



Bureau of Energy Efficiency



सत्यमेव जयते
Government of India
Ministry of Power



giz Deutsche Gesellschaft
für Internationale
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ANGAN

Augmenting Nature by Green Affordable New-habitat

A Courtyard for Revolutionary Change in Building Energy Efficiency

An International Conference on Building Energy Efficiency

9th-11th September, 2019 | Hotel The LaLIT, New Delhi





Bureau of Energy Efficiency



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Government of India
Ministry of Power



german
cooperation
DEUTSCHE ZUSAMMENARBEIT

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für Internationale
Zusammenarbeit (GIZ) GmbH

THIS PRESENTATION WAS SHARED BY

Sonam Wangchuk

SECMOL & HIAL

FOR THE SESSION:

“Keynote Address #2”

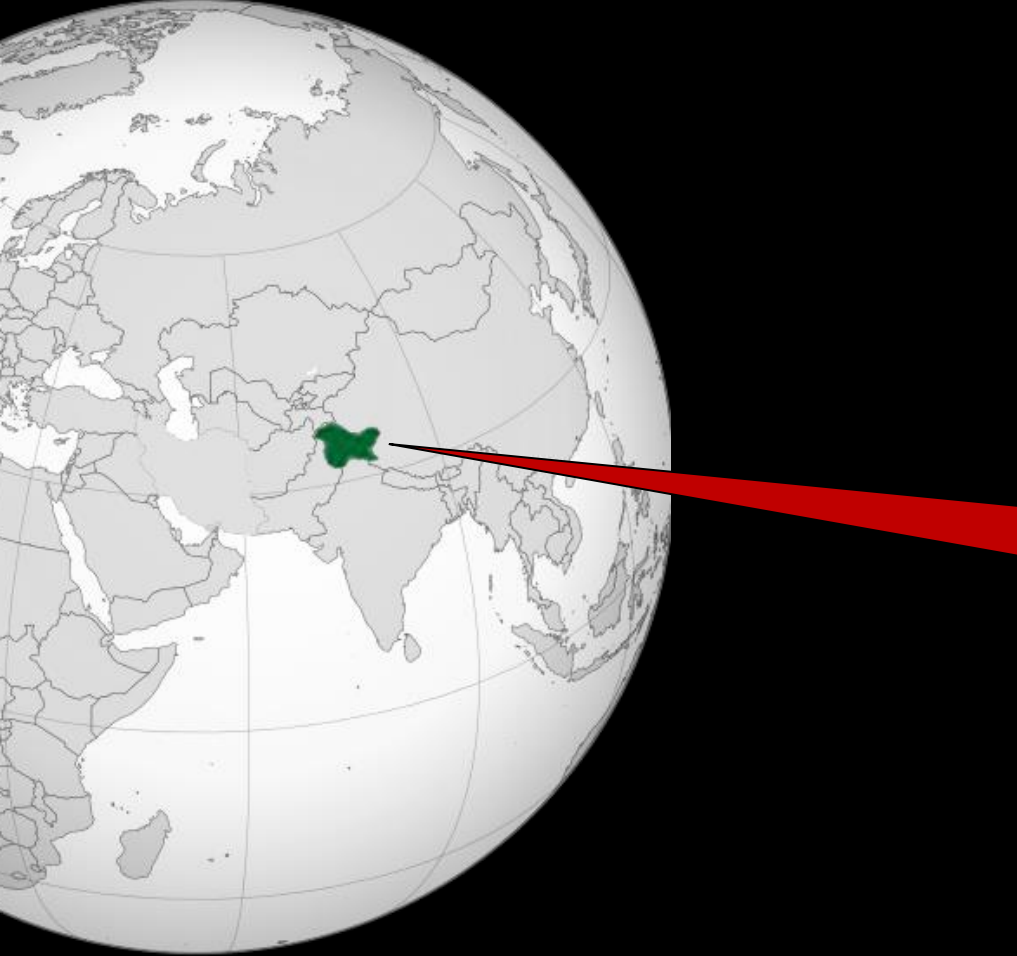
DURING ANGAN 2019

Knowledge Partner

teri | THE ENERGY AND
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Creating Innovative Solutions for a Sustainable Future

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Ladakh

Trans-
Himalayan
Mountain
Desert

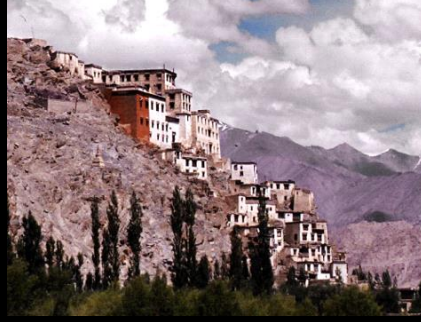
Temperatures
+35°C to
-35°C













A climatic and technological minority as well.

Through 1980s & 90s ...

95% of Ladakhi students used to fail in matric exams

Leh Distt regular students from Govt Schools

Zero % result in 16 Ladakhi High Schools

JAMMU, July 98 - Zero ...

Schools with zero p.c. result record

JAMMU, Dec. 13 (UNI)—Zero per cent result was recorded by 21 of the 33 schools of Leh and Kargil districts in the Class X new course examination in October last year, according to officials. In the April, 1985 session, zero per cent result was recorded in 15 of the 31 schools in the two districts. The number of candidates sponsored by these schools, all run by the Government, ranged from one to 22.

10th Class Matriculation Exam Results Low As Usual

This year the J&K Board of School Education stated that 14% of students in Ladakh. However, upon carefully counting every student in the Boards own published the pass rate is in fact only 10%. Why are the perfectly normal education by the many teachers and administrators that fails, not 90% of students!

(number passed/ total)
District (165/1 ...)

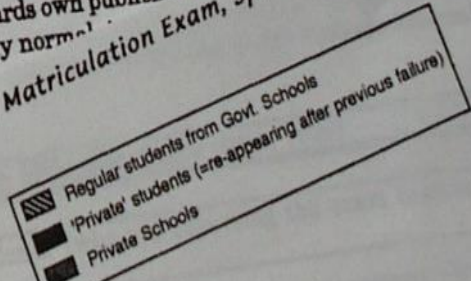
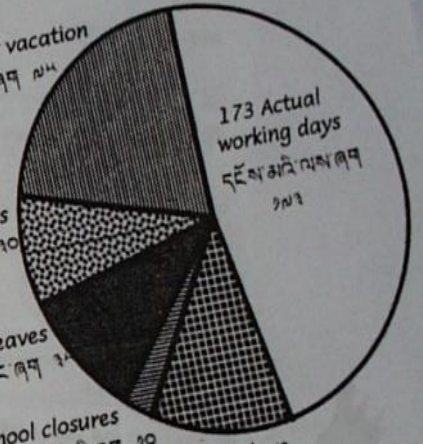
Did you know... ?
365 Days in the year of a lecturer

75 days winter vacation
དགུན་ཁའི་ལུང་མིང་ཞལ་ 75

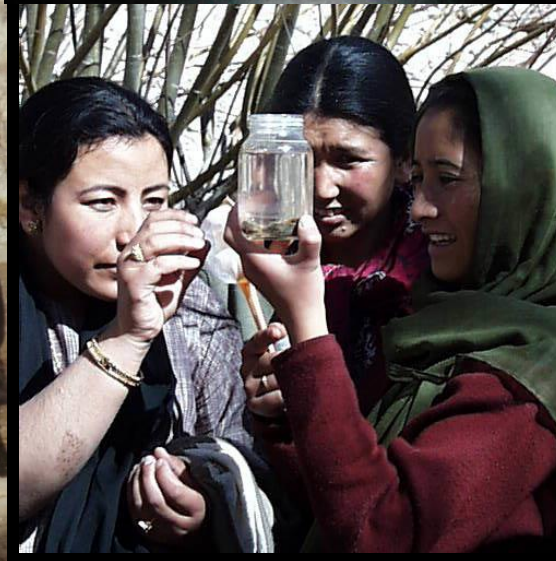
Government Holidays
འགྲུབ་ལུང་མིང་ཞལ་ 30

Authorised leaves
འགྲུབ་ལུང་མིང་ཞལ་ 30

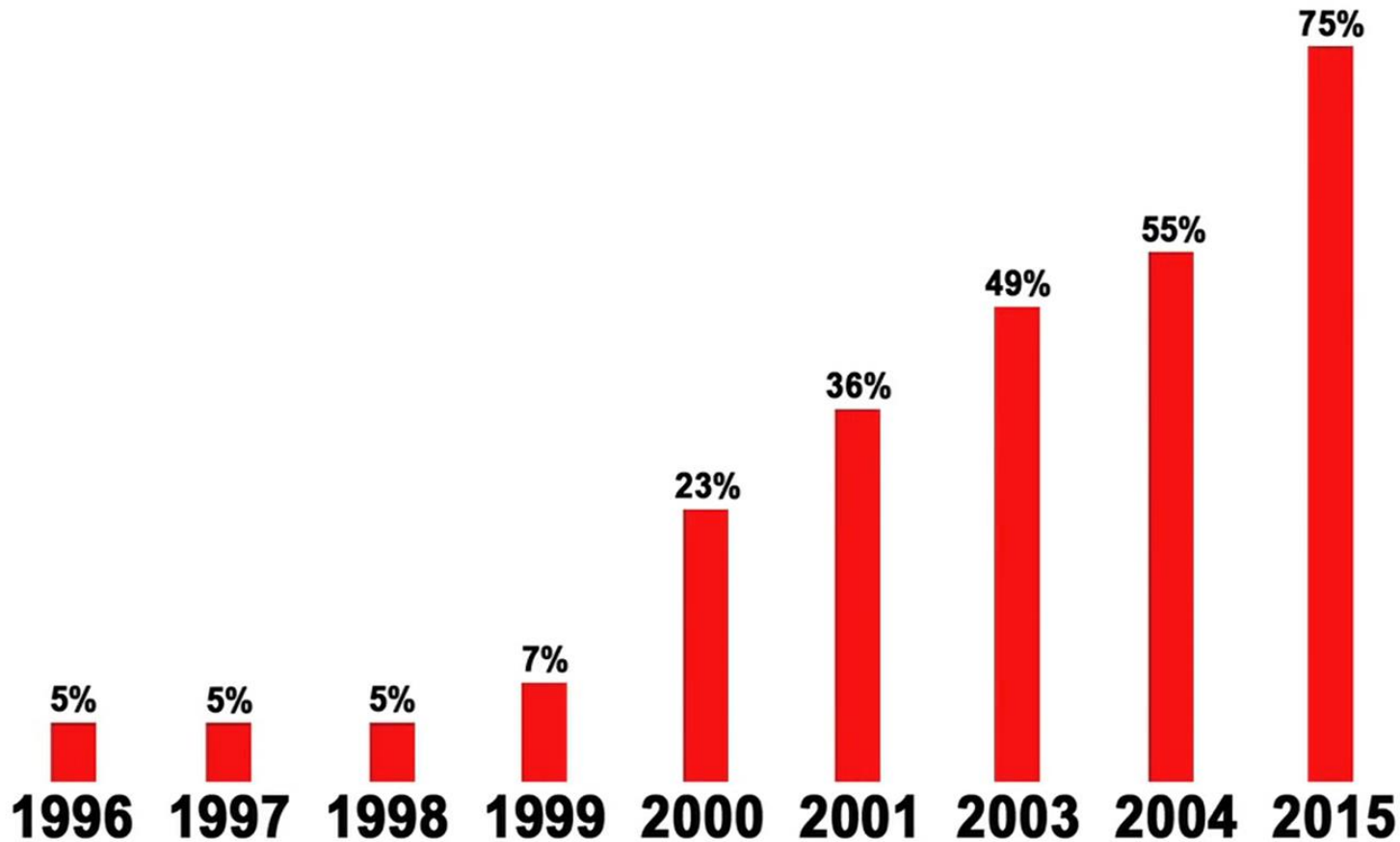
Observed school closures
སྒྲིབ་བྱ་བར་ལུང་མིང་ཞལ་ 30



Operation New Hope Education Reform Movement



Matric results%



**Phey Desert
1994**



SECMOL Alternative School





NW winter winds

15 Deg due SE

OFFICE BLOCK

NE monsoon winds

SECMOL Campus

W

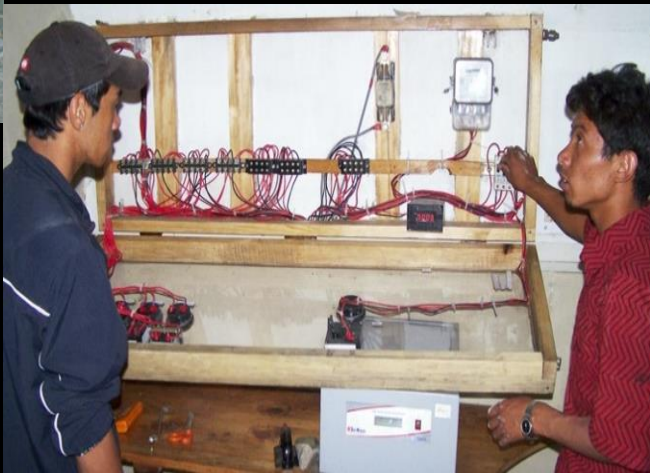
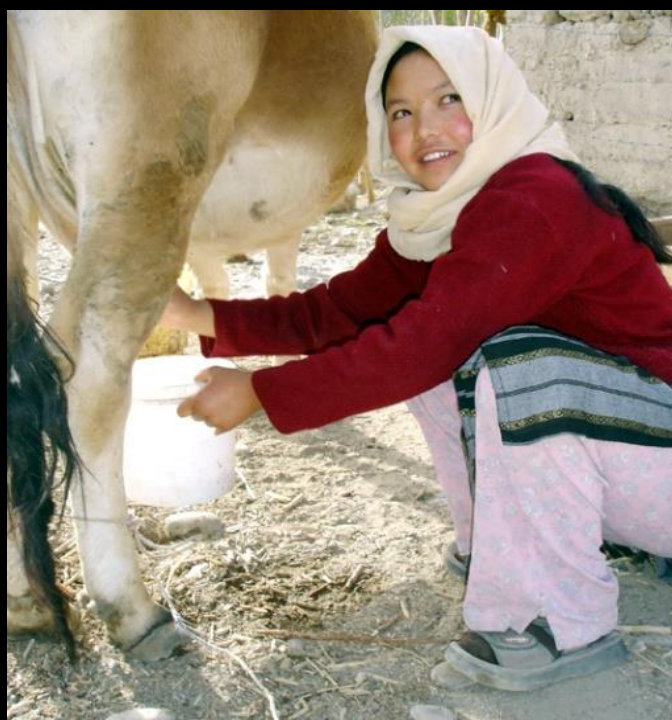
E

INDUS RIVER

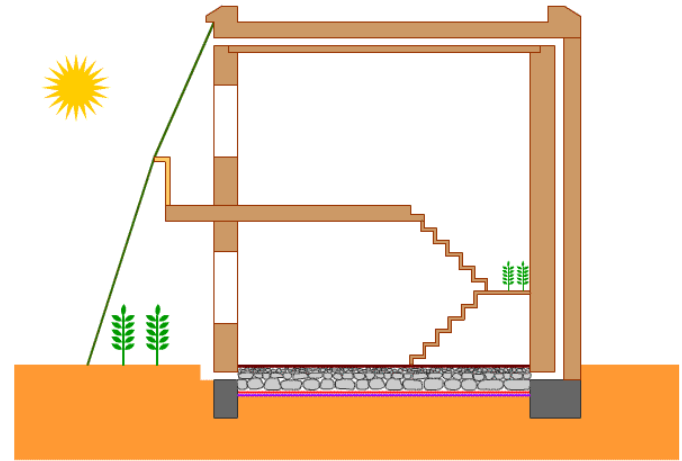
SUN PATH



Students in the driving seat!



