to the pans and work till 6 p.m. Later in the evening, a cup of black tea is followed by dinner at 7 p.m., which consists of bajra rotlo, chilli-garlic chutney and white jaggery.

Socio Economic Conditions

Category	Salt Producer	Acres of Land	Salt Production Units (as per Gujarat state)	Salt Manufacturers engaged in production (in %)	Salt Production (in %)
1	Small/ Individuals	Less than 10	1656	87.6%	28%
2	Medium	10–100	22	6.6%	10%
3	Large	More than 100	537	5.8%	62%

Demographics

An estimated 50,000 people (agairas) – salt farmers, their families and dependents – are engaged in salt farmingThe Agariya children start working in the salt fields from the age of 10 – generational poverty and lack of schools in the Rann of Kutch offer few chances for them to educate themselves.

Climate

The maximum temperature in May is about 40 C but some time it records temperatures of 48 C, leading to the development of very low pressure cells. During this period violent storms are very common. These violent storms or winds are of less duration and occur in the afternoon regularly because by that time the low pressure develops to its fullest. A very harsh northerly and easterly wind prevails in the winter season, followed by strong South-Western steady winds.

Power Supply

In recent years, Agarias have had access to solar pumps which have eased their Salt Farming Operations, but have no such supply for their homes

Interview Insights:

- They travel approx. **30 km from their village** after monsoon through rickshaw and bike with their ration, water, oil, diesel and household belongings and live at a salt farm for **8 months** from mid-October to mid-May.
- According to them, transportation costs them 2500-5000 depending upon the size of family.
- Then it takes them **3-4 days to construct a house** there. They use **Nilgiri, Saag and Babul** to make a structure and sac made up of **clothes, jute, plastic and grass** .

- Their house contained 4 sections.open space, living space and kitchen, private space and a storage.
- Sparrows build nests in their Houses, Some have a pet pigeon. Also their daughter used to make wall handlings and decorative things.
- They use traditional chulha to cook food and it is made at the corner of the house.
- Govt. doesn't Allow them to make permanent shelter in Rann.
- They do not have proper bathing and toilet facilities.
- House lacks proper ventilation, Thermal comfort, Wind resistance and has a risk of catching fire.

- Setting up a House takes around 5000-6000 including transportation every year.
- Most of the materials like Jute bag and Bamboo get deteriorated at the end of season and cannot be reused.
- Till the house is built, they have nowhere to live. A Certain type of flies breed in stagnant water after the monsoon and sometimes they are even forced to return to the village because of them.
- They want a structure that gets quickly erected and can be reused.
- Ambubhai, A community guide mentioned that Apart from Low-cost,Thermal comfort and Wind resistance a HUT should give the feeling of Relaxation, a Home .
- The previous Project was not successful in achieving the user acceptance at a wider extent Mainly Because Students visited the field at Off-seasons and were not able to deeply understand the daily lives and challenges of Agariyas. Besides, To achieve wide acceptance, some Demonstrations like Making one Family live in a Designed Hut for a certain period and seeking their Experience is required.

Problem Identification

Based on the insights from initial literature review and field visit, we have identified the following features that should be addressed:

- Easy to Rebuild
- Provides Thermal Comfort
- Cost Effective
- Basic Services Provided
- Fireproof
- Weather Resistant

Final Problem Statement: To develop climate responsive temporary houses for Salt Workers in Kutch, which are easy to rebuild.

