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WHAT SHOULD AN AFFORDABLE HOMESTEAD LOOK LIKE FOR THE FLOOD AFFECTED AREA?

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Abstract:

Flooding is a regular disastrous event in Bangladesh as it causes serious social and economic losses and damages in the different parts of the country in every year. Sufferings of people due to flood are beyond imagination. The Tropical Cyclones are critical natural hazards, the Indian subcontinent faced time and again, especially the coastal Bay of Bengal in India and Bangladesh.

Such a natural disaster and related human suffering call for a massive rehabilitation work. However, this won't be easy – the key challenges and barriers for rebuilding the houses and latrines includes scarcity of filling sand, required to make the infrastructures flood resilient, poor communication systems, and an immediate requirement of essential needs such as food and money for the communities affected.

Keywords: regular flood, natural hazards, rehabilitation work, food, infrastructure

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Introduction:

Bangladesh is one of those countries which has a unique setting for the occurrence of flooding. Most part of the country is low lying and 80% of the landmass is flood plain thereby leaving the country highly vulnerable to the threat of repeated floods. Historical and recent data show that during past 50 years, at least 7 major floods have taken place in Bangladesh. Intense and frequent flooding in Bangladesh occur due to geographical location and poor economic condition of Bangladesh.

The recent Super Cyclone, 'Amphan' in May 2020 was one of the most powerful storms that inflicted widespread damage in Khulna and Barisal divisions of Bangladesh. The most devastated region is the Sundarbans, both in India and Bangladesh, because of its fragile ecosystem, complex geography and the presence of sizable settlements. Poverty made the situation even more vulnerable. Since the fateful cyclonic day, heart-breaking images of destroyed houses and misery of people have flooded the web-space and reached all over the globe for everyone to realize the magnitude of the aftermath.

Study area:

Coastal areas are more vulnerable to climate change and natural disasters. Due to increased weather extremes caused by climate change, the coastal communities fall at high risk of casualties and damages.

Gabura, an island union under coastal Shyamnagar upozila of Satkhira surrounded by Kholpetua River is considered as one of the most vulnerable places for living in Bangladesh due to its disadvantageous location. The re-curvature characteristics of tropical cyclones cause the disproportionally large impact in the landfall in this region and due to climate change, the magnitude and the frequency of cyclones are increasing day-by-day, and eventually exacerbating the vulnerability of the Gabura union.

The recent Super Cyclone, 'Amphan' causes a heavy damage. Gabura has been flooded due to the collapse of the coastal embankment. Kholpetua River near the coastal embankment inundated two villages in Nebubunia area under Gabura Union. New areas have been submerged in tidal water at night as water continues to enter through six points of the eroded part of the embankment. It destroyed homes, polders, embankments, roads, electricity poles, mobile phone towers, bridges and culverts, with the exact costs still being tallied. Many agricultural fields and fish farms were overwhelmed by the saltwater storm surge.

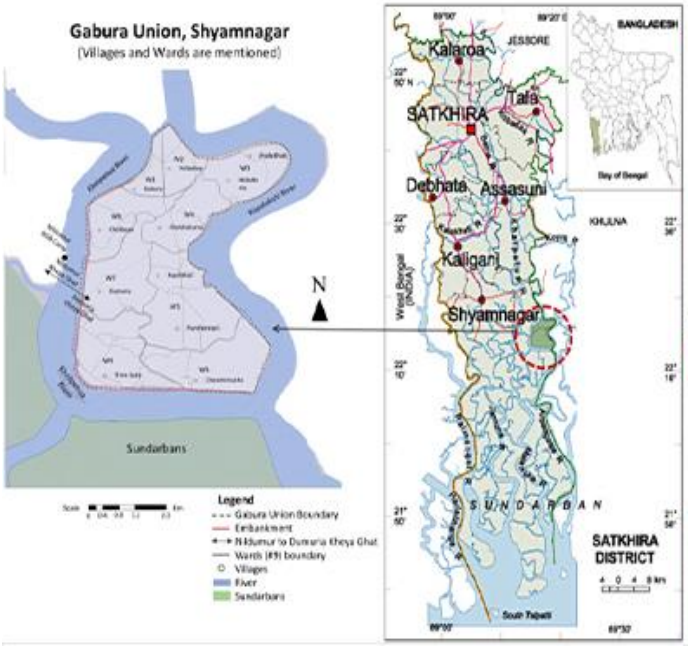
As the people are so poor that they can't build their houses continuously so we came up with a solution of an affordable home which may last long and survive the floods.

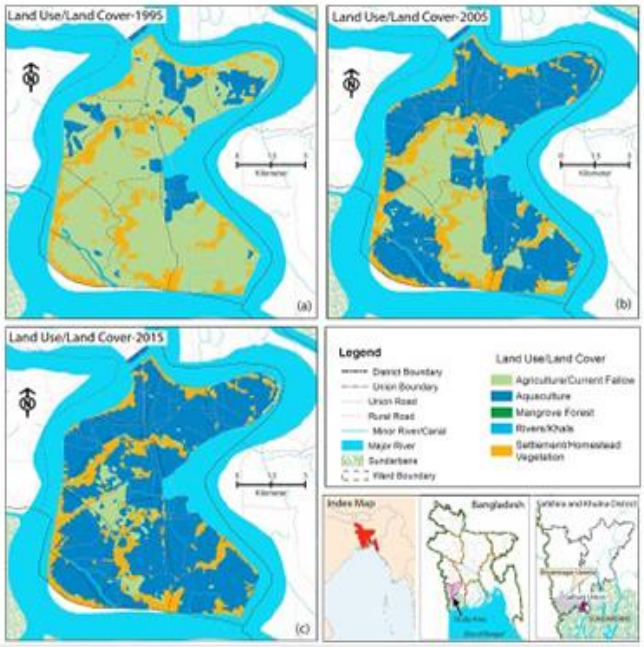
Highlights after flood:

