Transit shelters for agaria (salt workers)

Project 3
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Appreciation to all other PD faculty members for their valuable suggestions and feedbacks on the project. I am also thankful to my friends and colleagues, for their support and valuable inputs.
At last but not least I am grateful to my family, who have supported me throughout.

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Roll No - 186130009

Date -

Sign

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Introduction

Introduction

Situated about 130 km from Ahmedabad, the capital of the Indian state of Gujarat, lie the edges of the Rann of Kutch, just 10 km from the Arabian Sea. This is the land of the Agariyas, who have lived here for centuries, knowing just one means of livelihood – salt farming. Working day in day out under a fierce sun from October to June, they grow salt in square-shaped salt pans, harvesting 75 percent of India's total salt produce.

Fig : 1 Ladies making salt pan

Background:

Agariyas are the people who work in the Agar (Salt Pans) for their livelihood. In the little Rann of Kutch 75% of the Agariyas come from nearby village of Kharaghoda, a small town 3 hours away from Ahmedabad. The families of Agariyas move to the Rann for extracting brine and cultivating salt which takes around 8 months. It starts from the month of September and ends in April. The salt crystals are sold to companies for extremely cheaper rates of 1 Re per 4kgs.
They remain unemployed in the villages and hence prefer to work in the agars and deal with the harsh climatic conditions and salty environment for little of the money.

Figure : 2 Agaria family Head

Figure : 3 Agaria family member

During the monsoon months, the Rann of Kutch becomes submerged in sea water. As the water begins to recede in October, the Agariyas move in and begin a herculean process. They dig wells to pump out the briny groundwater and fill the square-shaped fields, then rely on the natural evaporation process to leave the white crystals. In winter, the harvest season begins in the salt fields, which are now silvery white with raw salt. Braving a relentless 40 degrees during the day, which often dips to 4 degrees in the night, the Agariyas live for six or seven months in the shacks beside their salt flats. Children begin working in the salt pans from the age of 10.

Production averages 12-15 tons every 15 days from each of the salt pans, and is sent to salt companies and chemical factories across the country. The Agariyas earn a paltry sum of Rs. 60 ($0.90) per ton. The market price of industrial salt is Rs. 4000 per ton while domestic salt sells for Rs. 5500 per ton.

The low incomes and lack of education facilities in the barren desert of the Rann offer few chances for the children of saltpan workers to escape a cycle of poverty and poor health. The salt workers remain generationally indebted to the salt merchants.

And the price of working for years in the harsh conditions is very high – skin lesions, severe eye problems due to intense reflections off the white surfaces, and tuberculosis. A salt worker of Kutch seldom lives beyond 60. When they die, their abnormally thin legs, stiff with years of exposure to highly saturated salt, do not burn in the funeral pyre. Rather, the legs are collected by their relatives and are buried separately in a small grave with salt so that they can decompose naturally.

Figure : 4 Salt worker foot. while working on salt pan

List of Problems Identified:

Figure : 5 Bore well for salt water

- Health Related:
- Soil and Water Related
- Climate Related
- Finance Related

Health Related:

- Salt deteriorates the skin of the salt workers by making them hard in nature.
- They suffer from skin diseases like having corns and specially when there is a cut and salt water penetrates the wound.
- The Agariyas suffer from heart diseases because of the hard laborious tasks.
- Most of them suffer from night blindness which is common due to lack of Vitamin A.
- Due to provision of no toilet, they prefer to do the job when its dark into the open, however, during emergency, female members generally hesitate to go out during day time and thus suffer from kidney related problems.
- The equipment used for breaking the salt crystals are heavier and hence it requires tremendous energy to pull the 'Dantara'. It's purposefully made heavier, by compromising the ergonomics.

Soil and Water Related:

- The soil is extremely porous and water is found in a depth of 10-15 ft.
- Water found underground has a TDS value of more than 1200 (unfit for normal usage).
- The family receives 1500 liters of potable water every 20 days. This 1500 liters of water is used for all the activities like cooking, drinking, cleaning themselves, washing etc. Lack of water is an issue.
- During monsoons, the whole Little Rann of Kutch gets flooded to a height of 5ft which makes it difficult for living beings to reside there. The agariyas move back to their villages with all their stuffs from the Rann.
- During September, they start moving to the Rann to start their salt cultivation. During that time, they dig wells manually to find water. Most of the time, it becomes difficult to get water and many wells stay as unsuccessful attempts.
- In the beginning of the season the Rann remains marshy and it becomes hard to commute.
- The water tankers lose track to deliver water as there are no landmarks or roads to commute.

Climate Related:

- The climatic condition is harsh due to the extreme heat during day time and cold during nights.
- The wind carries moisture which gradually starts decreasing as it approaches the end of the season during March and April.
- The heat during the end of the season is dry and causes heat stroke.

Soil and Water Related:

- Salt workers are indebted to the distributor who lend them money to produce salts.
- In case of dues, they have to stick to the same distributor for the next season.
- The agriyas earn approximately 25000 per season per family and the salt they cultivate is sold at mere rate of 1 Re per 4 Kgs.

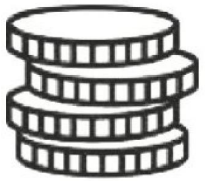


Figure 10

Field visit
in kharaghoda (Little rann)

The Agariya family dwelling

Figure : 6 Agaria dwelling

The Agariya family.

Melabhai
Agariya
Head of the family

Melabhai's Wife
Looks after kitchen

Daughter in Law
Looks after Kitchen

Eldest Son
Agariya

Daughter
Looks after the kitchen

Younger Son
Agariya

Grand son
Plays around

Figure : 7 Agaria family chart

Observations at Site :

Figure : 8

Figure : 9

Open defecation is common; however poses problem for ladies during daytime.

Figure 8 : Open defecation is carried out during dark by carrying these containers of approximately 750ml capacity of water to wash themselves as well as their hands.

Figure : 10

Figure : 11

Figure 9 : Observing the process of utensil waahing by agaria.

Figure 11 : Collection of wooden twigs is done before hand from the periphery of Rann, despite of having Gas cylinders in their hutments.

Figure : 12

Figure : 13

Figure : 14

Figure : 15

Storage & sanitation is mostly done in outdoors due to presence of security & available land.

Figure 12 : Hutment made of wooden logs with simple joints tied with rope. The walls are covered with gunny bags wrapped around the hutment.

Figure 13: The waste water produced from washing utensils is disposed off in the open by digging a shallow pit.

Figure 14 : Due to vast land availability & less storage space, the Agariyas keep the containers, machinerie

Figure : 16

Figure : 17

The salt cultivation is free of daily set routine as it provides time flexibility

Figure 16 : The soil is extremely porous & water is found in a depth of 10-15 feet with a TDS (total dissolved value) of more than 1200 (for potable water TDS<300).

Figure : 18

Figure : 19

Figure 17 : Locally called 'Jipta' is a weed which is easily available and has got many branches; apt for making crystals of salts.

Figure 18: Salt pans are under observation by the Agariyas and their job is to break down the bigger crystals which has no value in the market.

Figure : 20

Figure : 21

Figure : 22

Figure : 23

Commute & Tracking routes is difficult due to absence of dedicated roads.

Figure 20: Exposed electrical wires and tools kept in the open due to sense of security, however poses a threat to the children.

Figure 21: The Agariyas are experts in digging. They dig more than one well for extracting brine and if fails, leave the well as it is posing a threat for the children.

Figure 22: Continuous movements of trucks is evident in the region out of which some are meant to deliver potable water & some for carrying bromine water to the nearby factories at Kharaghoda.

Interview with Enablers

Figure : 24

Kharaghoda Panchayat

Assisting Agariyas
Kharaghoda Panchayat is responsible for supply of potable water to the Agariya families once in two weeks in the Rann.
The Panchayat employs tankers/trucks loaded with water which is carried to the Rann by a local driver, familiar with the conditions.
All the salt workers are from Kharaghoda village and are registered under the Panchayat. In addition to this, the Panchayat also has provided Solar Panels to the agariyas at a subsidized rate of 80:20 ratio where 20% is paid by them. These are used to produce electricity to extract underground brine, and has reduced the usage of diesel generator.
The Panchayat provide services to the agariyas for installation and repair as well. In the sector of health, the Panchayat has provided mobile health unit vans to the Little Rann of Kutch which visits the families once every week and provides them necessary medicine. They maintain a dedicated form which is numbered with the medicine considering the literacy of the Agariyas. In case of severity, the MHU refers the Agariya Kharaghoda to the nearby government hospitals.

Figure : 25 Gantar

Figure : 26 Scale model of school made by ngo's students

GANTAR

Education of
Agariya students

Gantar NGO provides basic education under the Right to Education Act to the children of Salt Workers. They started by establishing a school in the middle of Rann and employing outside teachers and then due to unavailability and hesitation, they started involving the senior students to teach the kids. The school building is designed with a semi basement by digging the ground erected with wooden logs, twigs & gunny bags tied to cover up the sides. The Gantar has its own campus in Patdi, where they have extended education by including vocational training to encourage livelihood diversification among the Agariya students. The students at Gantar are capable of stitching clothes, mending basic electrical failures, repair basic electronic items, construct basic structures among many more.

This has helped many of the Agariya children to not take up Salt cultivation as a profession as it involves exploitation. Under this NGO, they have taken up other ways to earn money and some joined as teachers in the Rann. Gantar has come up with a new school which is a non functioning disabled school bus transformed as a classroom. It is placed near the permanent structure of the school.

Figure : 27 Mobile health unit of SETU Ngo

Figure : 28 SETU , hospital in kharaghoda

SETU Charitable Trust

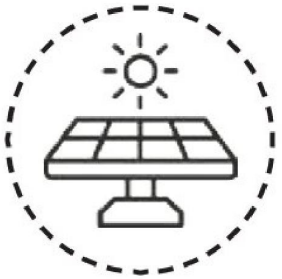
Bridge the gap

SETU Charitable Trust is an NGO that provides addition-
al health services to the people of Kharaghoda and nearby villages located at the periphery of the Rann. The benefcia-
ries include most of the Agariya families residing in the Rann. SETU bridges the gap between the Agariyas and the doctors by providing live video calls. SETU
maintains a form for each Agariya registered which includes basic information of the person along with general ailments mentioned. They refer to the hospitals
located in Ahmedabad or Rajkot in case of severe cases.
In addition to a campus in Kharaghoda, SETU has also got mobile van, modified with video conferencing facility with dispensary and other necessities to make it an independent unit. This van requires a driver and a technician who visits the villages

in the periphery of the Rann once a week and directly links the patient to the distant doctor through internet. SETU has set up network towers in some of the villages and look for-
ward to set more in order to cover as much village as they can. The agariyas come to these villages and enjoy the ser-
vice provided by SETU in a minimal charge of 10-20 rupees.