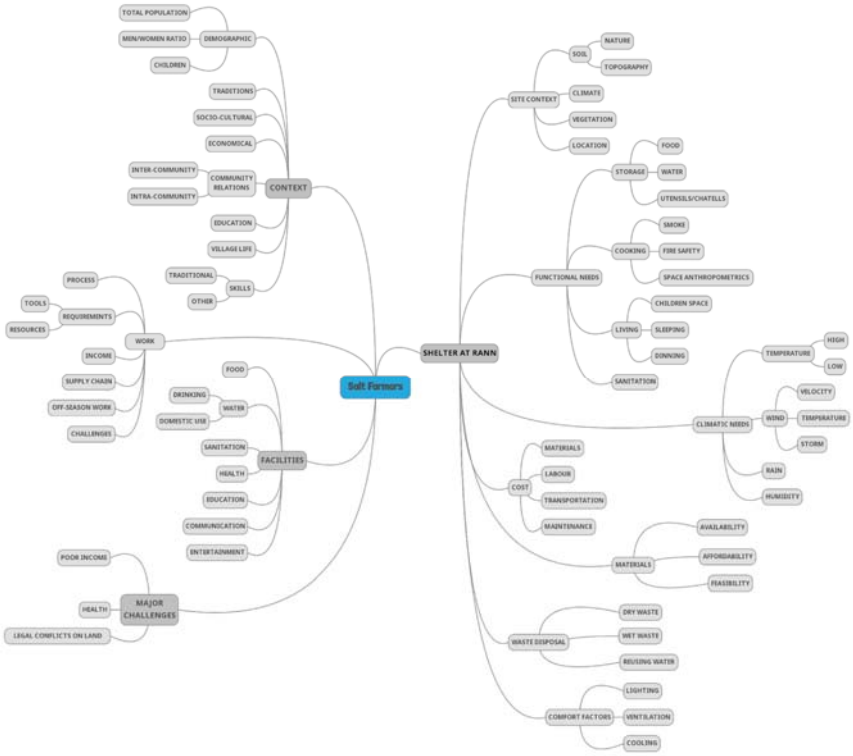
Prior Art Search:

We did an extensive search along the following points:

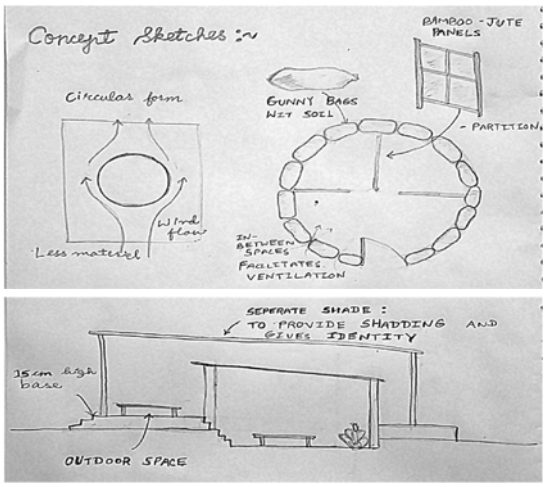
- Material Blocks: For improving Insulation, or fireproof in nature, at low costs.
- Easy Construction Methods: For quick Assembly, portability of structure, and involving less labor/skill in making the houses.
- Cost effective cooling techniques such as passive designs, evaporative cooling, etc.
- Low resource power generation techniques which are cost effective and have low resource requirements.
- Weather resistant techniques involving relevant designs,materials etc.

Detailed Information of our research is available on the following links:
https://docs.google.com/document/d/11R-_zXfYi0msjPVIpzTH-OfUsSX qGcwCGy6-kA-7PoU/edit#heading=h.y2hh6gdgrm3t https://docs.google.com/document/d/1KtyAA1FHEAi48JM1b-gn3sjlA2o iBfvUmyAIC7YM9Vo/edit#heading=h.yi37083qf2hr

Detailed Mind Map:



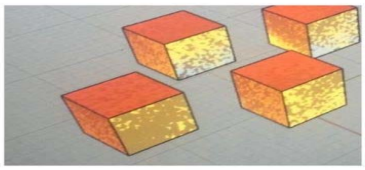
Concept Sketches



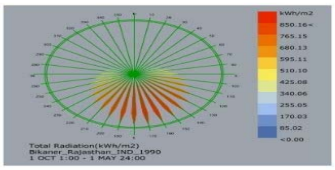
Based on the information gathered from our case studies and prior art search, we came up with a temporary house idea of making a sandbag house offering high insulation and wind tolerance, while being fireproof as well. Stacking bags filled with soil will be a faster means of earth construction. A separate shade will cut incoming heat, and circular shape will allow air to pass around our structure.