**LEARNING
BY LIVING**





Inside temperature in winter

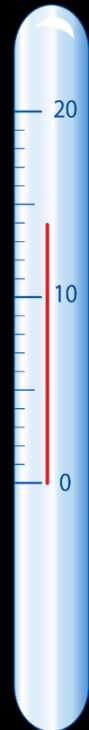
- Average evening temperature
- Minimum in a normal winter
- Minimum observed in 22 years

- And naturally cool in summer

+ 14 °C

+ 10 °C

+8°C





- Natural lighting:
- Windows and skylights are kept in a way that no place in the building needs electric lights during the day.

- Flowers bloom even in the stairwells in January when the minimum temperature outside is $-25\text{ }^{\circ}\text{C}$.





The fort of Tingmosgang



The Palace of Saspol



The Palace of Saspol

Saspol fort lies on a plateau above the village of sapol, 61 Kms from Leh city. Very little is known to historians about this Fort/palace. Carbon dating suggests it is 1,500 years old. It is four stories high and the walls are of roughly one meter thick.

The construction system used seemed like packed earth. There were no visible lift marks of ramming.

Layers are reinforced with branches of sed shrub(*colutea mesantha*)

The local soil was very sandy but the source of the purple clay mixed to stabilise it was some 300 m away.

The formwork heights varied from 80 to 100 cm.

Wall thickness: 85 to 95 cm,

Largest grain size: 7 cm.

Wall sample density: 2.2 Kg/L

Lab test results of the soil analysis in detailed version.





THIRD POLE ENTERPRISES



A Passive Solar Construction company





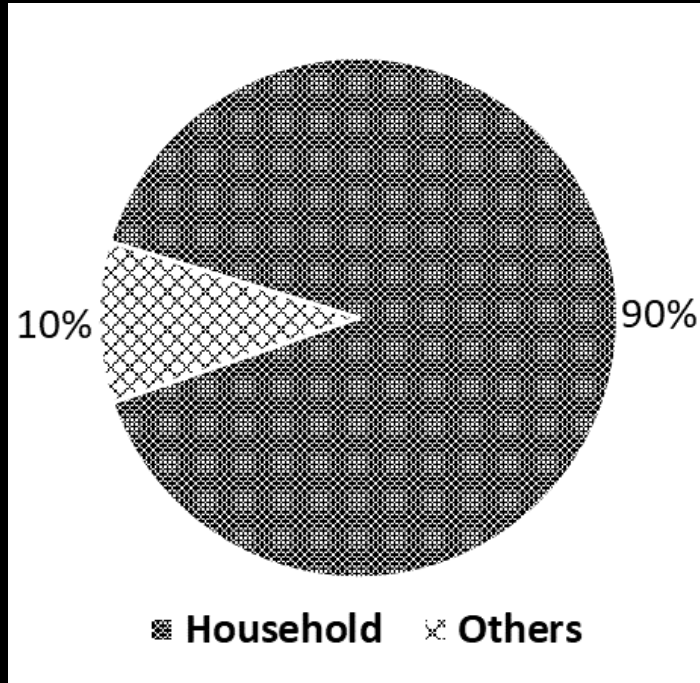


Terra 2016 Award at the 12th World Earth Congress in Lyon France

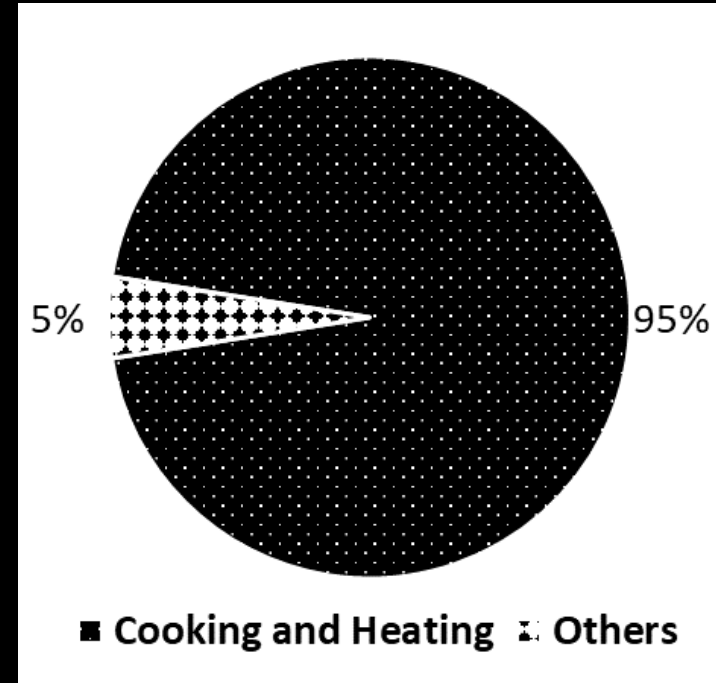


Energy Consumption in Ladakh

Total Energy Consumption



Domestic Energy Consumption



Source: I. Purohit, "Solarification of the Ladakh Region: Addressing Energy and Sustainable Development Issues," *The Solar Quarterly*, no. 2, pp. 33–64, Jan-2011.



