



Heimat_erde

homeland | native soil

Advanced Studio Landscape
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SS2022

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Advanced Studio Landscape:
Building Bangladesh: From farmhouse to refugee island?

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Abstract_

The aim of the project is to devise three related designs using the building materials earth and bamboo in the given contexts. Situated in the rural context of Bangladesh, an often overlooked young nation with an vibrant, substantially vernacularly influenced architecture scene, the project shines a light on the potential of natural building materials in a different cultural setting.

Starting with the design of a farmhouse in the small village of Rudrapur, the projects progressively increase in scale, moving on to the design of a Temple and finally leading up to the design of a refugee camp situated on the island of Bhasan Char.

All projects are connected by the same recurrent motifs. With the designs growing into each other as the development process advances, the focus shifts from small spatial details to a more holistic examination without losing touch to the perceptions gained throughout the continuous working process. By constantly refining the acquired knowledge and skills, aspects of the individual designs can be transformed, adapted, upscaled, eventually bringing the three projects together.

All project tasks are rooted in the purpose of the improvement of the quality of life by improving the quality of spaces. Considering all of the steps taken and thoughts exchanged throughout the design process led me to formulate the question:

Can the use of earth and bamboo as primary building materials influence or even contribute to the improvement of the quality of life?

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Introduction_

The collection of information as well as the analysis of the present conditions sets a context in which the architectural approach needs to be developed. Dealing with the complex settings each assignment brings means setting a first step to a strong project, drawing on touchstones close to reality, leading to stronger more resilient, valuable concepts. As a design is always rooted in its physical, historical and cultural context, gaining some insight into Bangladesh sets a first step in the development process of the project.

Bangladesh emerges as a young, often overlooked, culturally rich nation with a vibrant, vastly vernacularly influenced architecture scene. The historic influences of Buddhist, Hindu, Muslim and British leadership, especially regarding building culture, are still present today. Despite registering rapid and consistent economic growth, especially in the textile industry sector, Bangladesh is ranked the poorest of the “least developed countries”. The country is one of the most densely populated in the world. Whereas denseness in the large cities such as the capital Dhaka is the worst, the large rural regions are the most affected by poverty. The country is pervaded with waterbodies, making water an important cultural element. Regular floodings due to heavy rainfalls are a common threat, striking particularly hard in poor rural communities. This means that climate as well as climate change are factors to pay special attention to, as houses are usually constructed in earth and bamboo.

Considering the given social, economic and structural conditions, earth appears to be an ideal building material: the natural material may be sourced locally at almost any site, making it very cost-efficient. Mud is pliable and fairly easy to build with, as construction does not necessarily require skilled labor. Mud constructions attain strength over time, are breathable as well as insulating, and can be combined with various organic materials. Earth creates a comfortable, healthy interior climate as well as incomparable spatial qualities, imparting a comforting atmosphere to spaces. However, as building with earth is predominantly common in rural areas, the material is stigmatized and almost exclusively associated with the poor.

The project is dedicated to creating designs using the materials earth and bamboo. By emphasizing the benefits, the spatial qualities and the beauty of mud, the project aims to remove the stigmatization of these materials and improving the quality of life of the design's users. In order to refine and help transport the project's motive to others, it was given a title: The German word “Heimaterde” – meaning “native soil” as well as “homeland”, describes the connectedness of the Bangladeshi people's identity to their country, their culture rich in tradition and their vernacular building materials. The project aims to transport and translate these motifs in a sensitive design, defined by its qualities and spectacular in simplicity.

Omica's Home_



Fig.1 Omica

Approaching our first design task, professor Anna Heringer introduced us to the background story of our project.

The woman our design was meant for was Omica, a widow living in the small village of Rudrapur. While she is currently sharing a one-story house with her daughter and her son, she dreams of owning a two-story mud home, completed by a separate stable for some cows, ducks and chicken and a small kitchen.

As being a widow puts Omica in a socially exposed position, her wish for a safe and comforting home is very present.

Omica as well as her daughter find joy in sewing and working with fabric, they hope to have more space to engage in their passion in their new home.

As time goes by, Omica's daughter will most likely get married off and live with her husband, while her son will stay with Omica and, eventually, have his future wife and children live with them as well.

While Omica's home shall be designed considering vernacular structures, she still wishes for small, special elements to find pride in.



Fig. 2 Life in Rudrapur

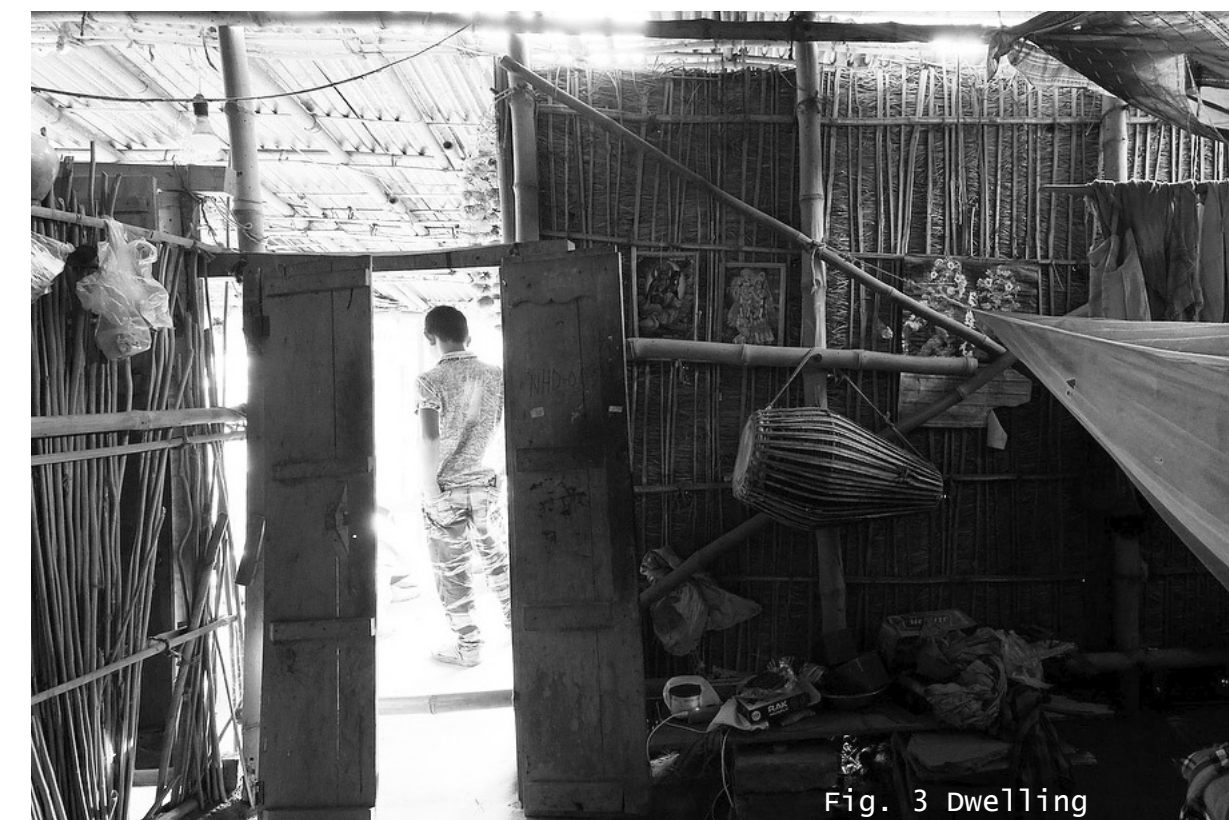


Fig. 3 Dwelling



Fig. 4 Courtyard

Baseline_

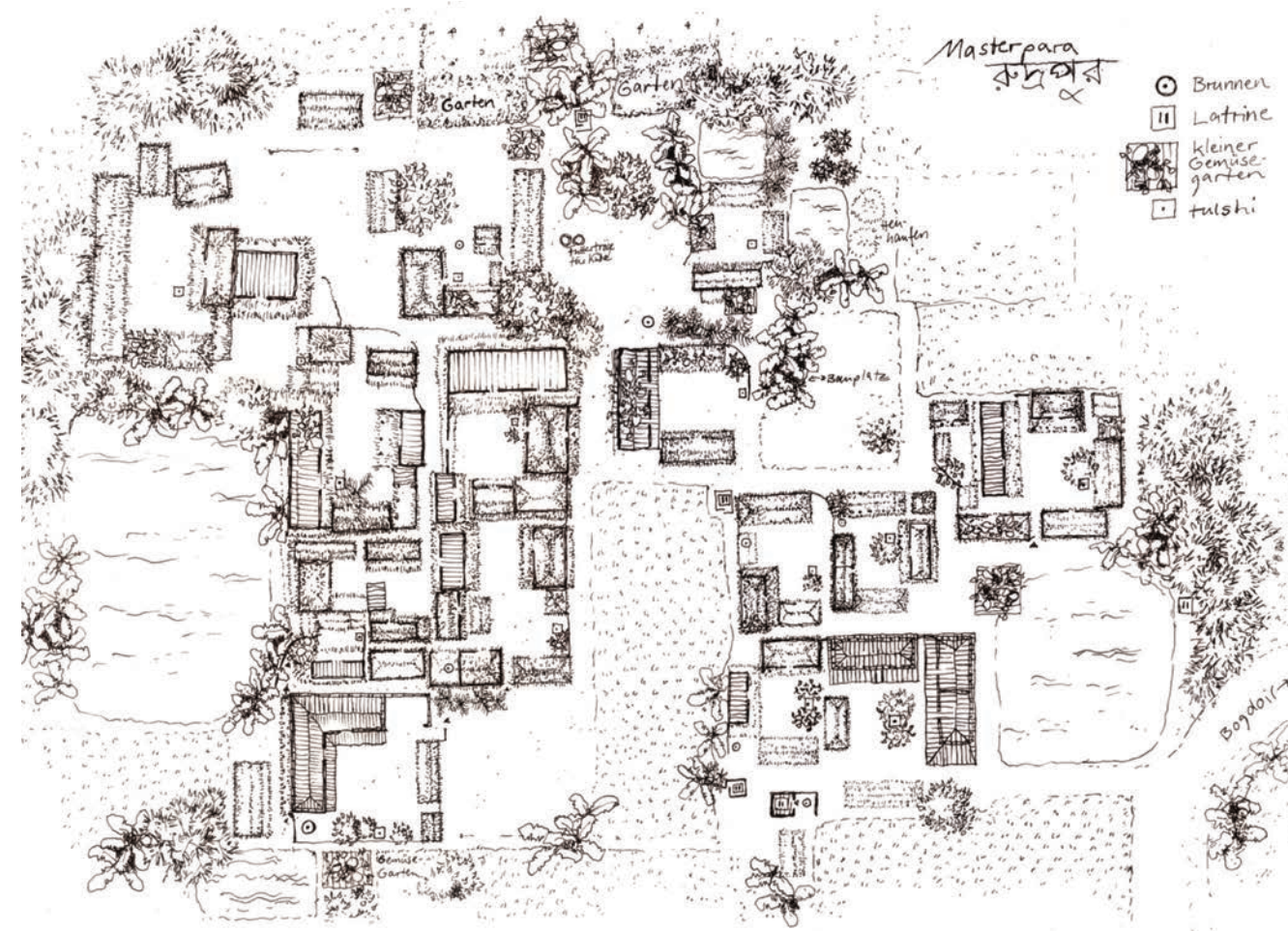


Fig 5 Masterplan Rudrapur

The first two design tasks are planned to be conducted in a small, very rural village of the name of Rudrapur. Rudrapur is close to the Indian border, making Hindu culture and religion fairly present in the residents every-day-lives. Basically, the village consists of mud islands above flood level, surrounded by various ponds and enclosed by wide fields. Classically, an average property consists of a dwelling, a stable, a kitchen, a latrine, a water well and a small religious shrine, all situated around a courtyard and directly bordering the neighboring property.

While the water well is usually situated close to the main dwelling, the kitchen is traditionally built within a certain distance in order to keep the smoke away. The main dwelling is mainly used as a place of retreat, as most aspects of daily life and social interaction takes place in the courtyard. Therefore, courtyards are usually surrounded by large verandas, providing shade as well as a cover from the rain.

As the climate is constantly humid, one should always keep an eye on the aspect of (cross-) ventilation. Another aspect that needs to be considered in the planning process is the resistance to water related damage: Heavy rainfalls during monsoon seasons as well as water pressing from below cause mud walls to become instable, eventually allowing rats to work their way through them.

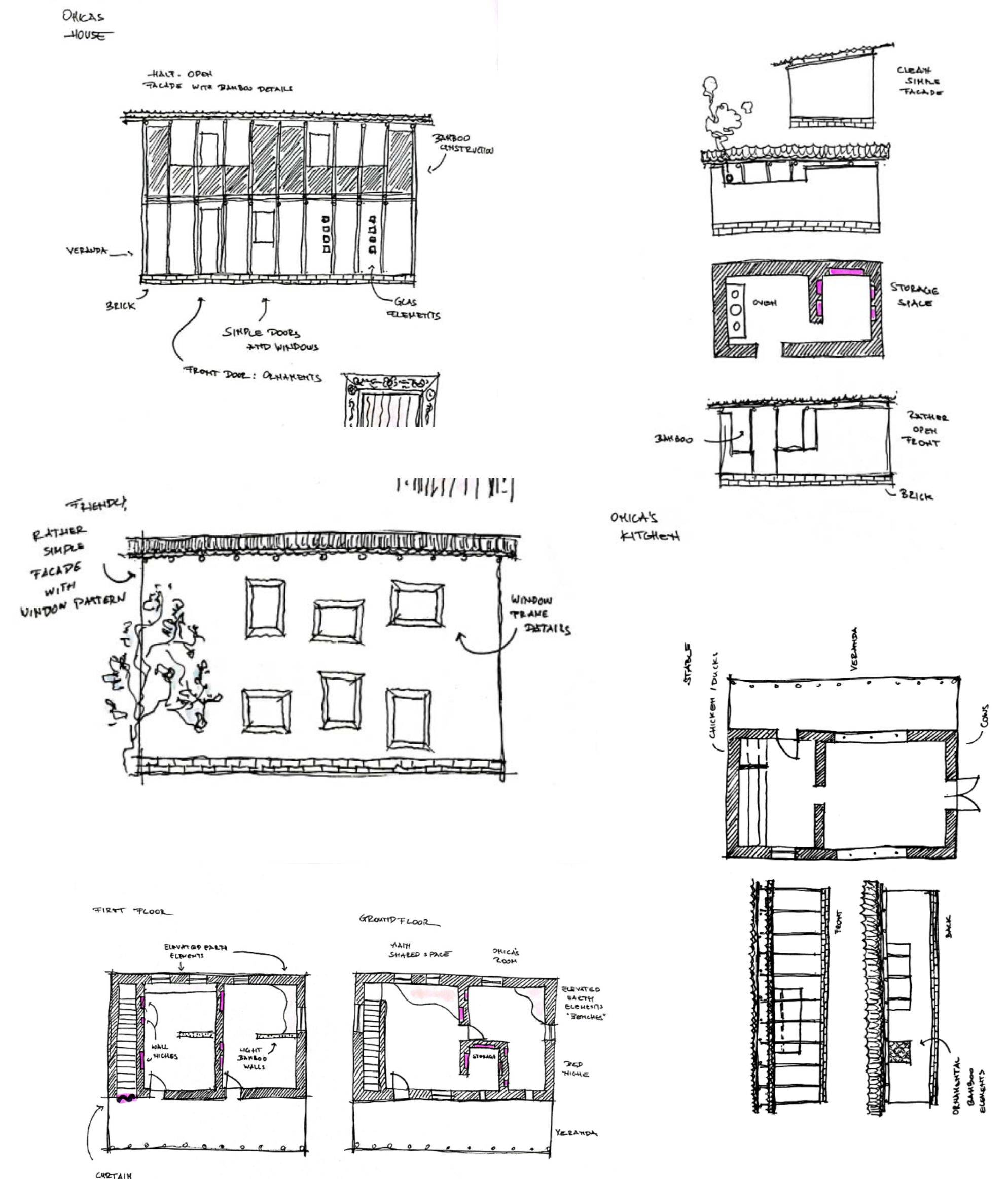


Fig 6 Drawings for Omica's Home

Design & Layout_

The background story preceding the design task, made me strive for creating not just a house but a home for Omica. Throughout the design process, I followed the principle I had set for myself to create something simple but thoughtful, homely as well as practical. The decision on using the traditional materials rammed earth and bamboo to define the ensembles construction as well as its appearance came to me naturally, as I thought the buildings needed not to look extravagant but should rather be characterized by their own special qualities.

Analyzing the villages layout of properties and neighborhoods, I found beauty in the ornamental and organic structures, leading me to decide on keeping the layout of the ensemble close to its original form in order to not interfere with the village structure, making the shapes and dimensions of the buildings remain similar.

Considering functional motives, the position of the kitchen remains the same, while the farmhouse and the stables positions are being switched in order to keep the courtyard - which is often used to lay out crops such as rice to dry in the sun - free and clean as cows do not need to cross it. As all buildings are arranged around the courtyard, a semi-private, protected, but still accessibly and welcoming space is being created.