- Tidal surges and heavy rains have broken barriers and flooded several coastal areas including Satkhira, Bagerhat, Khulna, Barishal, Bhola and Noakhali
- Aman paddy, livestock, enclosures, dams and houses damaged after coastal protection dams in Satkhira breached
- Kopotakkho dam broke in Gabura, Satkhira, affecting 5,000 people
- Dead bodies are being buried elsewhere in Satkhira
- 500-feet dam in Hazrakhali area, which broke in cyclone Amphan, has not been repaired yet
- No embankments in Nijum Dwip and 5,000 animals washed away

SITE CONTEXT

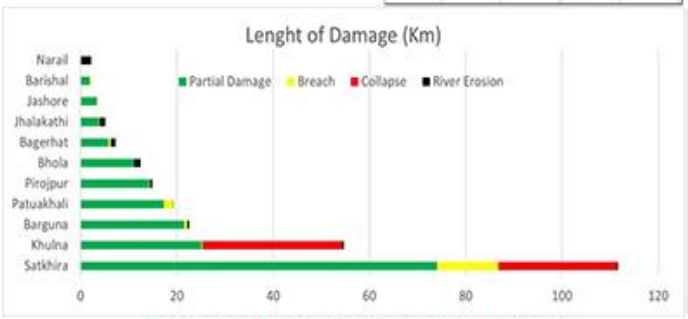
GABURA UNION IS SITUATED BESIDE THE WORLD FAMOUS MANGROVE FOREST SUNDARBAN AT SATKHIRA DISTRICT UNDER SHYAMNAGAR UPZILA. THIS IS THE SOUTHEAST PART OF SATKHIRA DISTRICT. THE KHOLPETUA RIVER IS FLOWING BY THE WEST SIDE OF THE UNION, NORTH SIDE THERE IS PADMAPUKUR UNION, EAST SIDE KAPOTAKHHA RIVER AND KHULNA DISTRICT AND SOUTH SIDE IS SUNDARBAN AND KHOLPETUA RIVER.



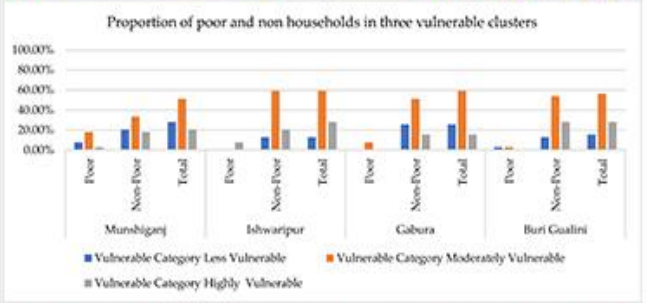


WHAT SURVIVES DURING CYCLONE IN COASTLE AREA?

TREES HAVING STILT ROOT STRUCTURE ARE MORE SUSTAINABLE AND SURVIVES THE MOST.



LENGTH OF DAMAGE (KM) AFTER AMPHAN



HOUSEHOLD VULNERABLE CLUSTERS BY POVERTY CATEGORIES.

Photographs have shown the situation of Gabura union:

Such a natural disaster and related human suffering call for a massive rehabilitation work, to which architecture and design community, perhaps, can respond effectively , by offering appropriate design alternatives.

CONCEPT: "MITIGATION THROUGH BIO-MIMICRY"

The solution for the crisis came up with a question, what survives during cyclone in Sundarbans area? The ever changing impersonation of this wondrous mangrove, eventually manages to keep some unique solutions for coping up from both saline water storm surge and strong wind of the annual super-cyclones. Trees having stilt root structure are more sustainable and survives the most. The overall architectural solution is summed up by 5 considerations.

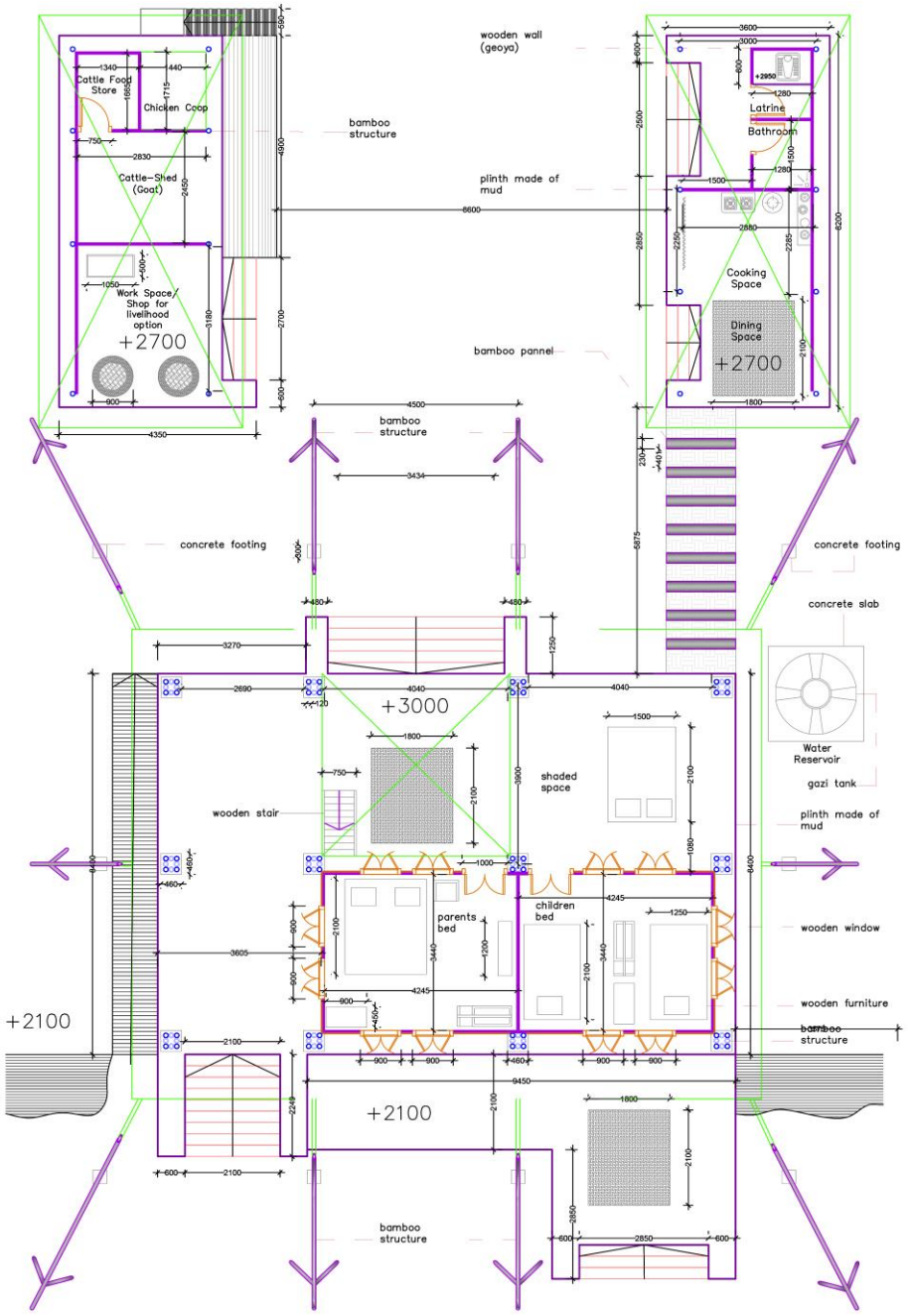
1. **RESILIENT**: strong structure against wind.