Mapping ecosystem

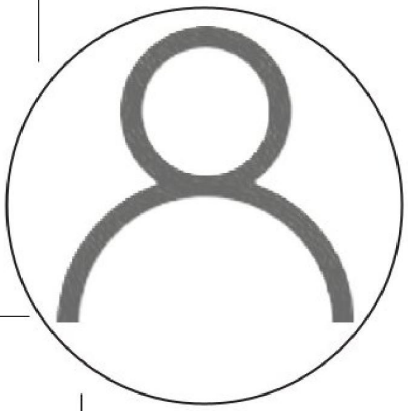
Distributor government
Salt worker kit
Gumboots,
goggles, gloves, and hat.
Two pairs of the set once in a year
to each family in rann.



Distribution of solar panel by government in highly subsidised rates.

Government -
water (drinking water - kharaghoda 20l 5rs. Ro plant self-self-service)
normal tanker water 1500 l in 15 days for one family.
3416 registered families and 25% unregistered (approx. 5000 people in rann)

Medical benefits by the government
mobile health unit 1 day in a week in little rann.
Medical benefits by NGOs
SETU charitable trust - in kharaghoda
10rs per patient
any report lab checks 20rs per patient.



Agaria

Bromine water plant.

Mapping ecosystem

Generator

Monthly ration for below poverty line families.

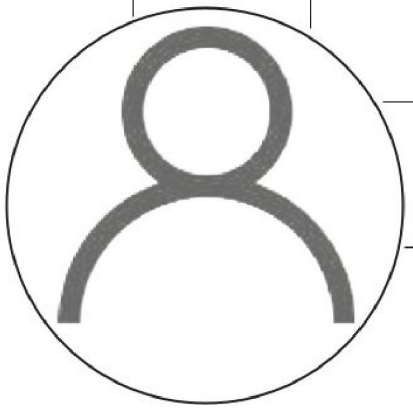
NGO

GIAN foundation - sanitation and settlement of Agaria community collaboration with DIC IIT Bombay

Education by Government
old buses transformed to make a school for their children's education.

NGO (Gantar)
this NGO work in kharaghoda for agaria's children. They provide education and skill development at their organization.

Electric panel



Agaria

Diesel

Figure : 29 Agaria, dwelling, and family


Figure : 30 Storage spaces.


Figure : 31 Dwelling structure used for hanging.


Figure : 32 The cooking area in dwelling.

Figure : 33 The water storage area in dwelling.

Figure : 34 The kitchen area in dwelling and storage.

Dwelling study: detail drawing

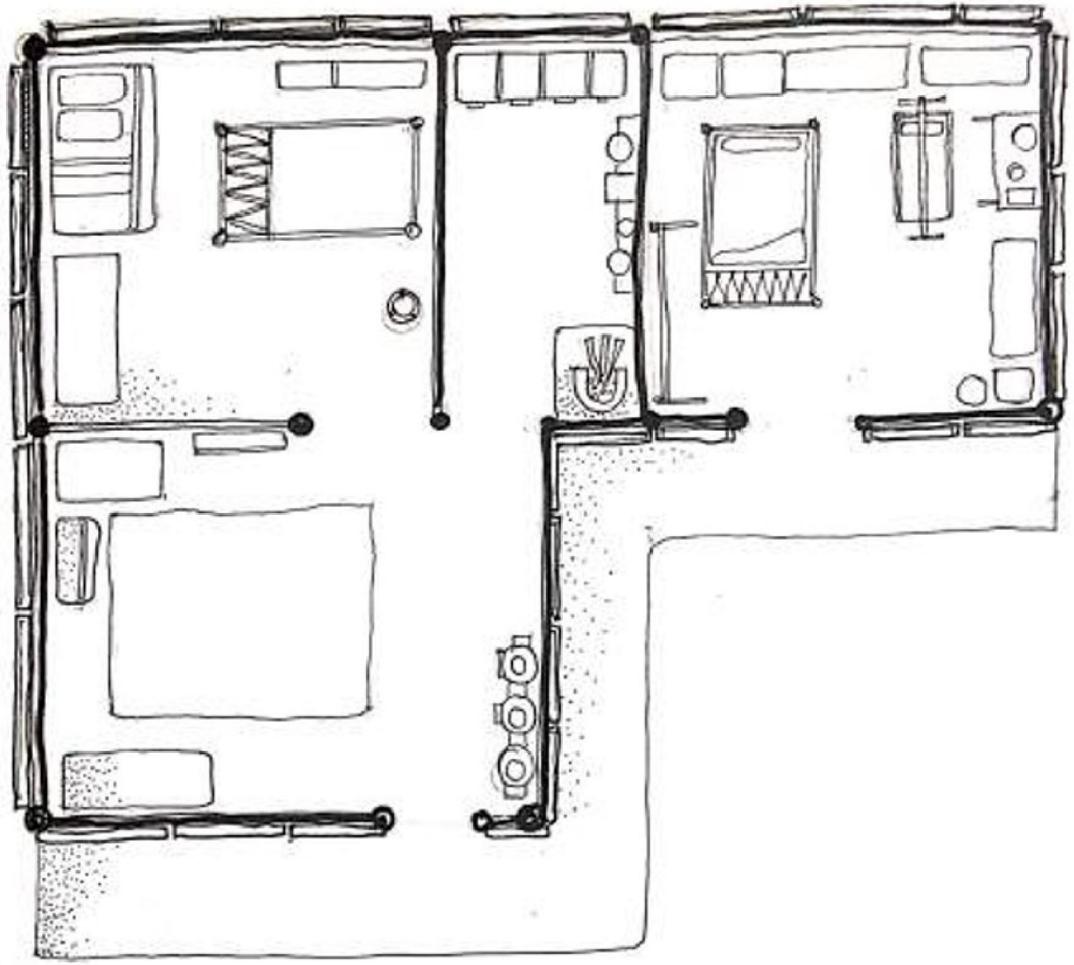


Figure : 34 Dwelling plan - 1

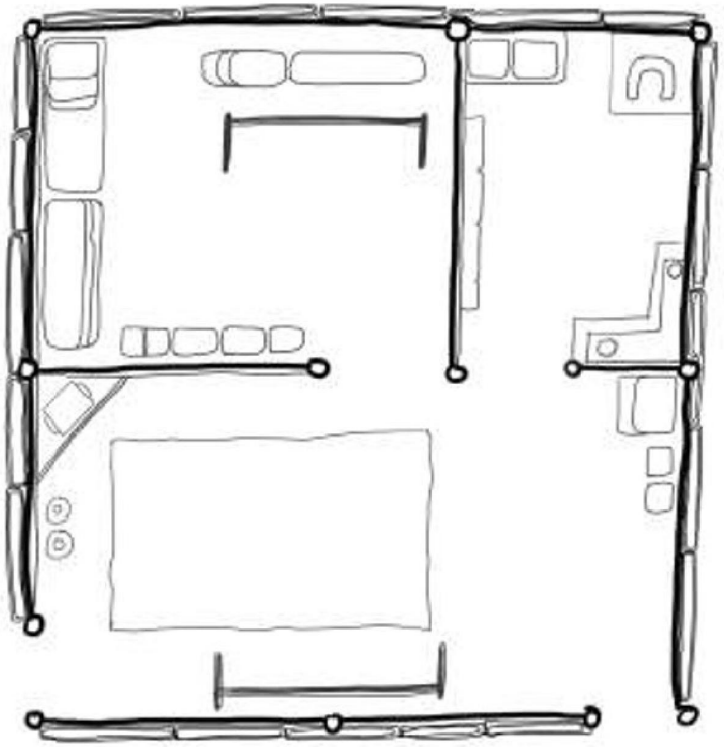


Figure : 35 Dwelling plan - 2

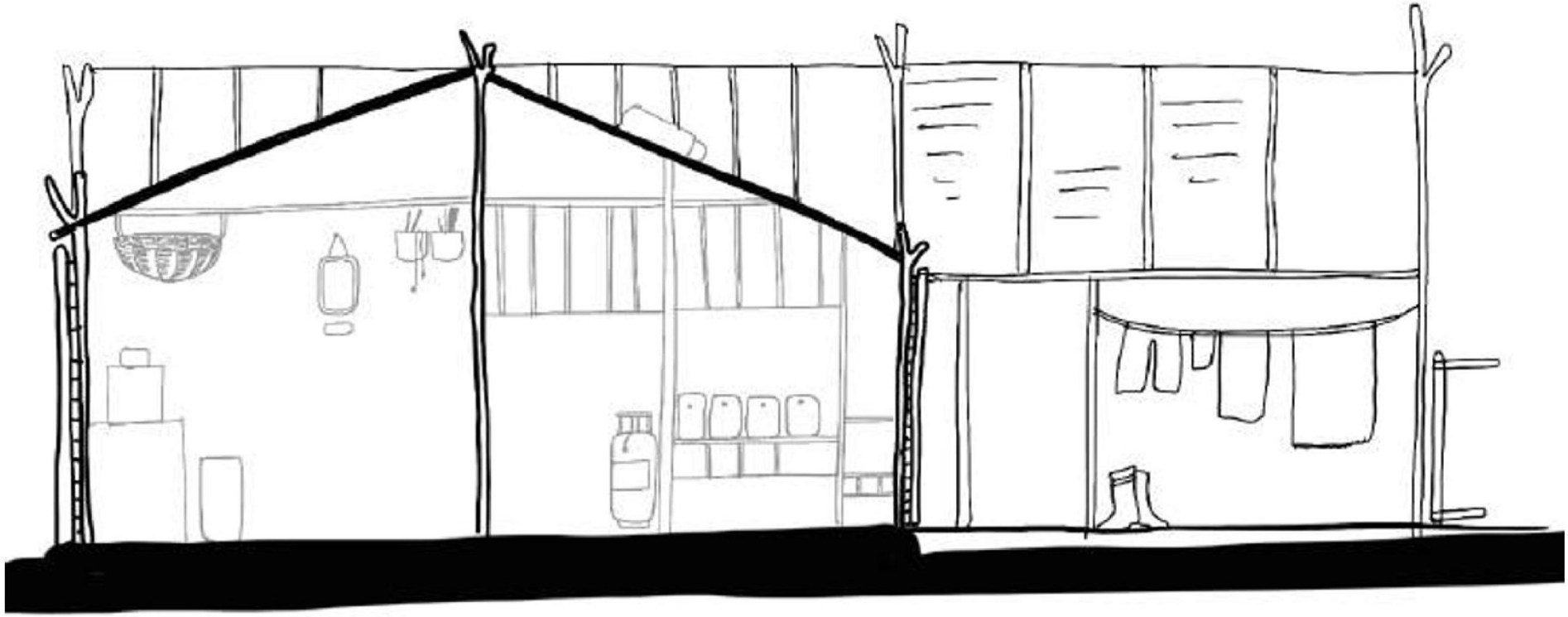


Figure : 36 Dwelling section - 2

Problems identification :