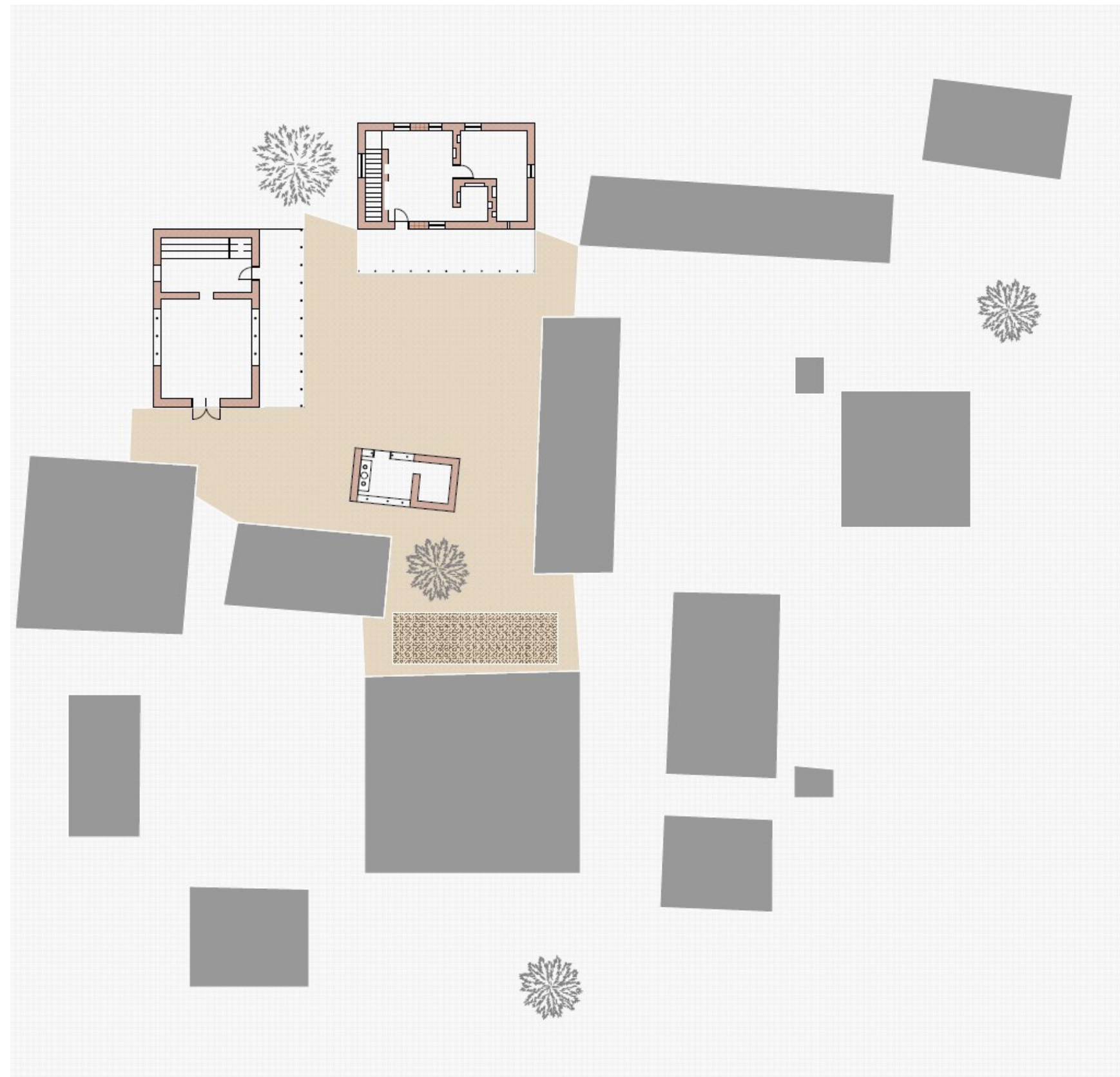


Fig 7 Masterplan Omica

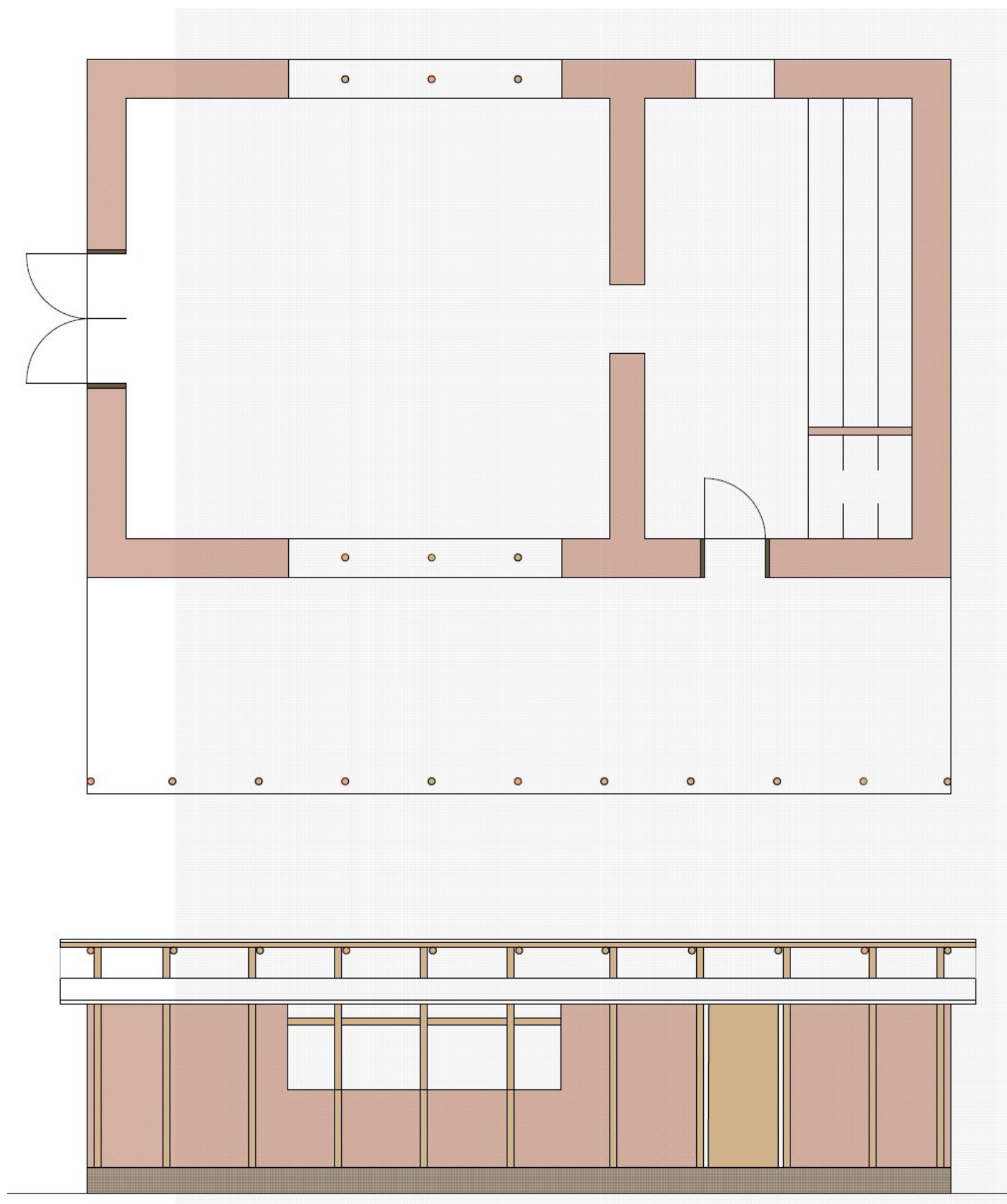


Fig 8 Stable

Functional buildings_

As the functionally buildings the kitchen and the stable are kept in a similar form with rather simple vernacularly inspired facades dominated by wide openings that allow ventilation. Both buildings are constructed with rammed earth walls and bamboo structures supporting the tin roofs.

As for the stable, these openings are designed to be used to feed the cows whilst standing on the covered veranda by putting hay either directly into the stable or into a hay rack, which can be fixated at the bamboo columns supporting the stable's roof. The stable is designed to have two separate entries: one meant to be used by the cows which is situated directly adjacent to the public pathway, keeping them from having to cross the courtyard, and another entry facing the courtyard, which is meant for Omica to access the stable's separated area for ducks and chicken.

Just like the stable, the kitchen is characterized by its functionality and its open facade, allowing emerging smoke to escape. The inner mud wall separates the cooking area from a storage area which is slightly recessed beneath ground level in order to provide natural cooling for perishable inventories. The storage areas walls are structured by various niches, creating a shelf-system. The currently unused plot of land right behind the kitchen could be used to cultivate crops, keeping the distance to the cooking and storage area short.

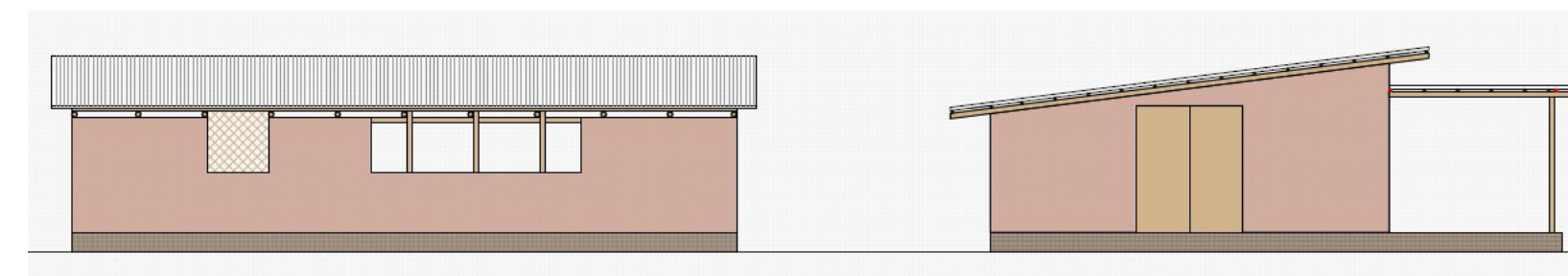


Fig 9 Stable

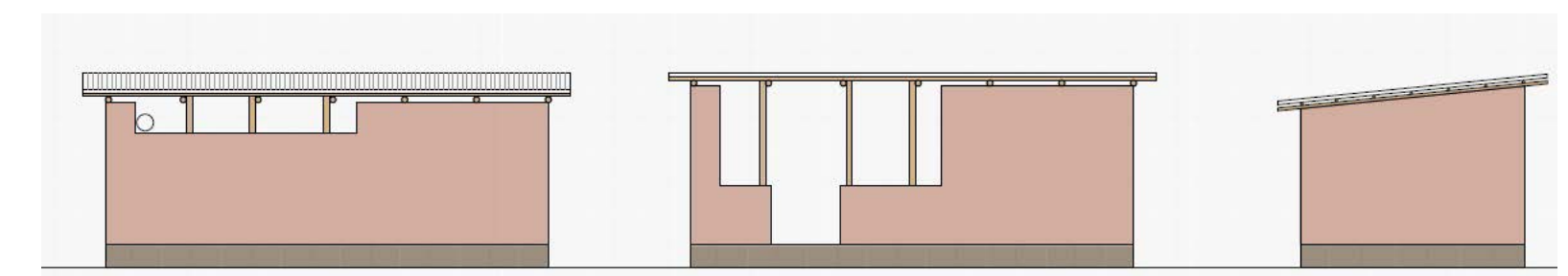


Fig 10 Kitchen

Farmhouse_

While the farmhouse's look is kept rather simple and straight forward, reflecting motives of vernacular Bangladeshi architecture, the inside hides a variation of spatially special qualities. The solid rammed earth walls and the rammed earth floor create a protected and comforting atmosphere, giving the spaces a flowy, soft, and organic look. The walls are defined by various niches, creating storage spaces, and playing with light and shade.

Entering the farmhouse from the courtyard, the common space transitions to become more and more private with every step taken further into the building. The first, rather open room functions as a shared space for all generations, defined by a larger storage niche as well as some smaller niches integrated into the mud walls.

The smaller, adjacent room is designed to give some privacy to Omica. Both rooms are vastly characterized by elevated mud platforms, which are both space-defining and functional, as they might be used as a base for sleeping space, sparing Omica the considerable investment of purchasing a bed. Small glass stone elements integrated in the mud wall allowing light to enter right above Omica's sleeping platform create an unique spatial atmosphere.

The staircase leading upstairs is designed to function as a protected and calm space, allowing the access to a sit-in window. The staircase ends with a fabric curtain, separating it from the first-floor balcony, which serves as an access to the two upstairs bedrooms. The balcony's spatial quality is defined by the lighting situation created by the woven bamboo railing, serving as a filtering layer towards the courtyard. Sitting on the balcony, one may observe without being seen and come to rest without being secluded. The two bedrooms are similar in size and design, both rooms are characterized by the earth-platforms underneath the windows and the various niches integrated within the solid mud walls. Lightweight, movable bamboo walls structure the rooms, separating them into two areas each. As one room is most likely to be shared by multiple people, the additional structuring might help create privacy and contribute to harmonious cohabitation.

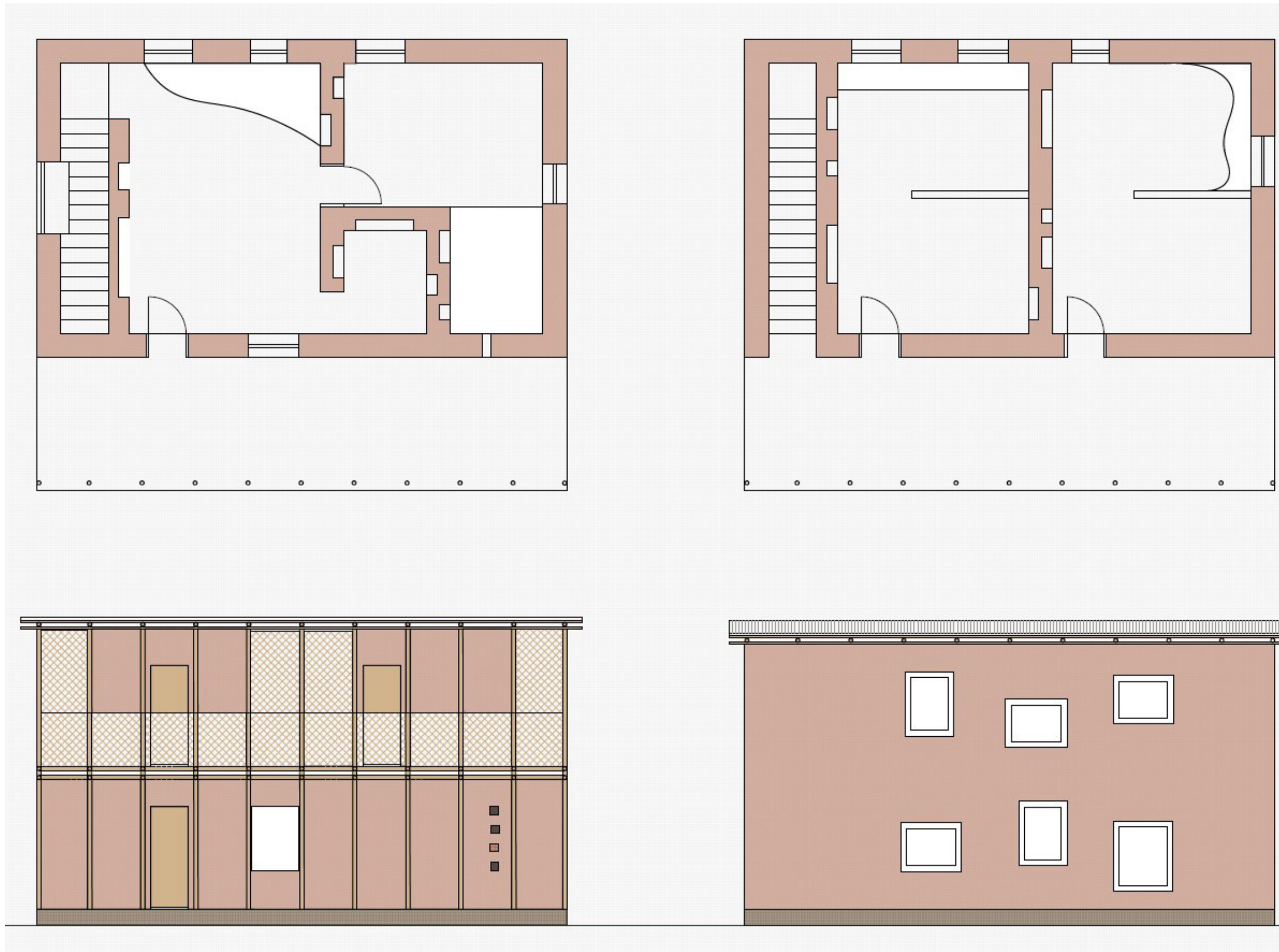


Fig 11 Farmhouse

Construction_

The terraced strip foundation is constructed with water-resilient adobe bricks, reaching up to fifty centimeters above ground level. The brick foundation is set on a levelling layer of cement. The balcony's foundations are made from casted cement, holding the bamboo columns in place.

All floors are made of rammed earth.

The monopitch tin roof is tilted towards the public pathway, leading the incidental rainwater away from the courtyard. The roof is being supported by a horizontal three-layer-bamboo structure, connected to vertical bamboo columns leading down into the forty-five-centimeter-thick rammed earth walls, where they are being fixated by a bamboo-ring-beam. The air-perfused area between the walls and the roof resulting from the construction allows cross ventilation.

Fig 12 Roof Construction Detail

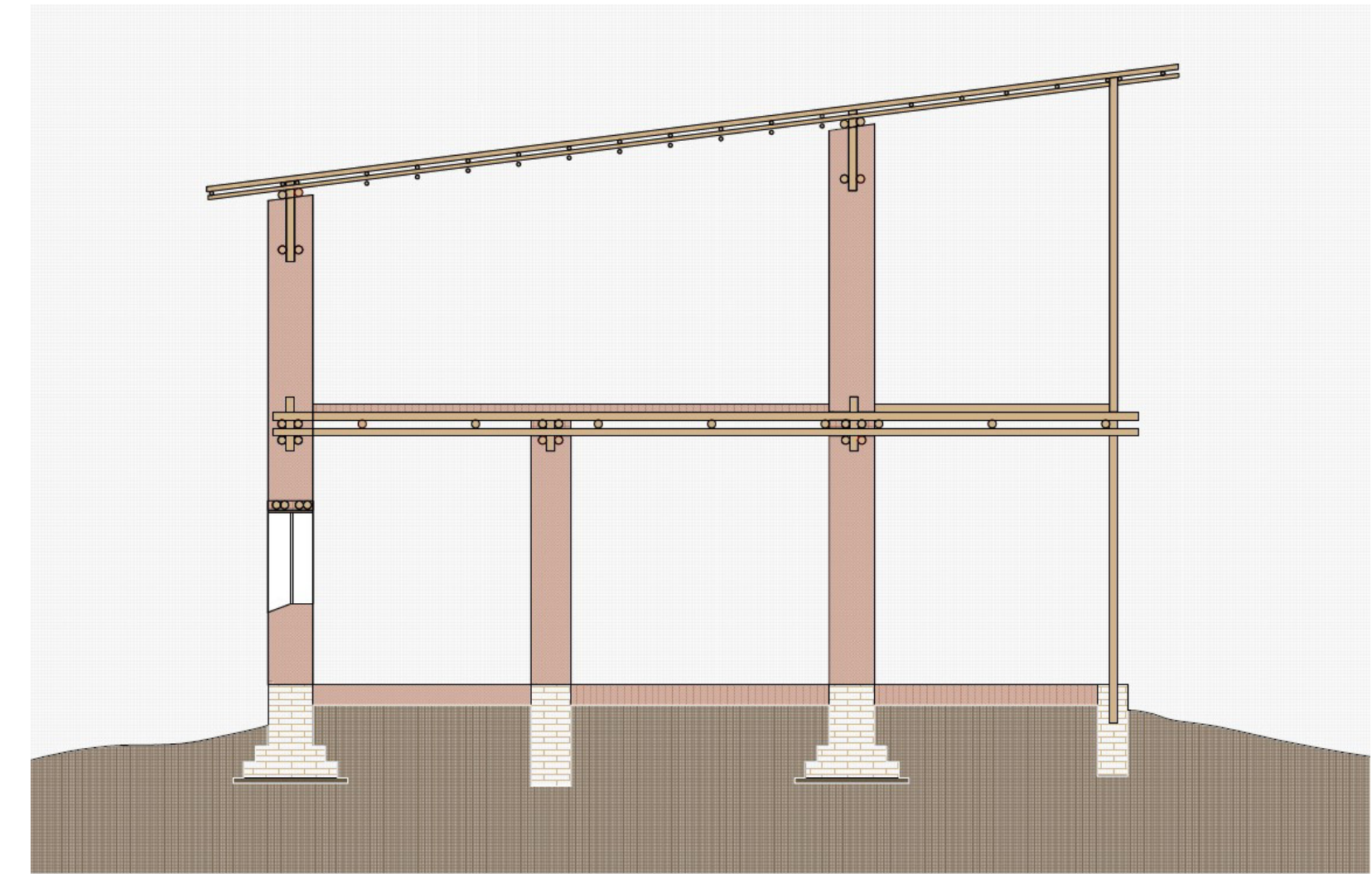
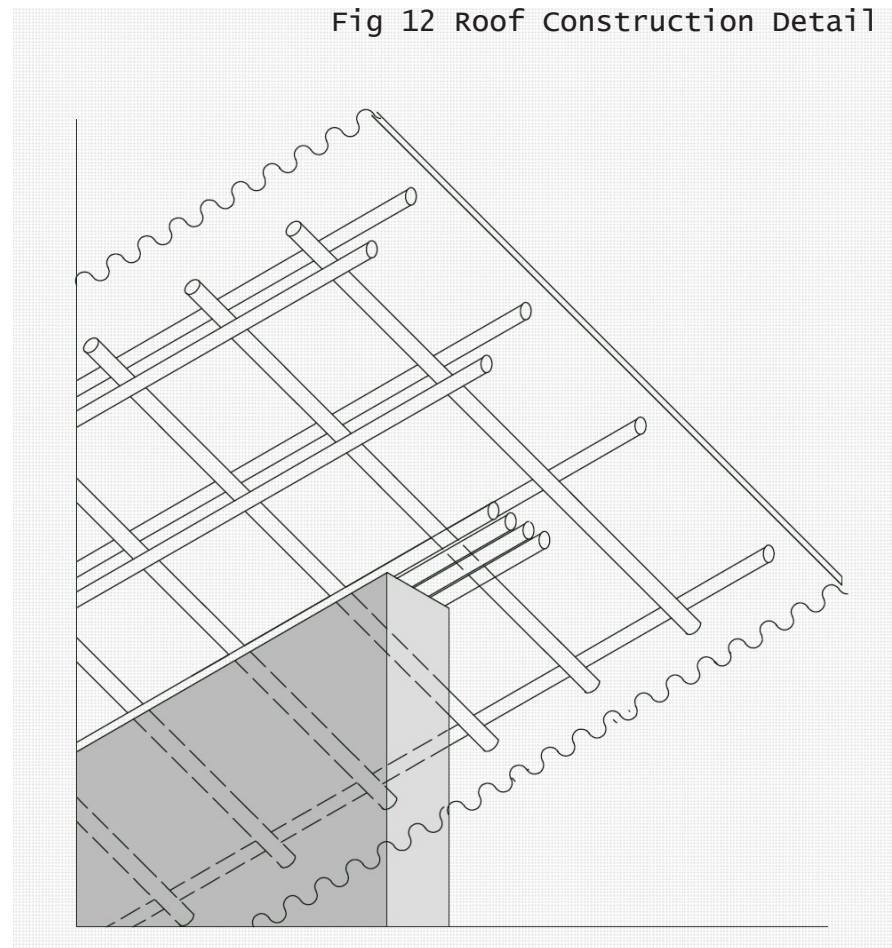