2. **SUSTAINABLE**: Environment isn't harmed by re-use of trees and rain water harvesting and use of renewable energy is present.

3. **CREATIVE**: Different elements of structure and blending with the lively hood through bio-mimicry and village homestead lifestyle.

4. **AFFORDABLE**: All the materials used are very cheap and available around with very less maintenance cost.

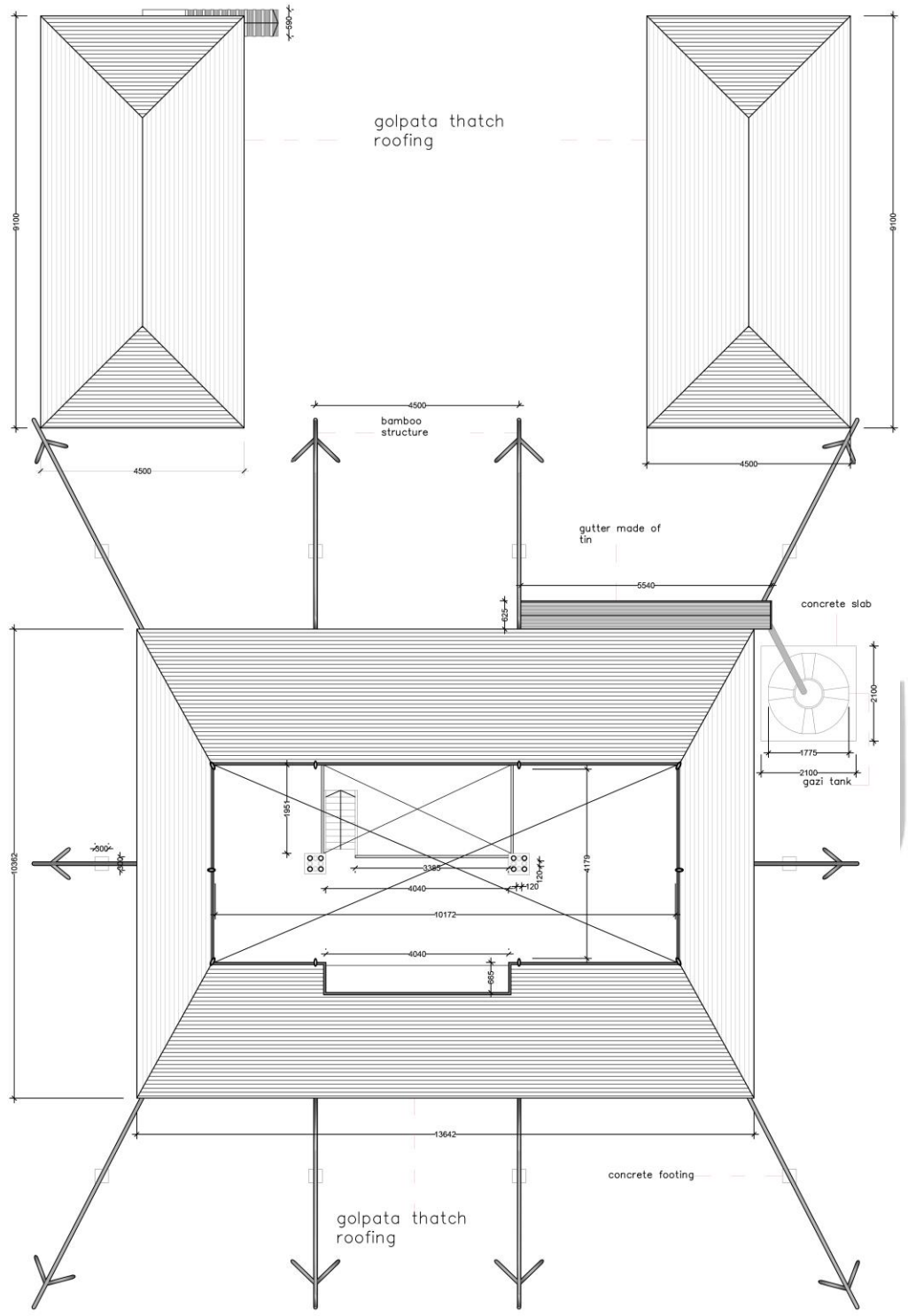
5. **IMPLEMENTABLE**: Local construction process and availability of all the materials make it very much implementable.