- Before making the dwelling, they have to search for underground saltwater.
- The placement and construction of the house depend upon that condition.
- Sometimes in the middle of the season, they were out of saltwater, which also affect the dwelling; they have to reconstruct or shift the whole house, where water is available.
- While construction, they don't have proper resources and materials to build their houses.
- To make dwelling light weight, they make their house from cardboard and jute bags. and gunny bags.
- Their construction materials are not waterproof and adequately insulated.
- They have many problems in summer and winter.
- The kitchen and cooking area is inside the house, which doesn't have any proper exhaust and chimney.
- No proper storage.
- The whole process of construction takes 3 to 4 days.
- Structural members of their dwelling are so weak and not proper load-bearing.
- There is no window and door in the house for ventilation.
- Weak joinery details and foundation of their dwellings.
- The proper storage of water in their house is missing.

Design brief:

Design a collapsible and modular houses for the Agariya community (salt workers).

1 **Easy maintain & repair**
It should be easily cleaned, maintained and repaired by the users

2 **Easy to fabricate**
It should be easy for locals to fabricate with readily available materials.

3 **Light weight**
It should be light weight, collapsible

4 **Easy to dismantle or install**
The product should be easy to understand, install and dismantle

5 **Firm & sturdy**
It should be firm and sturdy to counter the speedy winds at Rann

6 **Low cost**
The product should be low cost and affordable to the salt workers.

7 **Adaptable**
It should for both winter and summer season

Ideations

Ideation 1 - Double height structure

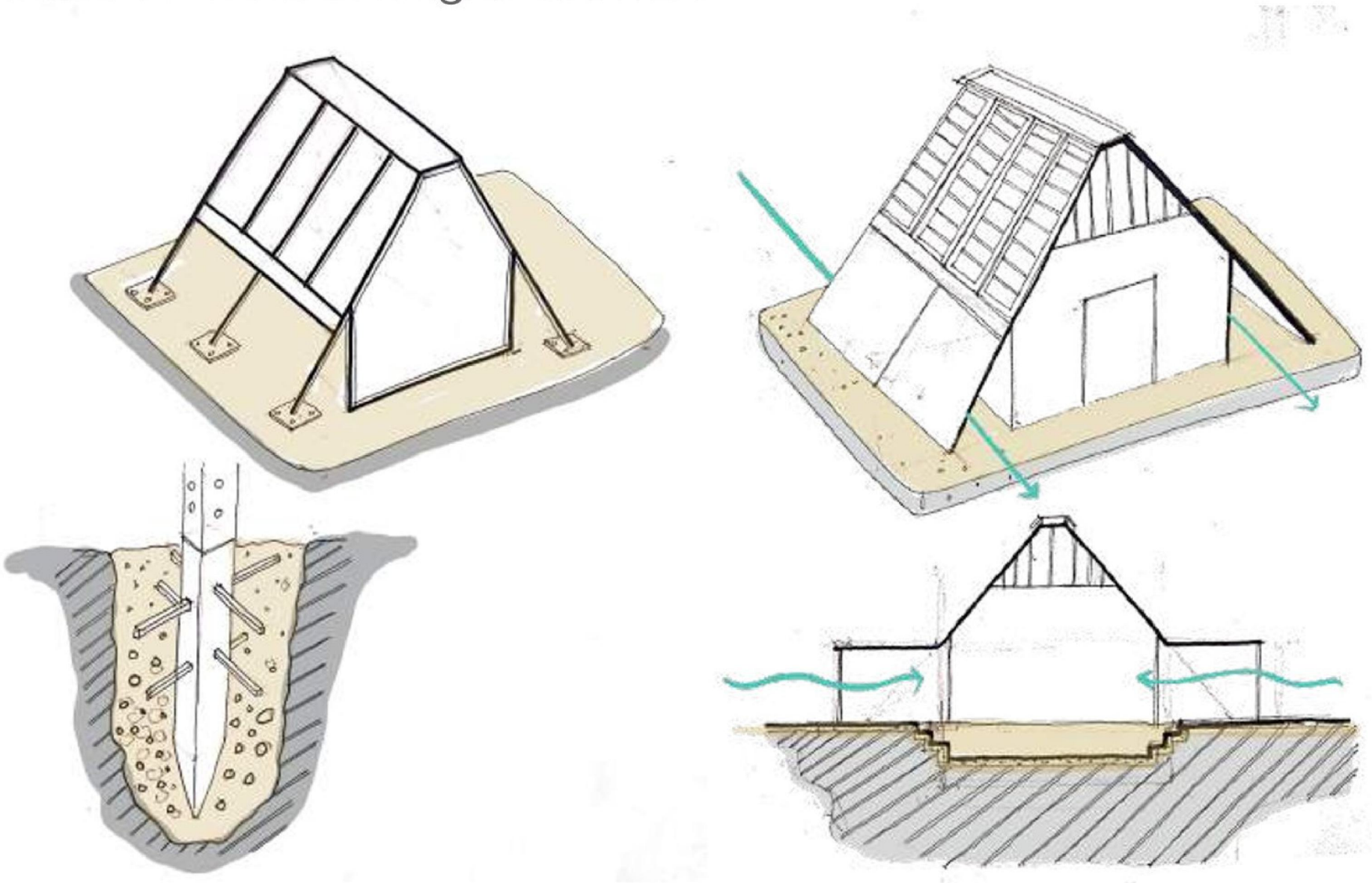


Figure : 37 Ideation 1

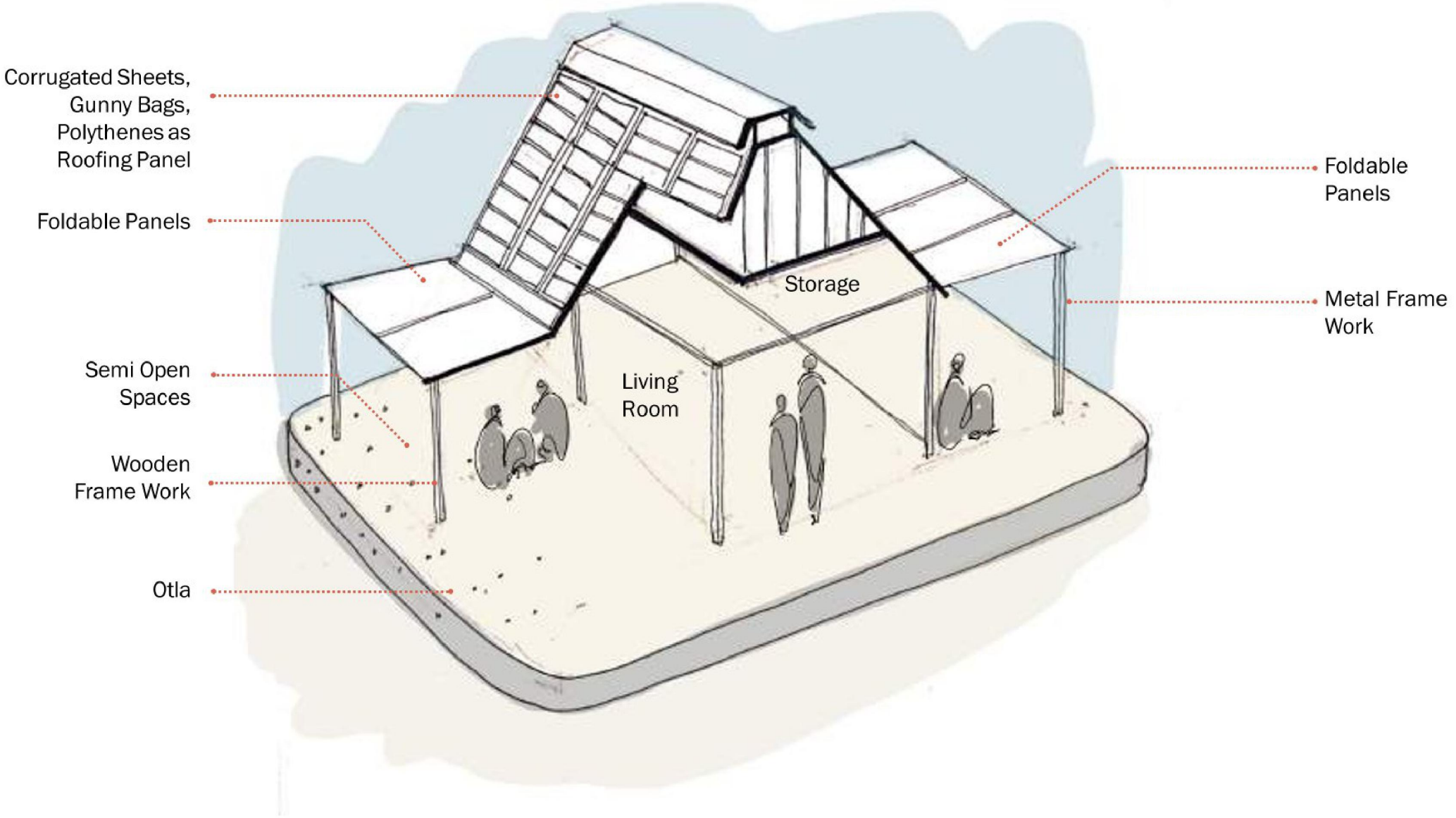

Corrugated Sheets, Gunny Bags, Polythenes as Roofing Panel
Foldable Panels
Semi Open Spaces
Wooden Frame Work
Otla
Foldable Panels
Metal Frame Work
Storage
Living Room

Figure : 38

Ideation 2 - Single modular panel structure

The concept of thier dwelling design is inspired by their traditional method of a house design.