Fig 13 Construction Farmhouse

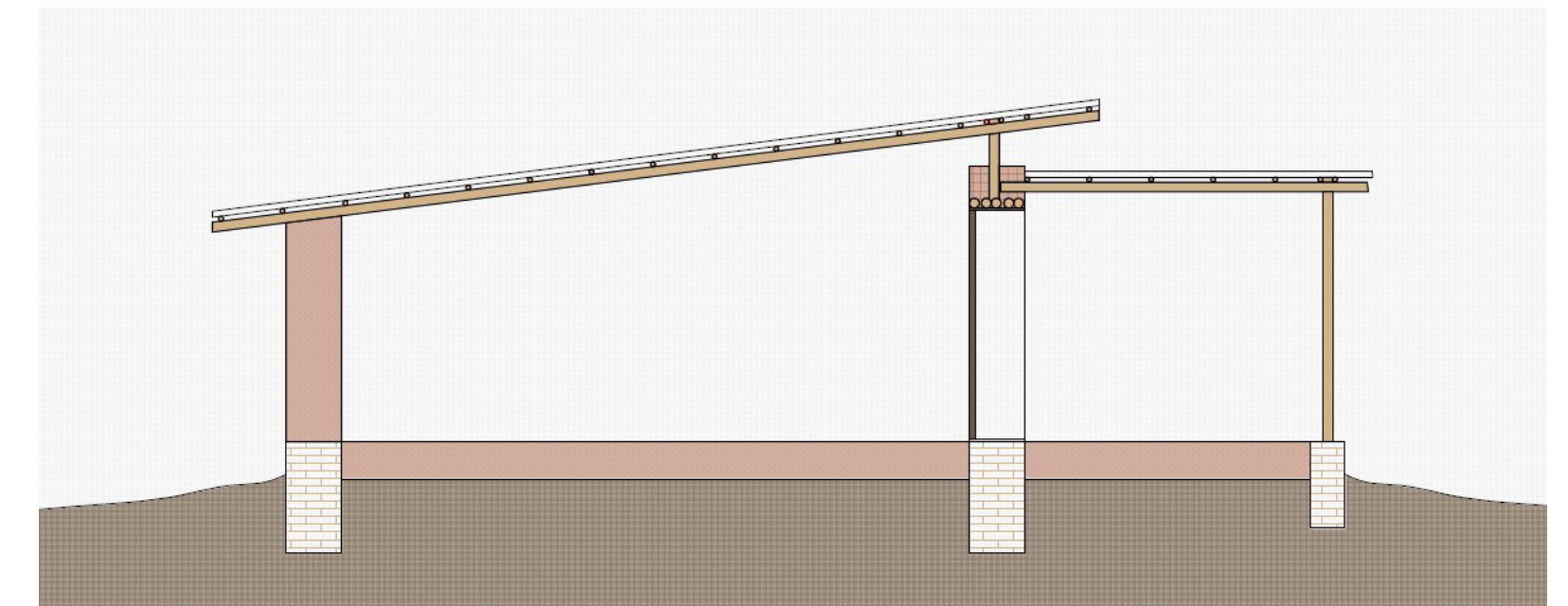


Fig 14 Construction Stable

Kali-Mandira_

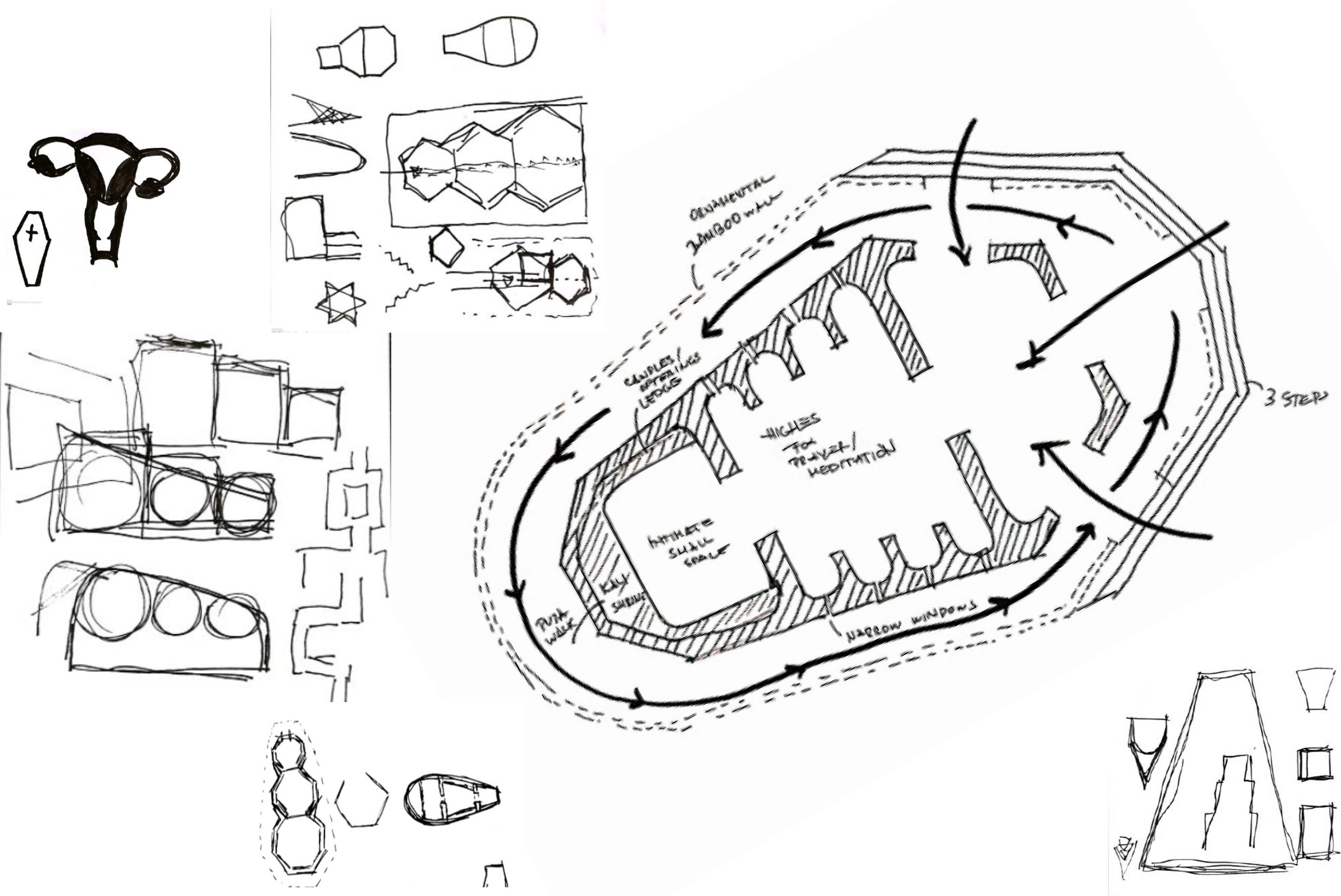


Fig 15 Drawings kali-temple

Baseline_

Hindu culture and religion are omnipresent in the every-day-life of the villagers of Rudrapur. While having private shrines and conducting daily rituals at home, most people still frequent the villages temple devoted to the goddess Kali regularly.

The design of Hindu-temples must follow a variety of architectural principles, showing great awareness and sensitivity towards religious precepts and rules. Temples are classically organized following a dictated layout.

Usually, the temple consists of at least three chambers, ascending in height. The first chamber, the ardha mandapa, is rather public and bustling, as it functions as the entrance area. The adjacent chamber, the maha mandapa, is more private as it leads the believers towards the third chamber, the garba griha, in which the deity resides. The garba griha is usually traversed by a high dome, representing the highest of universal powers. In prayer, the representing figure or shrine of the deity is often circled around by the prayer changing believers.

Perfect geometry, symmetry and mathematical principles are vital in temple design, as they express the striving for Dharma, meaning religious virtues. Temples are preferably situated near waterbodies and blooming gardens, with the entry facing east.

While the existing Kali-temple of Rudrapur might be sufficient for mundane prayer, it lacks spatial quality and fails to fulfill a Hindu-temples subsequent classical social functions, as its size and design does not promote meditation, gatherings, or the conduction of festivities.

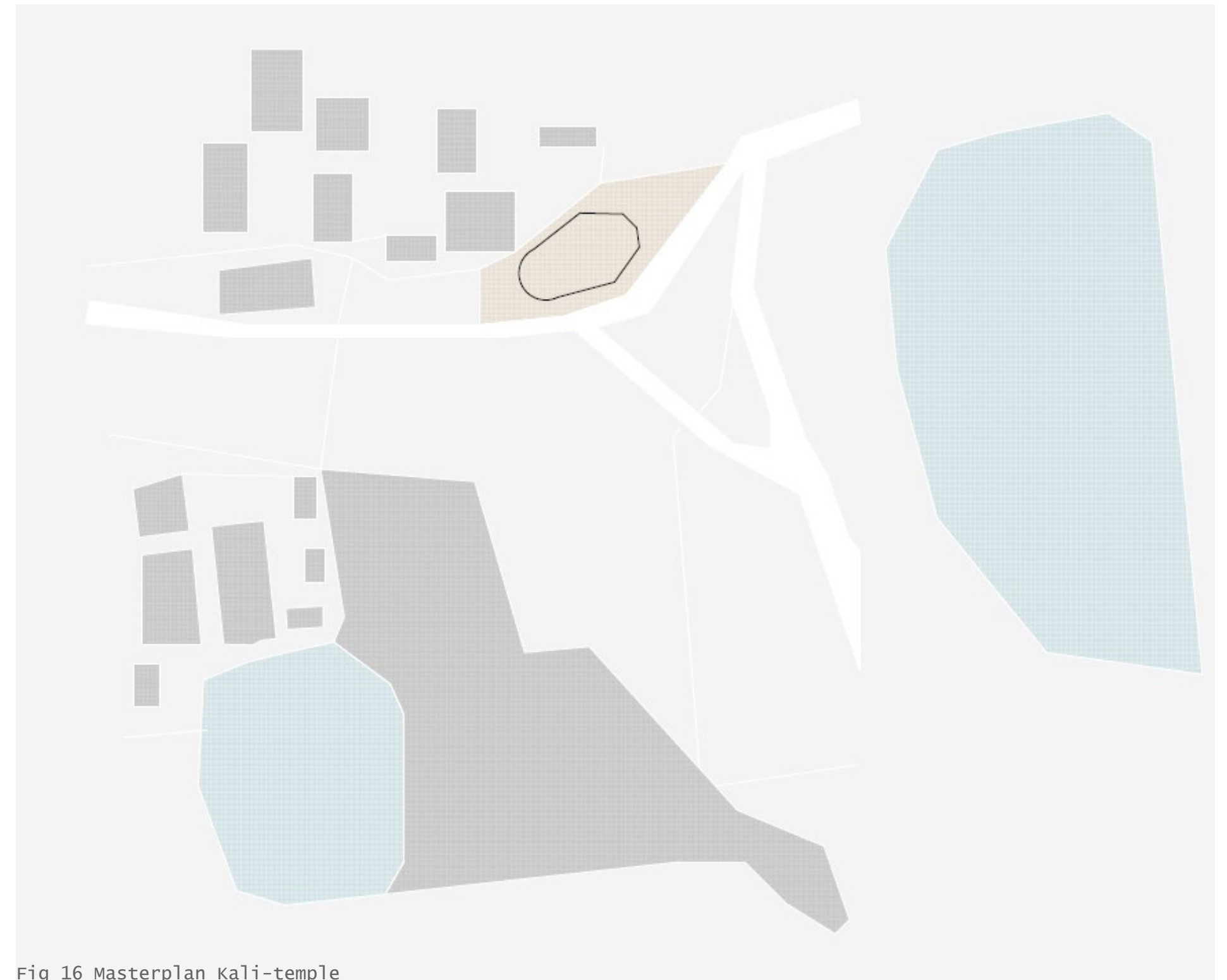


Fig 16 Masterplan Kali-temple

Kali-mandira temple_

Rudrapur's temple is and will be devoted to the goddess Kali, the deity of death and destruction as well as a motherly giver of life and renewal. The geometric design of the Kali-Mandira temple reflects these motifs, resembling the definite and sharp-edged form of a coffin from the outside, while having the solid earth walls transport the atmosphere of protectedness given by a mother's womb. The three chambers are symmetrically aligned along a central access-axis.

Directly replacing the existing building, the temple will be situated to the west of a large pond with the entry facing the waterbody, keeping the Bangali people's secular as well as sacral connection to the water present whenever approaching or leaving the temple.

The temple is constructed of thick rammed earth walls, elevated from the ground by a brick foundation, making the entry exclusively accessible over three ascending steps fulfilling a social purpose, as believers might sit down on them to rest and pray before advancing further.

After overcoming these steps, visitors will find themselves in front of the first rather open section of the temple, leading them on a course completely surrounding the building, which is meant for performing the puja ritual, encircling Kali sitting inside the building. The course is separated from the outside, the secular world, by a semi-see-through ornamentally woven bamboo wall.

The bamboo transitions into the temples organically shaped straw roof, completely enclosing the buildings silhouette as a protective and filtering layer to its sacredness.