ground floor plan

Scale Bar 1:50

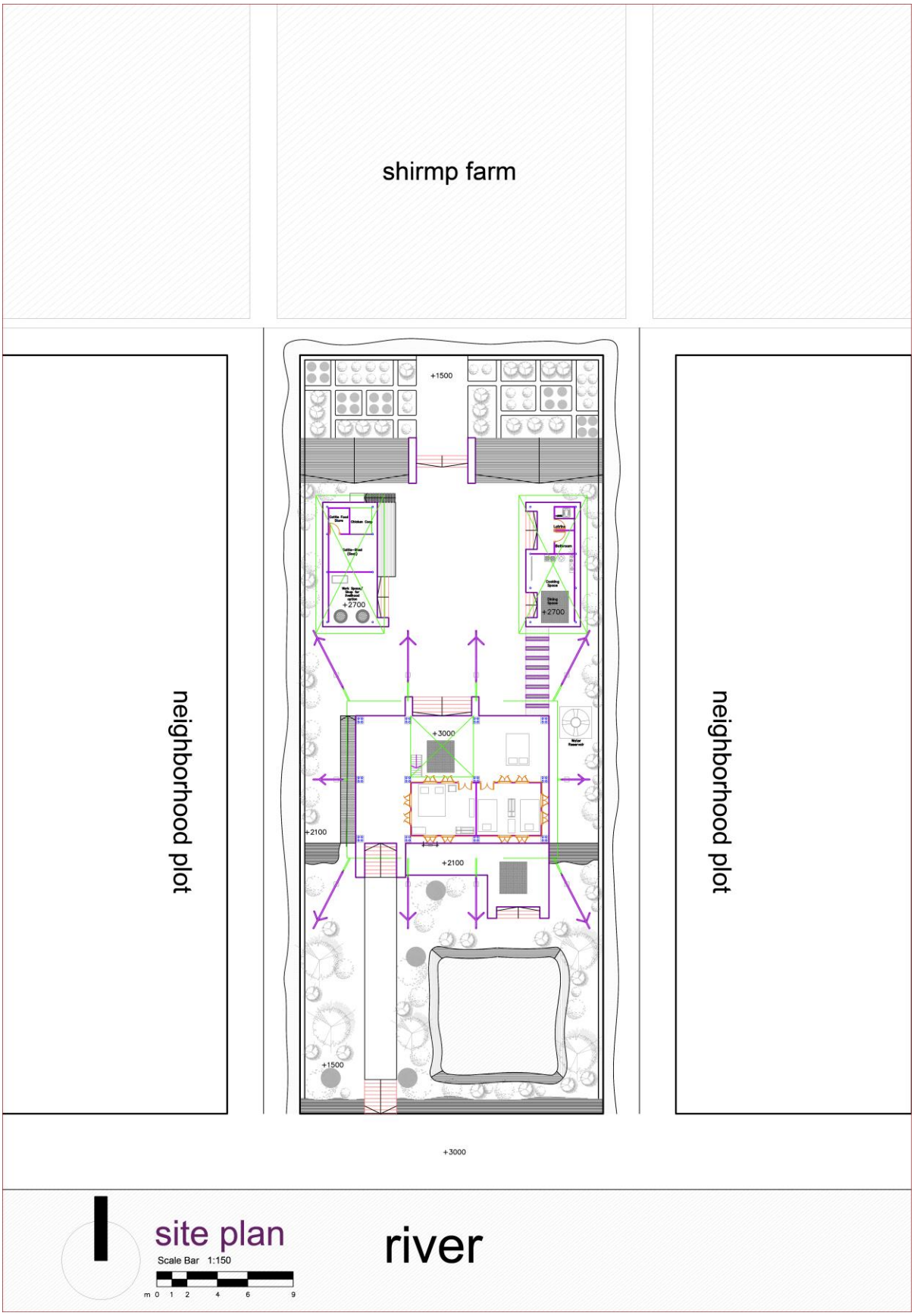
m 0 1 2 4 6 9



first floor plan

Scale Bar 1: 50

m 0 1 2 4 6 9


shirmp farm
neighborhood plot
neighborhood plot
+1500
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+2700