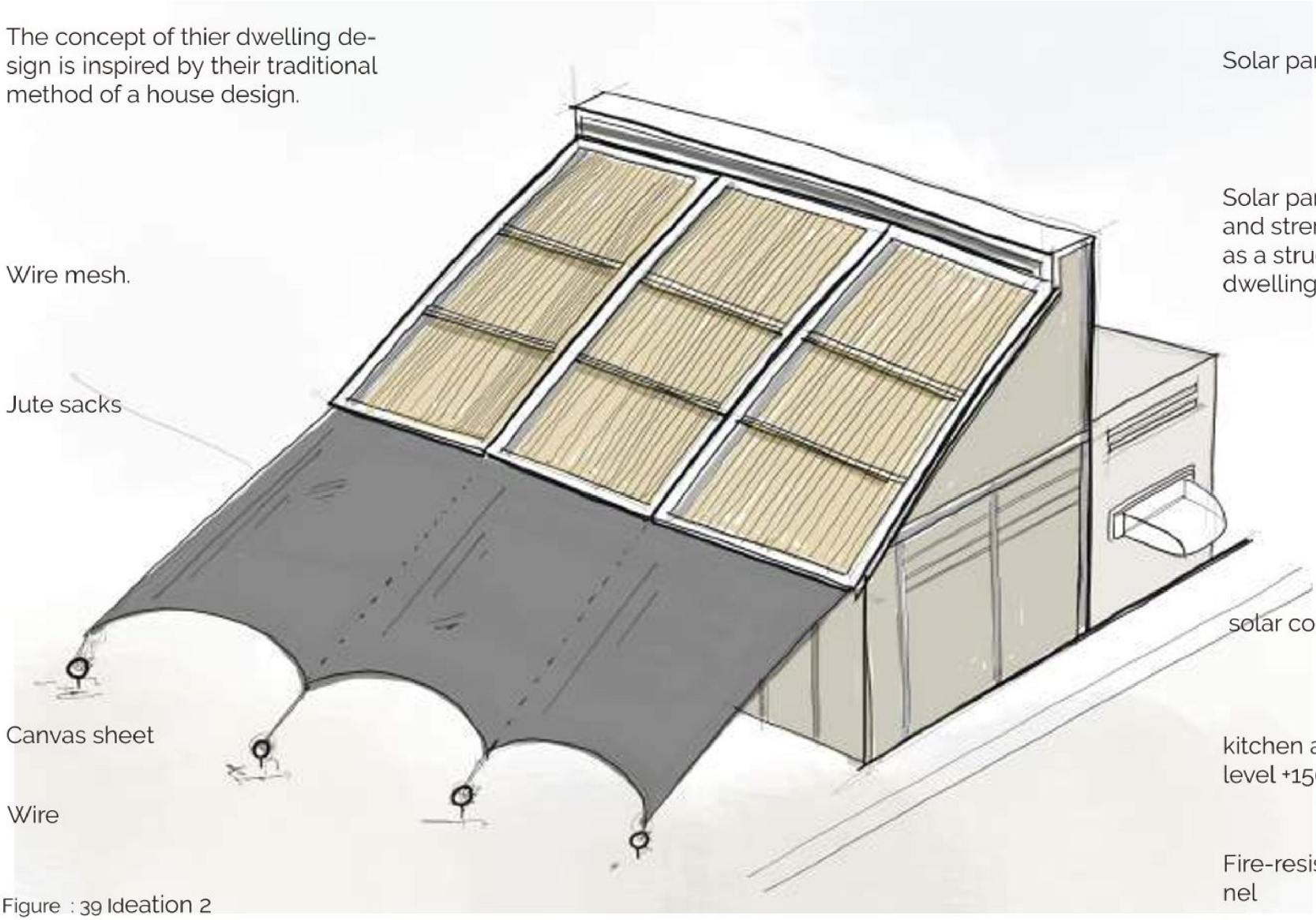
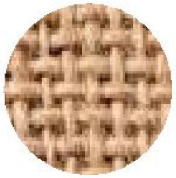


Figure : 39 Ideation 2

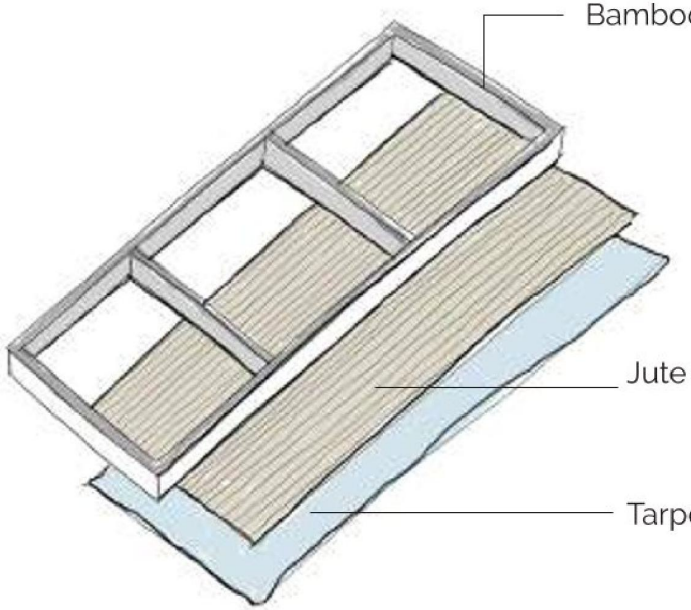
Tarpoline sheet



Jute sacks

Metal frame

Bamboo strips



The design of the dwelling is the modular type. Every panel of the house is an individual entity. The material used in that pannel is locally available.
there is three-layer in that pannel -

1- Metal frame
2- Bamboo strip in the metal frame for paneling.
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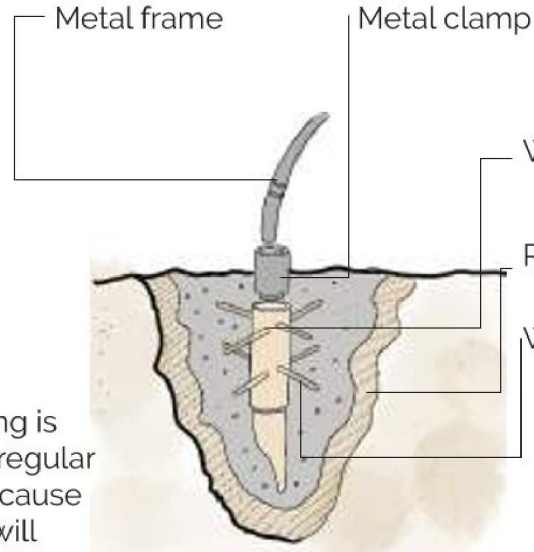
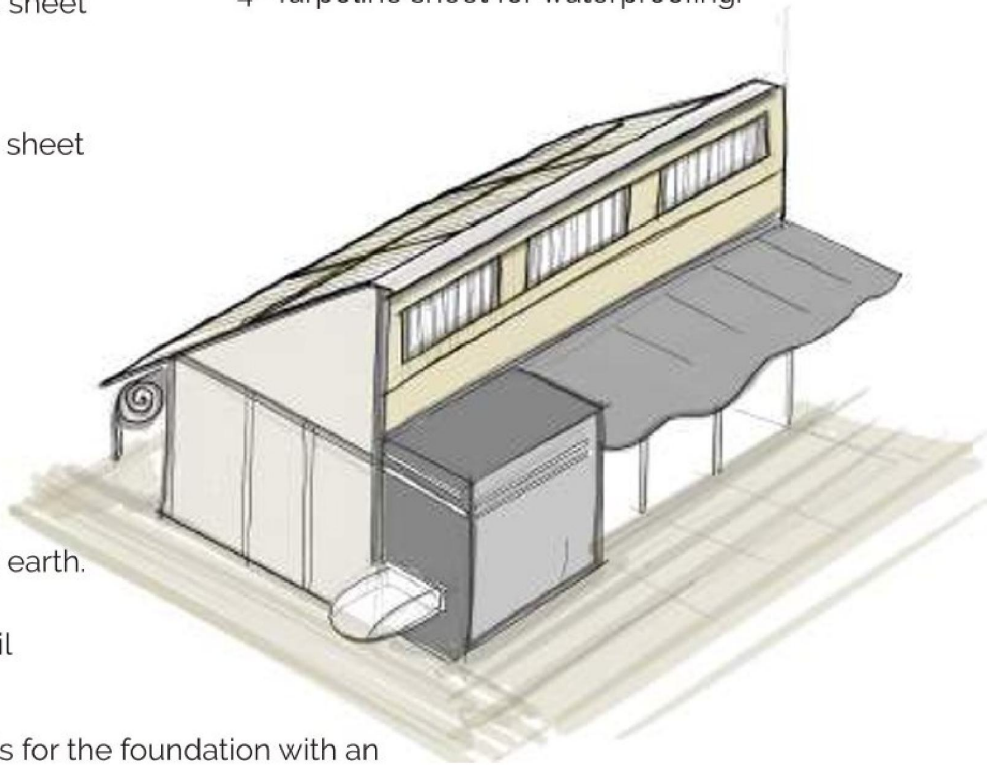




The foundation of the dwelling is also different from the other regular foundations of the house, because of salty groundwater. Water will affect the foundation, and metal gets rusted with the time.

Wood is for the foundation with an extra nail, which gives strength to the structure.