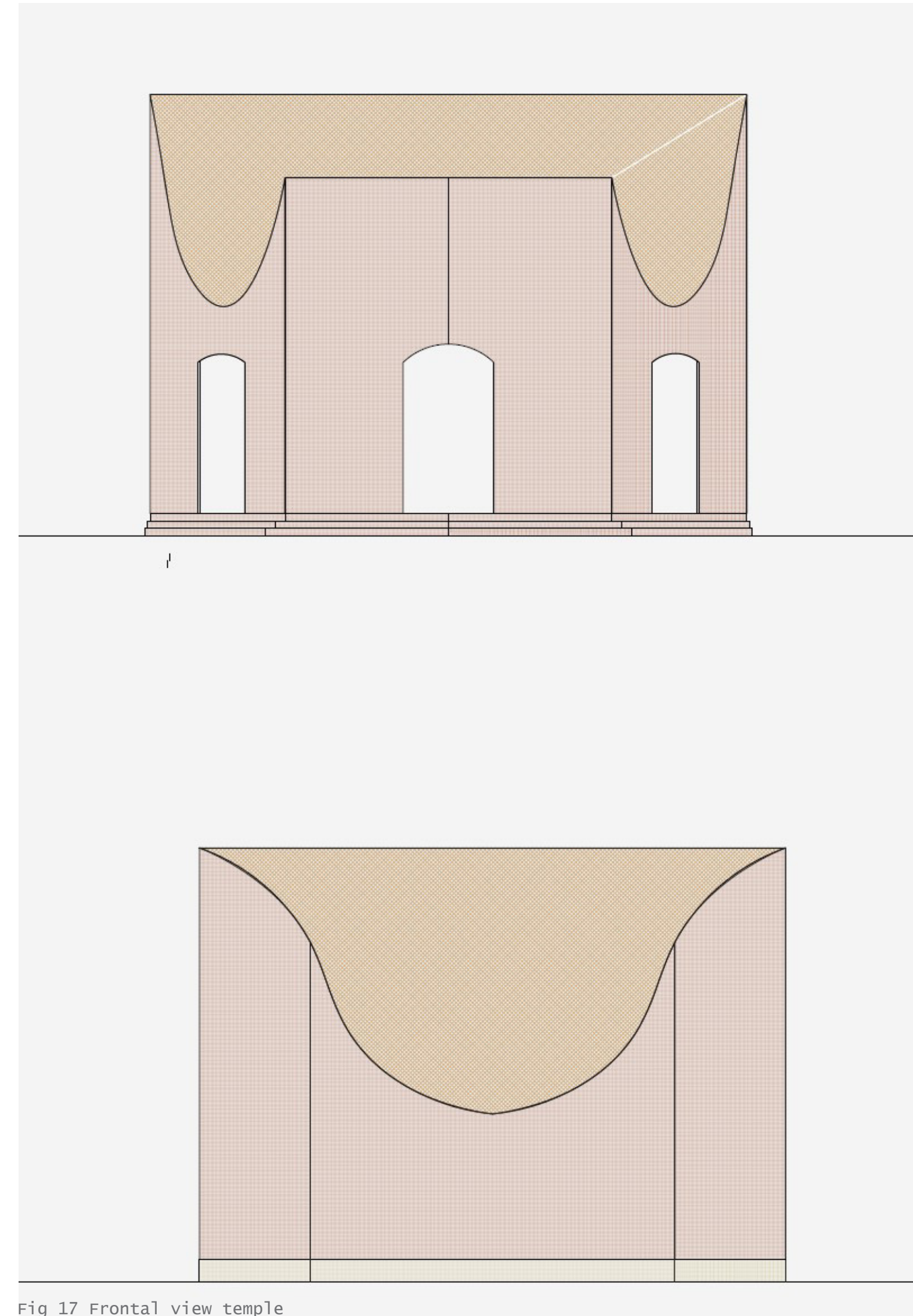


Fig 17 Frontal view temple

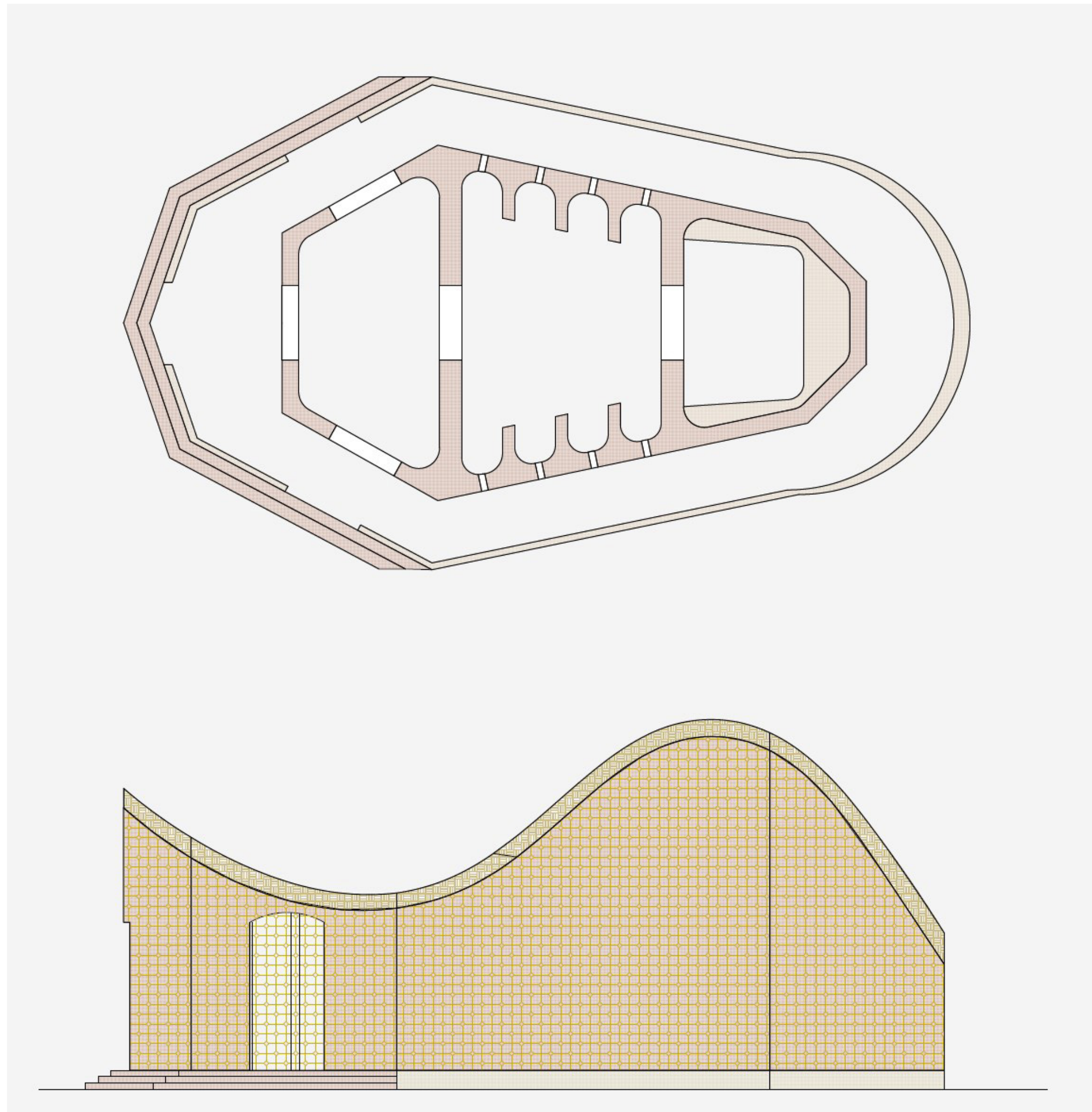


Fig 18 Top view, exterior view temple

with the course leading back to the front stairs, visitors will find themselves in front of three ornamentally crested, arched entries, leading into the first, rather open chamber of the temple, functioning as a space for community and interaction.

After passing through this first section, believers enter the second more intimate chamber. The built structures are minimal, creating the unbuilt in-between-spaces, characterizing the temple's atmosphere. Niches integrated in the chamber's walls allow visitors to pray and meditate more secluded, whilst still being among others.

The third and final chamber is the most intimate, accessed through a widened passage leading up to Kali's shrine. An elevated mud ledge going around the room allows the placement of candles, flowers, and offerings.

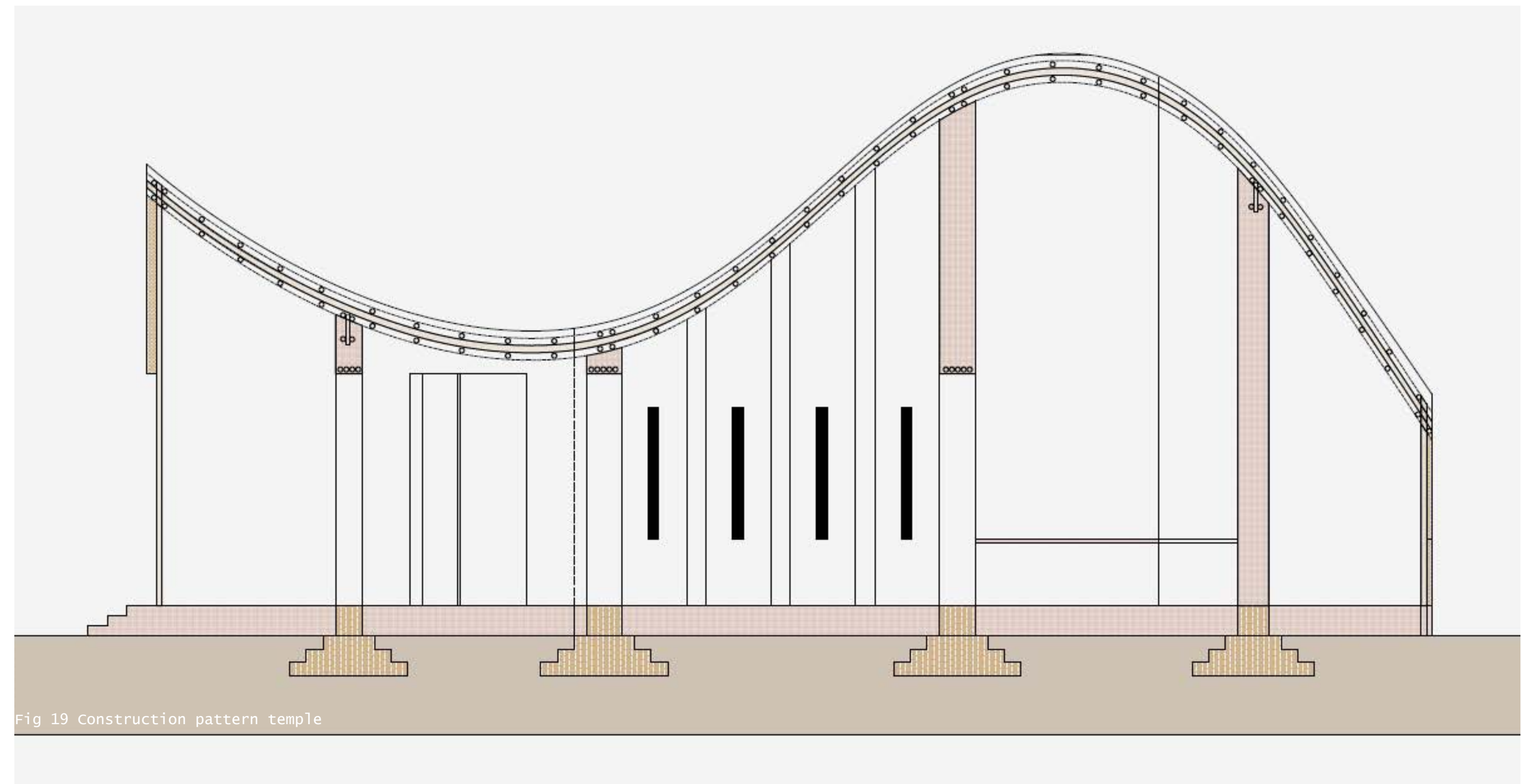
The motif of light and shade remains consistent: while the first chamber is spatially open and flooded with light, the second chamber is lighted more atmospherically by narrow windows bringing in light through the niches. The third chamber is no longer directly connected to the outside world but only to Kali, as the light is only coming in through the adjacent rooms and the candles placed by believers.

Construction_

The terraced strip foundation is constructed with water-resilient adobe bricks, reaching up to fifty centimeters above ground level. The brick foundation is set on a levelling layer of cement. The front steps leading up to the temple are made from adobe bricks as well.

The organically shaped, twenty-centimeter thick, multi-layer straw roof is constructed with multiple highpoints and a roof slope of forty degrees, making inclining rainwater drain away by itself.

The roof is being supported by a horizontal three-layer-bamboo structure, laying directly on the forty-five-centimeter-thick rammed earth walls. The construction is pinned down into the walls, where it is fixated by a ring beam. As the roof is overhanging the rammed earth construction, fully covering the surrounding course, it is additionally being supported by bamboo columns enclosing the course.



Bhasan Char_

The Rohingya people are a stateless ethnic group, predominately residing in Myanmar. Ongoing conflicts leading up to a Rohingya genocide 2017, lead to an ongoing wave of refugees fleeing Myanmar, with most of them ending up seeking refuge in the neighboring state of Bangladesh. However, their situation in Bangladesh is considerably fragile as well.

In 2020, the Bangladeshi government began relocating Rohingya refugees from the overcrowded Cox's Bazar refugee camp to Bhasan Char, a remote and cyclone-prone island in the Bay of Bengal, risen from the sea only twenty years ago. While the island's total surface amounts to forty square kilometers, only seven square kilometers are settled. By the end of 2022, the Bangladeshi government is planning on having relocated 100,000 Rohingya to Bhasan Char, a rise in population leading to extreme denseness.

With Bhasan Char being in a thirty-kilometer distance from the mainland, refugees are being kept in situations of restricted mobility. Speaking to human rights associations, many Rohingya living on Bhasan Char repeatedly stated they were living in "prison-like" conditions with very limited access to healthcare, education, work, and protection. (Nguyen; Lewis, 2022)

The development prospects ensuing from Bhasan Char's current situation lead to clear cut first design principles dedicated to the improvement in the Rohingyas quality of life.



Fig 20 Life in Bhasan Char



Fig 21 Bhasan Char Sattelite picture

Design principles and main motifs_

Reduction of denseness:

reduction of maximum capacity of island to 50.000 people;
minimum amount of land needed is 35 square meters per person

Reuse of existing materials and structures

Long term solutions

Overall approach: create a functioning system in all aspects,
propose solutions for extended and related issues

Simple systems

Organic growth

Helping people help themselves: teach them construction, let
them build and repair their own homes

Tackle systematic problems by implementing structures for

... education, health, administration

... religion, culture, social space

... consumption, economy

... protection from natural forces

Autonomy: circular economy, partial self-provider
community (farming, fishing, production)

Translation of motifs and principles from farmhouse and
temple designs (upscaling)...

... proportions: variation of sizes and spaces

... in-between-spaces: beauty and importance of the unbuilt

... buildings that emphasise the beauty and quality of
natural building materials

... systems within systems (onion-principle, design and
connect layer by layer)

Fig 22 Personal notes Bhasan Char

BHASAN CHAR REFUGE CAMP

- FIRST THOUGHTS -

What are the problems ?

→ DIMENSIONS (natural, architectural, social, ...)

What kind of structures would be needed
to solve the problems of each dimension ?

What kind of public structure would the
island need ? (schools, stores, hospital, ...)

NATURAL THREATS

• Cyclones, floods, monsoon, wind, erosion

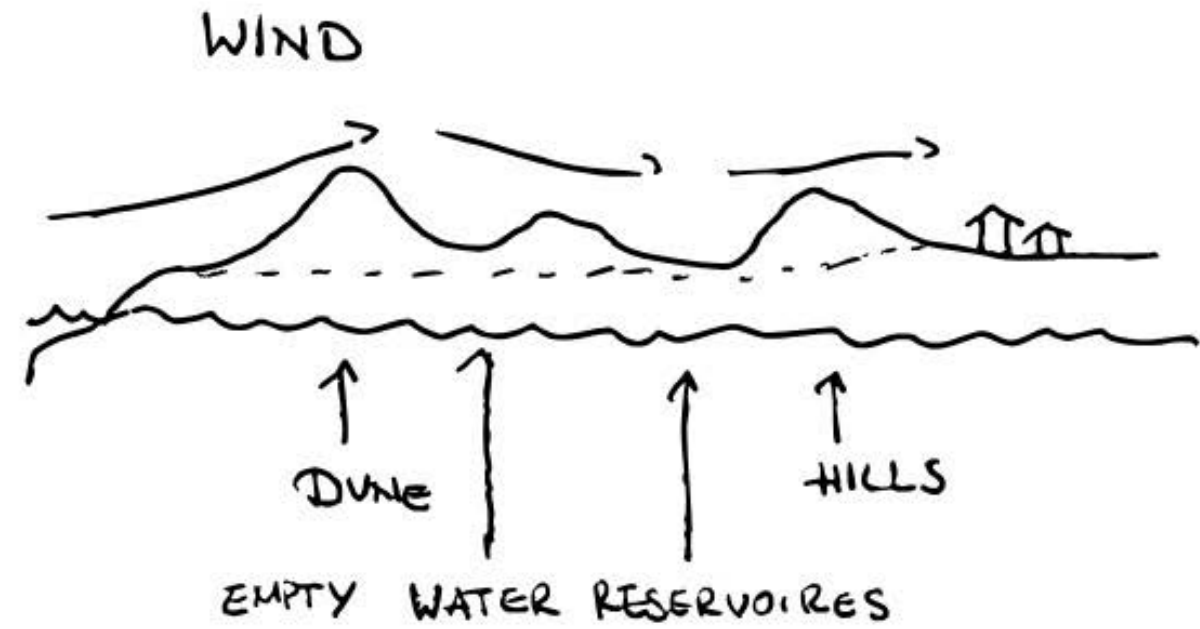
⇒ STRUCTURES :

- buildings on the highest level

- buildings in more exposed areas : on
pillars ?

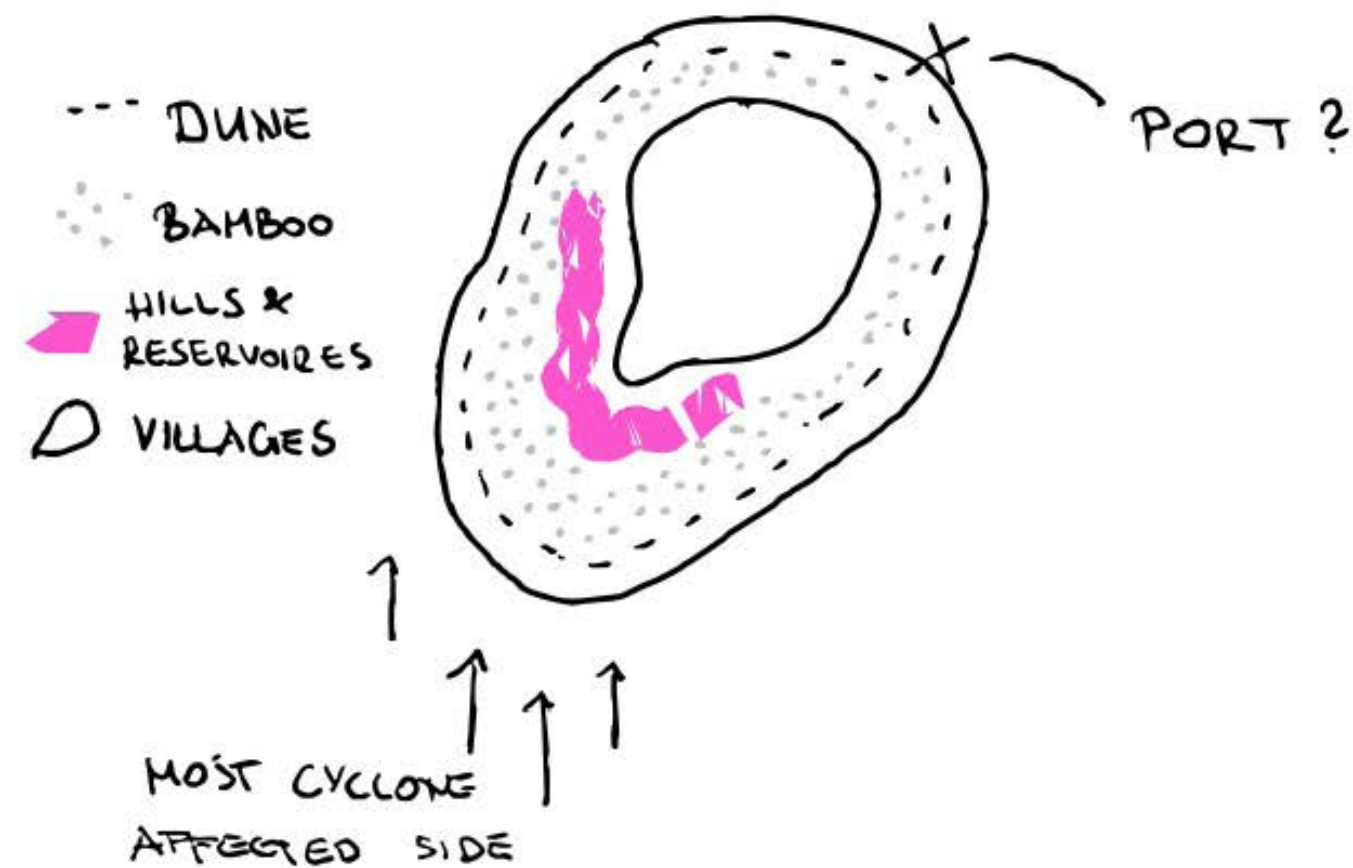
- port on the side of the island that is less
likely to be hit by a cyclone (north)

- form a terrain with hills to slow down
incoming wind and water & furrows to
function as possible water reservoirs



- plant a surrounding "belt" of plants with strong roots to give more stability to the soil & act as a barrier / to slow incoming wind & water down => bamboo: strong roots, grows fast, natural building material

- secure shore are by building up a dune



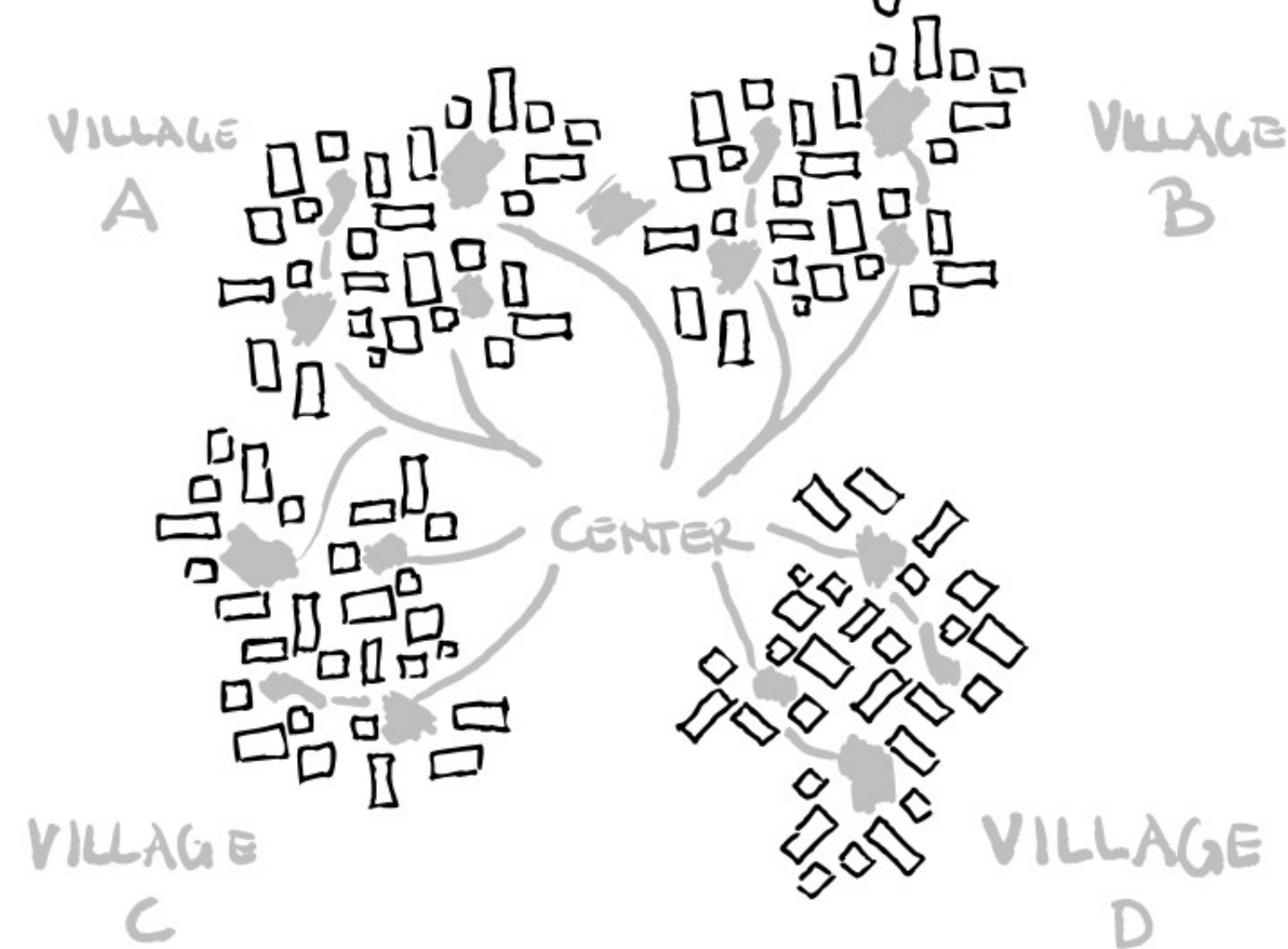
ARCHITECTURAL PROBLEMS

- uncomfortable atmosphere, planned "chess-board" structure, no variation, no individuality
- lack of diversity in built structures & limited use of structures (no stables, stores, workshops...)
- wind goes directly through built corridors