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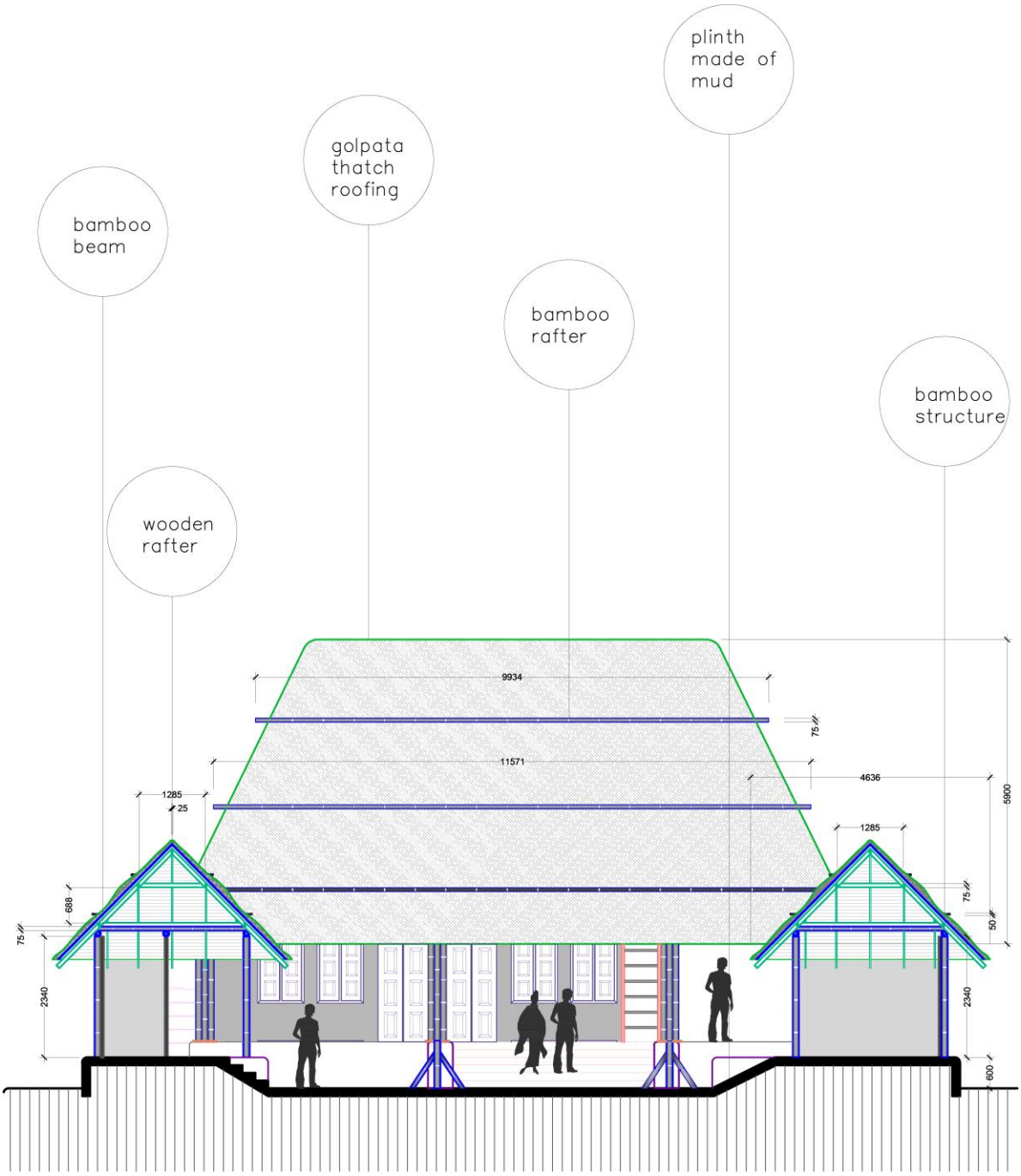
+2100
+1500
+3000
site plan
Scale Bar 1:150
m 0 1 2 4 6 9
river



section

Scale Bar 1:50

m 0 1 2 4 6 9

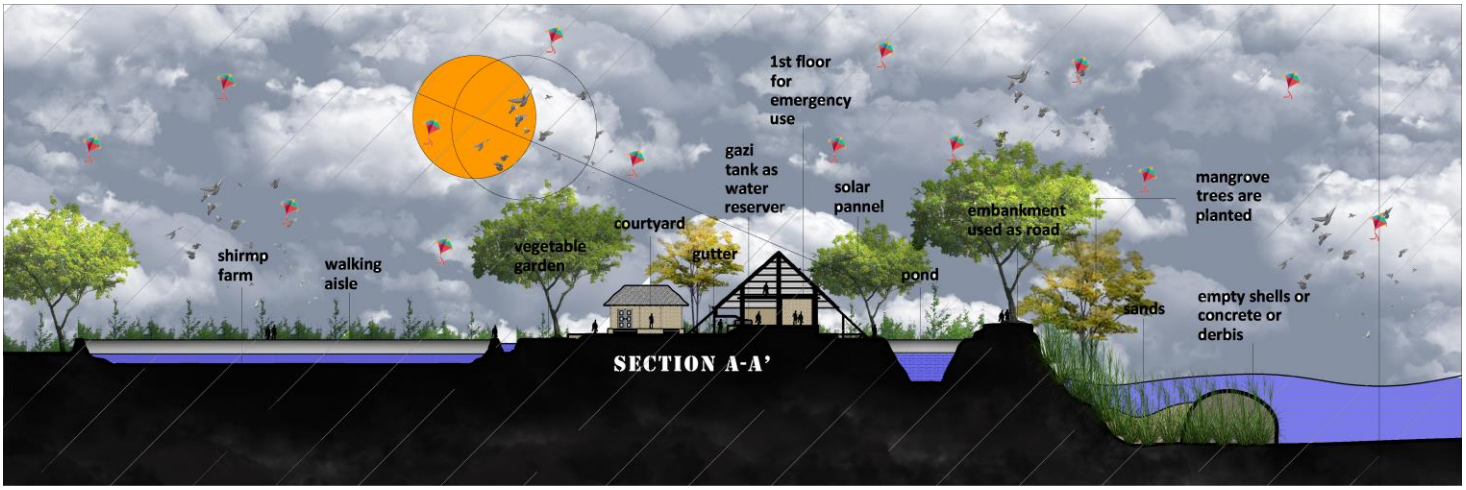


Figure: section aa'