Figure : 40

Ideation 3 - Foldable panel structure

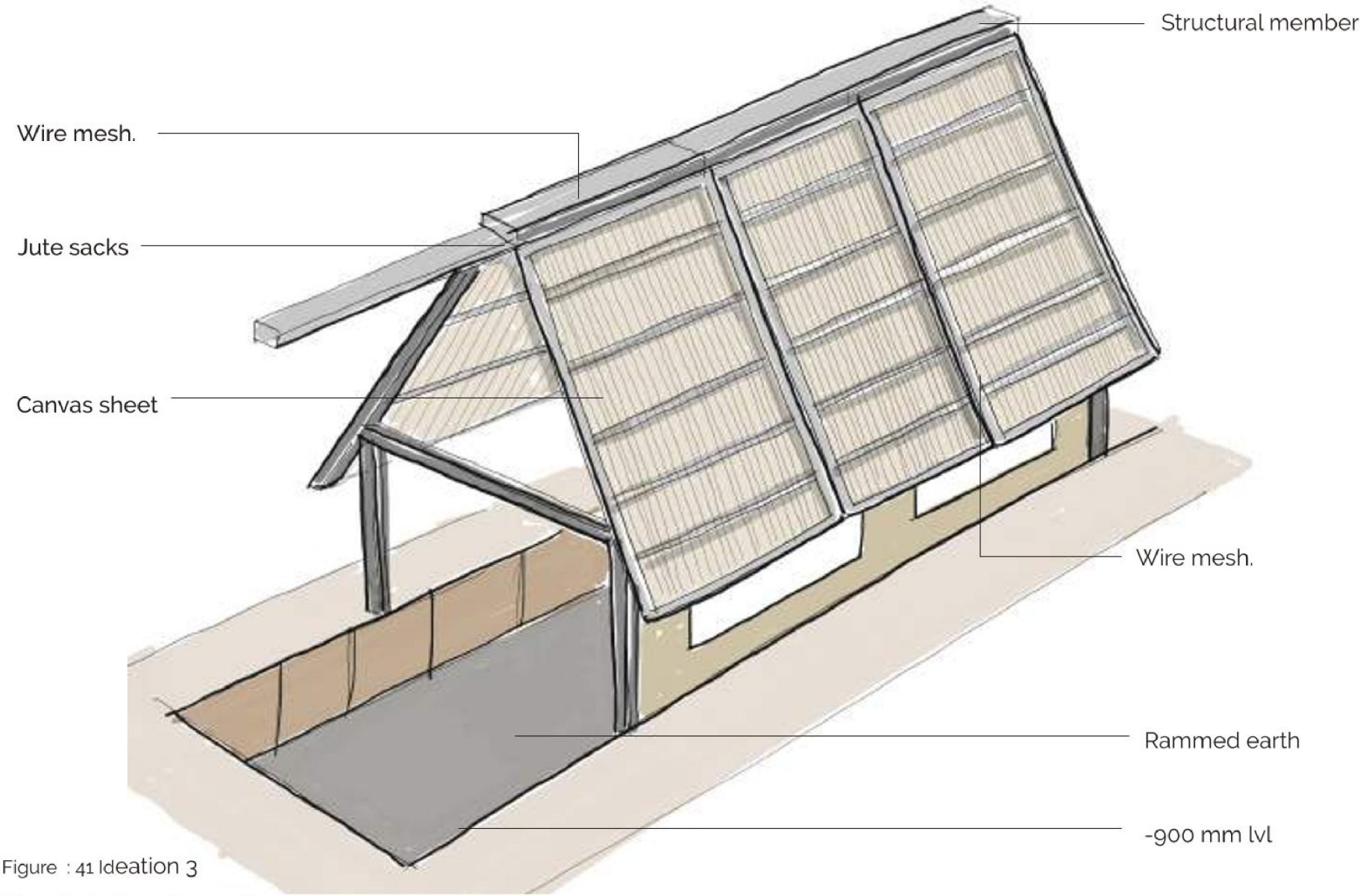
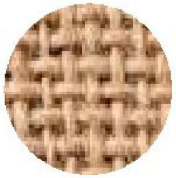


Figure : 41 Ideation 3

Tarpoline sheet



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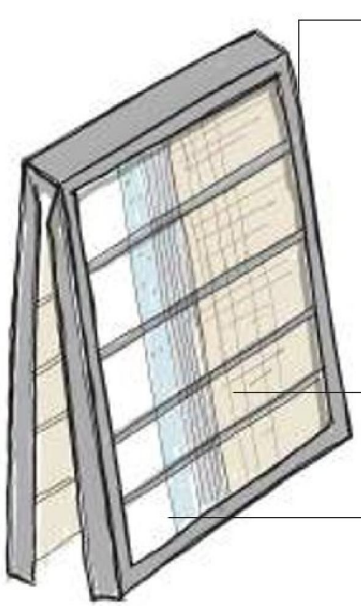

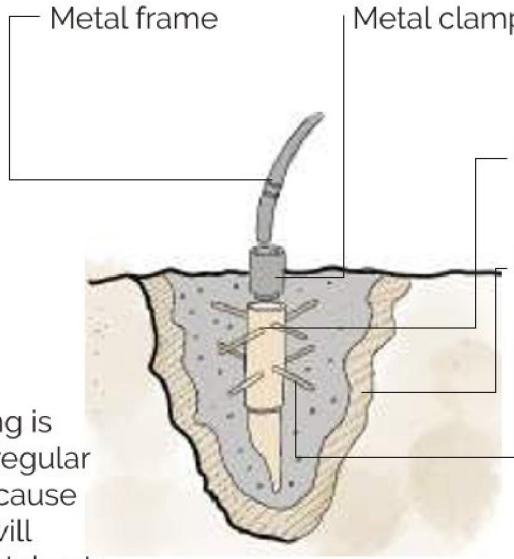

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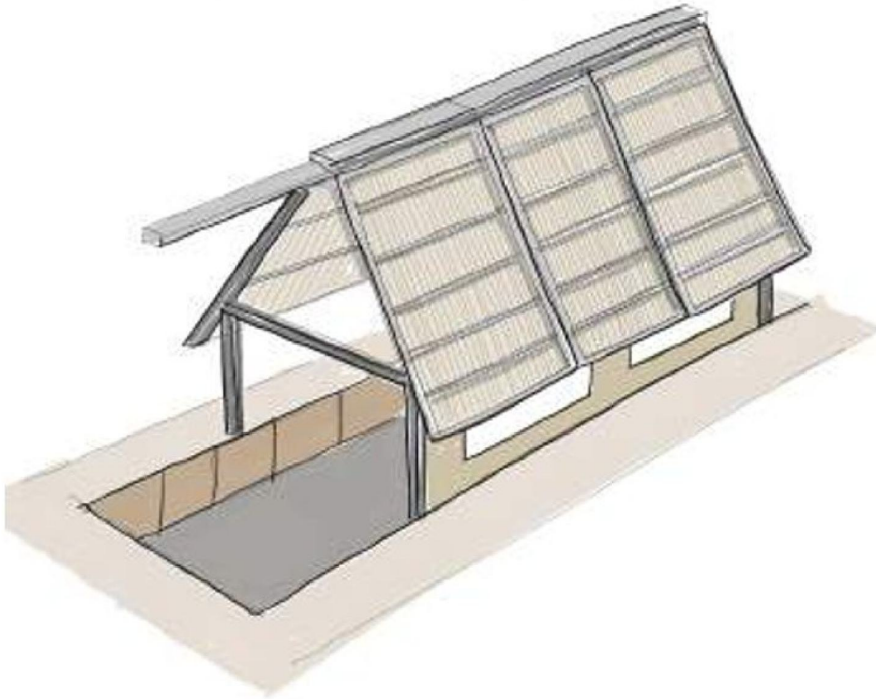


Figure : 42

Ideation 4 - Dome shape structure

The concept of dew collection wings inspired by the dragonfly wings , how thin membrane-like members with branches can help to collect dew from the environment

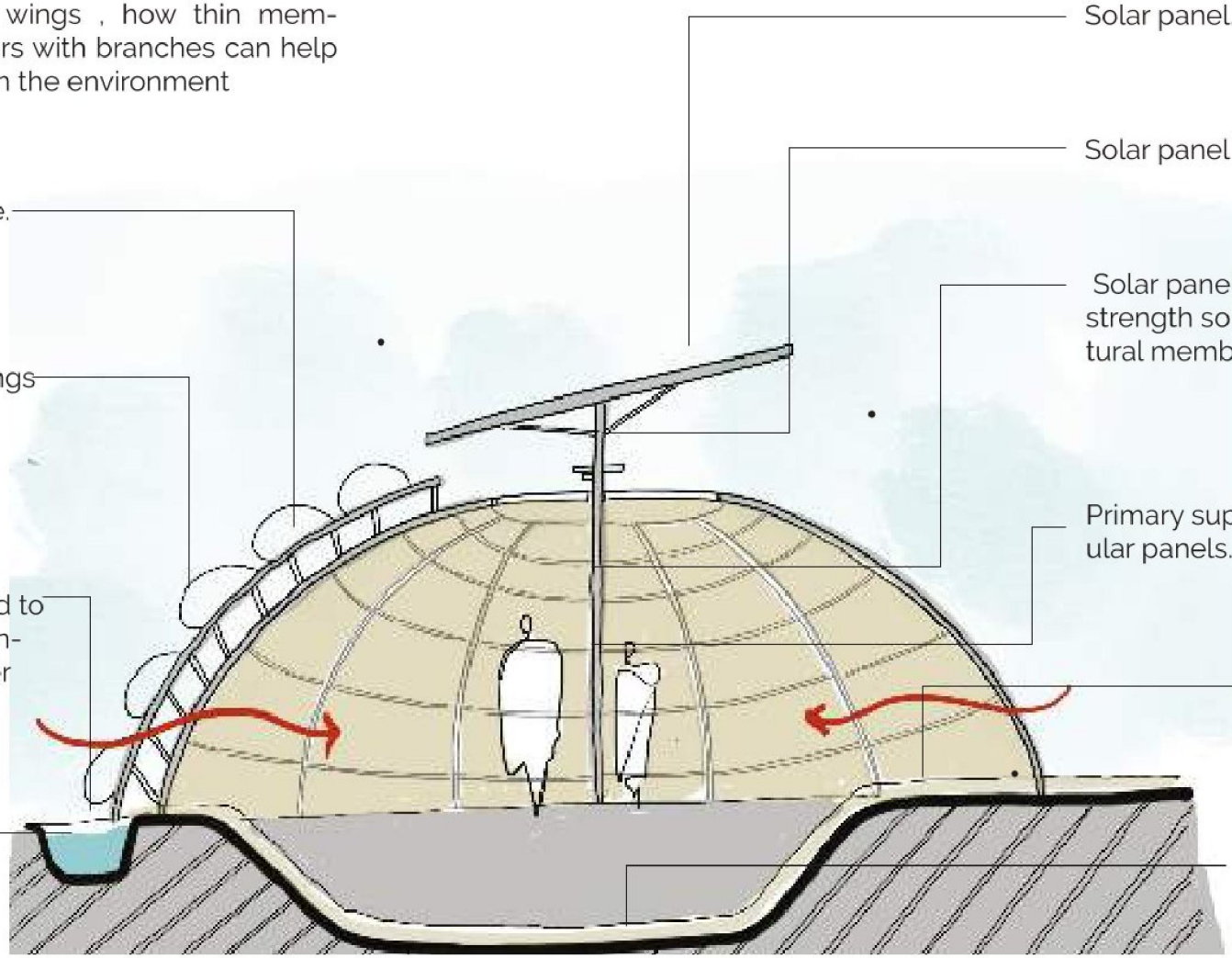
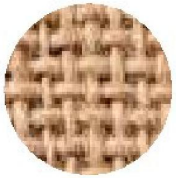