=> STRUCTURES:

- develop "villages" that consist of neighborhoods
- villages are surrounding a center with a public structure (hospital, ...)
- neighborhoods consist of 10 (+-) buildings & shared structures (2 shared kitchens, shared bathrooms) & a semi-private patio/courtyard. There might also be 1 (+-) special structure per neighborhood, for example...
 - ... a stable -> courtyard is used for animals
 - ... a garden to grow crops
 - ... a workshop / a store / a tea stall
 - > social function / gatherings

- find a slightly varying typology for buildings → subtle diversity
- change building materials to create a softer, more homely atmosphere, establish comfort and security
- connect neighbourhoods & villages by axes towards the center, not straight corridors; place buildings slightly shifted ⇒ helps break strong winds



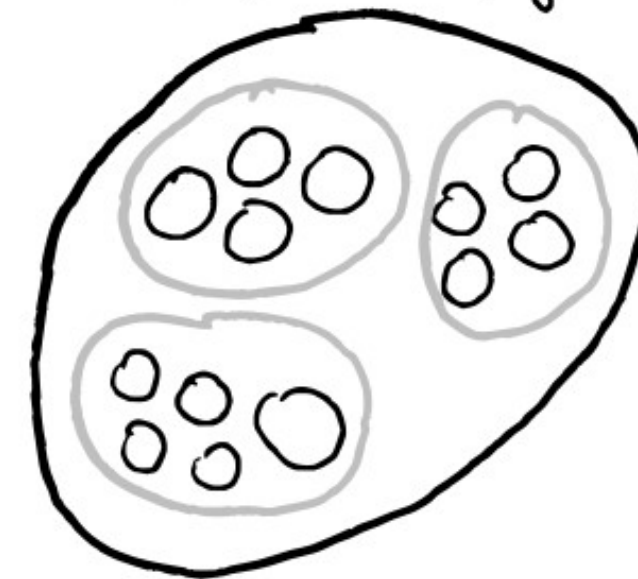
- each village might specialize in sth... eg. farming, fishing, fabrication...

SOCIAL PROBLEMS

- lack of perspective, boredom, depression
- no urban qualities
- difficult resource & hygiene situation
- no shared spaces / social spaces
- no infrastructure that allows work / economic growth / stability
- no appropriation

⇒ STRUCTURES

- individuality of villages & neighbourhoods allow forming of community & new identity → shift from "refugee camp" to "home"



STRUCTURE OF ISLANDS
FORMS A MULTI-LAYER
"WE" - IDENTITY
(FEEL AS PART OF A WHOLE)

- different features of neighbourhoods & villages allow individual specialisation ⇒ purpose

Design approach_

As stated previously, the island currently lacks a lot of urban qualities. Everything is very monotonous and there is very little space for privacy, individuality and appropriation, as the entire settlement has been planned in form of a rigid grid structure.

Apart from the problems related to the built structure, Bhasan Char especially lacks perspective. The current situation does not allow people to build up a business or engage in trading goods with the communities situated on the mainland, as the island is only accessible by a three-hour boat ride. Currently, the Bhasan Char is as isolated as a prison, with no way for the Rohingya to leave or physically interact with other communities.

Our design aims to give space to the people of Bhasan Char to unfold themselves in order to help them create an identity for the island that is linked to their pride and culture, as well as to implement qualities worth making Bhasan Char their new home. To achieve a better quality of life, we decided to reduce the island's approximate capacity from the originally planned 100.000 to 50.000 inhabitants. This will not only reduce denseness as well as the risk of conflicts coming along with it but will also allow more space per person - for individual or common use - as well as for agriculture / food production.

Our approach includes giving the island a new structure, consisting of combinations of different housing typologies, forming neighbourhoods with gardens, courtyards and individual spaces as well as common space to meet up and interact with others. These neighbourhoods continue to form villages with shared public structures for themes of culture, infrastructure, health, religion and economics. Each of these settlements comes with its own specialisation, helping people to grow a community and an identity and bond with their new home.

With the specialisations being e.g., fishing, farming or fabric production, different fields of occupations for the Rohingya are being implemented and the first steps to forming a circular economy and engaging in trade are being set. Perspectives are created for personal and social life as well as for community and economy.

A first step to starting trade with the mainland communities is set by enabling the Rohingya to partially build their houses themselves. Due to the island's soil conditions, the adobe bricks that are required for building their mud houses might have to be produced on the mainland, opening the opportunity of having the bricks produced by the people in the Kutupalong camp. Making the island's development visible to the refugees living in Kutupalong can help remove stigma from Bhasan Char and give them hope for a better future.

We see a lot of potential for the island's development in the idea of organic growth, starting with one village open to further development. Ideally, the original settlement of Bhasan Char would get torn down step by step to be replaced by the new villages, keeping only some foundations and the existing cyclone shelter buildings. After tearing down the original structures, the remaining used building material could be used as landfill to consolidate roads and build up an artificial terrain structure as part of the design programme to protect the island from incoming floods and strong winds.

Slowly but steadily, the emerging villages will form around the new centre of the island, where structures of public interest, such as a hospital, a police station and administrative buildings will be placed. Bhasan Char's road system to consist of axes leading outwards from the centre, through the villages which are structured by smaller roads towards the agricultural areas that are located right inside the area of protective barriers separating the inhabited and cultivated part of the island from the coastal area.

Urban qualities_

Analysing the current situation in Bhasan Char we decided to focus especially on urban qualities, mapping our findings using the spider-diagram.

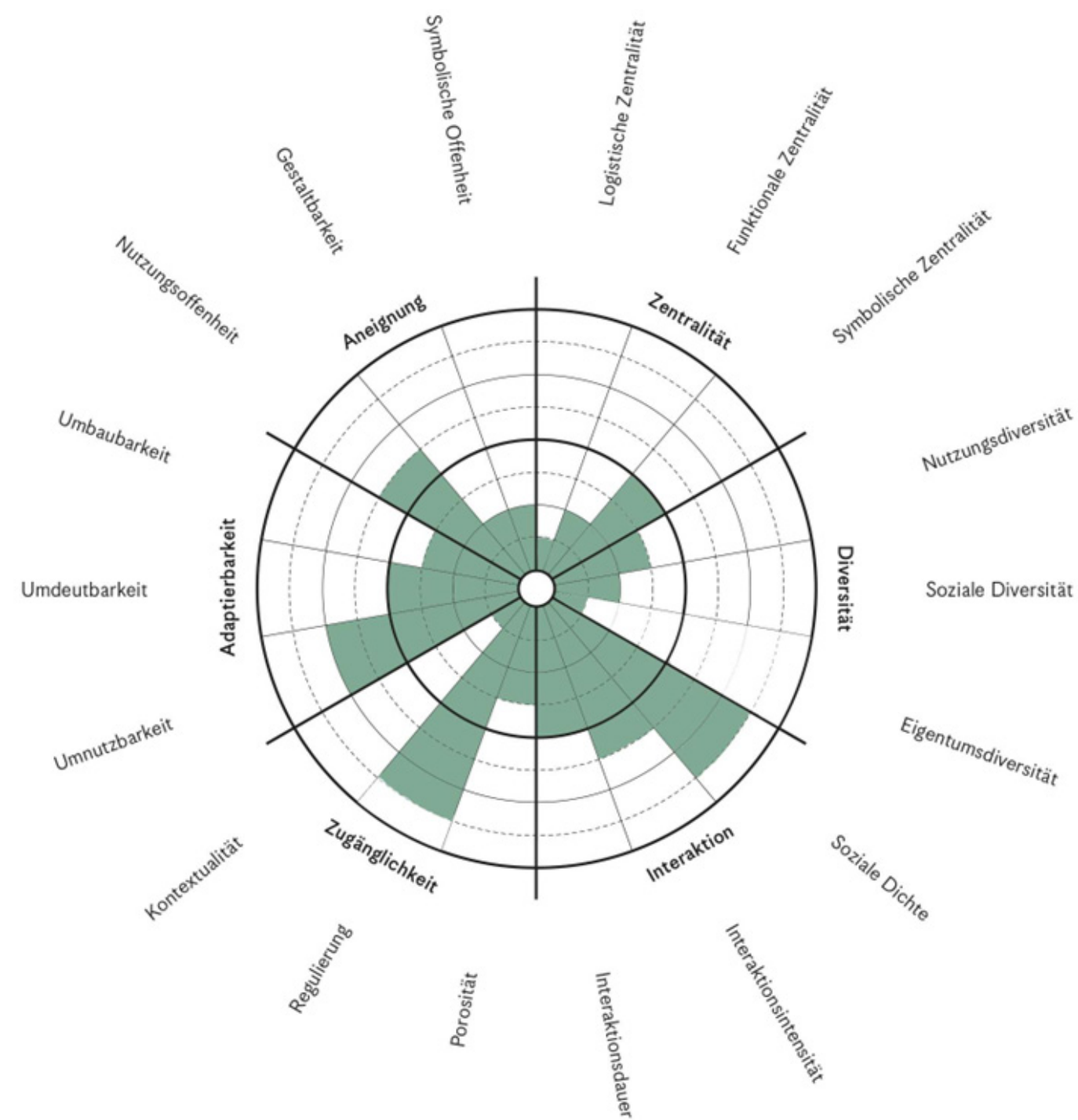


Fig 23 Urban qualities Bhasan Char

Logistic centrality: very low to non-existent, as the island is only accessible by a three-hour-boat ride. Also, there is no regular schedule for the boats to Bhasan Char and the Rohingya cannot leave the island when they want to.

Functional centrality: the island's infrastructure is minimal as well as very centralized and therefore hardly sufficient for the amount of people living in Bhasan Char.

Symbolic centrality: Bhasan Char is notorious for being compared to a prison island. On the mainland, the island is well known, but mostly negatively associated.

Diversity of use: the existing structure mainly consists of identical houses accommodating multiple families per housing unit, cyclone shelters, a few infrastructural buildings and the port.

Social diversity: All people living on Bhasan Char are Rohingya refugees, likely sharing the same culture and religion. The population therefore mostly differs in age and gender. The unity of the camp erases personal, professional and social backgrounds and lacks a healthy and diverse societal structure, which leads to an increased risk of ghettoization.

Diversity of property: As all of the island's structures were built by the Bangladeshi government, there is close to no diversity in property.

Social denseness: very high, as the living spaces are rather crowded, and the streets are the only common space.

Intensity of interaction: might vary as people do not have a lot of regular occupancies structuring their day. However, spaces that allow a variation in interaction are very limited.

Length of interaction: might vary as most people are likely to spend the majority of their time with family or peer group members, but hardly any time with anyone outside their closest personal circle, as the island lacks structures that promote interaction.

Porosity: very low as the island is structured by a very dense and rigid building pattern.

Regulation: probably very high, as the access to the island itself as well as the access to the shelter buildings is state- and police-regulated.

New use: due to their simple shape and functional construction, the buildings can be fairly easily used for other functions than accommodation.

New meaning: the built structures create an uncomfortable atmosphere, which makes removing stigma from the island and creating a positive association quite hard.

Physical adaptability: the given structures are built in concrete, there is only very little space between them. Therefore, making adaptations will be almost impossible without the destruction of some structures.

Openness to different uses: The housing units are designed with the purpose of accommodating multiple families. However, the structures appear to be fairly neutral and therefore possibly usable.

Configurability: overall very low, as the uniformly built structures as well as the resources and the constellation of multiple people sharing a housing unit do not allow individual configurations.

Symbolic openness: the rigid, concrete-built structures create a dense and constricting atmosphere.

Urban qualities: Development goals_

what would we like to achieve?
what are the changes we need to make to implement urban qualities?



Fig 24 Urban qualities: development goal

Logistic centrality: even though Bhasan Char is an island and therefore in a naturally isolated position, we aim to increase the logistic centrality by improving the existing port in order to set the base for a regular transportation schedule, connecting the island to the mainland.

Functional centrality: by creating a basic infrastructure, all needs of the inhabitants can be covered withing walking distance.

Symbolic centrality: We aim to change the connotation of Bhasan Char from negative to mainly positive by providing a new quality of life, making people associate the island with a fresh start, a new home and a positive perspective.

Diversity of use: by providing design of a variation of possible functional structures, we hope to increase the diversity of uses within the settlements. Apart from housing, there might be workshops, stores, tea stalls, ...

Social diversity: By letting people choose where they want to live themselves and by providing different housing typologies for different people within one neighbourhood, we hope to create functioning and harmonious, more socially diverse and integrative communities.

Diversity of property: allowing every person to build and own their house contributes to helping people settle down and connecting to the island, transforming the refugee camp to a "safe space".

Social denseness: by creating a new layout for the island including private space as well as public spaces, we aim to give more space to each individual. Also, the formation of matching but diverse neighbourhoods helps reduce social denseness and potential ghettoization.

Intensity of interaction: by providing people with social / meeting spaces suited for their interests and needs, the base for more intense interactions is being set.

Length of interaction: having facilities such as schools, mosques, temples, marketplaces, community centres and streets and courtyards will not only boost the intensity but also the length of interactions.

Porosity: letting the settlements grow more organically around a basic infrastructure instead of having a rigid grid system will surely increase porosity.

Regulation: allowing communities to grow less dense and more socially adequate will not only help people to feels safe and comfortable amongst their neighbours but also reduce the need for regulation.

New use: the design propositions allow a wide variation of uses. By letting the Rohingya build their houses themselves, minor adaptations to form their homes according to their desired functions can easily be made.

New meaning: even though the buildings have been constructed to serve a certain purpose, giving a new meaning to them is fairly easy, as the designs are rather simple and neutral.

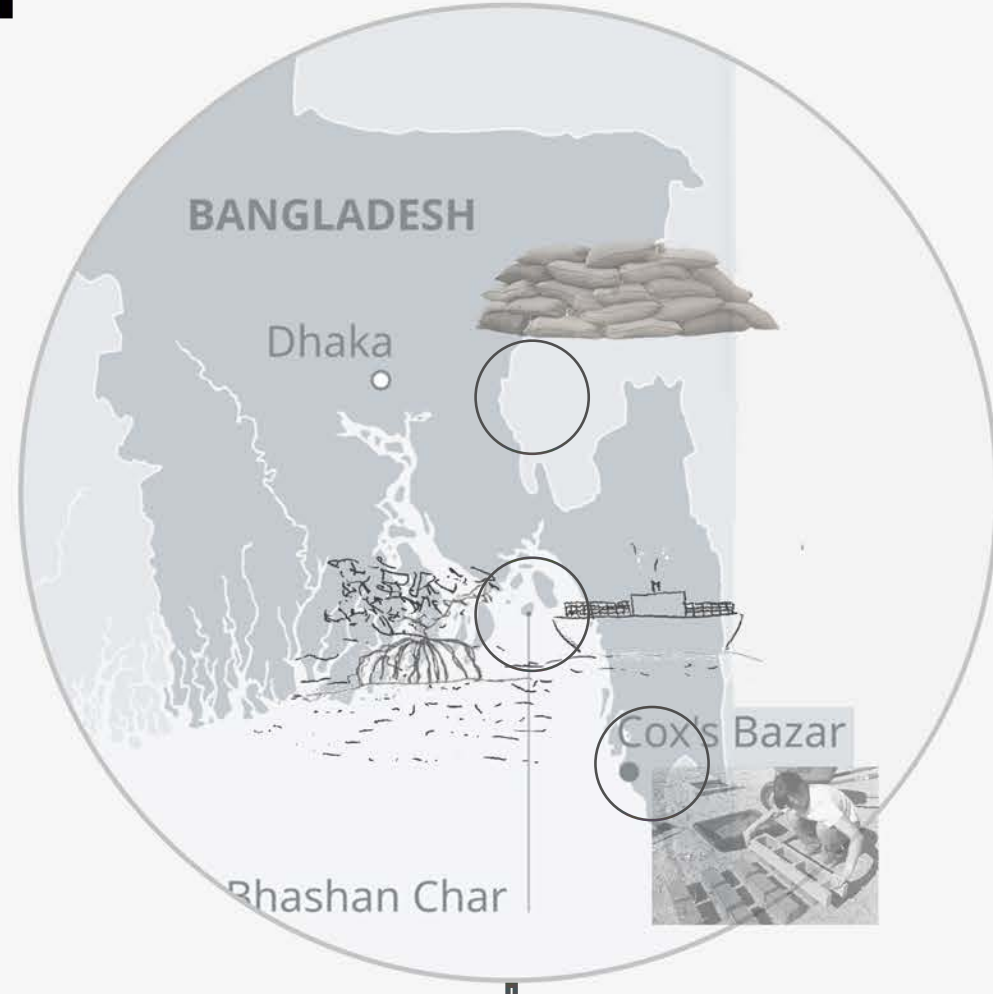
Physical adaptability: building with adobe bricks and bamboo makes minor adaptations easy. when carefully deconstructed, all materials are fully reusable.

Openness to different uses: the designs are rather simple and individually adaptable to certain extend, which makes them open to a variety of uses.

Configurability: as the refugees will build their homes themselves, configurability within a certain building pattern increases significantly.

Symbolic openness: the organically structured neighbourhoods and settlements create a homely atmosphere with a strong identity.