COOKING



GREENHOUSE



NATURAL LIGHTING



ELECTRICITY



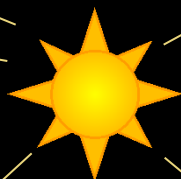
WATER HEATING



WATER PUMPING



SOLAR COW SHEDS



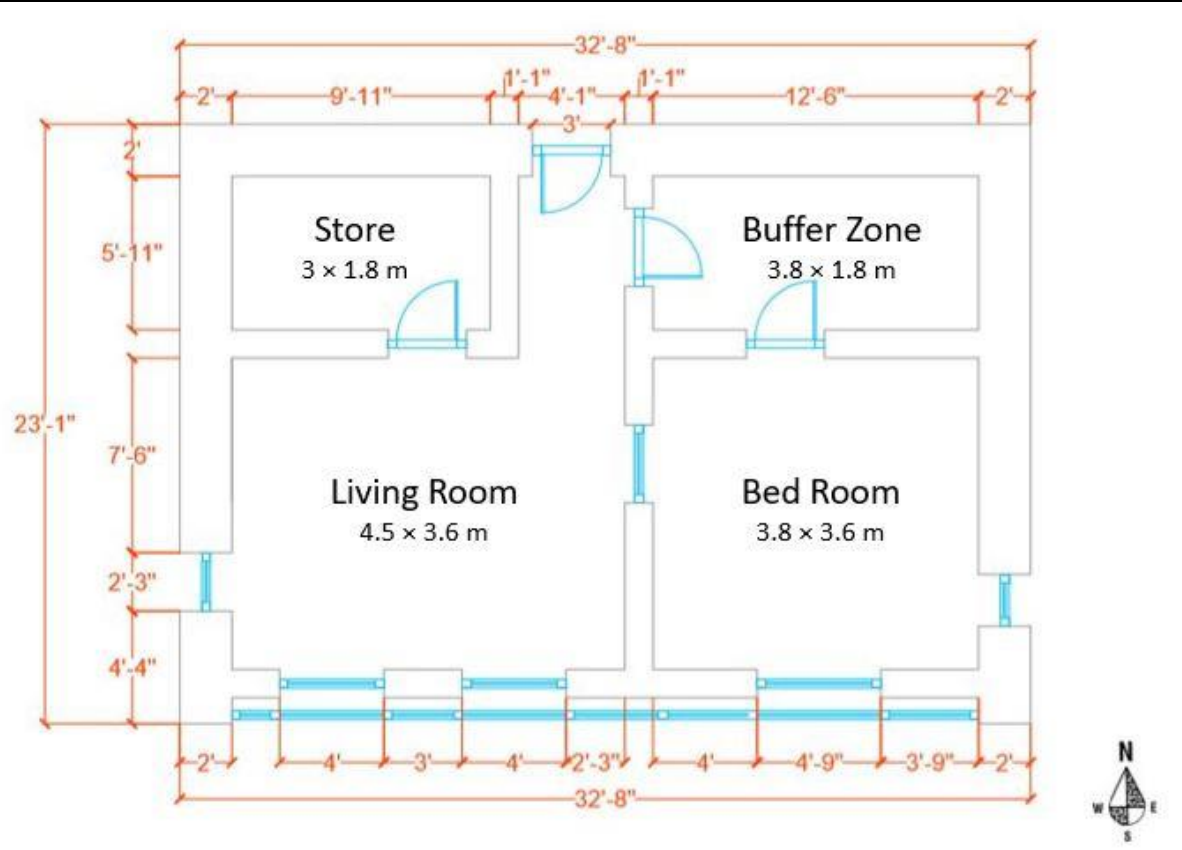


Global Award for Sustainable Architecture 2017, Paris

Model House

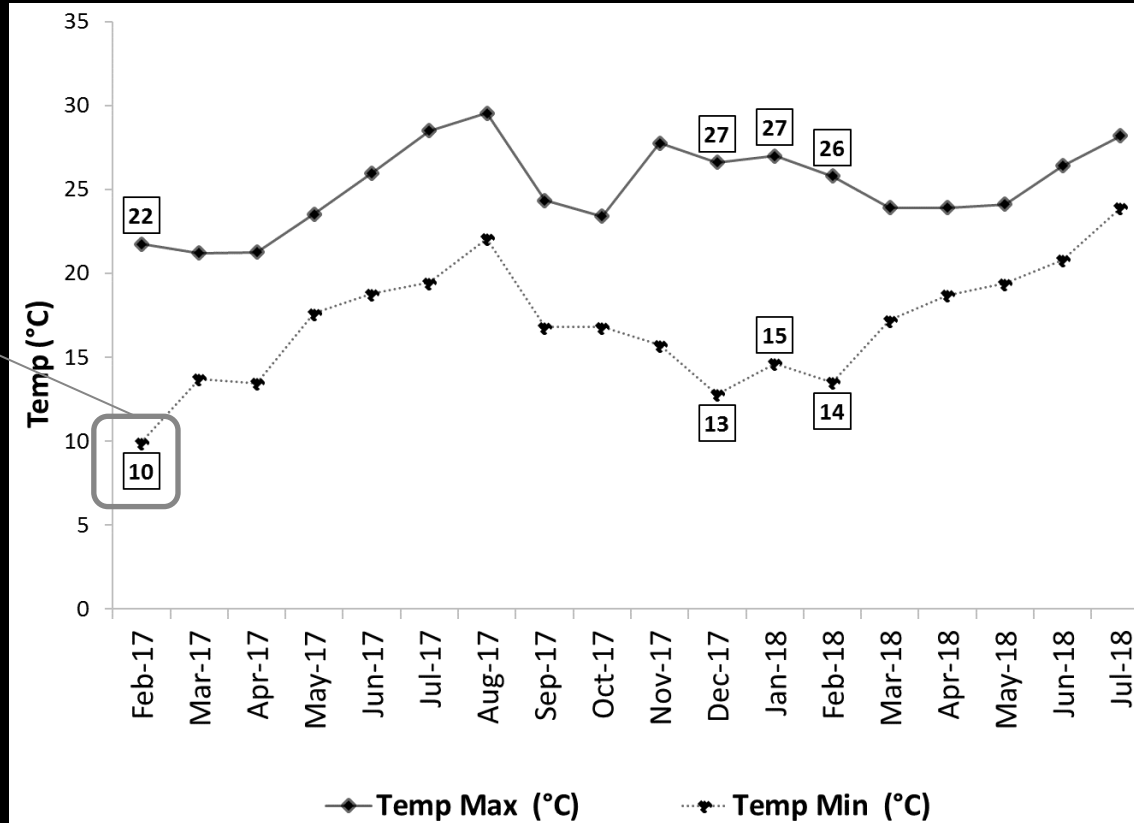


Model House Plan



Temperature Profile

Minimum Indoor
Air Temperature

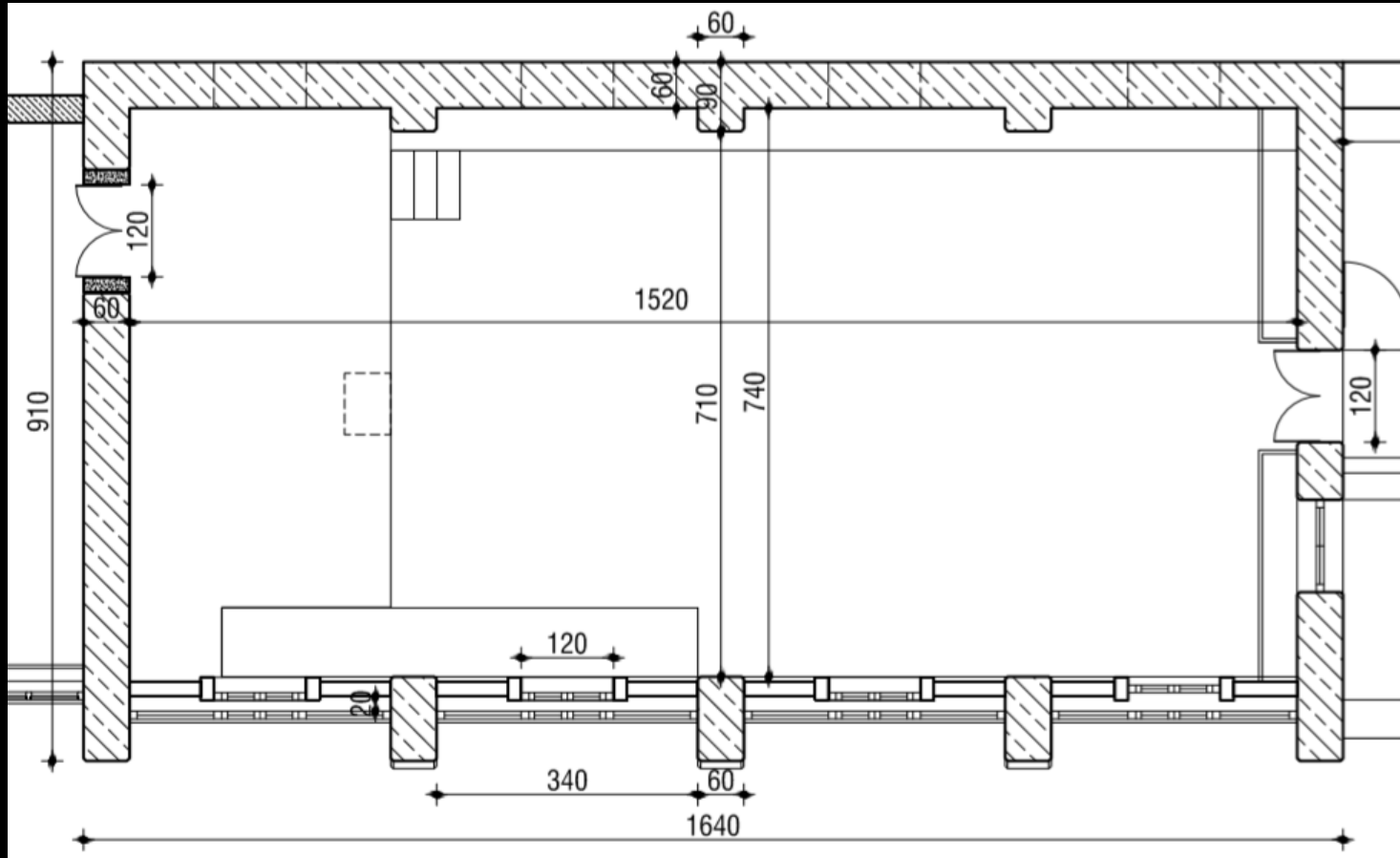




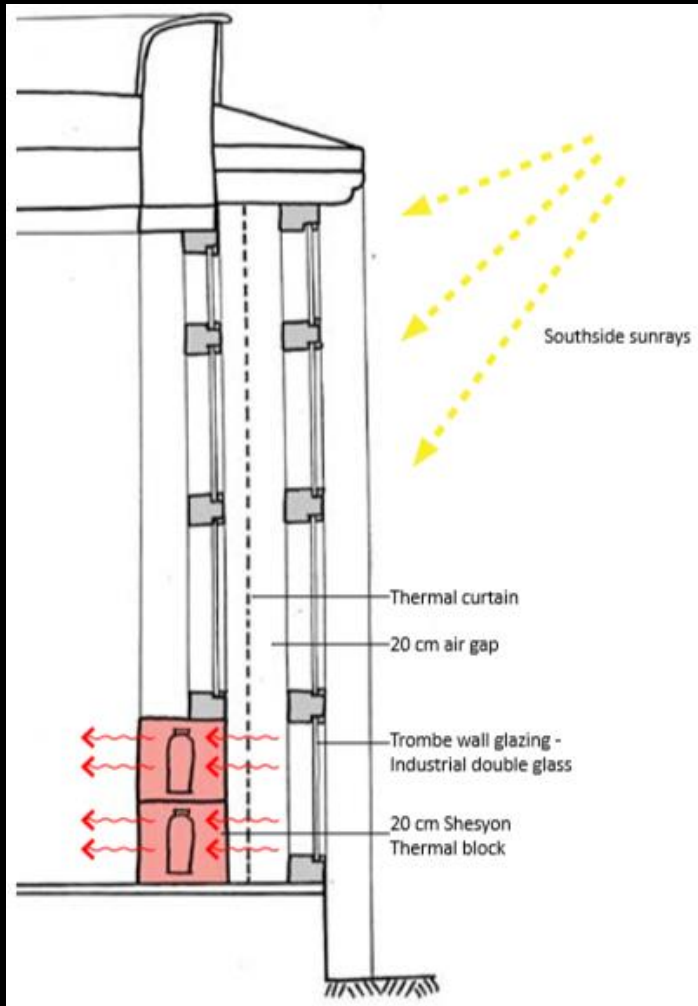
Multipurpose Dining Hall



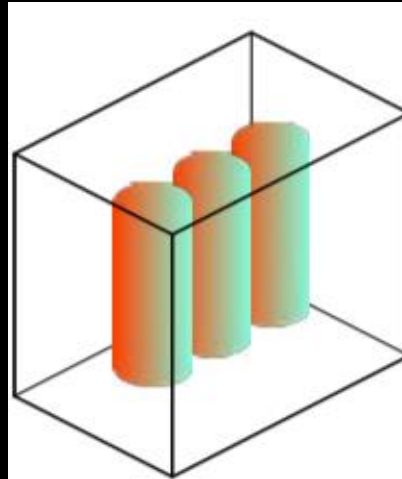
Plan



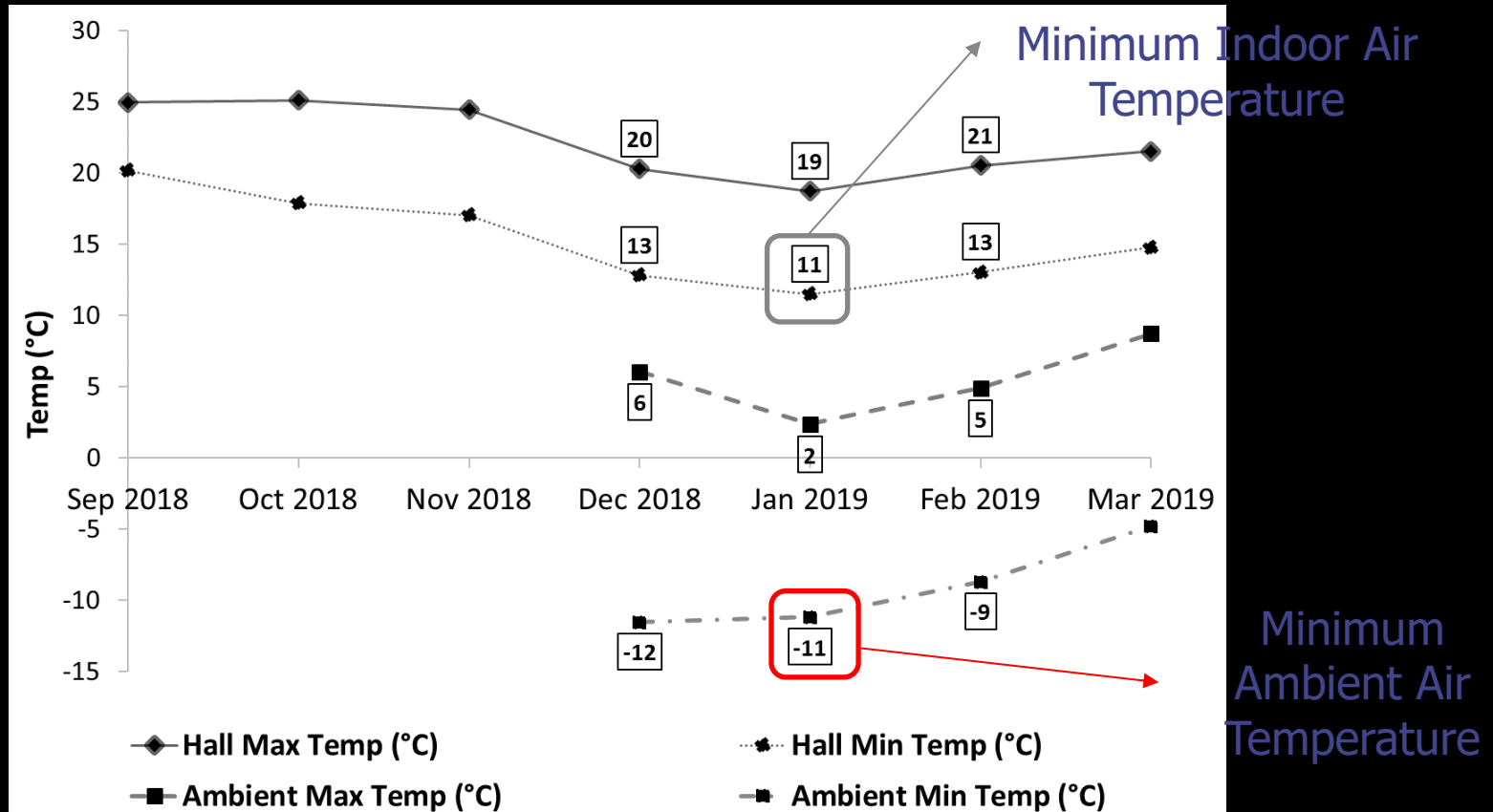
Modified Trombe Wall



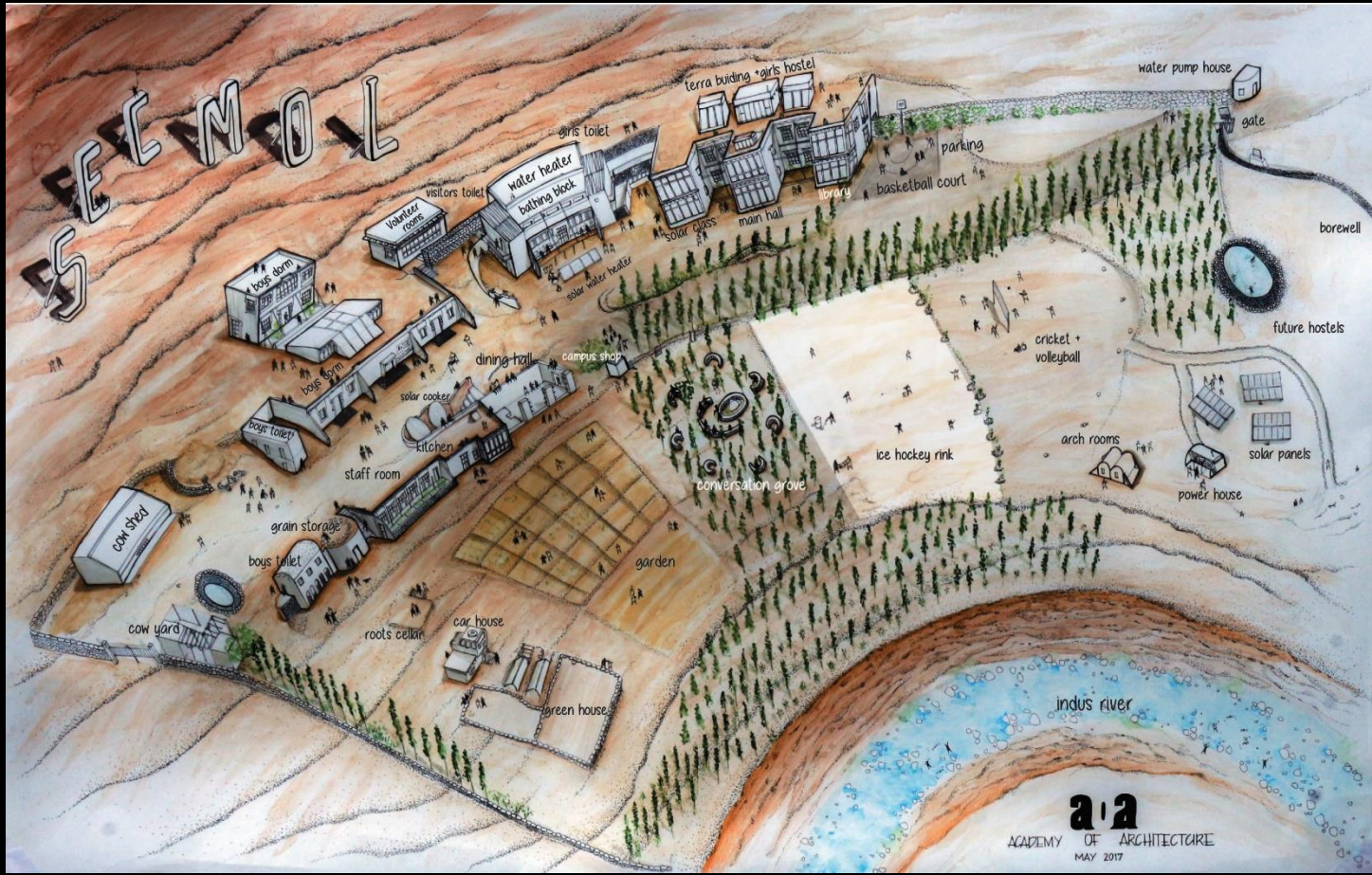
Thermal Blocks

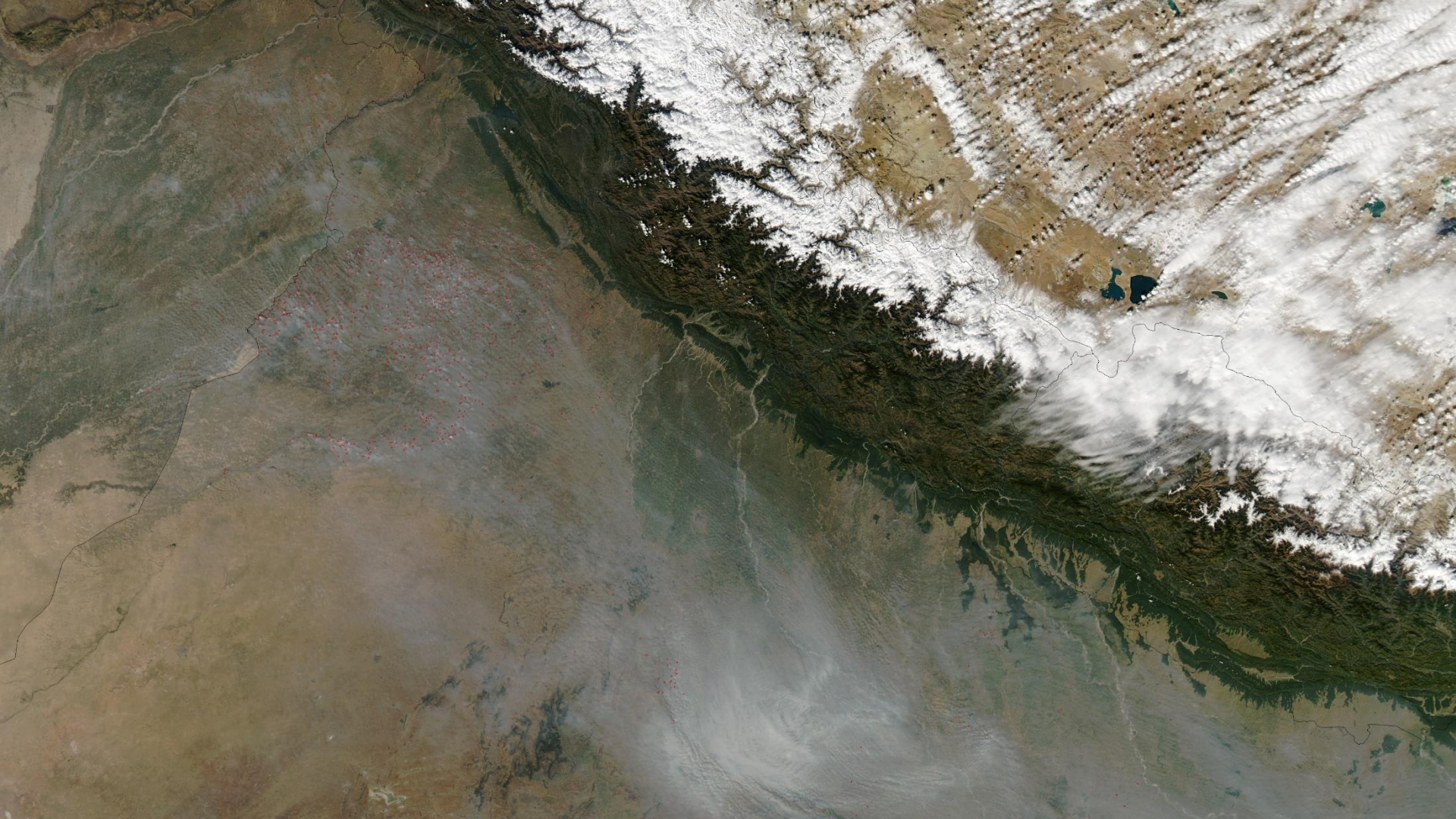


Temperature Profile



Gravity Planning







India

Pakistan





Leh in winter



PREFAB PASSIVE SOLAR HOUSE DESIGN



Clay Binder

Bagged, powdered clay



Or

Clay soil with high clay content of 25-50%



Chopped Straw



Any type of straw will work. Ideally, straw is chopped in pieces from 1 -6 inches in length. Straw from a rotary combine will already be chopped.



Pre-Fab Solar Earth Building

- ◆ Low density pre-cast straw-clay blocks
- ◆ Relatively light weight and insulating
- ◆ Modular, Lego like
- ◆ Quick and easy to assemble
- ◆
- ◆ Straw sourced from Punjab, Haryana cuts emission/pollution
- ◆ Solar Passive house cuts emission/pollution 2nd time in Ladakh.

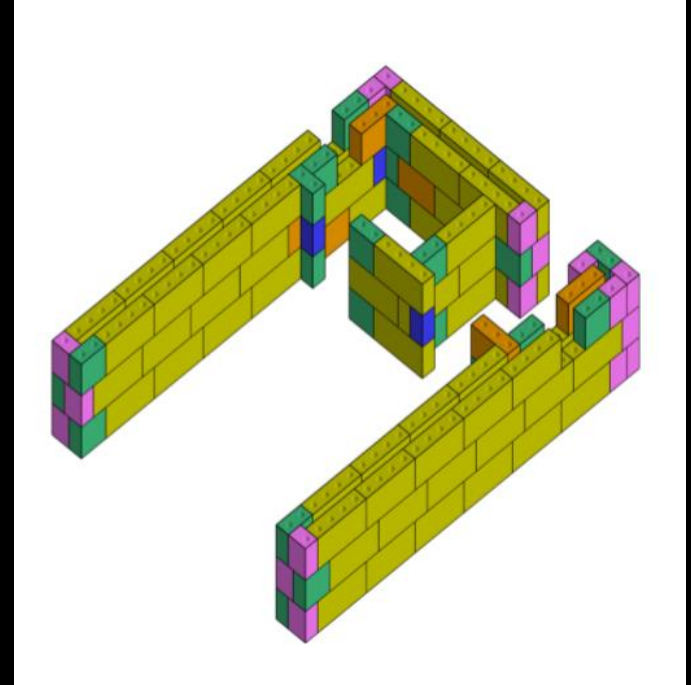