Figure : 42 Ideation 4

Tarpoline sheet



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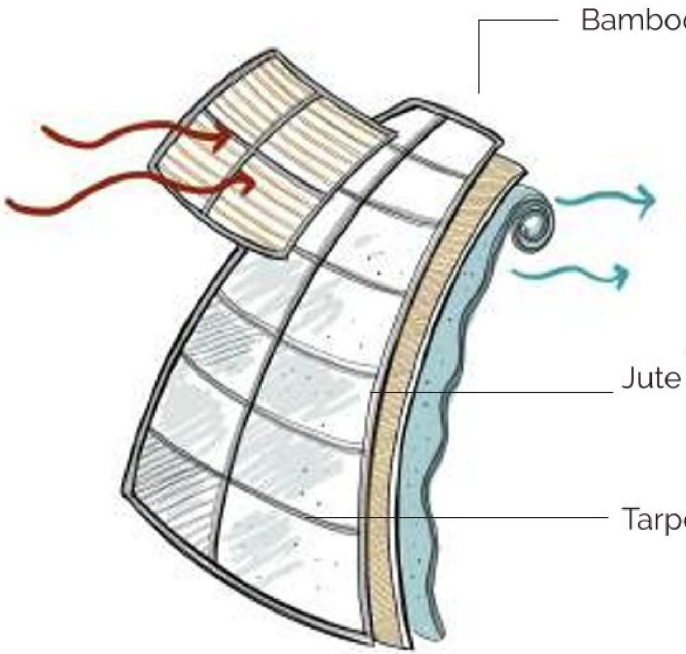

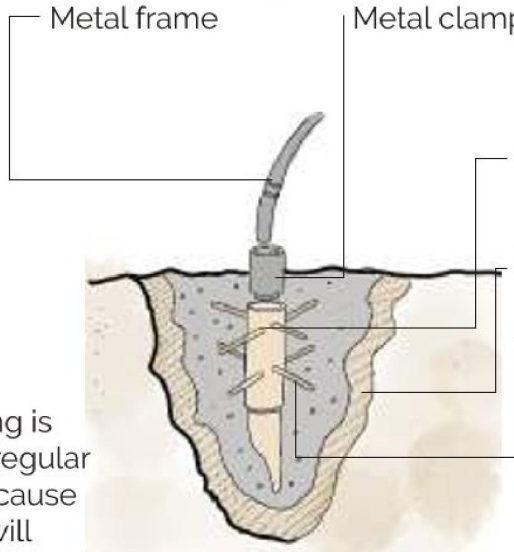

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Final Concept

Final concept -Single modular panel structure

Figure : 43

Material and Construction and Renewable Energy Usage

Bamboo:
What makes bamboo such a promising building material for modern buildings is its combination of tensile
strength light weight, and fast-growing renewable nature

Straw Bales:
Rather than relying on new research and technology, straw bale building hearkens back to the days when homes were built from natural, locally-occurring materials.

Rammed Earth:
Rammed earth is a technology that has been used by human civilisation for thousands of years, and can last a very long time.The design is modular, portable.

Cast Iron
Iron is an incredibly useful substance. It's less brittle than stone yet, compared to wood or copper, extremely strong. It it is properly heated then it is relatively easy to shape into various forms, as well as refine, using simple tools

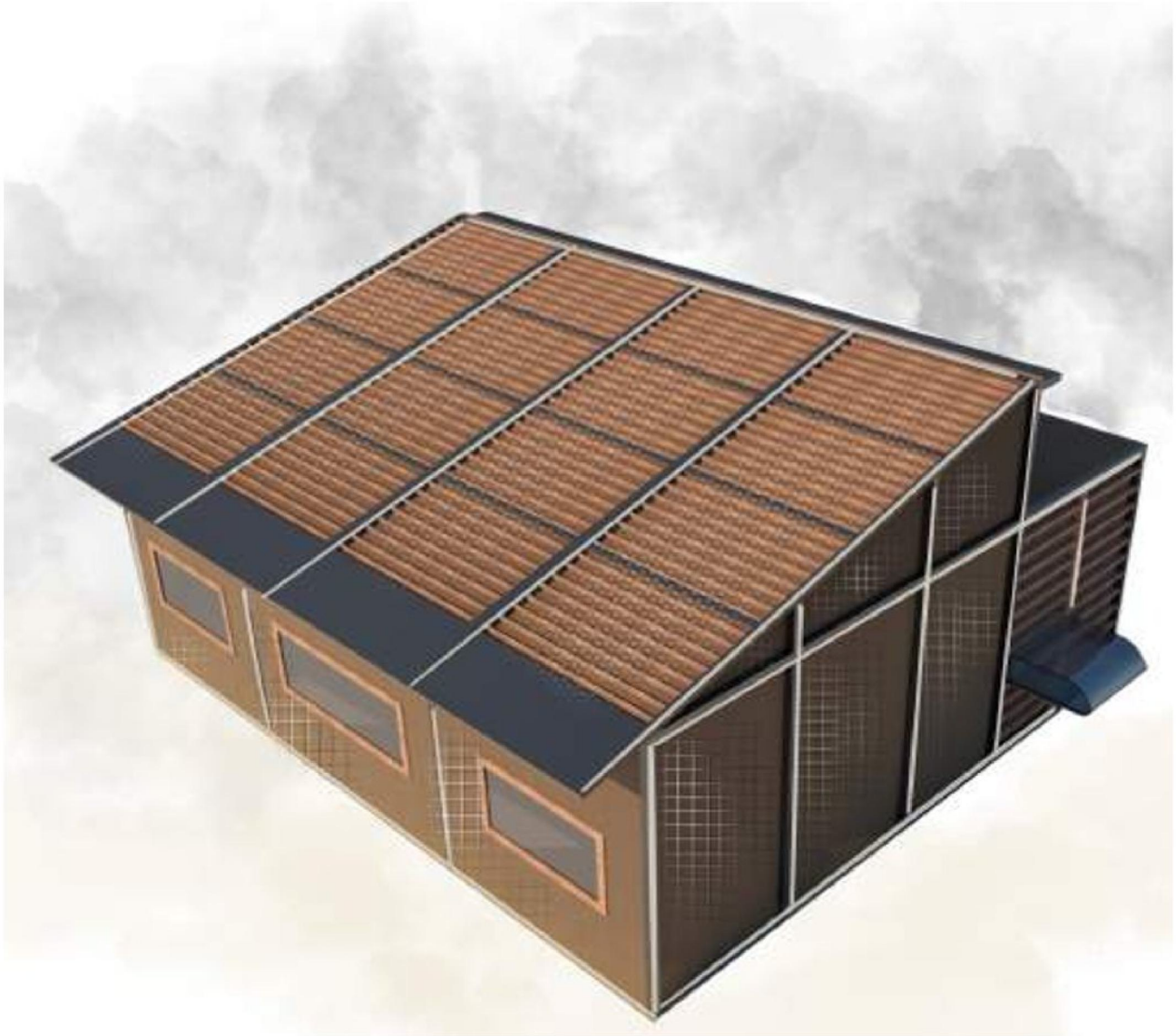


Figure : 44

Use of Renewable Energy

Solar Energy:

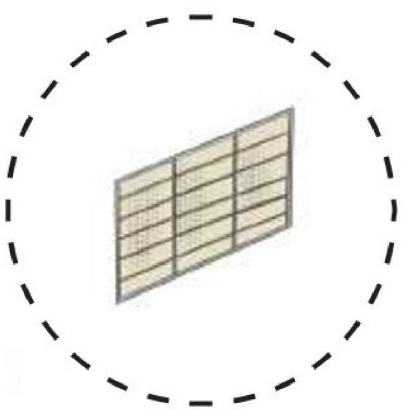
Solar power is energy from the sun that is converted into
thermal or electrical energy. Solar energy is the cleanest and most abundant renewable energy source available.

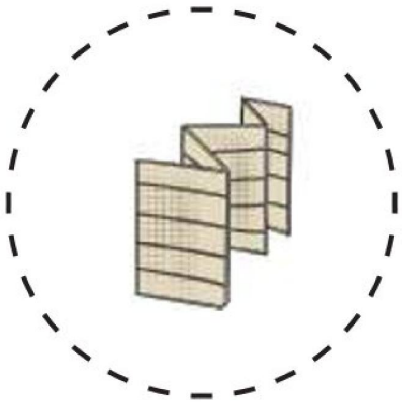
Solar Technologies

There are three main ways to harness solar energy:
Photovoltaics solar heating and cooling.
Photovoltaics generate electricity directly from sunlight via an electronic process and can be used to power anything from small electronics.
In this design solar panel is fixed in top most part of the
dwelling so that it will take maximum amount of sun light and store more energy.
And the reason behind to put it up in top part is that, we can also get the shade from the solar panel in our dwelling.

Final concept -Single modular panel structure

Figure : 45





The foldable panel will be used for the hutment of salt workers. in that foldable panels, the insulation material will be used cardboard, cotton, hollow cartons, glass-wool , and and locally available materials.

The metal frame is used for extra stability and giving the strength to structure. It is also suitable for the harsh environment of that area little rann of kutch

Construction Details

Referring some metal and wood Joinery

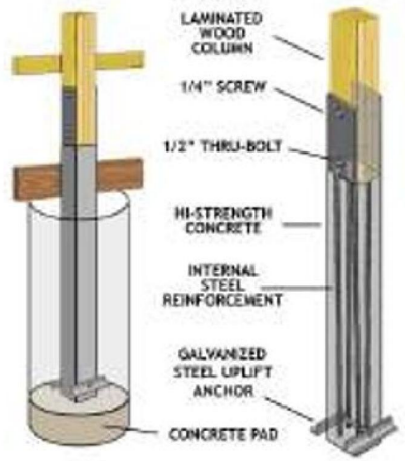


Figure : 46

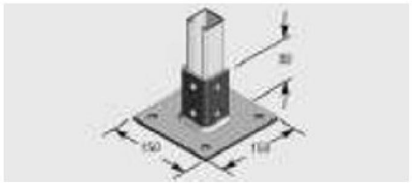


Figure : 47

Figure : 48

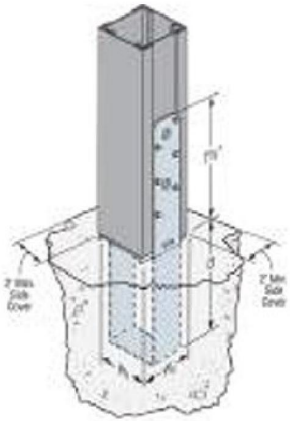


Figure : 49

The foundation of the dwelling is also different from the other regular foundations of the house, because of salty groundwater. Water will affect the foundation, and metal gets rusted with the time.