Case Studies

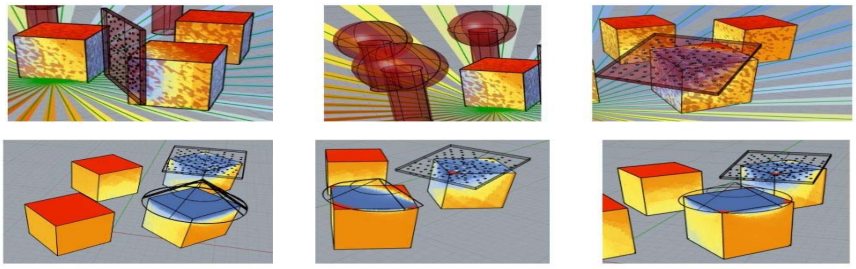
- Sun Analysis and Shade Selection(Analysis on Ladybug)



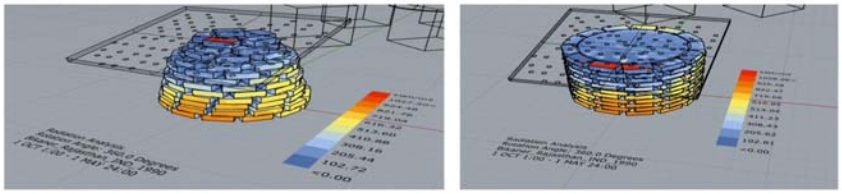
First trial with box houses



Radiation Data for a similar desert area

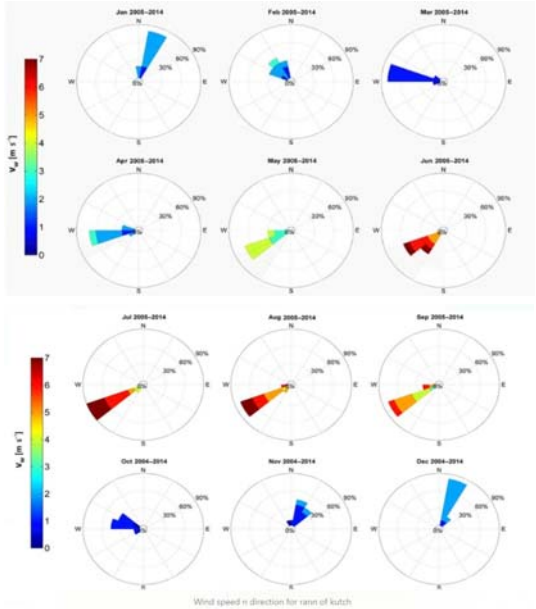


Some trials with different arrangements of shading



Selected shading for different house geometry

- **Wind Analysis**



Wind Data of Kutch:

Though our initial structure was circular to be resistant to wind from all directions, this information helped us orient the structure in subsequent iterations.

Material Analysis

We made list of materials that can be either locally found or easily sourced, then compared them using a Pugh Matrix

References for Pugh Matrix

+	0	-
Positive	Neutral	Negative

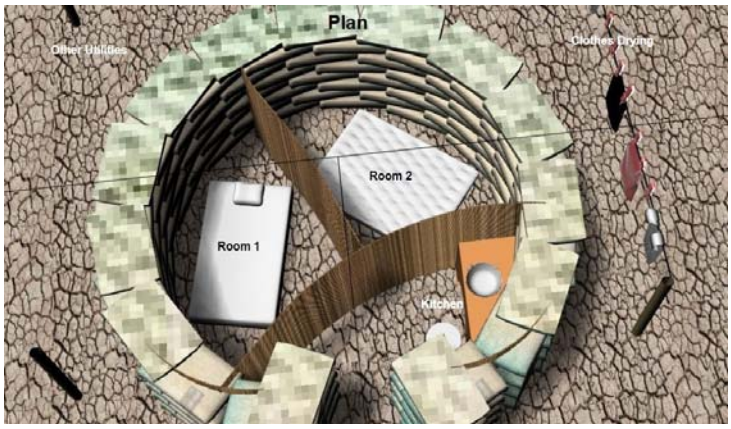
Materials /Factors	Jute	Wood	Bamboo	Vegetation	Plastic (Sack)	Soil	Dung (Binding layer)	Organic Composites	Thermocol (reinforcement)
Thermal	-	0	0	+	0	+	+	+	+
Fireproof	0	-	-	-	-	+	-	0	-
Humidity /Salinity	0	-	-	-	+	+	+	+	+
Availability	+	0	0	+	+	+	+	-	0
Wind	-	+	+	-	0	+	+	+	-
Roof	0	0	+	+	0	-	0	+	-
Cost	+	0	0	+	+	+	+	-	-
Score	**0**	**-1**	**0**	**1**	**2**	**5**	**4**	**2**	**-2**