Pre-Fab Panels



Pre-Fab Construction



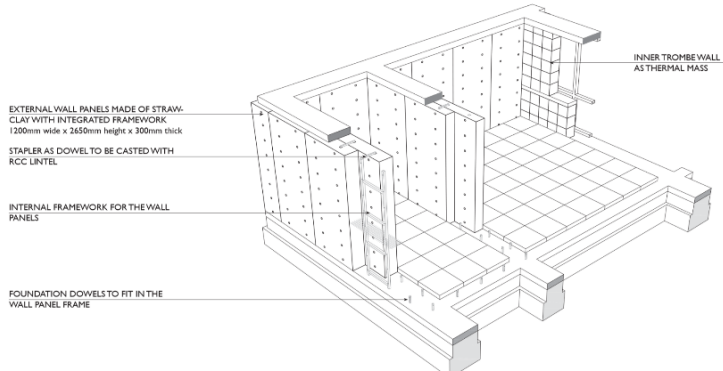
Foundation



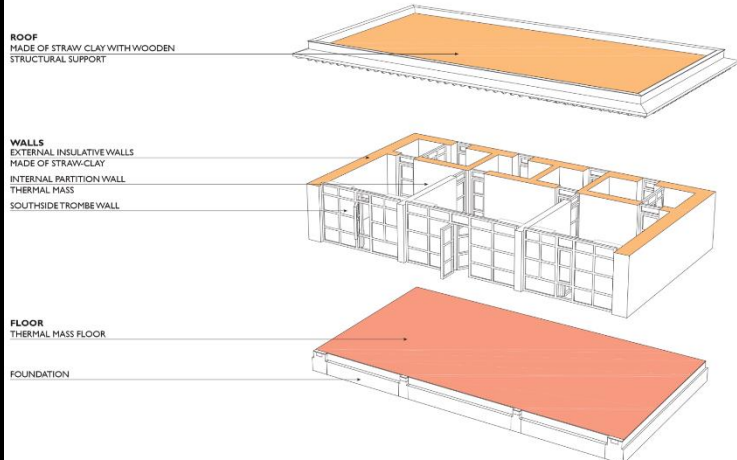
Lego block type assembly

STEP 03

MODULAR WALL PANELS FOR MULTISTOREY BUILDINGS

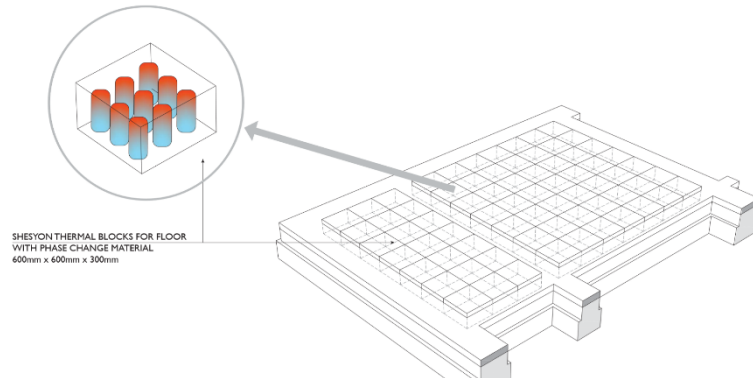


BASIC PASSIVE SOLAR HOUSE DESIGN:

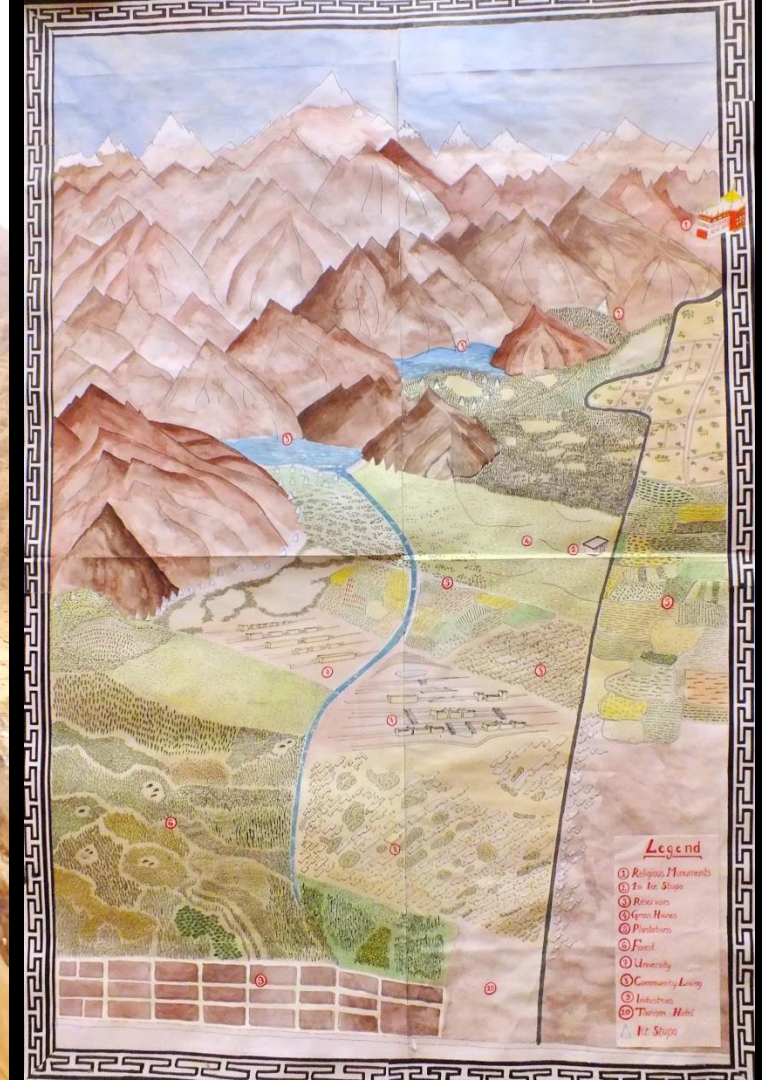


STEP 02

SHESYON THERMAL BLOCKS FOR FLOOR



TOWARDS A DOER'S MAKERS' UNIVERSITY



The Ice Stupa Project:

This Indian innovation was chosen from 2,322 contenders from 144 nationalities



A truly Peoples' University

◆ <https://milaap.org/fundraisers/hial>

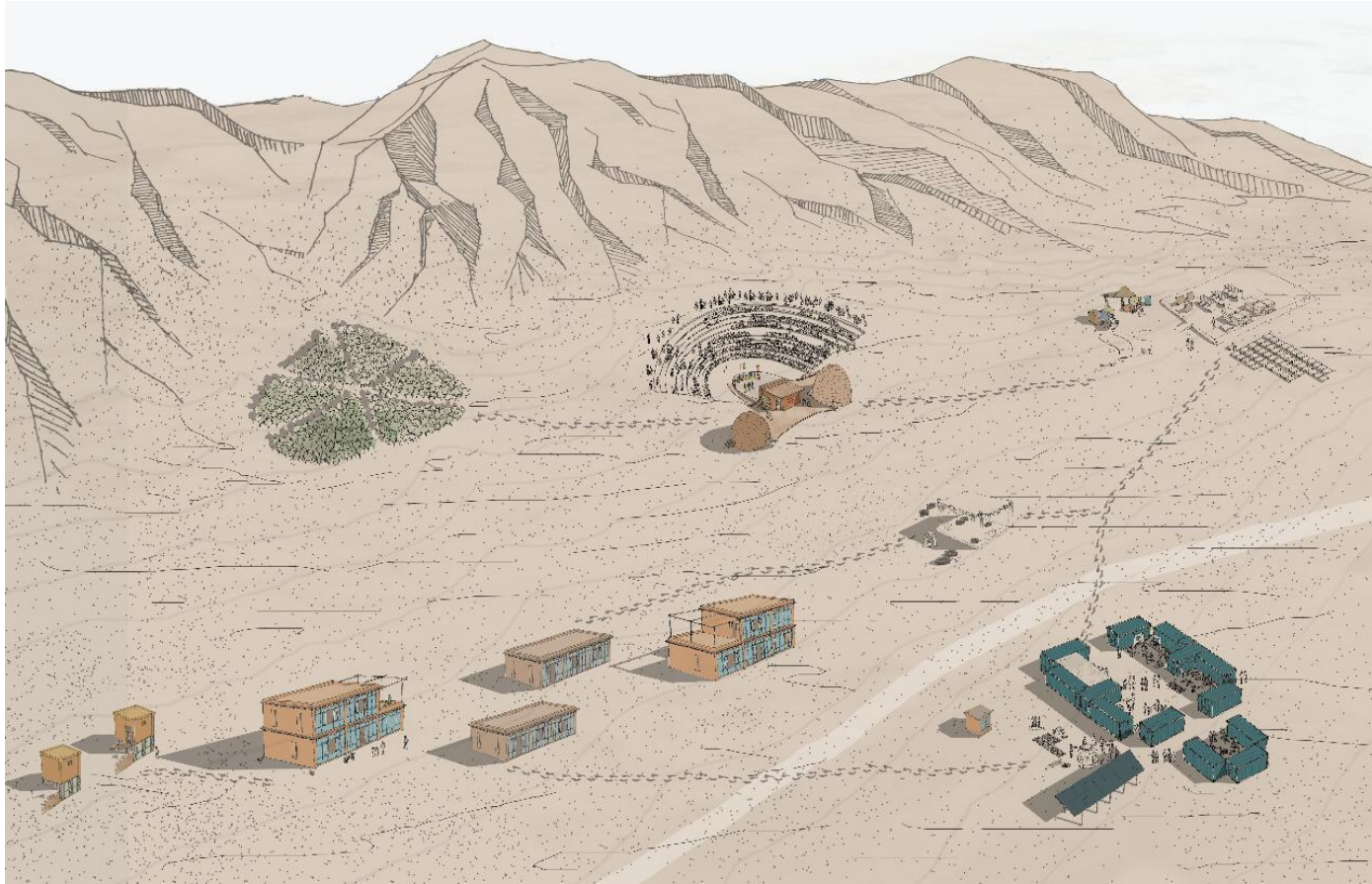
The screenshot shows the Milaap website interface. At the top, the Milaap logo is followed by the text "India's largest crowdfunding site. Over Rs.122.43 Crores raised." Navigation links for "Join Us / Login" and "Donate now" (in a red button) and "Share" (in a blue button) are visible. A large banner features a video player with the text "After Rolex Award, Sonam Wangchuk starts campaign for a pathbreaking... University". Below the banner, the campaign progress is shown: "Rs.11,417,976 raised of Rs.70,000,000 goal" with a progress bar. It also indicates "244 Supporters" and "7 Days to go". A donation form shows a dropdown for currency set to "Rs." and a text input field containing "5000". A prominent red "Donate now" button is at the bottom right of the form area.