Figure : 50

Figure : 51

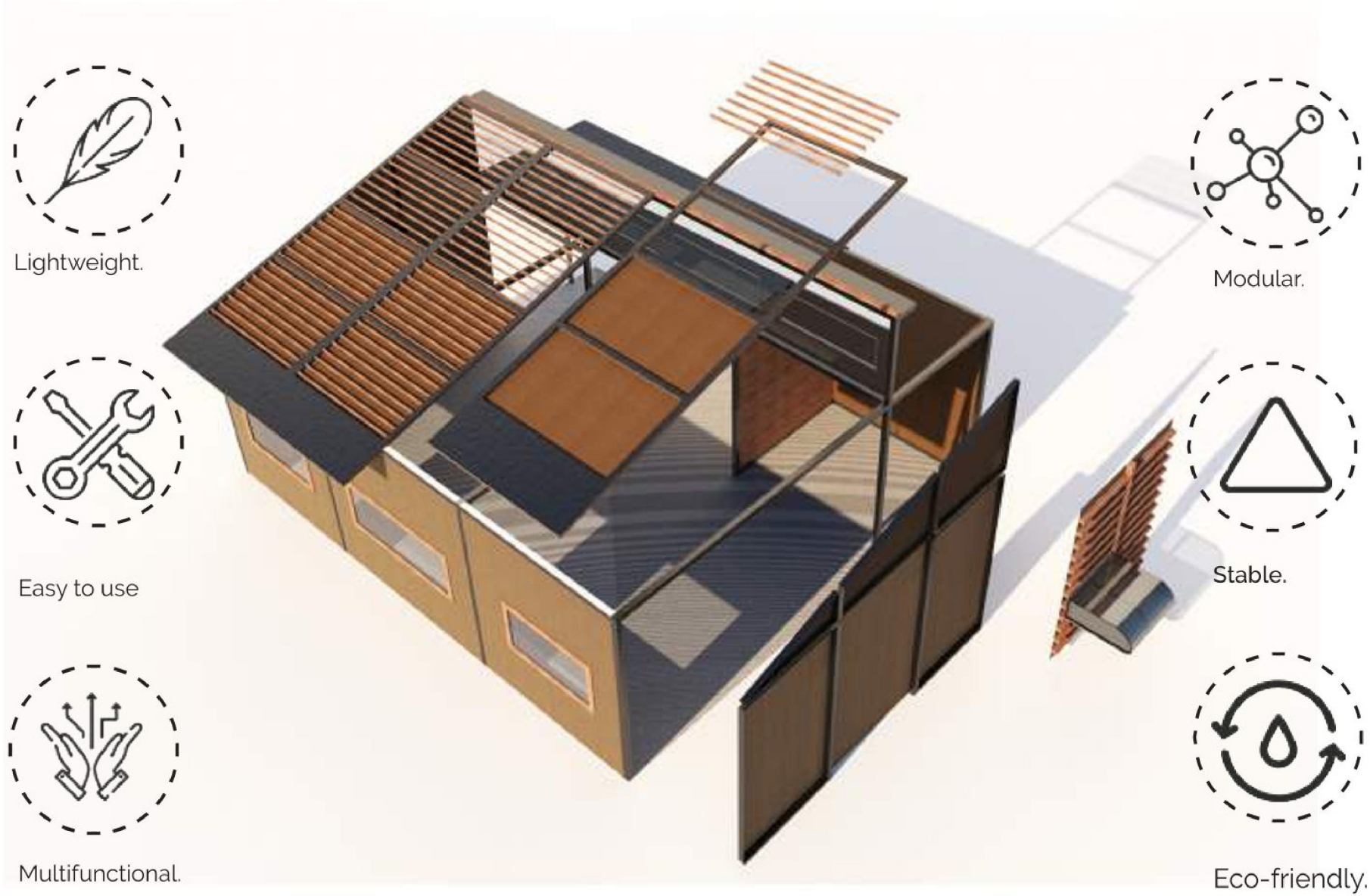
Figure : 52

Figure : 53

Figure : 54

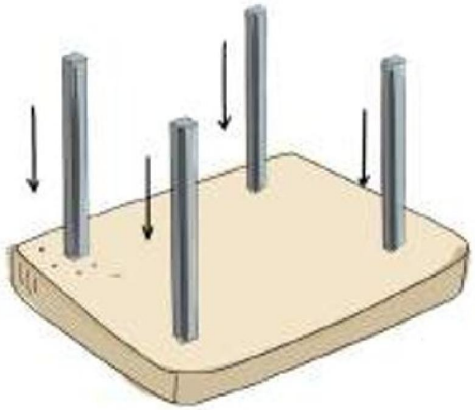
The foldable panel will be used for the hutment of salt workers.in that foldable panels, the insulation material will be used cardboard, cotton hollow cartons, glasswool , and and locally available materials.