1 import, mangroves



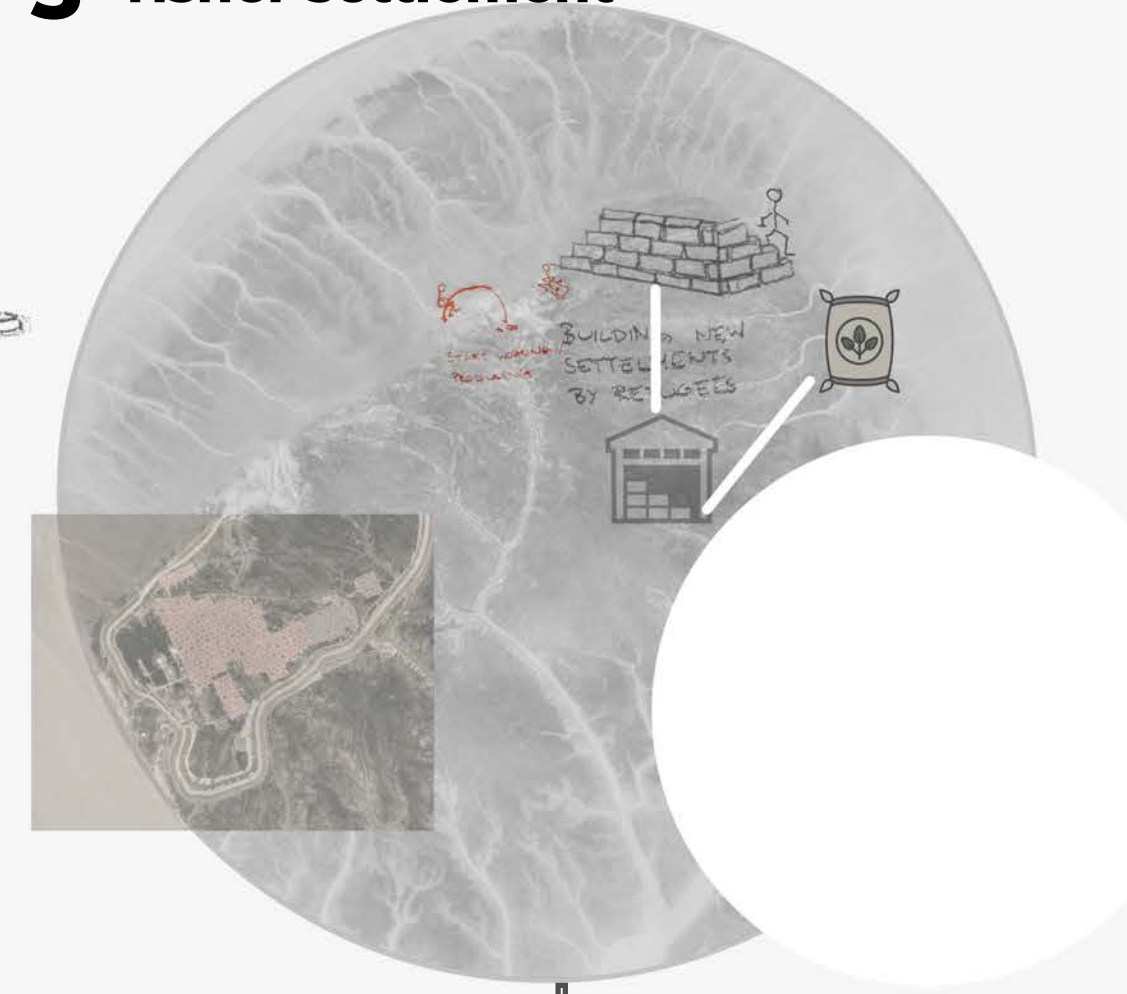
1 half year

2 storage



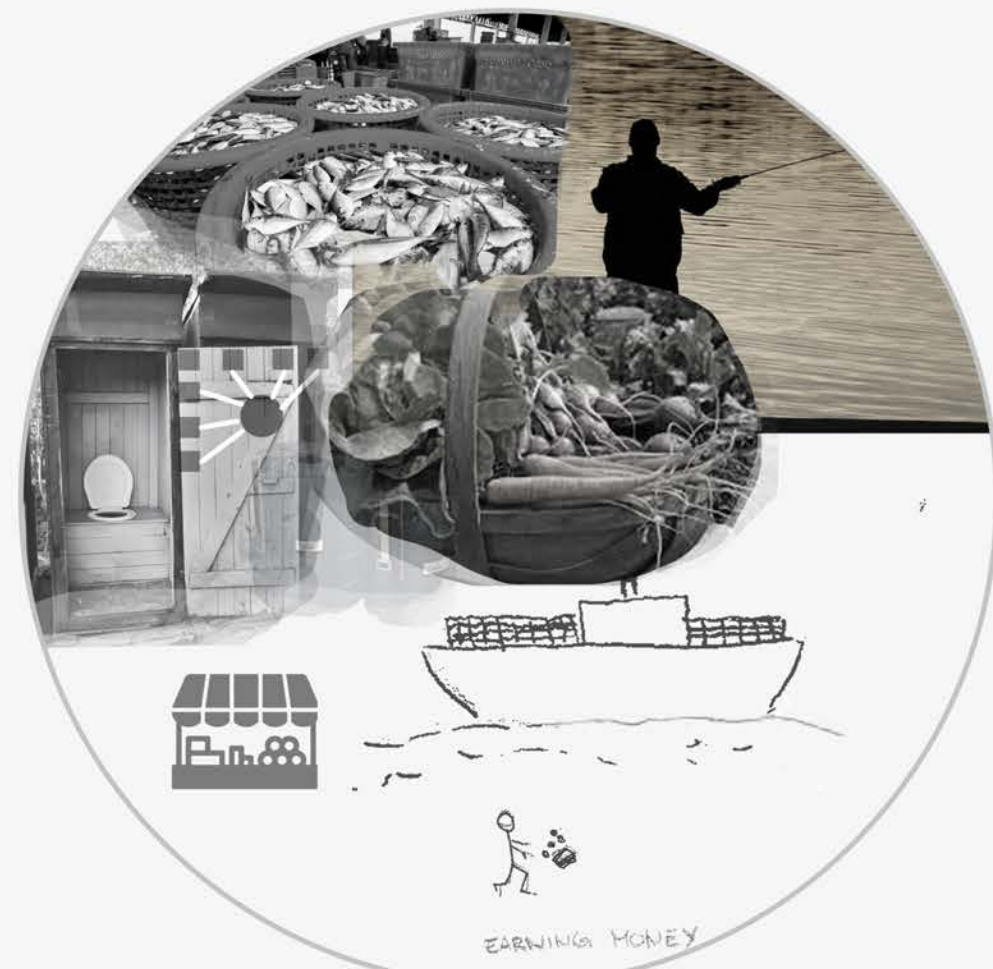
2. half year

3 fisher settlement



3. half year

4 producing goods and export



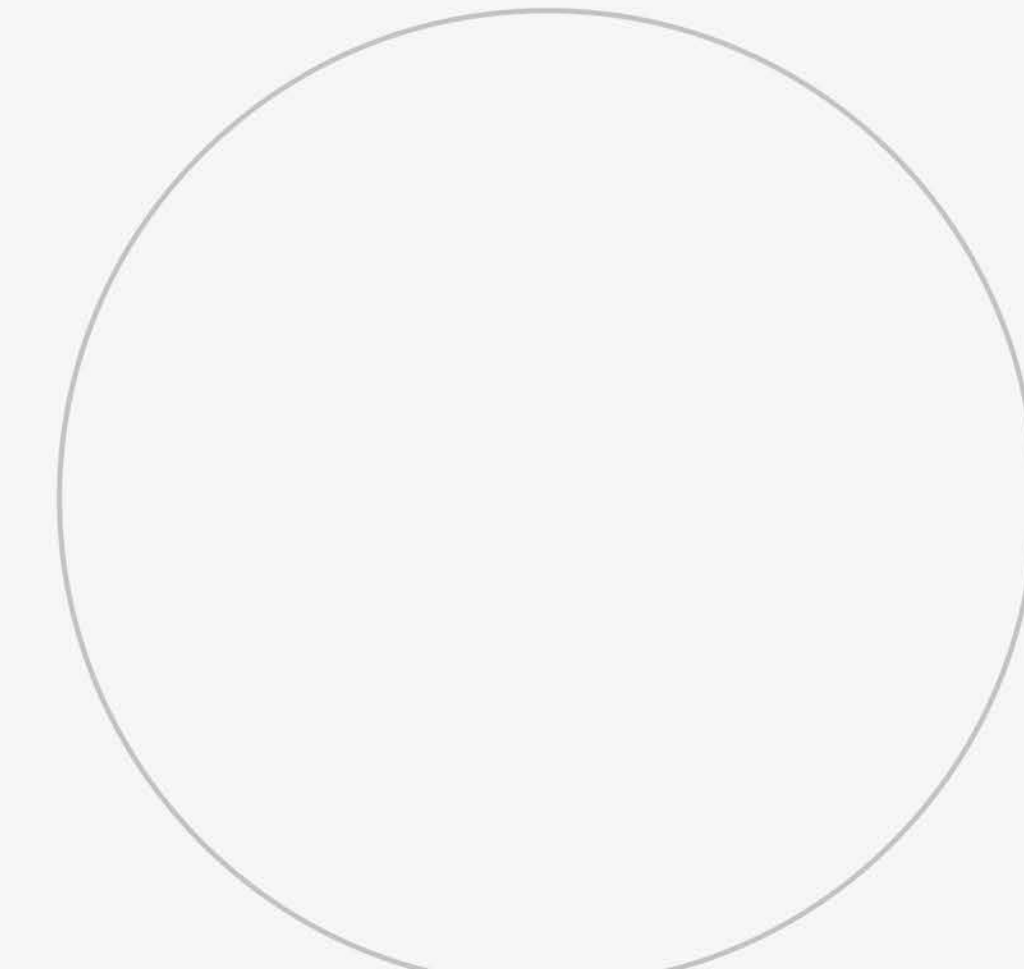
4. half year

5 own currency



5. half year

6



6. half year

Fig 25 Development process step-by-step

Material Management_

The currently existing built structures on Bhasan Char will have to be deconstructed in order to form the new settlements. When developing a material management strategy, we tried to find ways to reuse existing materials. The shingles used to cover the roofs of the houses can easily be fully reused. The existing houses walls are built in concrete, which could later be used to form new foundations for housing units and streets.

If the condition of the deconstructed material is not good enough to be used in these kinds of constructions, it could be used as landfill material in order to build up the protective layers.

The new houses will be built out of adobe bricks, forming the outer walls, and bamboo, supporting the roof and forming the inner walls as well as the ceiling. According to our research, the soil of the island is not well suited for forming adobe bricks. However, the soil in Kutupalong, the refugee camp on the mainland, is fine to be used for producing bricks. As Kutupalong is a very hilly area, the landscape must be artificially terraced for houses to be built. This ongoing process leads to a lot of unused excess material. By producing bricks for the new settlement on Bhasan Char, the refugees of Kutupalong are not only occupied and financially rewarded, but also involved in the process of building up a new home for their people or even themselves.

As Bhasan Char is surrounded by saltwater, the salty soil makes it almost impossible for bamboo to grow. Therefore, the bamboo will have to be imported from the mainland, supporting Bangladesh's local economy, and therefore also catering to the government's interests.

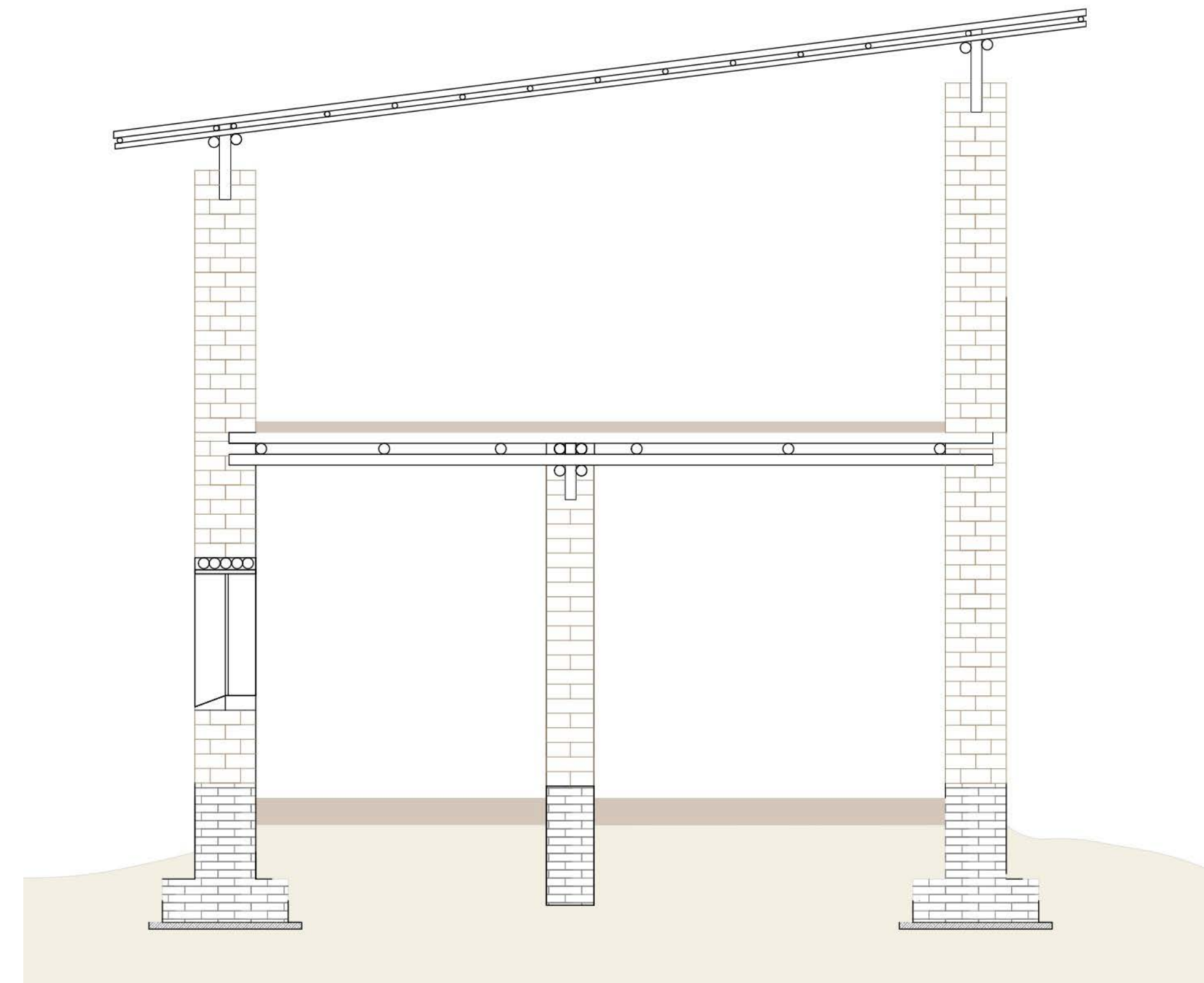


Fig 26 construction

Step by step plan: Process of developing and building new settlements_

The formation of new settlements will be conducted following a step-by-step plan. Following the concept, these steps can be repeated until a whole settlement is built. Starting with a small group of refugees building up their homes as well as the required infrastructure and having more people follow as the settlement is growing, long-term development and organic growth are being initiated.

1. PROTECTION FROM NATURAL FORCES

Firstly, the coastal area will be separated from the building area by setting up the structural protection against natural forces.

2. STREETS

After deciding on a basic layout for the plot in question, first steps in forming a basic infrastructure will have to be taken. Streets are not only crucial for transportation, as the building materials must be brought to the construction site but can also help give structure, security, and orientation to the growing settlement.

3. STORAGE

Following the enhancement of first main axis for transportation, a storage place for building materials will be laid out in direct proximity to the street, making it easily accessible to the surrounding land that will be built on next.

4. COMMON SPACE / SHELTER

A larger, commonly used shelter building will be one of the first built structures. This shared space is meant to temporarily provide accommodation and serve as a shared social space while the following housing structures are still under construction. In later phases, it might be used as a community centre. Along with these centres, a basic structure for hygiene related issues needs to be installed.

5. HOUSING

The streets as well as the common building are setting starting points for further development, naturally making the following structures grow around them organically and extending the settlement outwards. While the exact placement and individual aspects of the houses are being left to the refugees, a certain palette of typologies and an overall strategic design plan should be followed. Neighbourhoods share structures such as bathrooms and courtyards.

6. PUBLIC STRUCTURES

With people settling permanently, the need for public structures that are easily accessible within walking distance and create a space allowing interaction and occupation grows rapidly. Therefore, structures such as schools, mosques or marketplaces are crucial for a good quality of life in the settlements.

7. IN-BETWEEN-SPACES

The building process includes the formation of unbuilt spaces. As these in-between-spaces do not only reduce denseness, but also help giving space to individual expression and appropriation, their value should not be underestimated.

8. FURTHER STREETS

Despite letting the neighbourhoods grow individually and organically, accessibility and safety must be granted. Therefore, more streets, probably varying in wideness, will have to be built to make more private spaces accessible. In this stage, the streets start gaining a social function as a space for people to meet up and chat, a space full of life and movement, as they will melt into the semi-private spaces and courtyards.

9. MORE COMMON SPACES

As the settlements and numbers of people living there increase, more common spaces will need to be provided. These spaces will again be placed to form cores for new neighbourhoods to grow around them.

10. LARGER NEIGHBOURHOOD SPACES

As this process is constantly repeating, neighbourhoods grow into larger settlements to finally form the new Bhasan Char. The built structures allow the appropriation and individual as well as common use of spaces. Courtyards, gardens, and similar areas will be used, configured and operated individually by the surrounding neighbourhoods.