The screenshot shows a Facebook post by Sonam Wangchuk. The post is titled "I WANT A REVOLUTION IN EDUCATION BEFORE I GROW UP.....Arjun Singh Rajawat, Age 13." The text of the post reads: "With this spirit, this young boy of 7th grade from Ridge Valley School in Gurugram set out to raise funds for the Alternative University. Arjun is not the kind to wait for destiny to take shape. Instead after attending a talk entitled The Next Learning Revolution by Sonam Wangchuk about Himalayan Institute of Alternatives, Ladakh... HIAL, (organised by The Future Institute Delhi), Arjun de... See More". Below the text is a video thumbnail showing a young boy, Arjun Singh Rajawat, wearing a black leather jacket and looking down thoughtfully. The Facebook interface includes a profile picture of Sonam Wangchuk, his name, and a list of navigation options: Home, Posts, Videos, Photos, About, Likes, and Manage Tabs. A "Promote" button is also visible.



HIMALAYAN INSTITUTE OF ALTERNATIVES, LADAKH

An Alternative Institute for Mountain Development



Vision

From DESERT

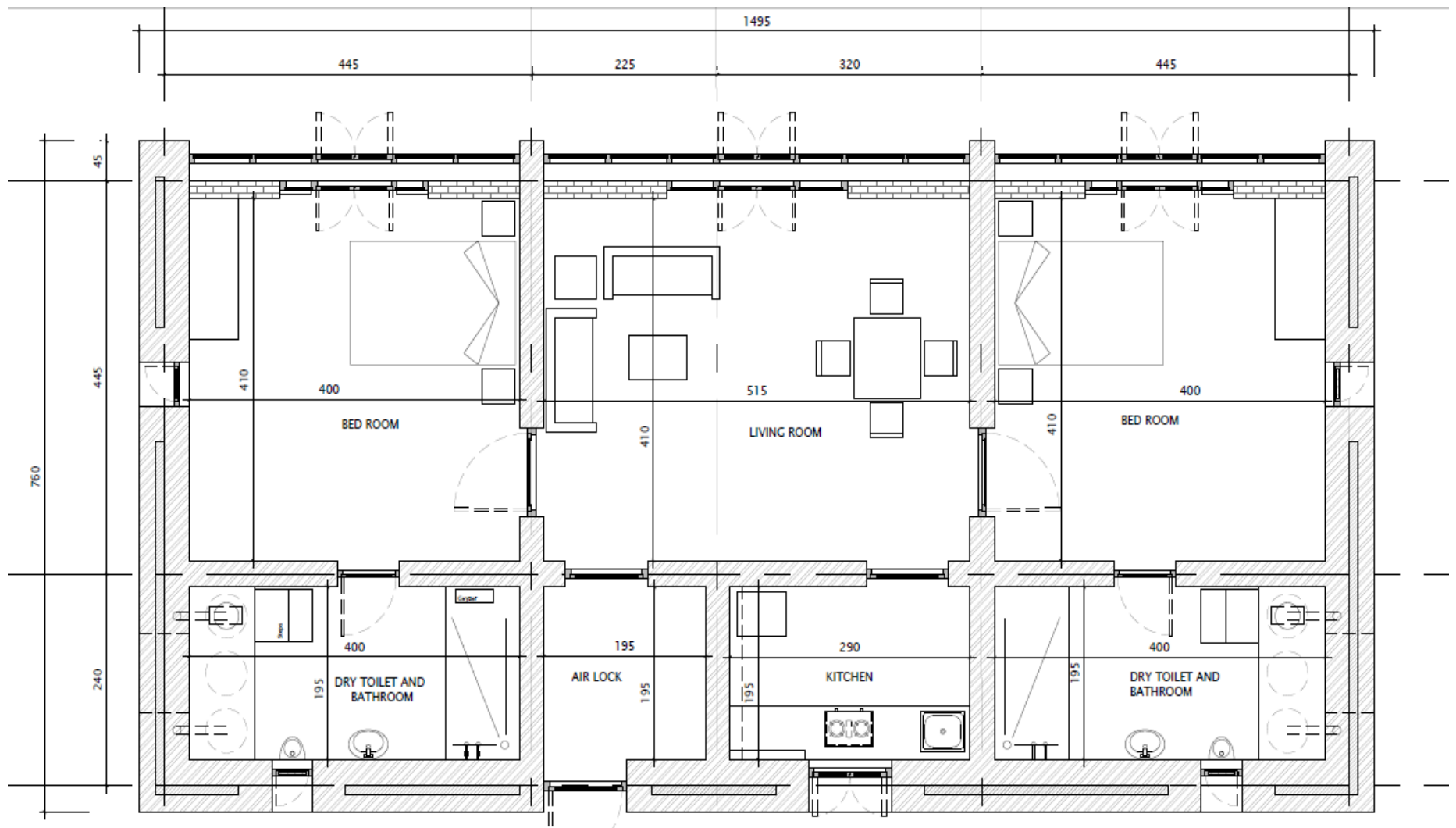


To Univer-City



Staff Quarters





Features

- 4 SQs of same design but different construction materials
- Full-scale experiment instead of Models
- Built-up Area of 113 m² each.
- No mechanical heating required.
- **Year-round running hot tap water**
- **Attached dry-toilet and bathroom**

Solar Car-shed



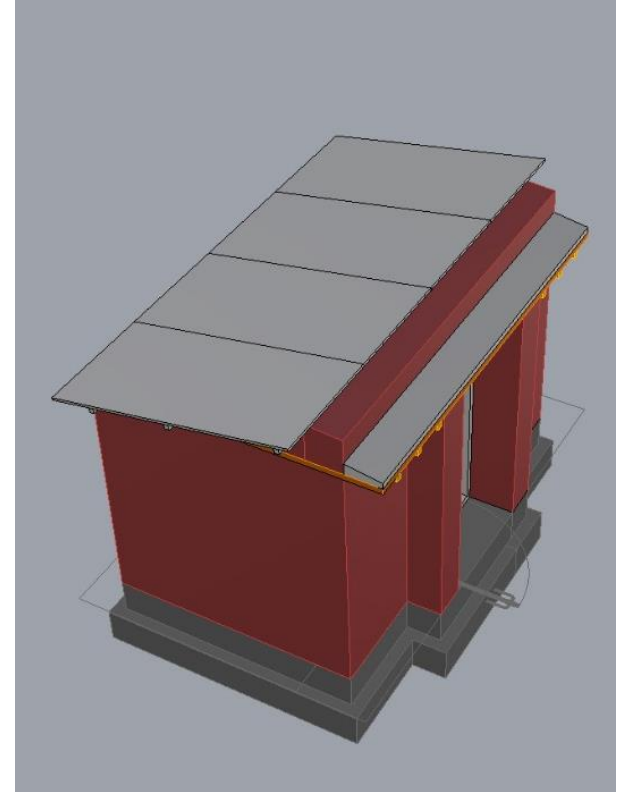
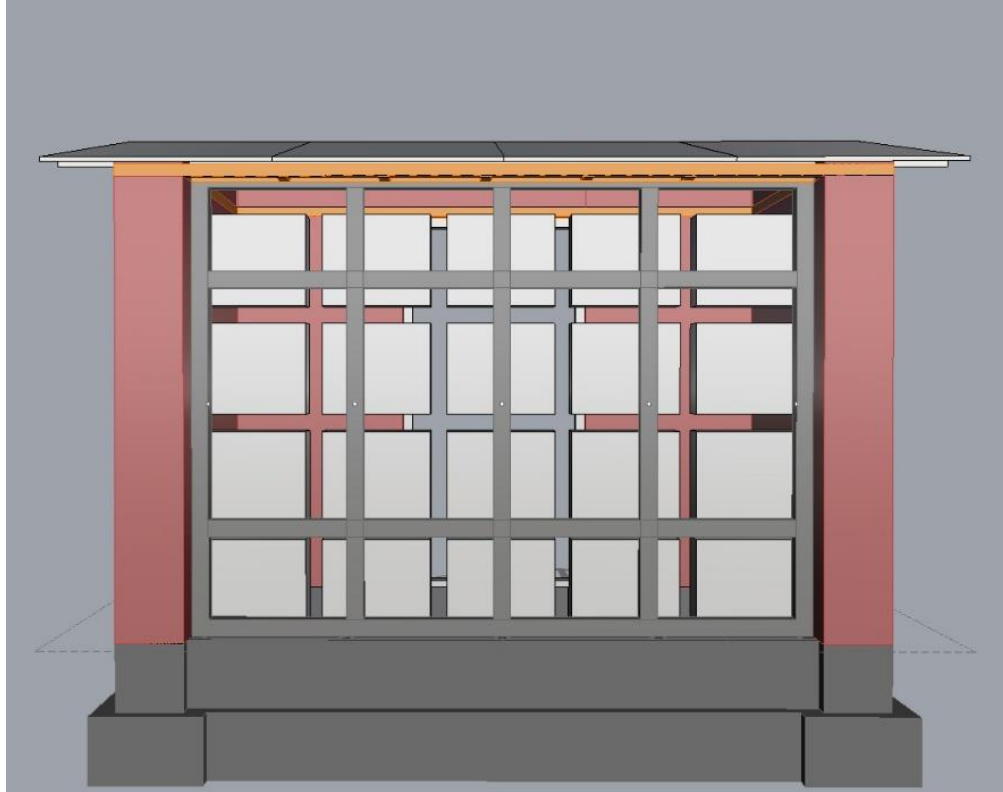
Solar Car-shed Features

- Solar mounting structure doubling as car-shed
- Will power HIAL's construction activities
- Powering the current electric bikes and electric car at campus and other future electric vehicles

Battery House



Battery House 3D



Battery House Features

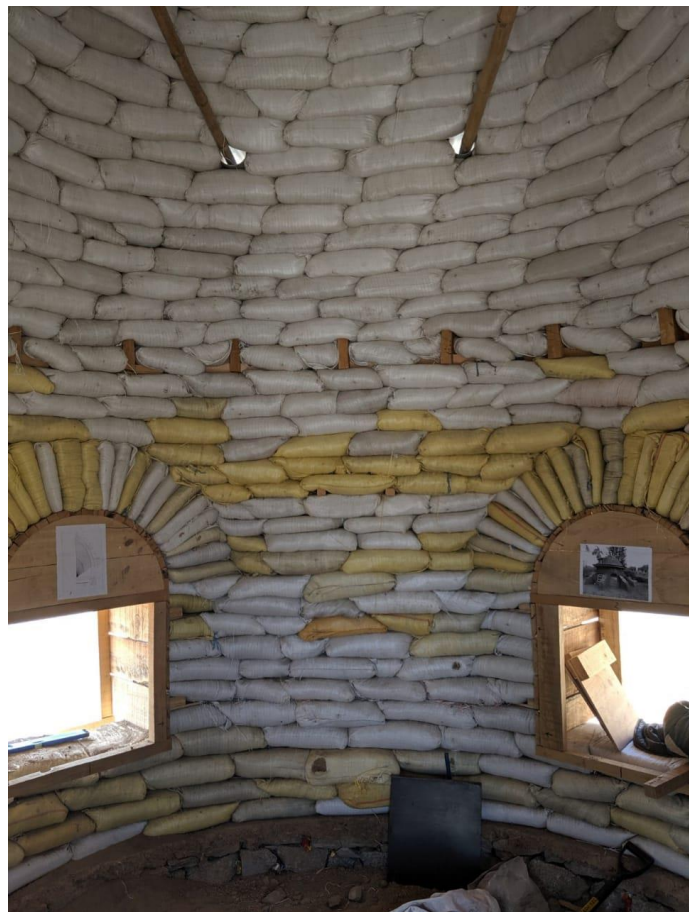
- Passive Solar Heated to maintain Battery Temperature
- Full scale experiment of Batteries as Thermal Wall
- Solar Panels as light, insulative and power generating roof
 - Reducing the dependency on wood
- A model that can be replicated for Army Guard House (Santri House)
 - many of them die due to fire accidents

Earth Bag Dome



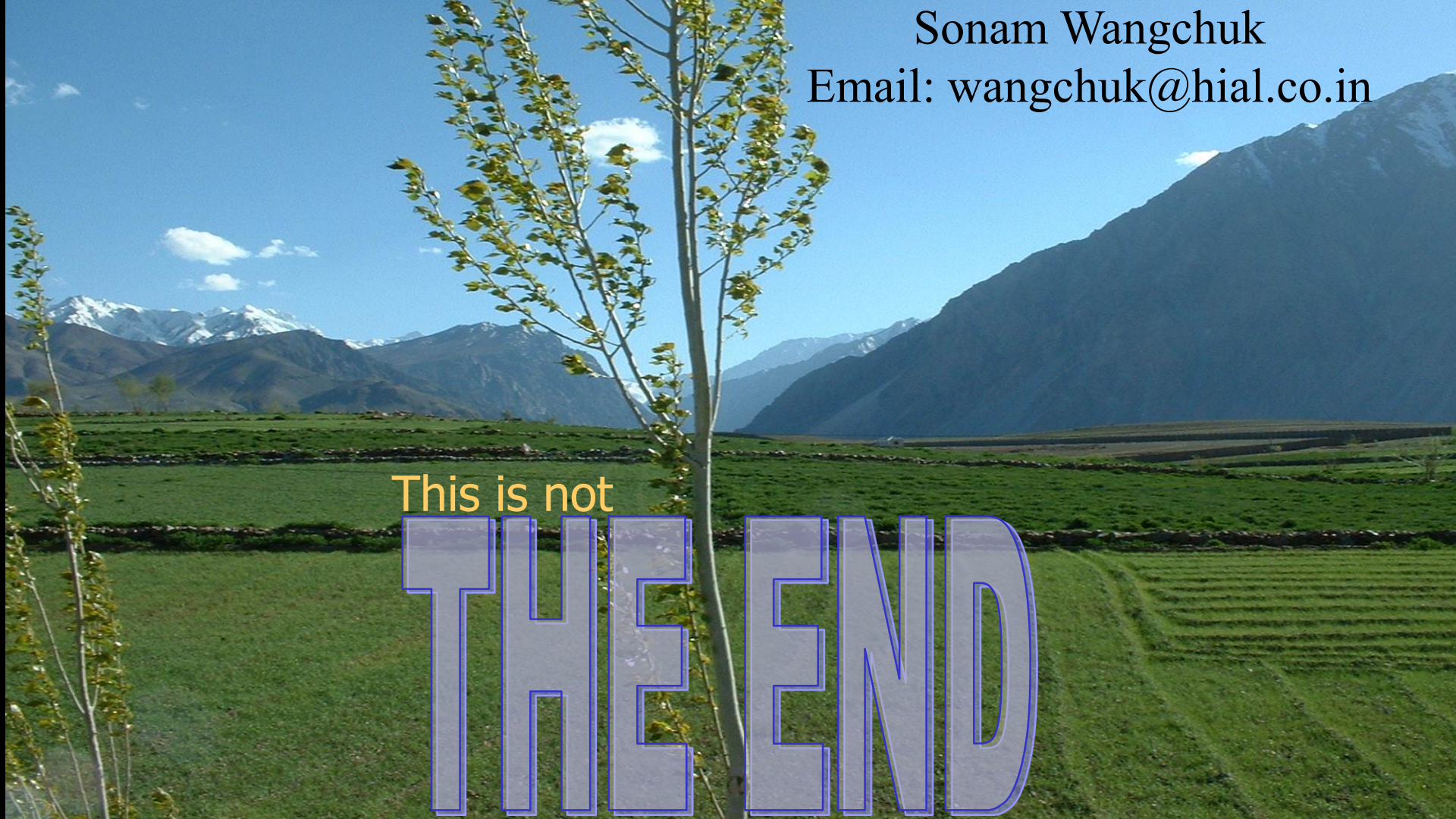
Earth Bag Dome Features

- Natural and local material building technique
- Low embedded energy
- **Upcycling of waste cement bags**
- Serves as Green room for the amphitheatre



The Beginning...