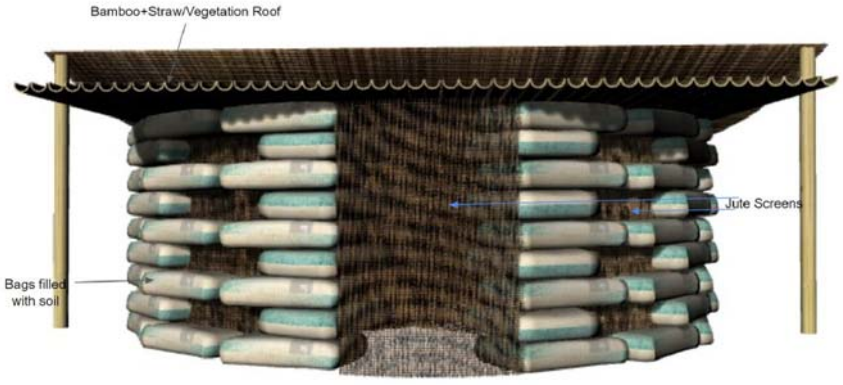
This information helped us make decisions on the combination of materials to be used for the walls and roof of our proposed house. We selected sandbag for the walls and

bamboo+vegetation for the roofing

Mockups(Proof of Concept):

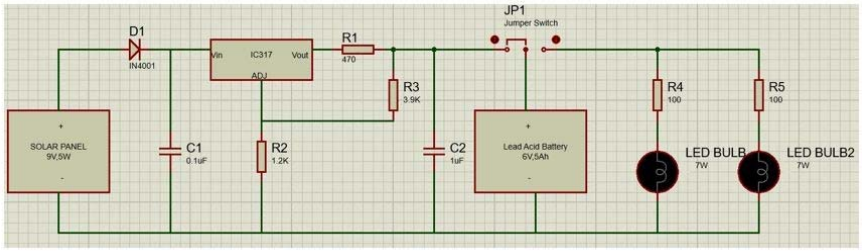
- **Renders/Models** (On Rhino 3D)