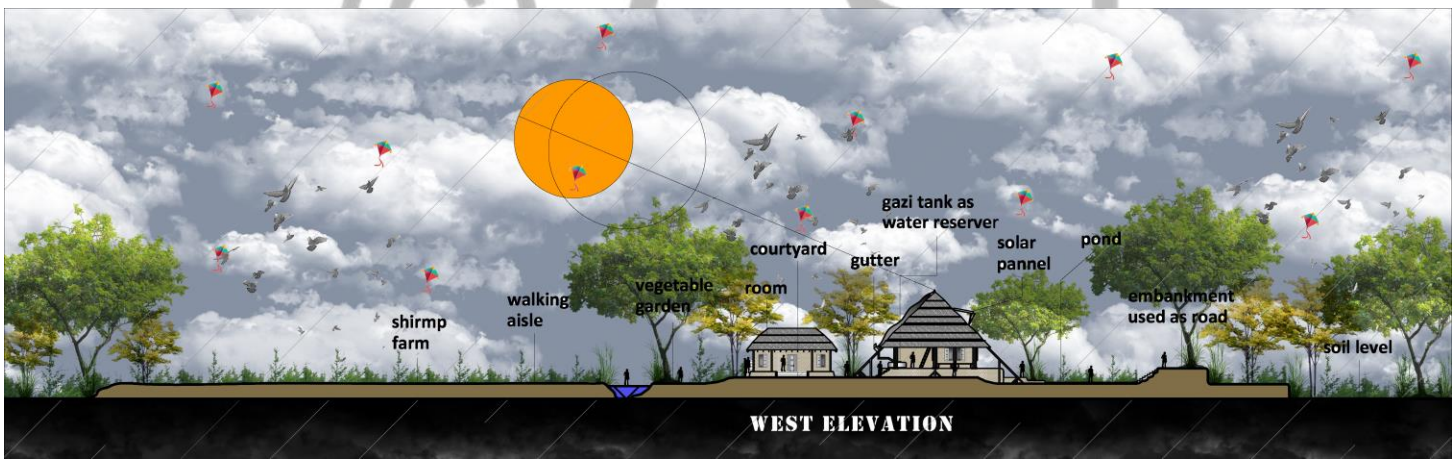


Figure: west elevation

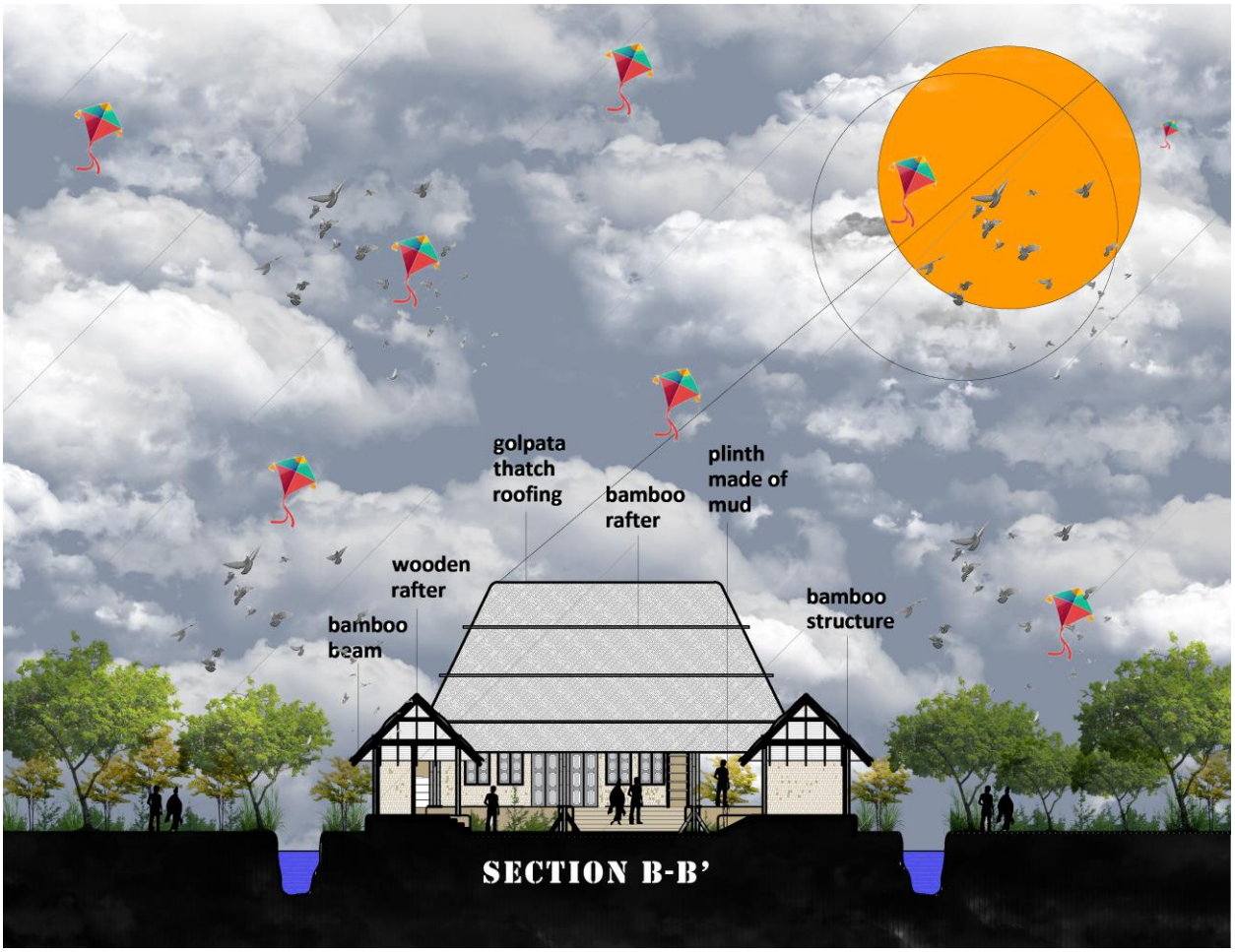


Figure: section bb'

Stilt roots of mangrove trees are comparatively stronger against cyclones and tidal surge in the Sundarbans, however bio-mimicry of stilt root is done to achieve resilience, and maintain the harmony with the nature. A practice of mitigation might bring stability to the people of lower Sundarban villages, which will decrease high dependency on cyclone shelters, which barely attracts the local people, their beliefs and culture. While choosing the material, following the stilt root structure system, local load bearing wood is avoided, as it might harm the Sundarbans ("Sundari" wood, used for load bearing, is banned to cut without permission by the authority. Other such trees are also important to preserve for the forest to protect itself). For very good flexural strength, and the very good availability, bamboo is used as the material of the structure. It can be easily transported through boats to the selected site, Gabura at Satkhira, Bangladesh. Well processed bamboo (with saline water, borax, etc.) lasts for decades.