Salient feature of the humen

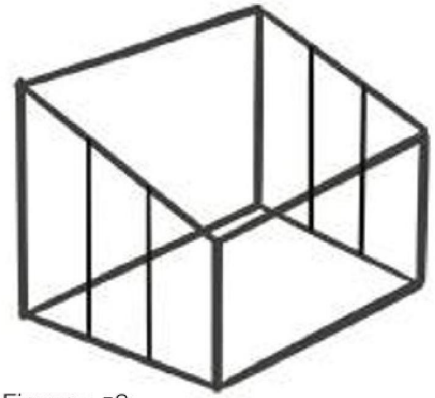


Instructional Graphics

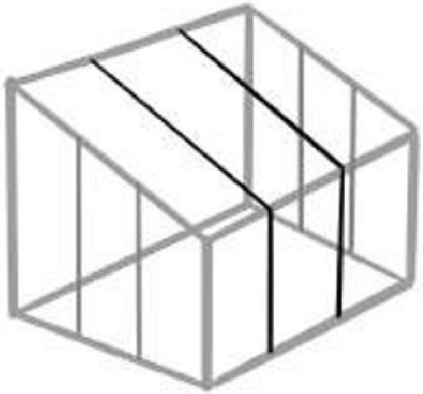
1 Figure : 56



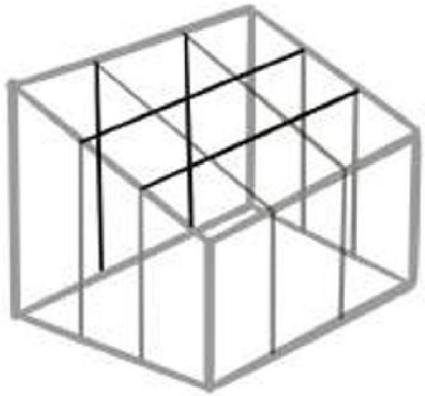
2 Figure : 57



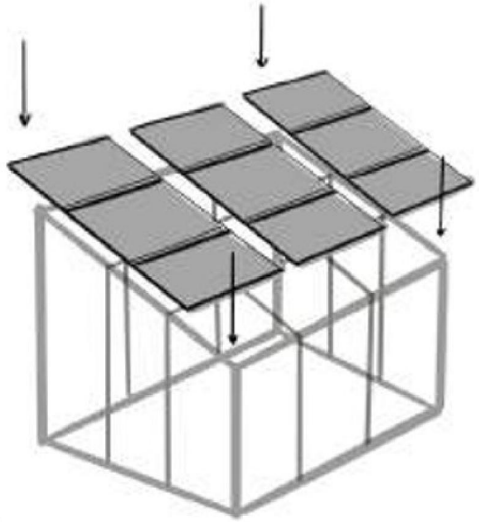
3 Figure : 58



4 Figure : 59

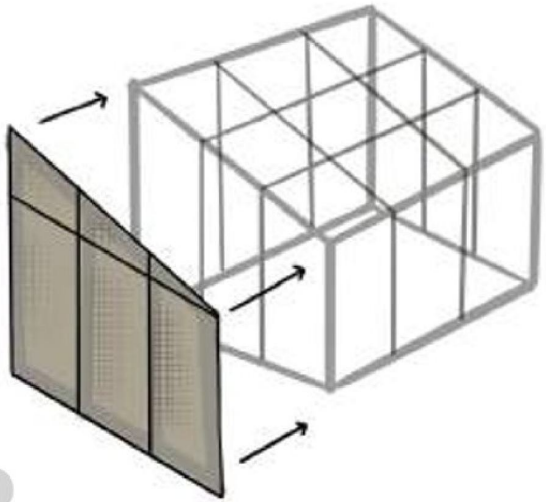


5 Figure : 60

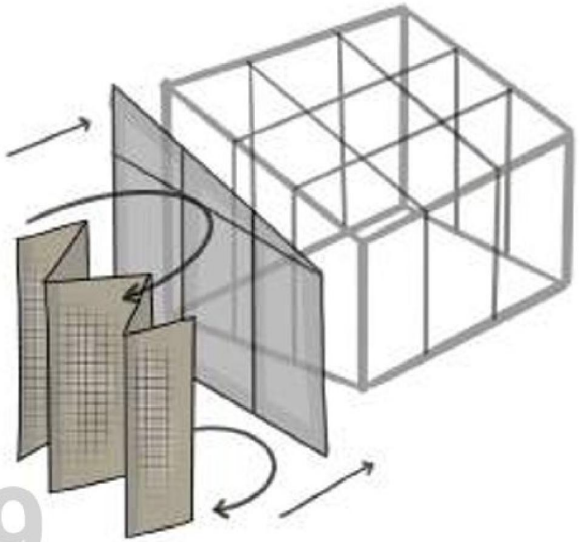


6 Figure : 61

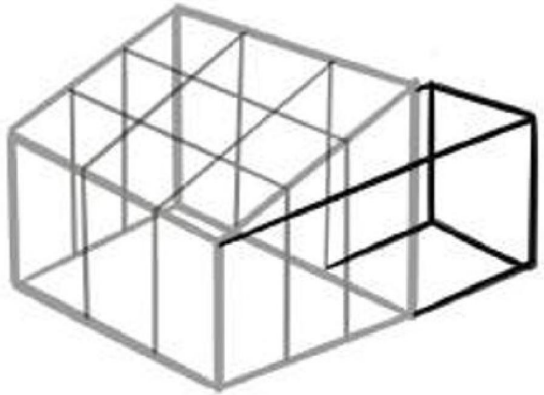
7 Figure : 62



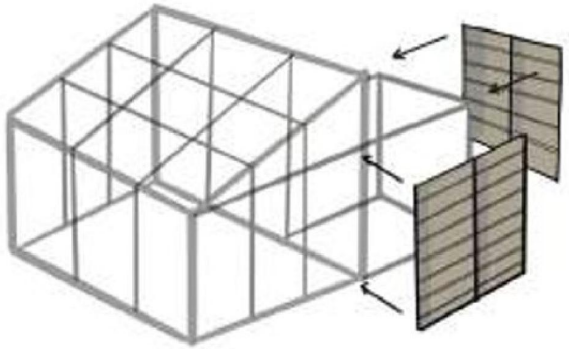
8 Figure : 63



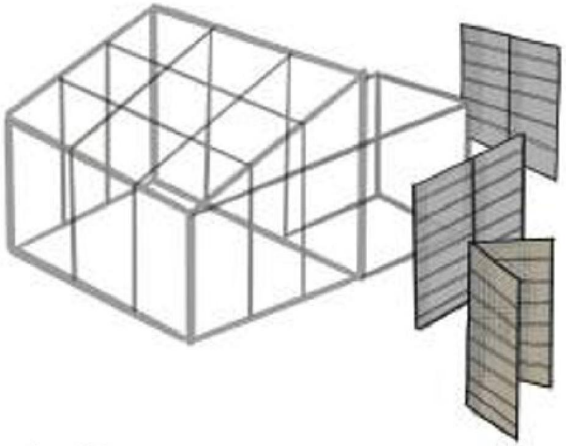
9 Figure : 64



10 Figure : 65



11 Figure : 66



12 Figure : 67

Dimensional drawing :

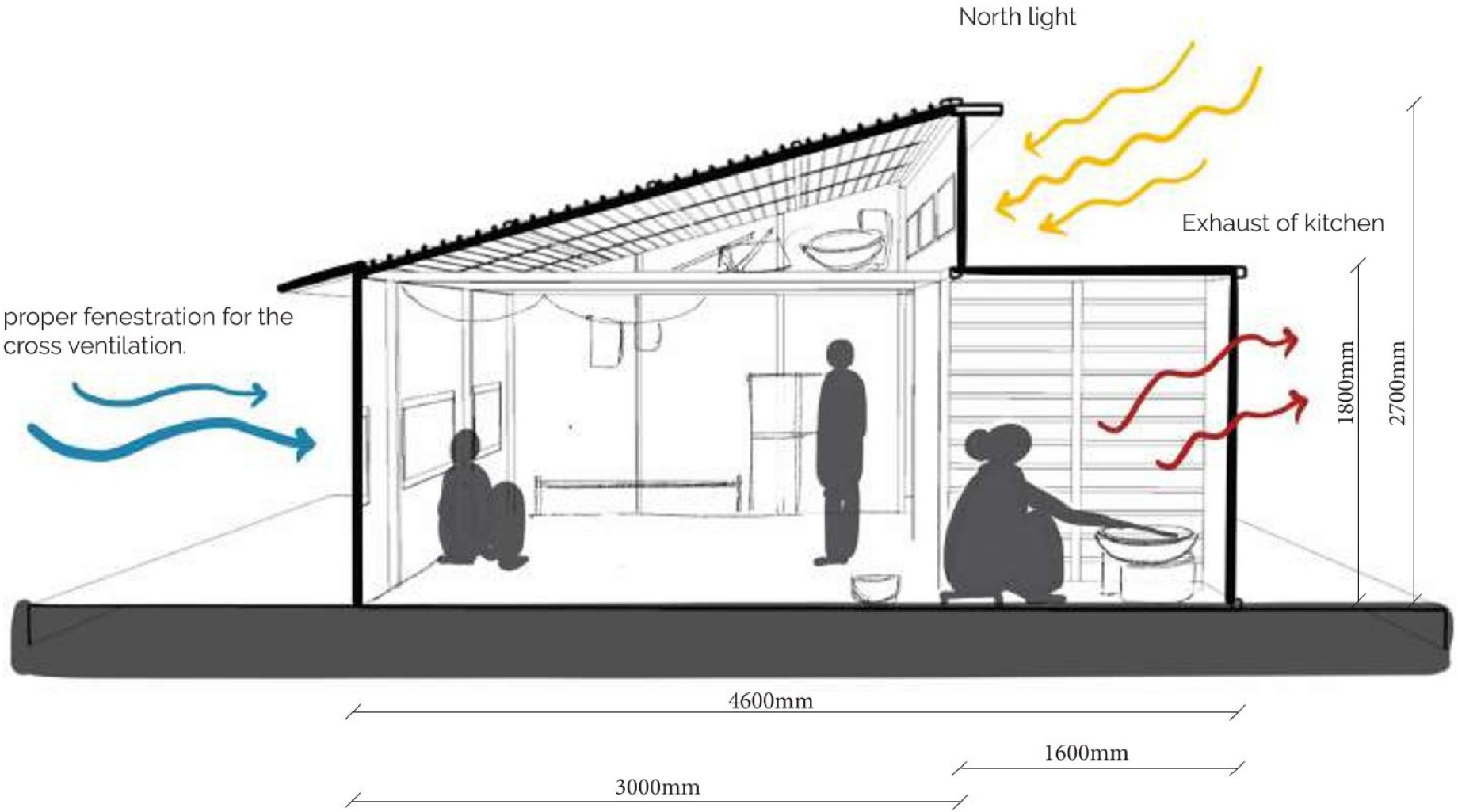


Figure : 68

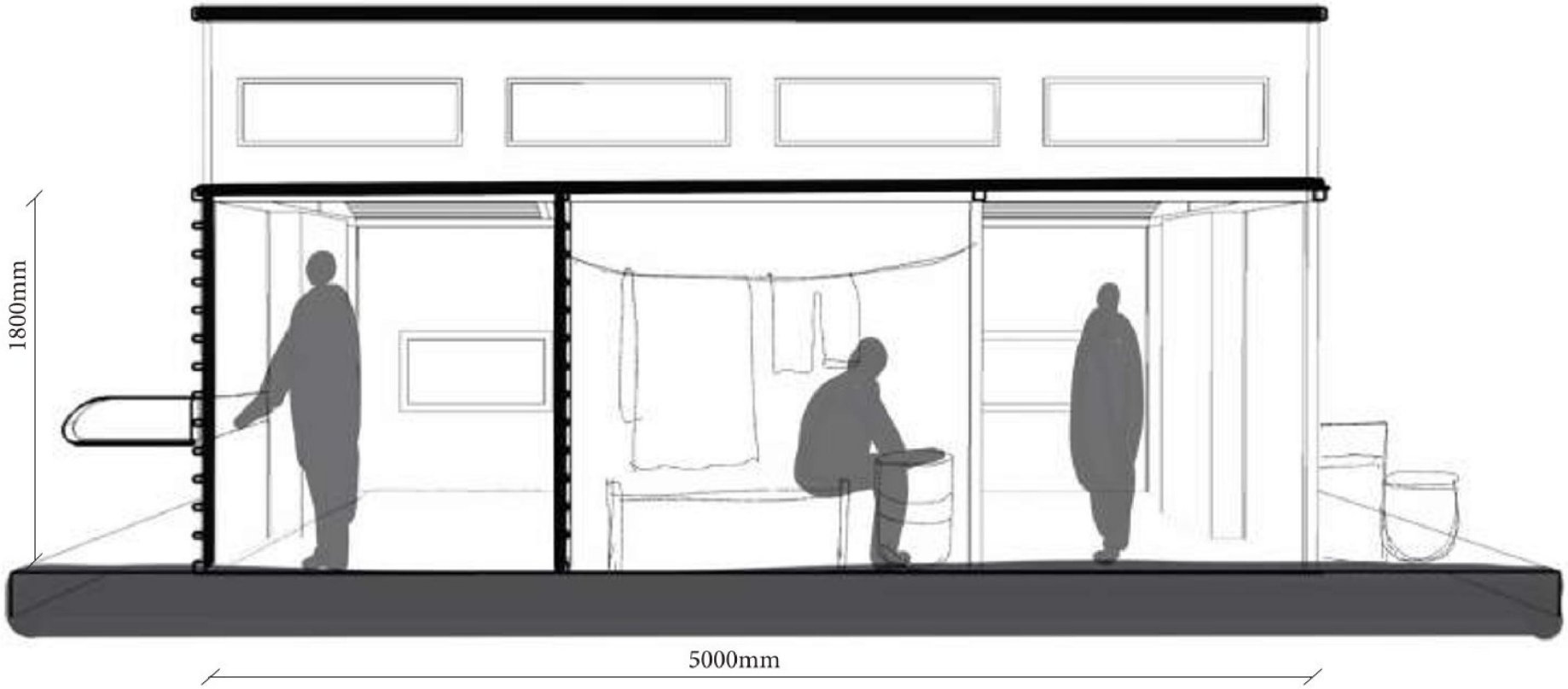


Figure : 69

Comparison between old and new dwelling

Current dwelling

Weak joinery
Unstable structure
Use of local material
Weak foundation
No fenestration
No storage spaces

Dwelling with changes and new fearures.

Strong joinery
Stable structure
Use of local material
Strong foundation,
Proper fenestration
Storage spaces with water tank and separate kithen space.

CO2 Lifecycle Assessment

Use of low costs material with less embodied energy like Jute bags, Bamboo Strips, Rammed Earth with Dung as binding material etc make it Zero Carbon Footprint Design. In addition to this, the usage of Aluminium is mass manufactured and handed over to the locals for their construction. The locals shall customise the design as per their needs. Moreover, the operational costs of the proposed hutment is zero as the use of Solar Panels and Dew Collectors are used for sustaining under the harsh sun

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