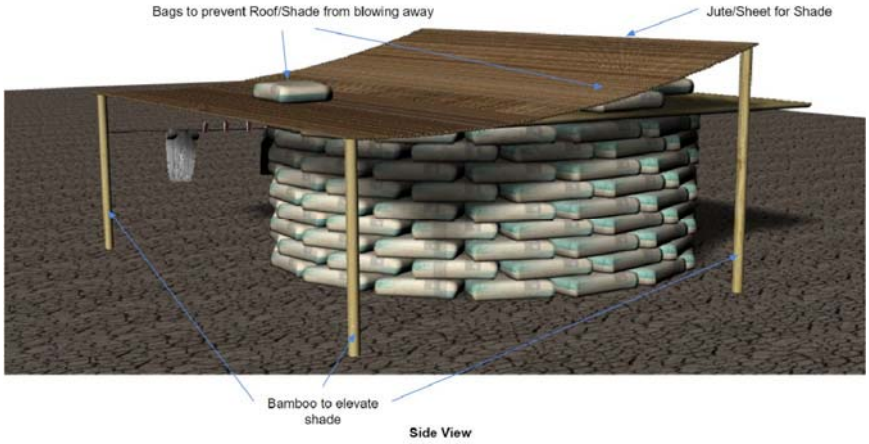




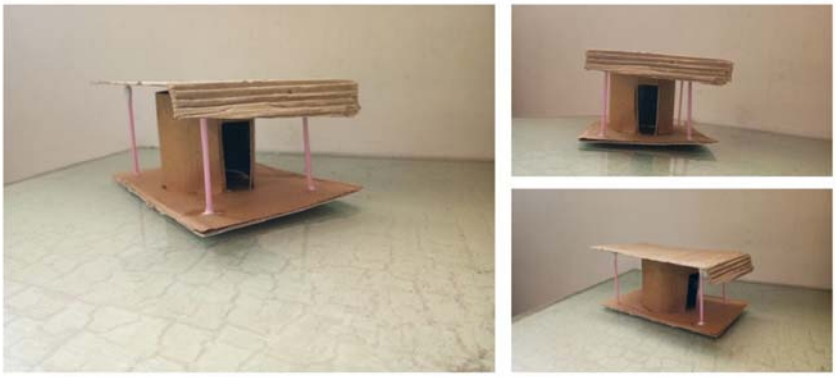
Front View

- **Lighting System (Under 1000 Rs)**





- **Physical Concept Model**



Users/Mentors Feedback

- Anil sir pointed out drainage might be an issue in our system, especially if we use half dug houses.
- We talked to some salt farmers, one of them mentioned that they would like to use some material which is reusable to them so that they incur less cost.
- Another pointed out that they would want a structure that is even more quicker to assemble as they need quick shelter.
- The farmers highlighted that the idea will have to be demonstrated by us for them in order to be convinced of its viability.

Key Takeaways

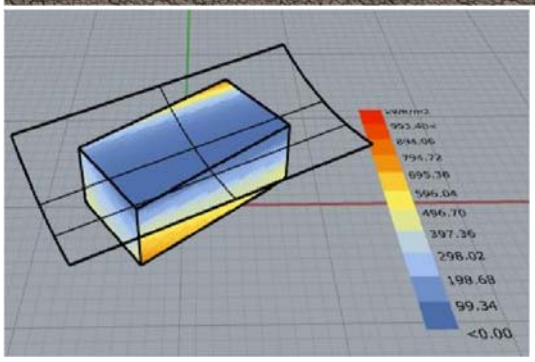
- Unless a suitable drainage system can be constructed, half dug houses will be difficult to manage.

- Though our solution is cost effective, the salt farmers need to be shown how it is benefiting them in order to get them to adopt this system.
- Digging is an issue for them, if we provide them for quick and mechanical means to do so.
- We can think of some retrofit solutions which can be executed in the case of failure of our system.

Iterations and Appropriation

Based on the feedback, we gathered that though the solution had promise, it would be hard to convince the Agarias to adopt this solution without demonstrating to them its benefits. Hence, we have prepared some retrofit solutions for their current houses which they can implement right away.

Optimized house position and shade placement, for current house design



- Evaporative cooling: Water absorbing materials such as khus, jute etc can be drenched and placed like a screen on the windows, such that it allows air to partially enter the house. The incoming air will be cooled a result

- A low cost washroom suggested in the previous SRISTI editions can be incorporated near the house for their use. https://www.ss.sristi.org/a-low-cost-toile t

Way forward

The main aim of the project remains to focus on the homes for the salt workers, the needs of the workers which focus on the essential conditions of living. The iterations can be incorporated into the

further models of the house, which can focus on desert architecture, also accounting for sporadic rainfall.

- The above structure was used as a reference to the more reusable structures that was preferred, it can be used over the years, and the slanting roof ensures that rainwater isn't collected. This design was not made inclusive initially due to heavy weight and construction costs, however the roof like structure if built in villages itself

- Furthermore, the drainage system can be incorporated into the hut structure. It draws inspiration from the ancient civilization of Harappa and Mohenjo Daro, the community drainage system can be incorporated itself, and using bamboos as the pipe, which forms a french drain structure that can be incorporated vertically. The bamboo stem can also allow the water to move in a flow like path, which once collected, can also be reused.