Sonam Wangchuk
Email: wangchuk@hial.co.in

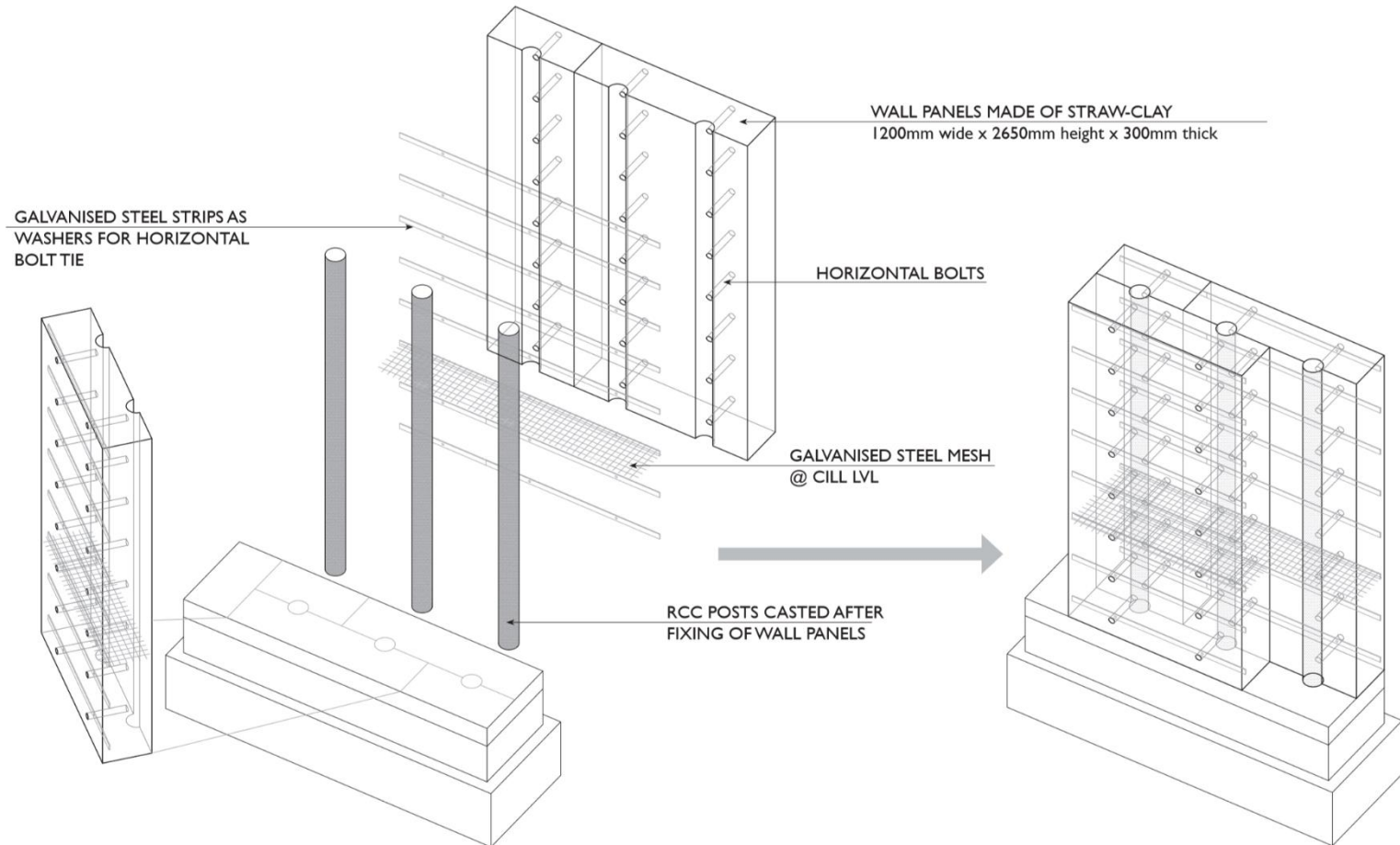
This is not

THE END



MODULAR WALL PANELS -TYPE 02

FOR MULTISTOREY BUILDINGS



SECMOL Alternate Institute Campus



Solar Heated and Powered

Terra Building



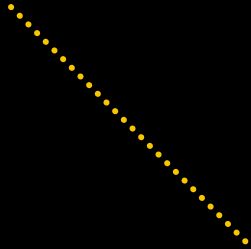
Features

- ◆ South orientation to collect solar heat
- ◆ Uses three Passive Solar Heating systems for space heating
 - Direct Gain
 - Attached Greenhouse
 - Modified Trombe Wall
- ◆ Rammed Earth Method of Construction

We use solar energy for:



Building heating

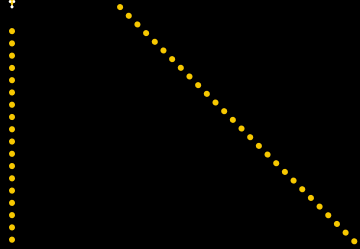


Water pumping



Greenhouse

We use solar energy for:



Cooking



Water heating

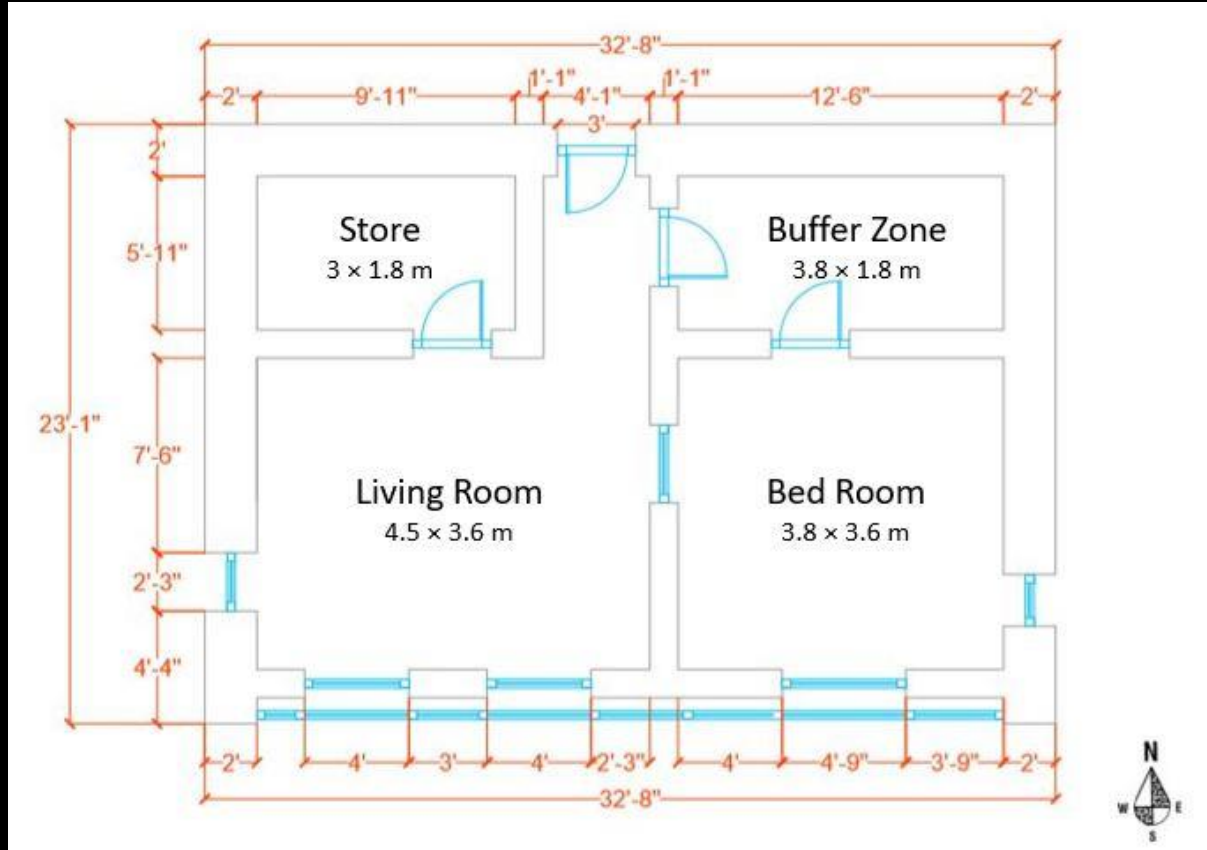


Electricity

Model House

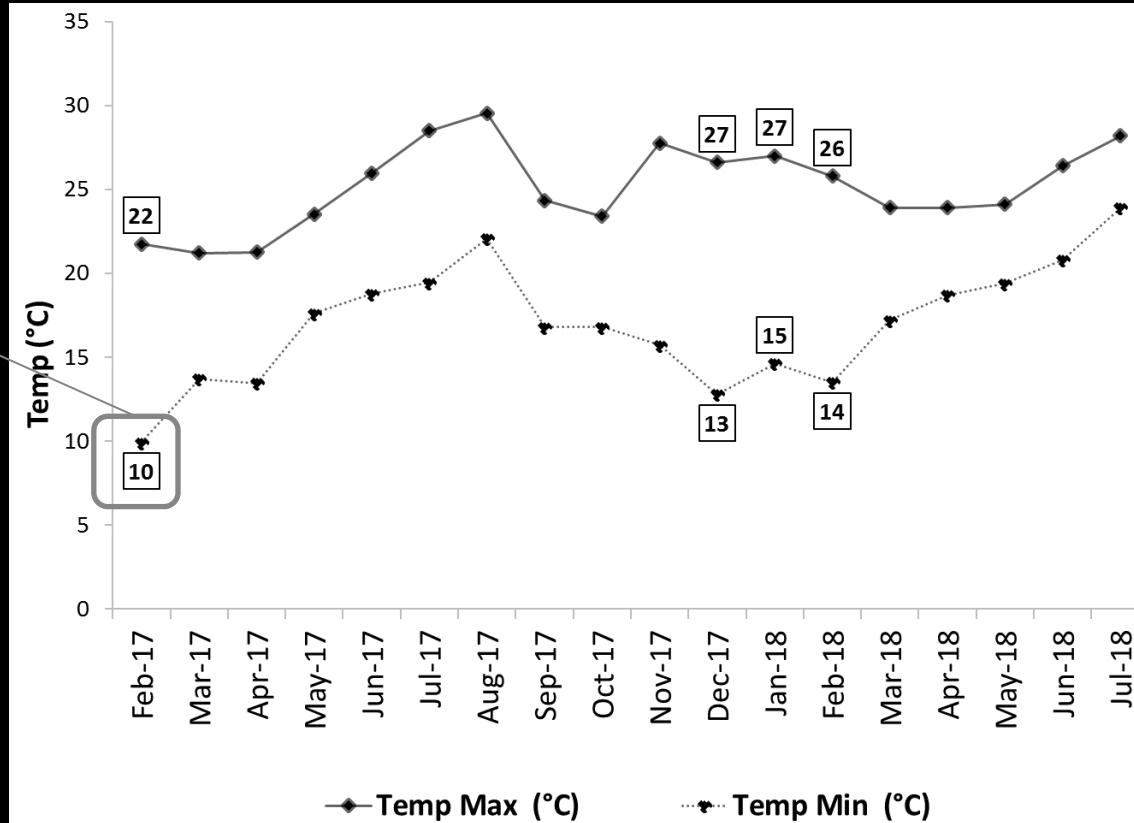


Model House Plan



Temperature Profile

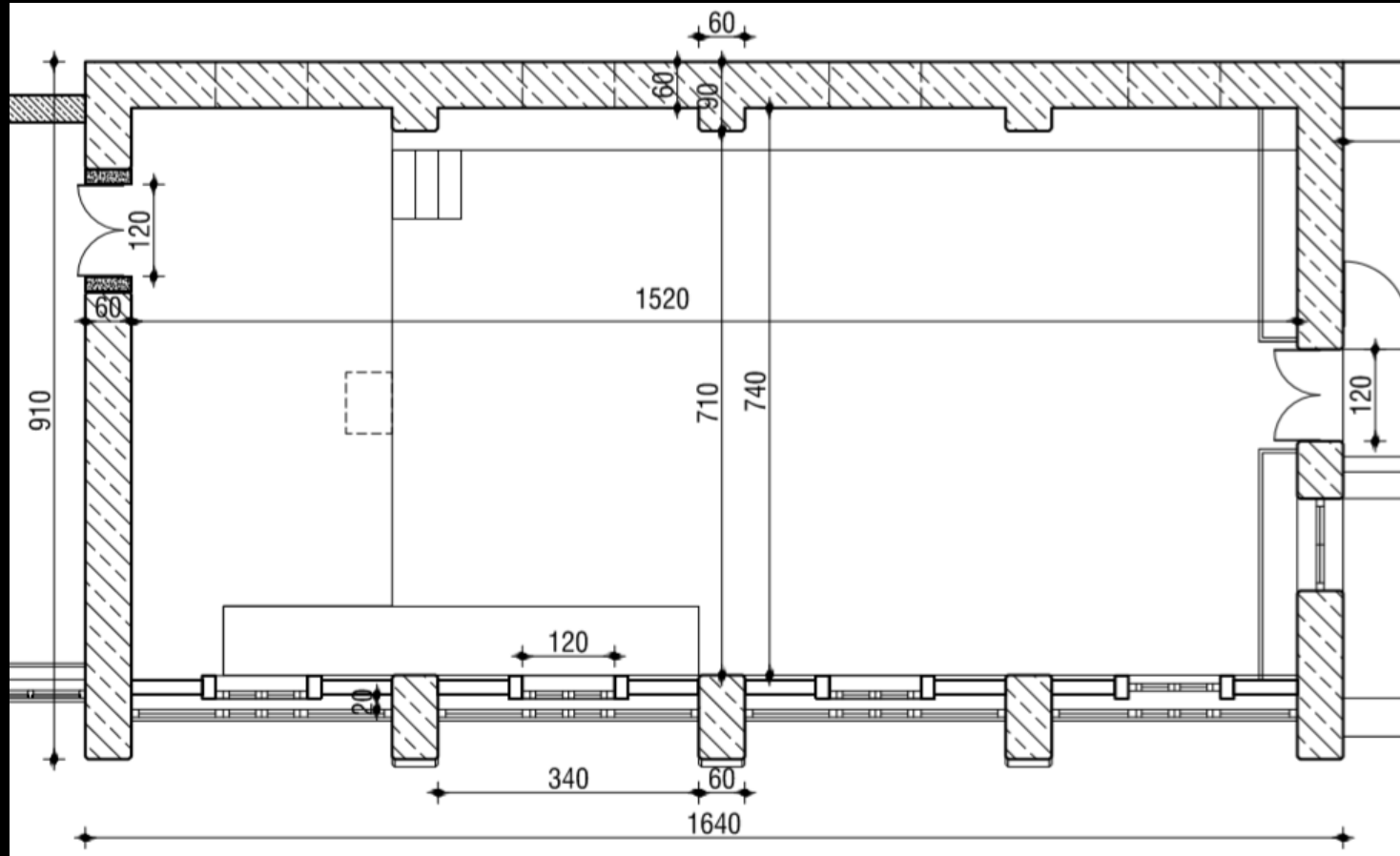
Minimum Indoor
Air Temperature



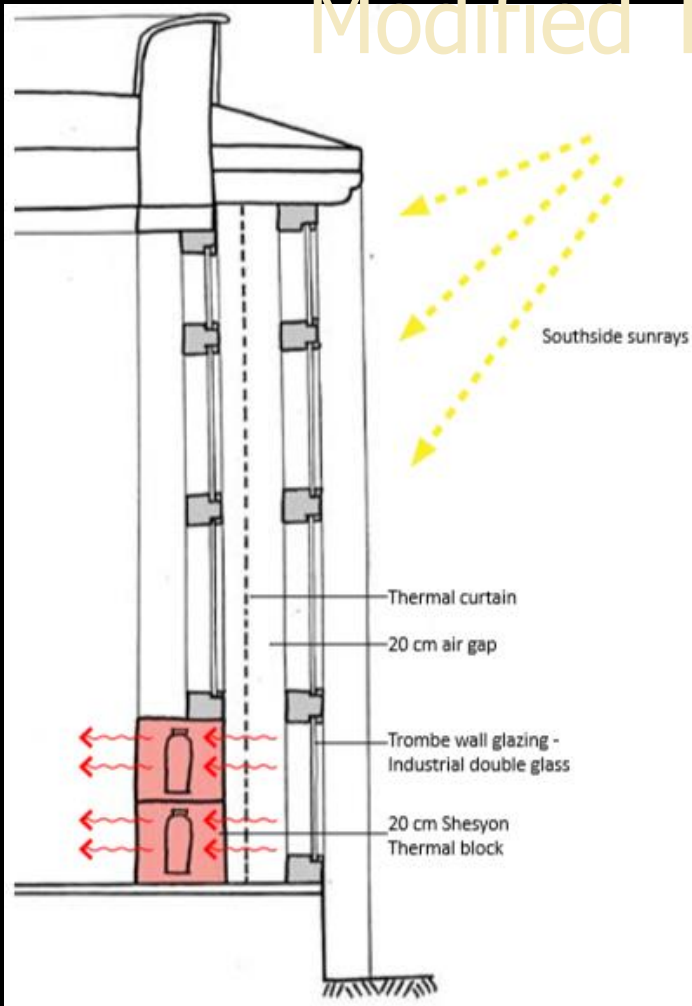
Multipurpose Dining Hall



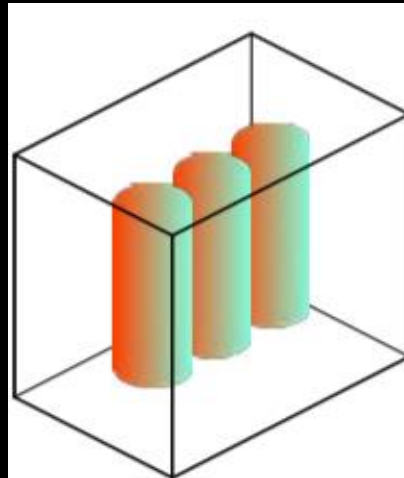
Plan



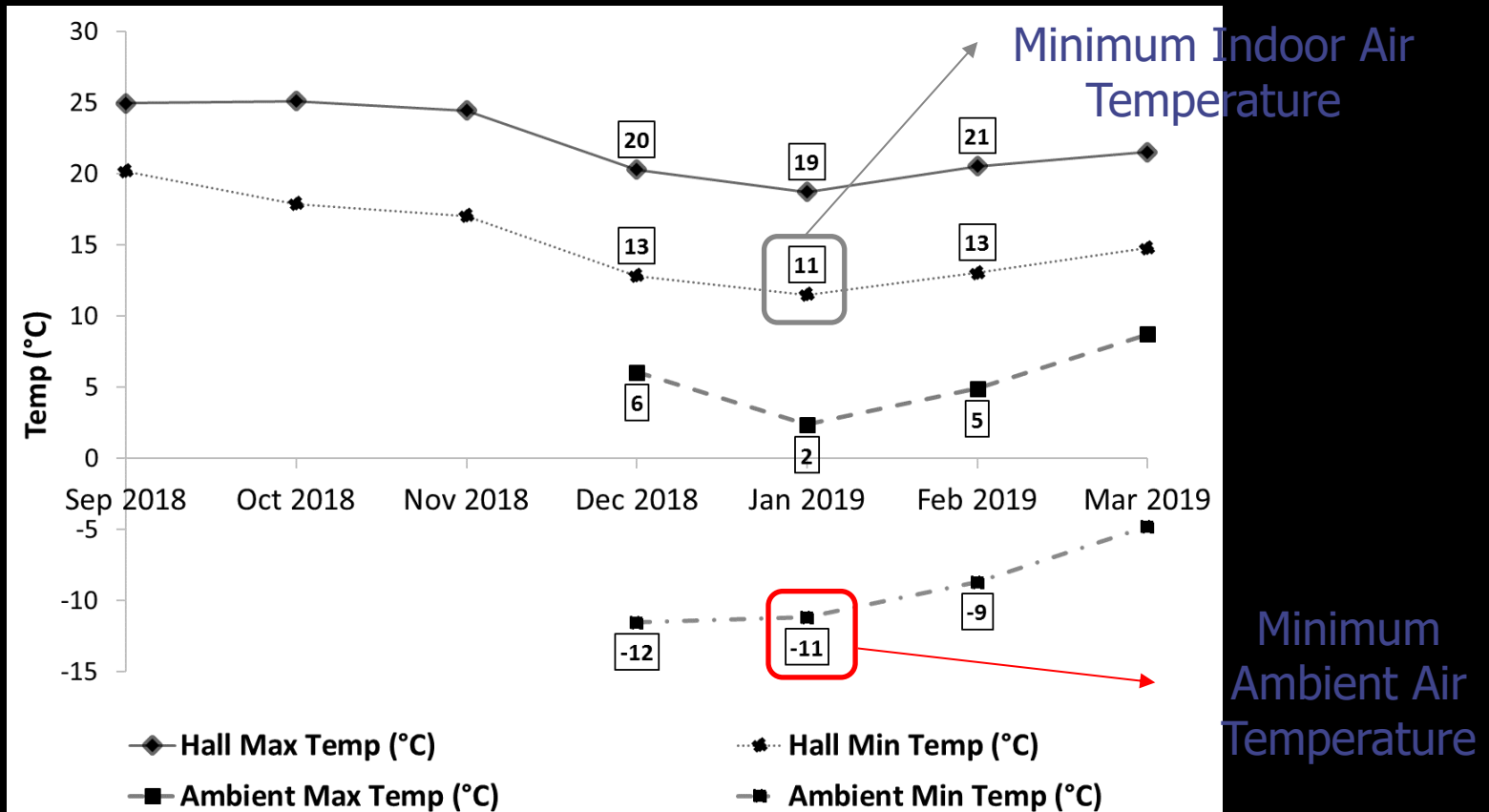
Modified Trombe Wall



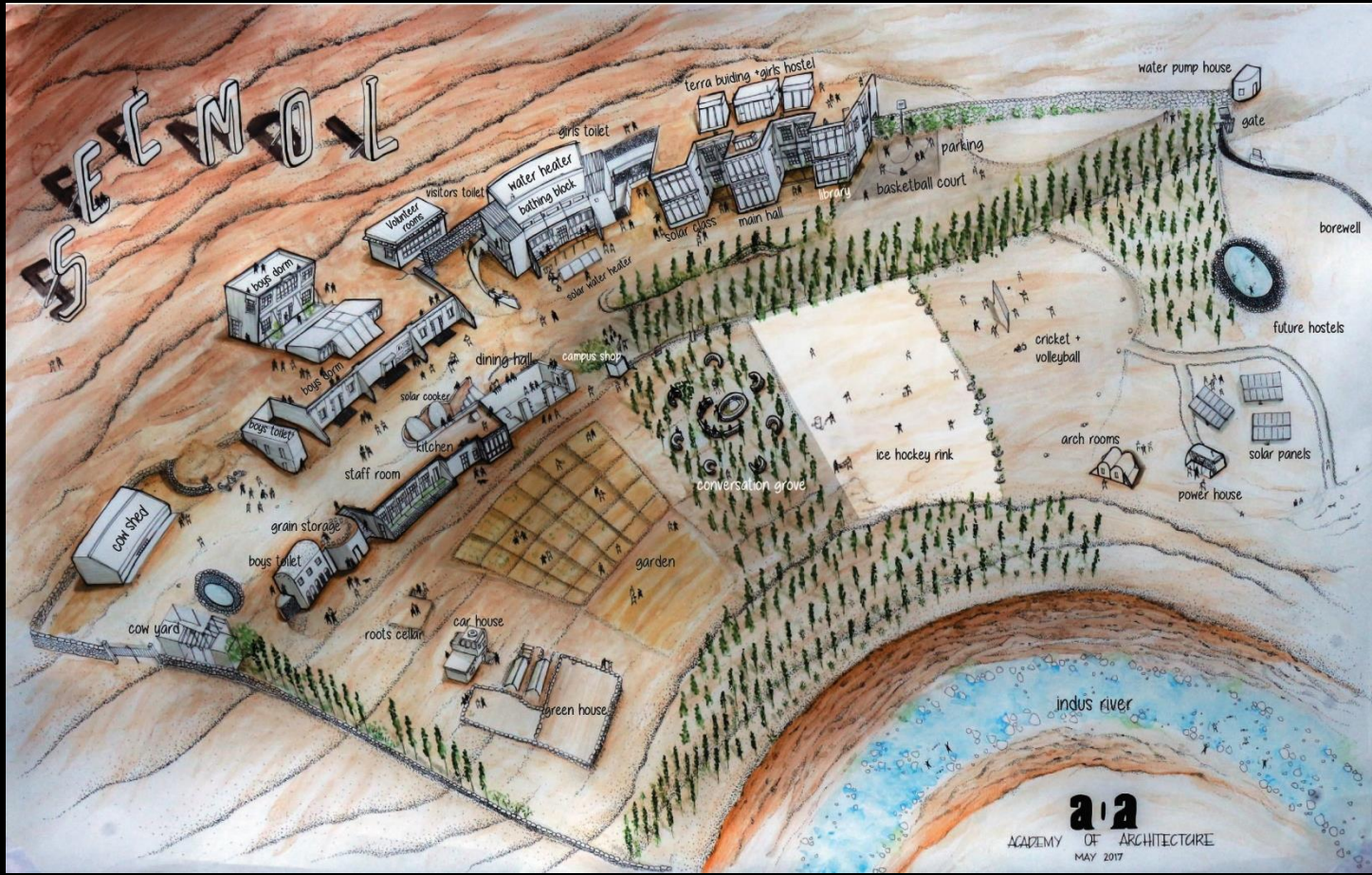
Thermal Blocks



Temperature Profile



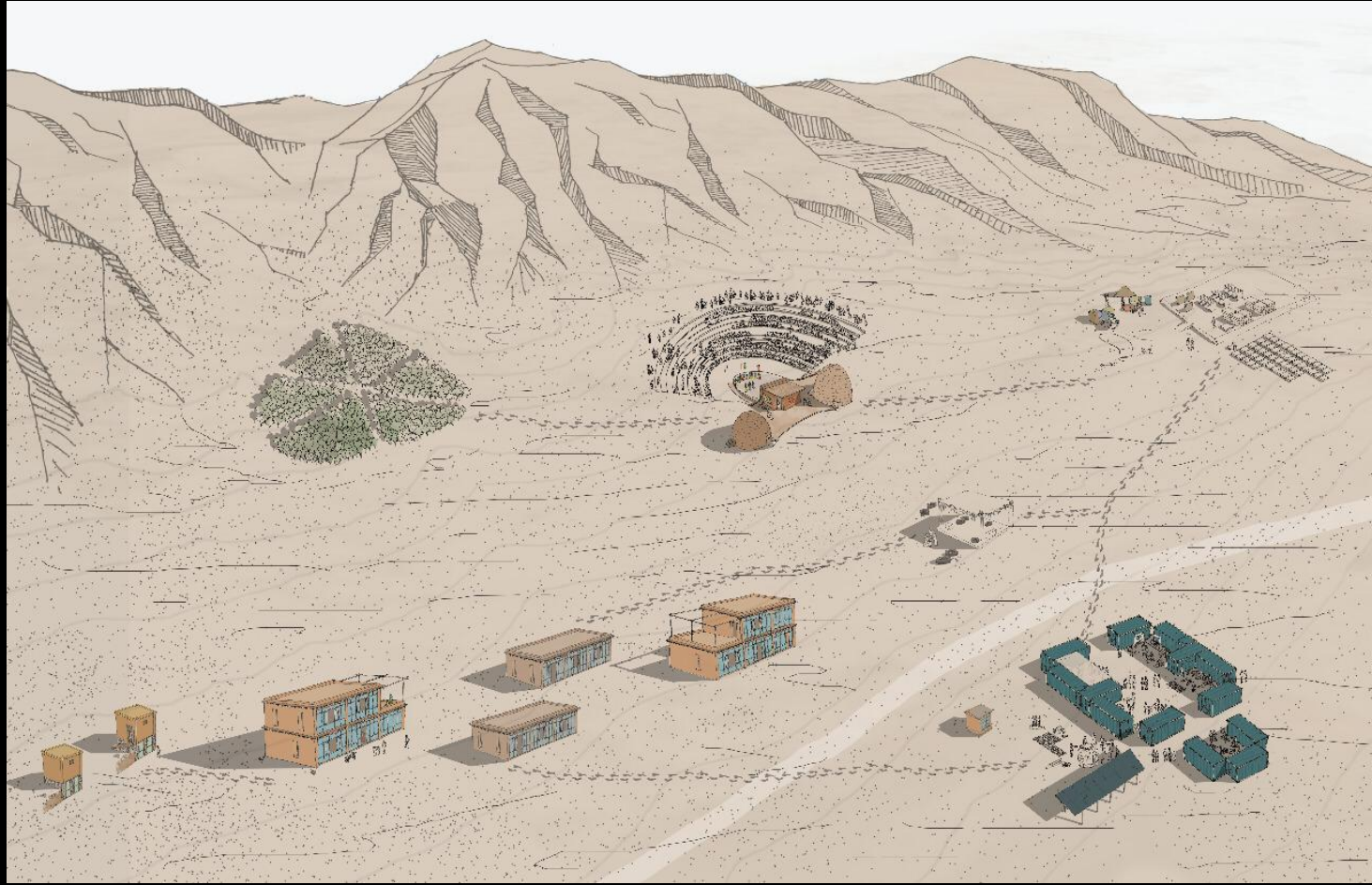
Gravity Planning



SECMOL Time

Early to bed,
early to rise,
saves a lot of energy
for everybody to utilize...