Contextually, the pattern of Bangladeshi village homestead is maintained and blended with the unconventional structural solution. Three levels of mud plinth layer are maintained to merge with 10 feet uplifted house platform, from the high tide level. The main plinth of the compact living solution is only 3 feet above the respective level, thus, easy to reach. Almost everything would be built with local practices and easily available and sustainable materials. The collection of fresh water at Gabura is generally done by rain water harvesting. This process is kept in the proposed design, in a modified way. The roof is used for collecting the water and a 5000 liters plastic water tank is used. Also, solar panel is used for electricity source

However, the compact, liveable and affordable solution for the crisis moments does not harm daily activity.

Structural Detail:

According to KHARE (2016), 60% of housing in Bangladesh is informal. Self-build by individuals, households, and communities is
very common both in rural and urban areas in low and middle income contexts (rural landless or smallholders and urban slum
and squatter dwellers).
There might be the eventual help of hired skilled labour but within reasonable limits.

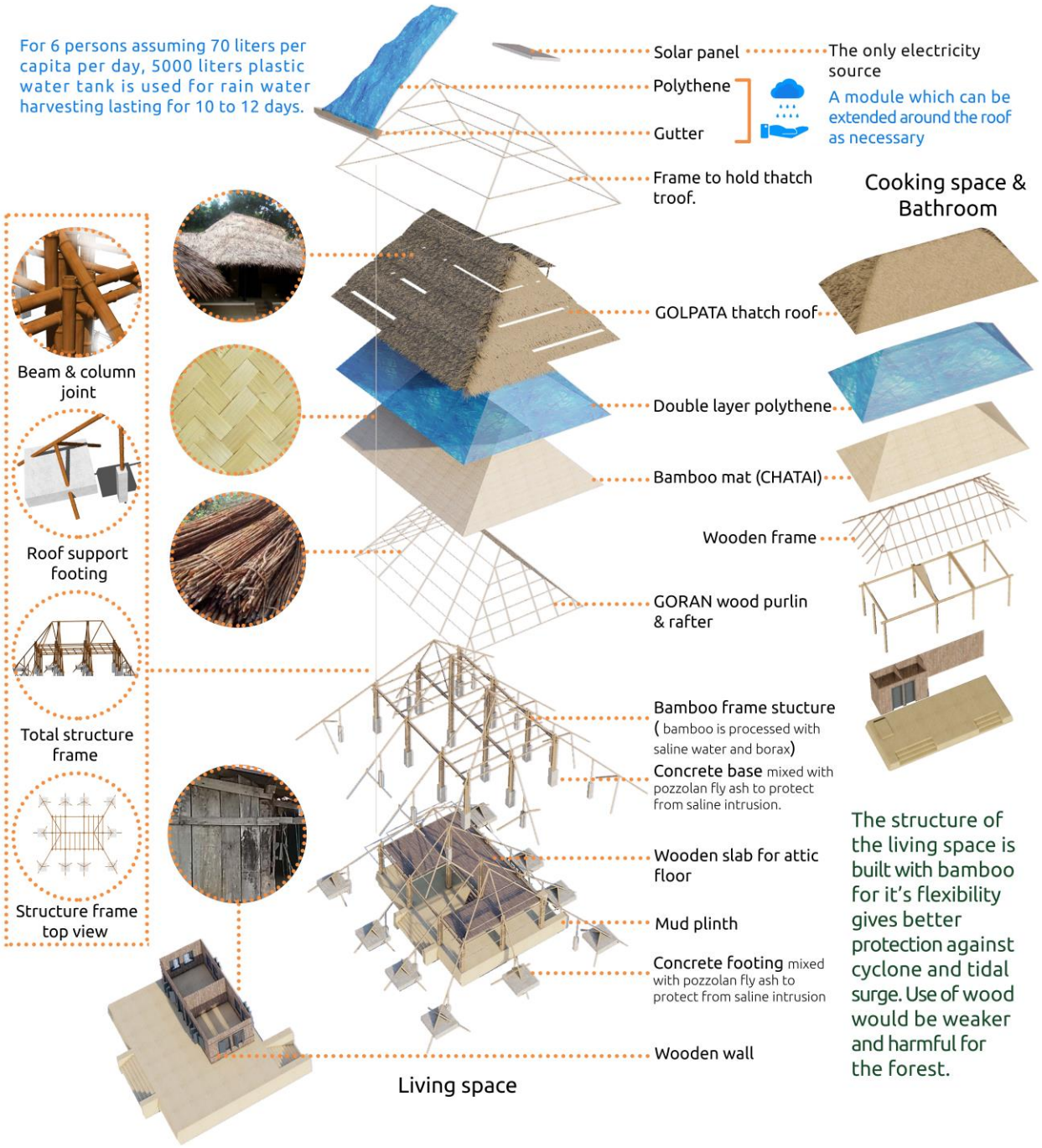


Diagram: structural detail

Eco engineering:

Ecological engineering is defined as the design, restoration, or creation of ecosystems, with a strong emphasis on ecosystem self-design and self-organization.