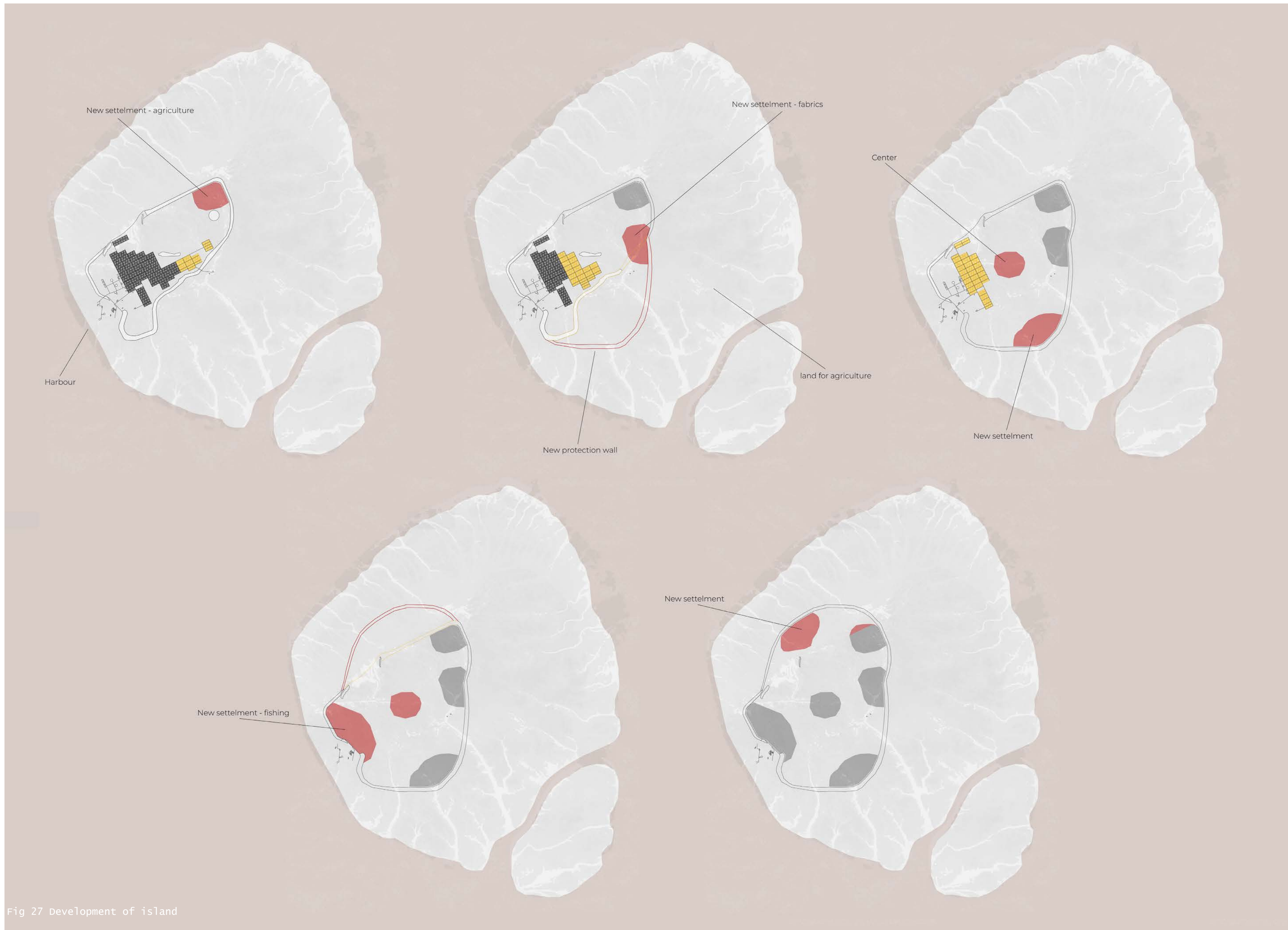


Fig 27 Development of island

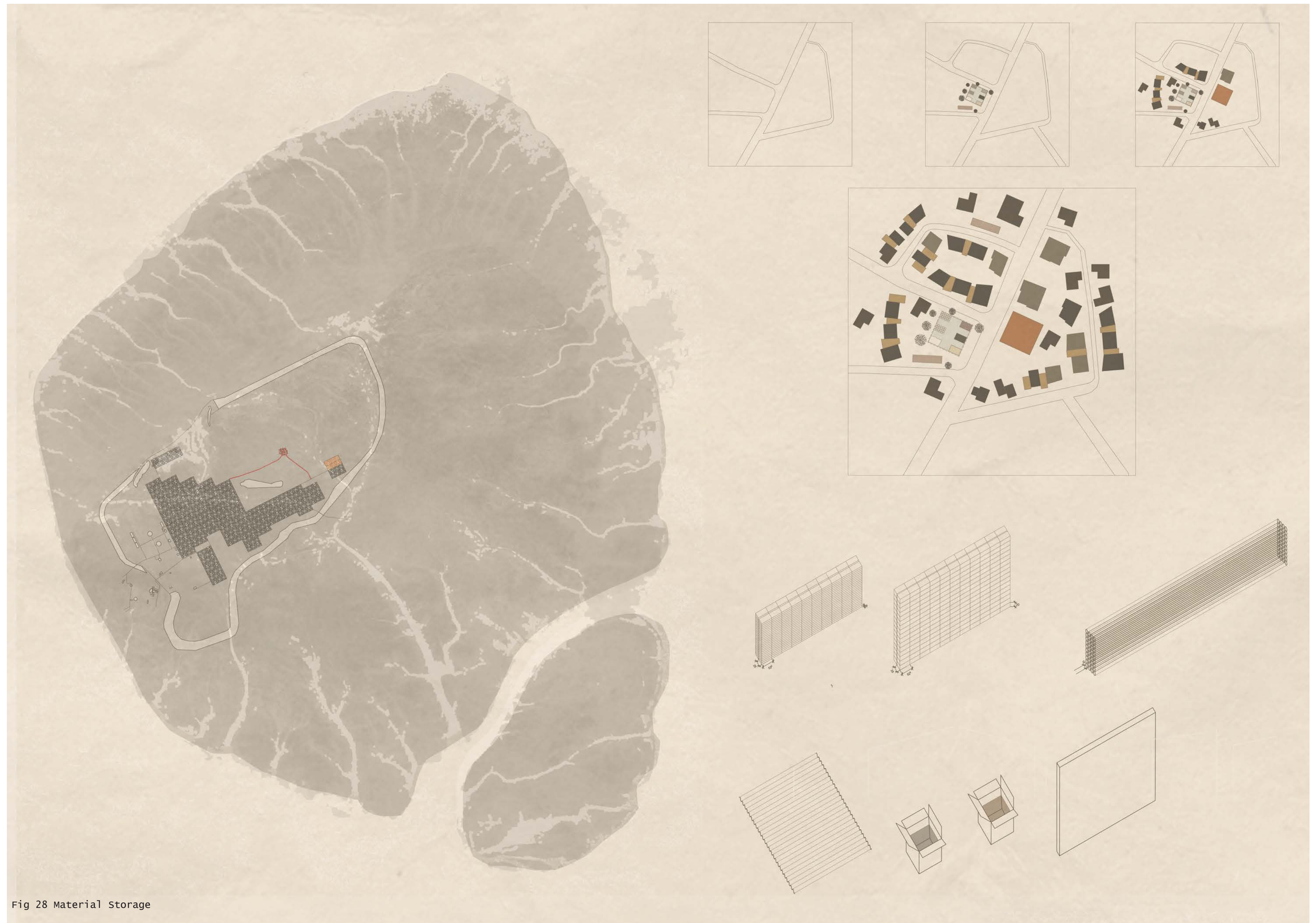


Fig 28 Material Storage

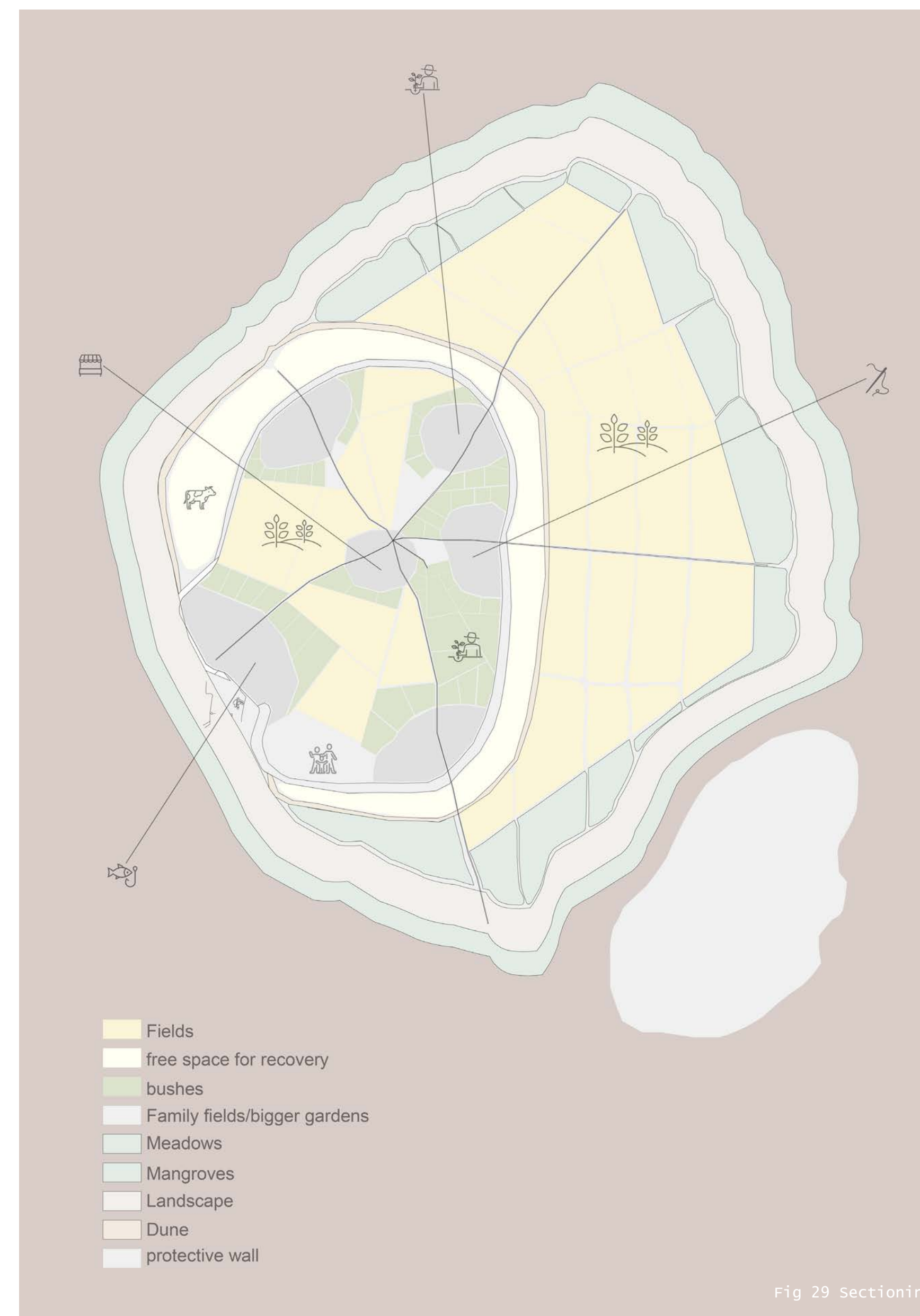
Protection from natural forces_

As Bhasan Char is prone to strong winds and cyclones, the design includes a long-term strategy to better manage water and winds coming in from the sea. The island will, at least partially, be surrounded by a multi-layer belt of protective structures, starting with a mangrove belt to stabilize the soil, covering approximately 200 m in width from the shoreline towards the island's centre.

The mangrove belt is followed by a 400 m wide overgrown, hilly landscape, designed to help slow down incoming waves and to allow water to retain in the artificially formed depressions. The final protective layer separating the settlements from the coastal area will be a dune with an estimated width of 100 m and 25 m maximum elevation, merging into the existing protective wall going around the settlement.

Economic & Resources strategy_

New Bhasan char is designed to function as a partially self-providing circular economy within a few years. By fishing and farming, the most basic needs of the population could be covered at least partially. Planning the island's new structures, various calculations have been made in order to find optimized land use strategies, leading up to the zoning of the island's surface



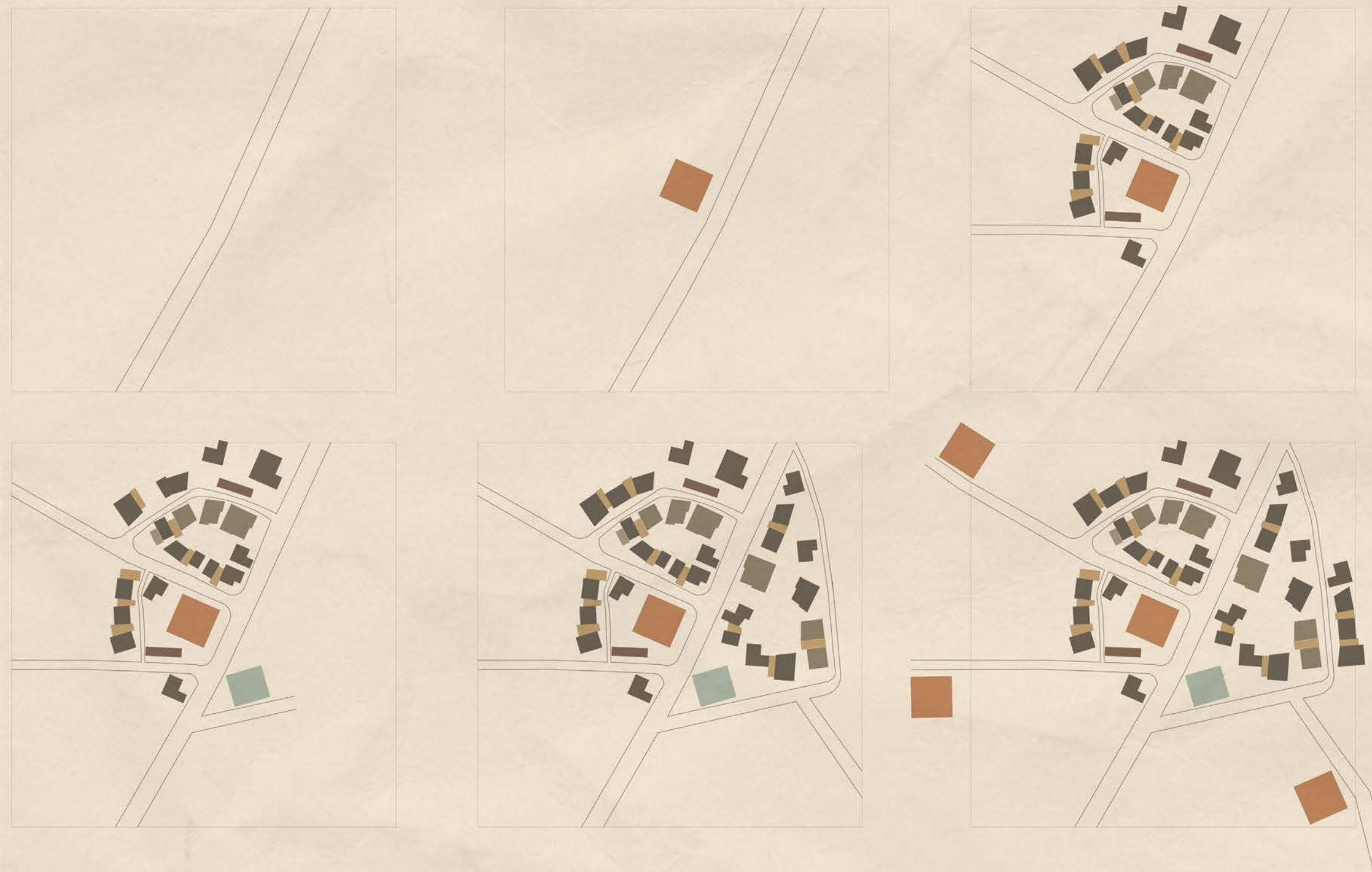


Fig 30 Settlement development

Sanitary system_

Planning a water- supply and sanitary-system for Bhasan Char, priorities were once again set on finding a simple, low-cost, flood resistant, easily accessible and repairable system with an usable output.

Taking all of these aspects into consideration, a waterless sanitation system with urine diversion appears to be the best option. The toilet itself is elevated from the ground, making the dehydration vaults placed in the storage units underneath it easily accessible. The system is waterless, faeces and urine are collected separately, reducing the risks of objectionable odour and the attraction of flies. The sanitary facilities can be built using local materials; however, the system should be well-ventilated and watertight.

The dried faeces can be stored for six months before it can be brought out on the fields to help improve the structure and water-holding-capacity of the soil. The urine storage tank must be removed and cleaned more regularly.

The stored urine might be used as an agricultural fertilizer.

In order to ensure good hygienic conditions, one hand-washing station should be placed in close proximity to every other sanitary facility.

water supply system_

When it comes to water supply, the collection of rainwater appears to be a suitable option: The method of raised-surface-collection leads to a high-quality output while being technically modest, cost efficient and locally viable. Inclining, clean rainwater can be collected on every tin roof, eventually leading it into a storage tank with an integrated multi-layer filtration system, using natural materials to further improve the water's quality.

The tank should be kept covered in order to prevent the contamination of the stored water. The water can be taken from the tank and carried into the house in sterile containers whenever necessary. Optionally, it might be sterilized by boiling.

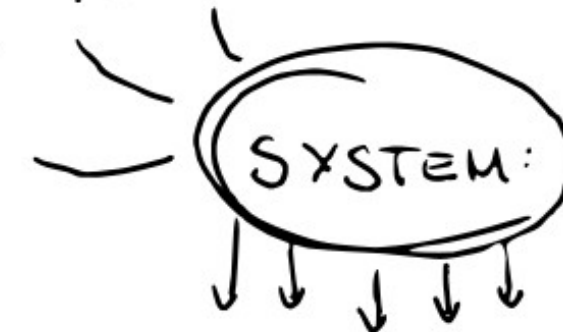
WATER & SANITATION :

- IDEAS FOR BHASAN CHAR -

TOILETS / SANITARY STRUCTURE

→ PRIORITIES :

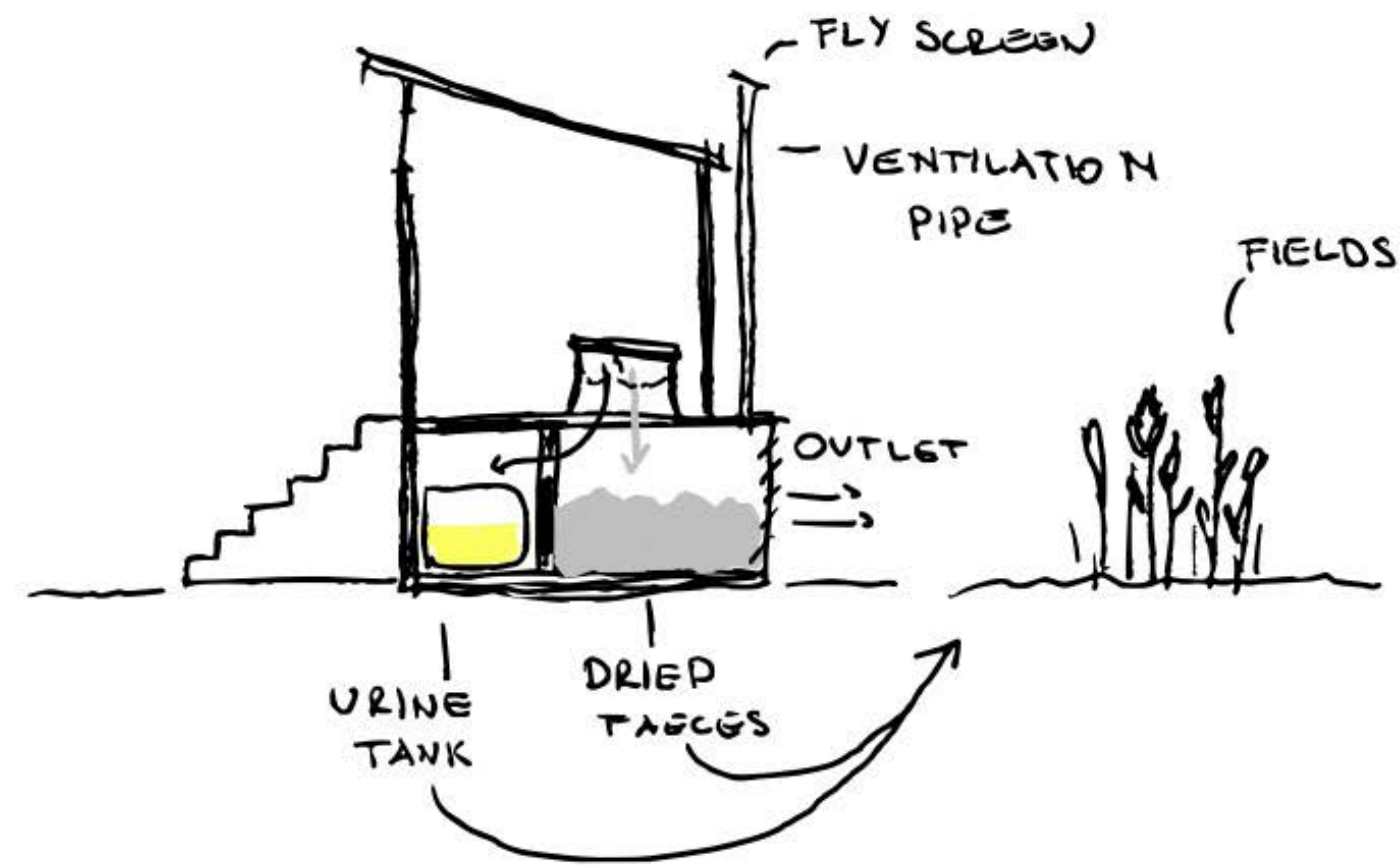
- KEEP IT SIMPLE → EASY MAINTAINANCE, LOW COSTS, NO PROFESSIONALS NEEDED, EASILY ACCESSIBLE & REPAIRABLE SYSTEM
- FLOOD-RESISTANT
- USABLE OUTPUT



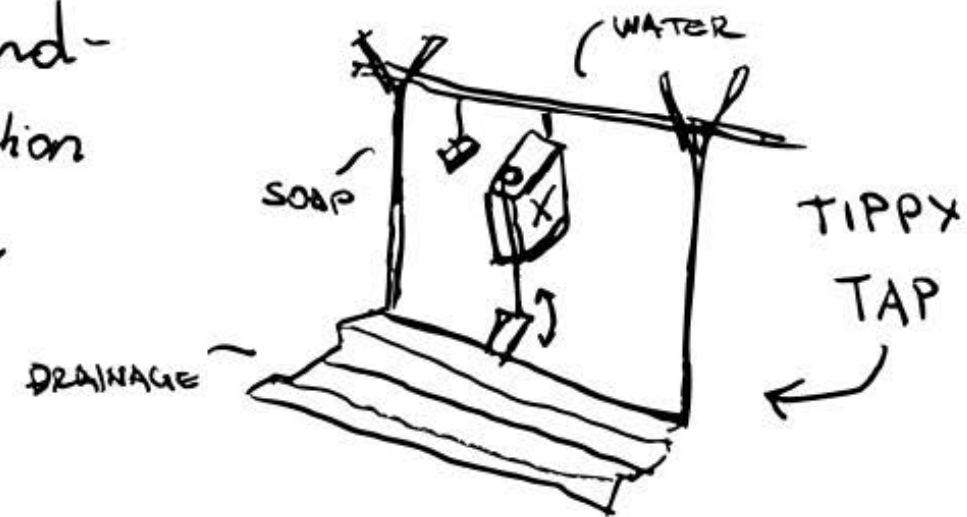
⇒ WATERLESS SYSTEM WITH URINE DIVERSION

- Elevated from the ground → Dehydration vaults to collect, store & dry faeces
- Urine storage is separate, no flies & odour
- System must be well-ventilated & water-tight
- 6 months of storage, urine tanks can be easily removed & changed more regularly
- Low cost, built with local materials
- Culture appropriate
- No water involved

- FAECES: Can be used to improve the structure & water-holding capacity of soil
- URINE: Can be used as a fertilizer for agriculture



Optional: Second storage unit → toilet above is moved when first unit is full
 ⇒ One hand-washing station next to each toilet!