Himalayan Institute of Alternatives,



Vision

Past

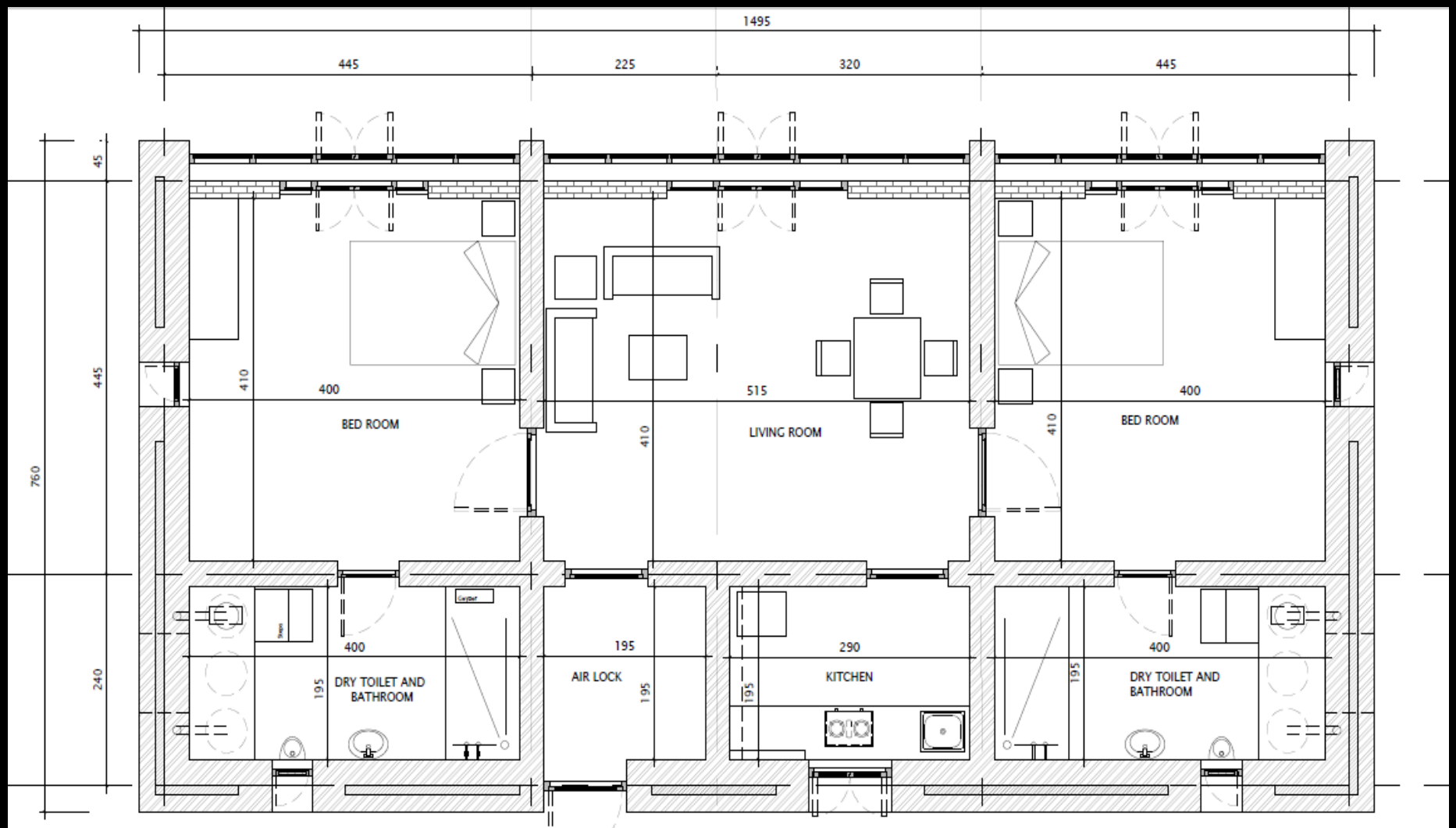


Future



Staff Quarters





Features

- ◆ 4 SQs of same design but different construction materials
- ◆ Full-scale experiment instead of Models
- ◆ Built-up Area of 113 m² each.
- ◆ Year-round running hot tap water
- ◆ Attached dry-toilet and bathroom

Solar Car-shed



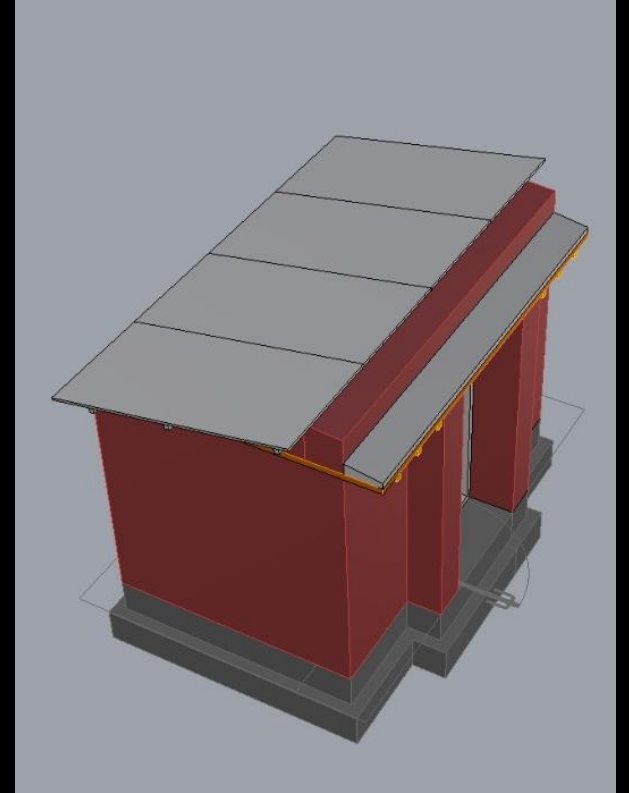
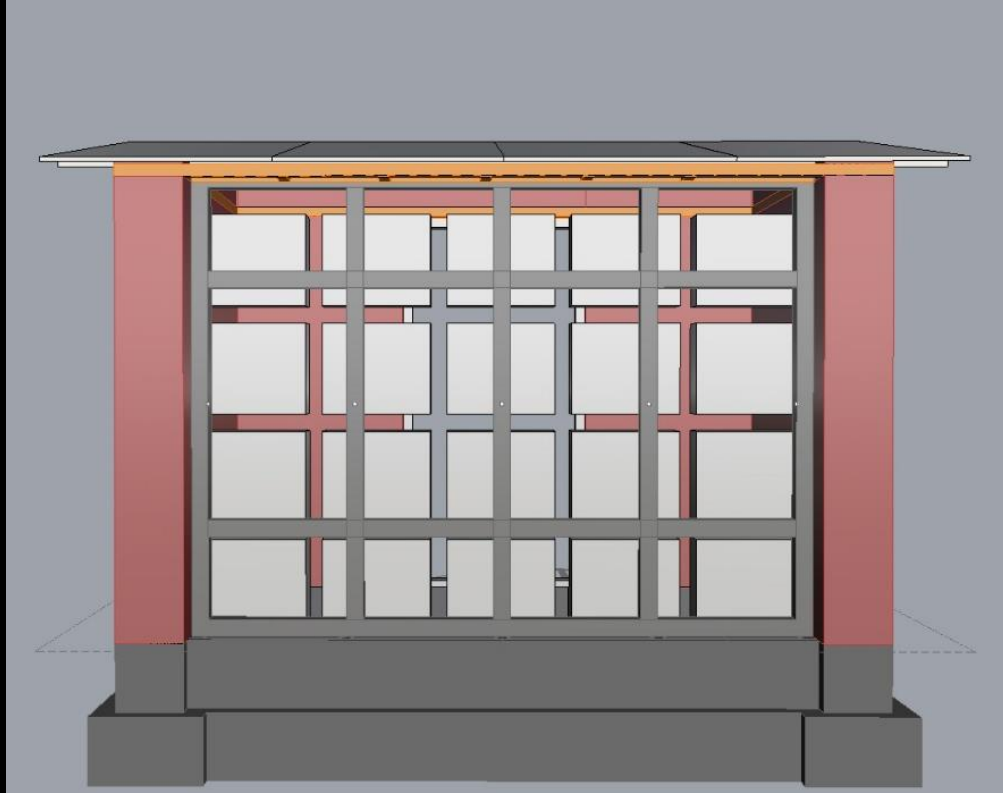
Solar Car-shed Features

- ◆ Solar mounting structure doubling as car-shed
- ◆ Will power HIAL's construction activities
- ◆ Will power eMobility (Cars and cycles) within Campus
- ◆ Future-ready for eVehicles

Battery House



Battery House 3D



Battery House Features

- ◆ Passive Solar Heated for maintaining Temperature
- ◆ Full scale experiment of Batteries as Thermal Wall
- ◆ Solar Panels as light, insulative and power generating roof
 - Reducing the emphasis on wood
- ◆ A model that can be replicated for Army Guards at Gates (Santri House)

Earth Bag Dome



Earth Bag Dome Features

- ◆ Natural and local material building technique
- ◆ Low embedded energy
- ◆ Upcycling of waste cement bags
- ◆ Serves as Green room for the amphitheatre



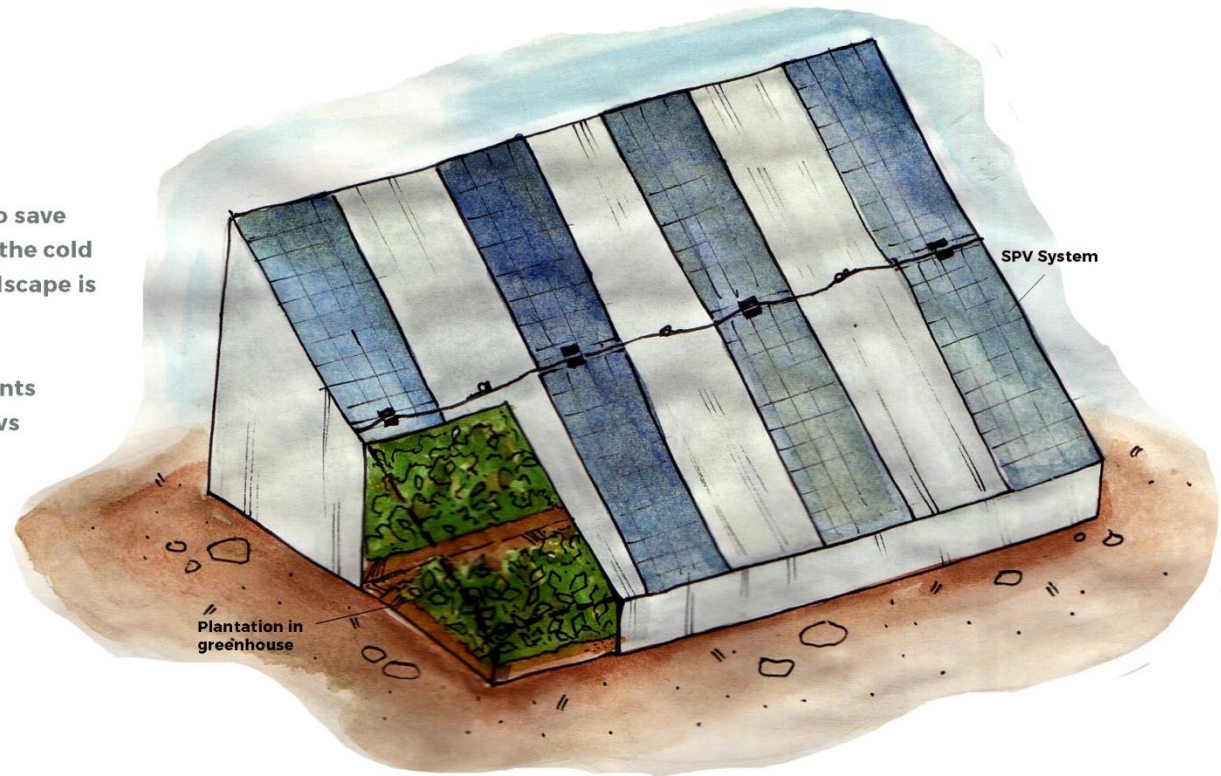
Solar PV Greenhouse



Solar Photovoltaic Greenhouse

Piloting Power Generation with Fodder Production

- 5 kW Solar PV system fixed atop a greenhouse
- It achieves the following:
 - Powers the campus
 - Produces Fodder for cattle
- This experiment if successful has the potential to save the Pashmina goats in Changtang from dying in the cold winters when there is no grass as the whole landscape is covered with snow.
- The experiment compares the type of fodder plants (Alfalfa & Peas) that can grow in partial shading vs open area.



Fodder Growth



The Beginning...