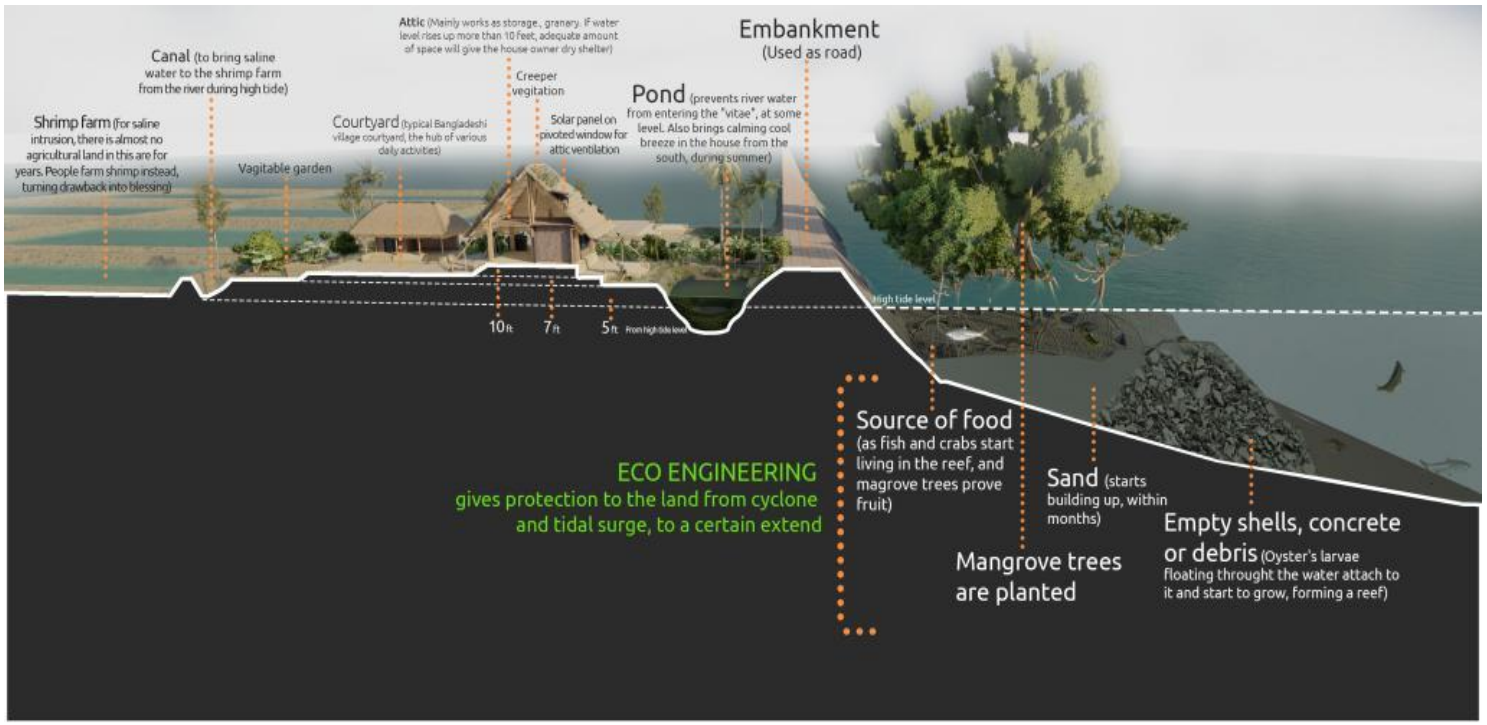


figure: eco engineering is used on the design

AN AFFORDABLE HOMESTEAD LOOK LIKE FOR THE FLOOD AFFECTED AREA (in visualization)

MAIN ENTRY OF HOME

INTERNAL POND OF HOME

MAIN ENTRY DURING MONSOON SEASON

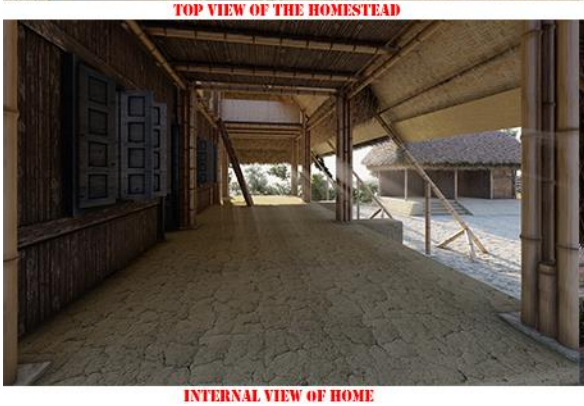
INTERNAL CONDITION DURING MONSOON SEASON

OWN VEGETABLE GARDEN

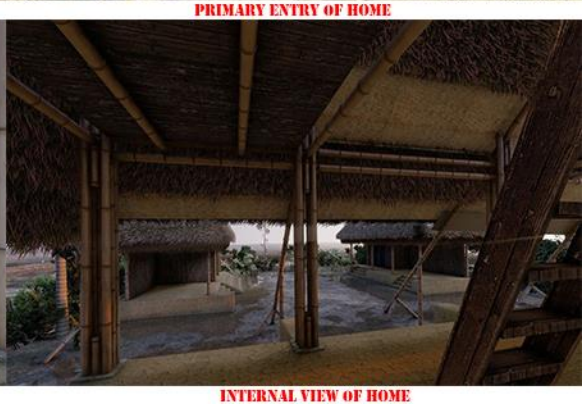
OWN VEGETABLE GARDEN DURING MONSOON SEASON

TOP VIEW OF THE HOMESTEAD

PRIMARY ENTRY OF HOME



INTERNAL VIEW OF HOME



INTERNAL VIEW OF HOME

Conclusion:

A large proportion of the countryside in Bangladesh is flood-prone, which primarily affects the predominantly low-income population. There is a need for developing housing which is appropriate for flood-prone areas, where the suggested solutions are 'cost-effective' - that is, rationalization of economy without compromising quality. This article successfully showed the homestead which is useful for flood affected areas.

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