WATER COLLECTION & SANITATION

PRIORITIES:

- LOW-MAINTAINANCE / LOW-TECH / LOW COST SYSTEM, HIGH-QUALITY OUTPUT, STORAGE OPTION, LOCAL LABOUR & MATERIAL

↓ ↓ ↓
 PRIMARY OPTION

⇒ RAINWATER COLLECTION

METHOD: RAISED SURFACE COLLECTION

- Raised surface → every roof, water is less polluted than on ground level
- Roof → Gutter → pipe → water tank
- Tank with internal filter of gravel / pieces of ceramics → better water quality
- tank should be covered to keep water clean (dirt, contamination through animals, mosquito infestation etc.) & surrounded by stone covering to keep water cool

- water can be taken from tank and carried into the house via bottles / sterile containers → sterilize containers regularly by cooking
- water can be made sterile by boiling
- one tank per household



WHAT IF THERE IS NO RAIN / TOO LITTLE RAINWATER ?

- for difficult times : alternative
- one / two filtration spots for saltwater on less cyclone prone side of island
- rather brackwater than seawater → less salty ; station could be more central
- filtration through Nanofiltration / Reverse Osmosis
- not a preferred primary option (high cost, chemistry, reliable power, high power use)
- water could be stored in a big water tank
- people could come to the tank to get their water themselves / workers could go around the island distributing water containers from a vendor cart → source of income

Housing_

The design aims to provide people with simple, but spatially qualitative housing systems. Therefore, there are some main typologies scheduled according to needs and preferences of people, which can and are meant to be adapted individually. The typologies range from larger dwellings for one to four families of multiple generations with a capacity of twenty people to dwellings consisting of multiple small individual units, accommodating one to three people each.

As we encourage refugees to build their homes themselves, the constructions are designed to be reliable, rather simple, material efficient, durable, and easy to repair. The outer walls will consist of two layers of Adobe bricks with the approximate measurements of 23 cm in width by 11 cm in height by 36,5 cm in length. The roof construction will consist of a three-layer bamboo substructure and a tin-covering, as tin is the most convenient for rainwater collection. The inner walls as well as the ceiling will be made from bamboo, the floors will be made out of rammed earth.

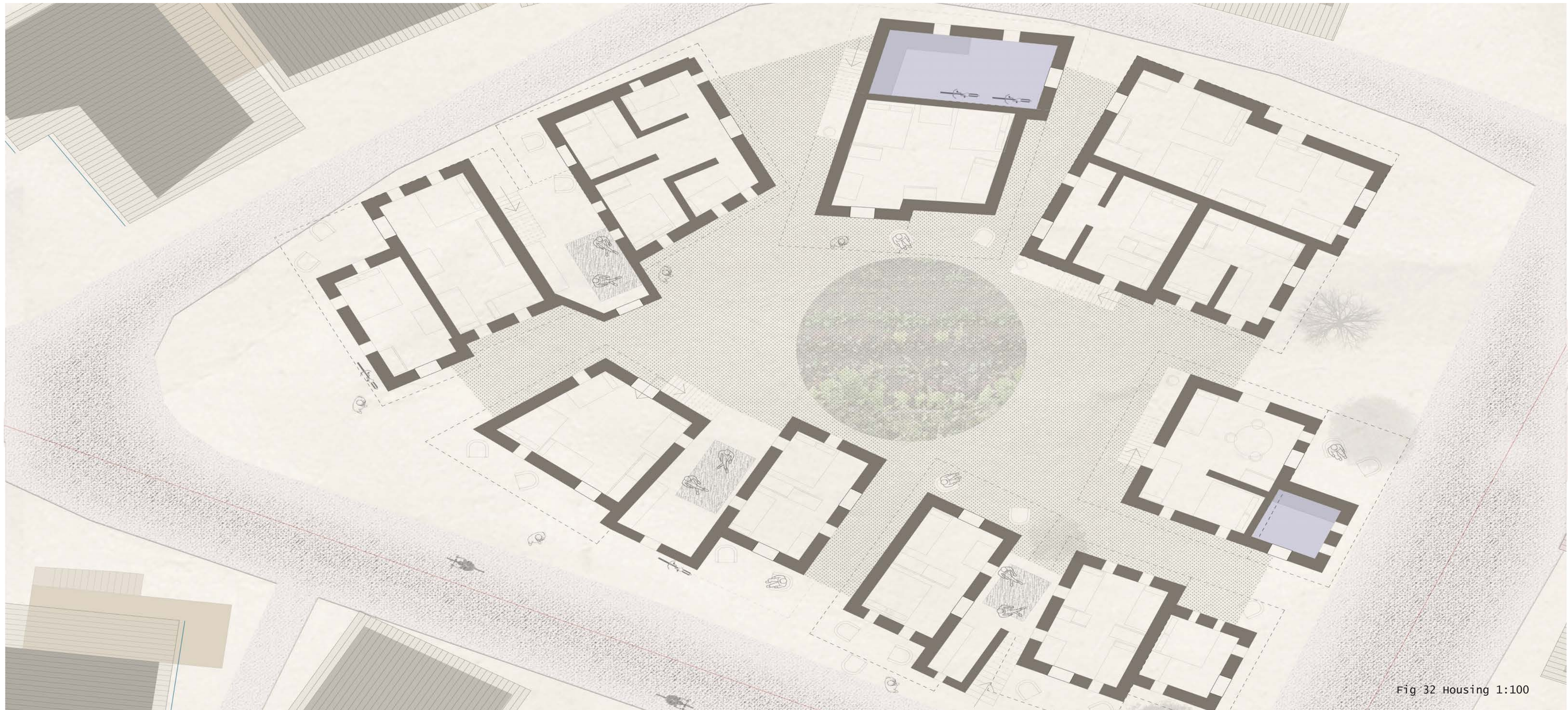


Fig 32 Housing 1:100

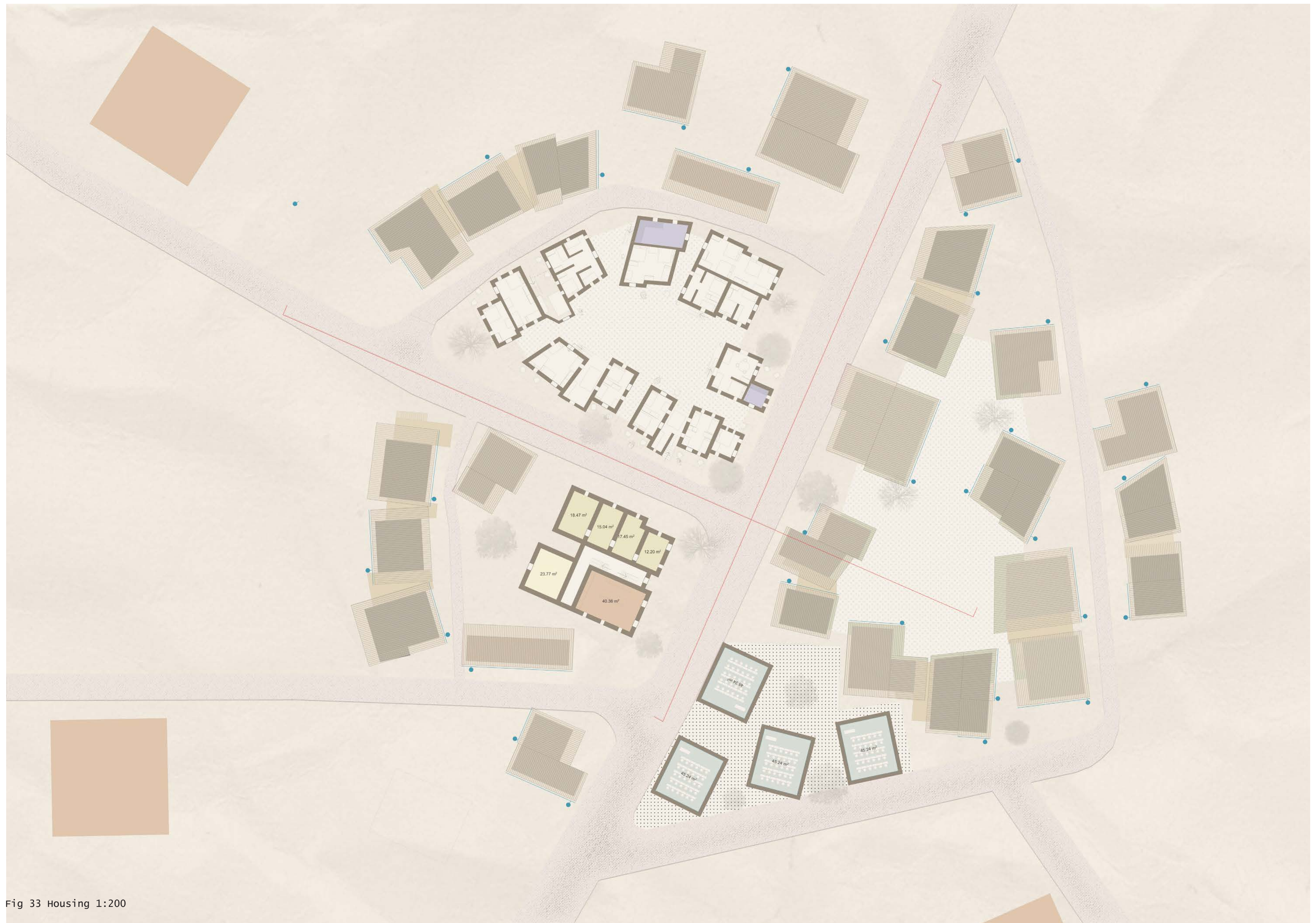


Fig 33 Housing 1:200



Fig 34 Masterplan Settlement

Social & Spatial strategy_

As described in the step-by-step plan, the design process is widely defined by organic growth. However, by implementing an overall structural development goal, a good quality can be granted. Starting with building one neighbourhood around a central functional building and slowly adding courtyards, gardens, more houses and public buildings, neighbourhoods start growing into settlements. After reaching a certain capacity, further growth needs to be decentralized and restarted around a new core structure in order to avoid high density and potential safety and accessibility issues.

With the process of houses growing into neighbourhoods with shared spaces and neighbourhoods sharing a public infrastructure, fully developed settlements evolve, finally melting into each other and forming the new Bhasan Char.

As each of the settlements is vastly influenced its very own conditions and its population, letting people specialize and engage in these individual qualities can help create stronger identities and a stronger sense of community. For example, the settlement close to the port might specialize in fishing, while others might focus on farming or providing more infrastructure for production and trade. This is however, to be understood in the sense of optional specialisation, not planned centralisation, as we wish to keep each settlement diverse and vibrant. The concept of keeping living and working spatially separate, meaning that people might have to leave their neighbourhood in order to get to their workplace is actually crucial for interaction and integration, especially regarding women.

Community Centres_

As mentioned before, the former, rather basic shelter buildings will in a later stage of development be transformed into community centres. While the specific use of these centres will be left to the inhabitants of each settlement, a few propositions shall be made. As the centres will be used as shelter buildings for the surrounding neighbourhoods during cyclones, their functionality should be granted at any time. The community centres could provide space for smaller health care centres, in which trained personnel could take care of minor health issues and provide basic treatment and medication. Other functions catering the community, such as tea stalls, bigger corner stores, workshops requiring more space such as a weaving mill.

A house is not a home_

An Essay on the importance of participation for building projects in development cooperation.

When planning and building in development cooperation, we often tend to set our focus on efficiency, functionality, and basic structures. Even though these are very important parameters, we must not forget that, after all, we are planning for people, individuals with needs, ideas and wishes. Therefore, even with setting a clear priority to develop and functional overall plan that helps with managing financial as well as physical resources in order to grant safety and long-term usability, we should not overlook the potential of participation of the future users.

As each and every settlement is vastly influenced its very own conditions and its population, letting people specialize and engage in these individual qualities further can help create stronger identities and a stronger sense of community.

Developing structural- and housing typologies - which can and are meant to be adapted individually - according to the needs and preferences of people is what distinguishes a home from a house.

Deliberately and actively seeking conversation with people and letting them participate in the design process by taking in their ideas, providing for their needs, and helping fulfill small wishes does not only show actual appreciation and help raise cultural awareness amongst us architects, but also sets the basis for a good quality of life.

Another key factor to a successful project might be helping people help themselves by having them actively participate in the building process and teaching them construction methods that can later be applied independently for repair work or further building projects.

Enabling and allowing people to build their own homes is more than just a temporary occupation: Common participation strengthens the people's confidence as well as the bond with one another and implements trust in the community, the projects, and the executing organisation.

Participation makes the vague hope for a better future perceptible.

A neighbourhood of 250 people

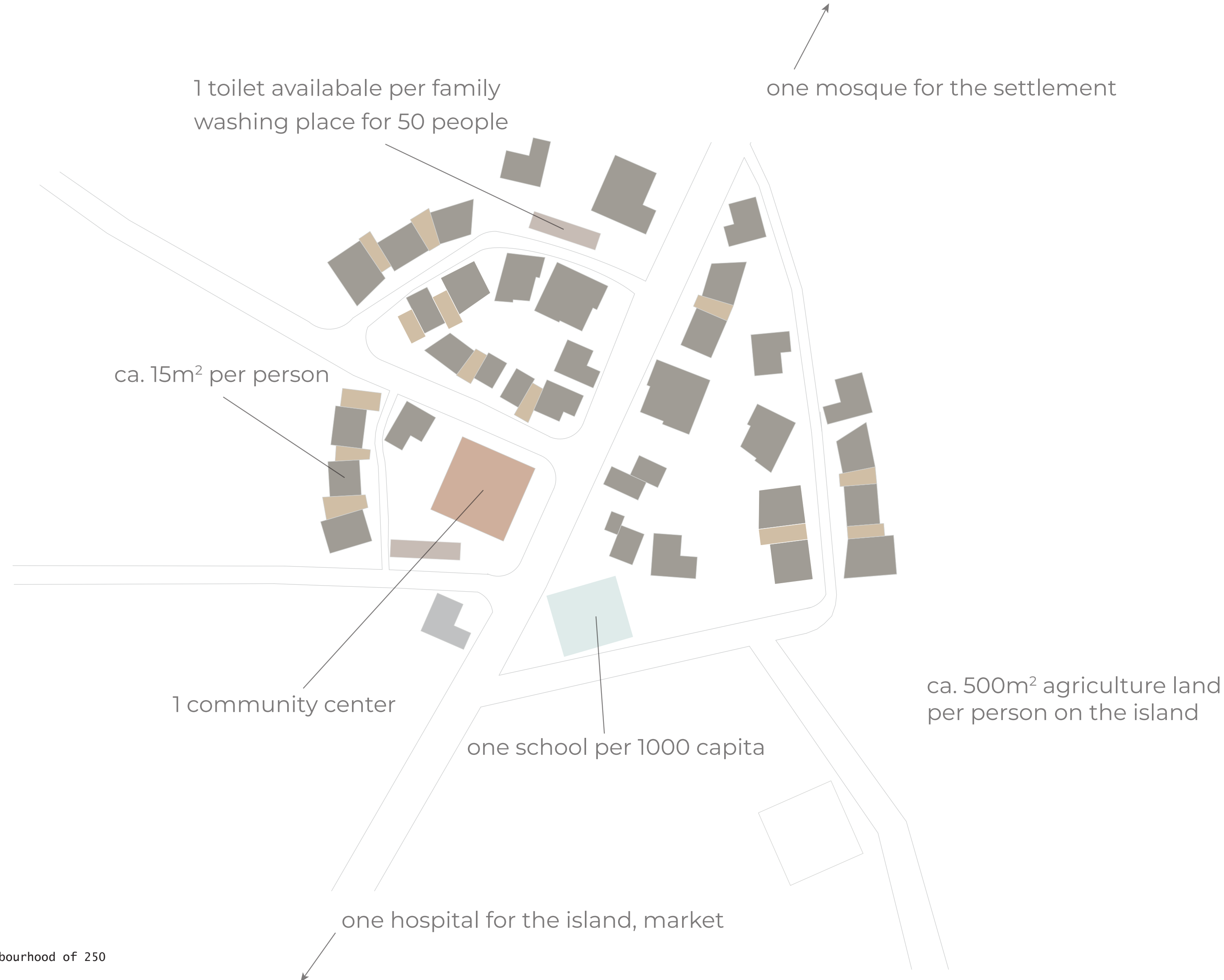


Fig 35 Infrastructure for a neighbourhood of 250



Fig 36 Settlement 1:500 - clay model



Fig 37 Life in Bhasan Char 1 - clay model



Fig 38 Life in Bhasan Char 2



Fig 39 Collage 1



Fig 40 Collage 2

Reflection_

„Can the use of earth and bamboo as primary building materials influence or even contribute to the improvement of the quality of life?“

Reflecting back on this semester made me come to the realisation that all the ingredients needed for the designs were all ready there, provided by personal stories, culture, religion, history of the people of Bangladesh. The only things needed to bring them together to form a design were thoughtfulness, sensitivity and recognition, leading to a process of trial and error. With the willingness to embrace making changes and the steadfastness follow through with the principles i had set for myself, the project grew to become far from perfect, but as a reflection of authenticity.

Throughout the process I came to recognize the importance of participation as well as the atmospheric and therefore social potential of the building materials used. Earth and bamboo are not only ecologically and economically valuable and convenient resources, they also create buildings of strong character, imparting them healthy, comforting and calming atmospheres.

Earth is not a material of the poor, it is a material of empowerment, allowing people with little resources to build up a better future for themselves, eventually improving their quality of life significantly.

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