

# **BETHLEHEM**

from *exploitation* to *ecosystemservice*

‘revitalizing a former sugercane plantation into a public park that cultivates building materials to stimulate a transition towards a sustainable domestic (self)building culture’

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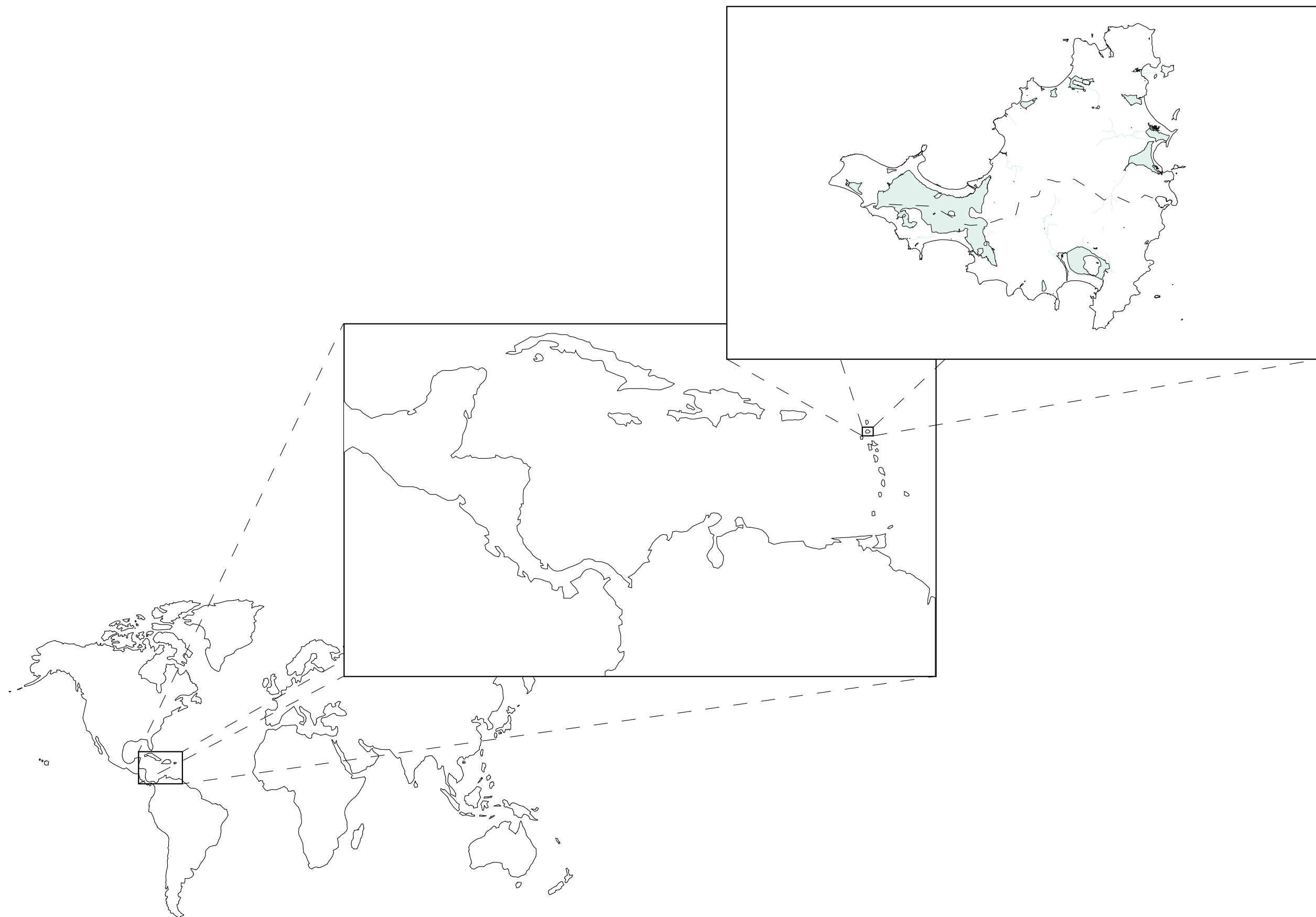
BETHLEHEMS BUILDING TECHNOLOGY

IMPACT / RELEVANCE



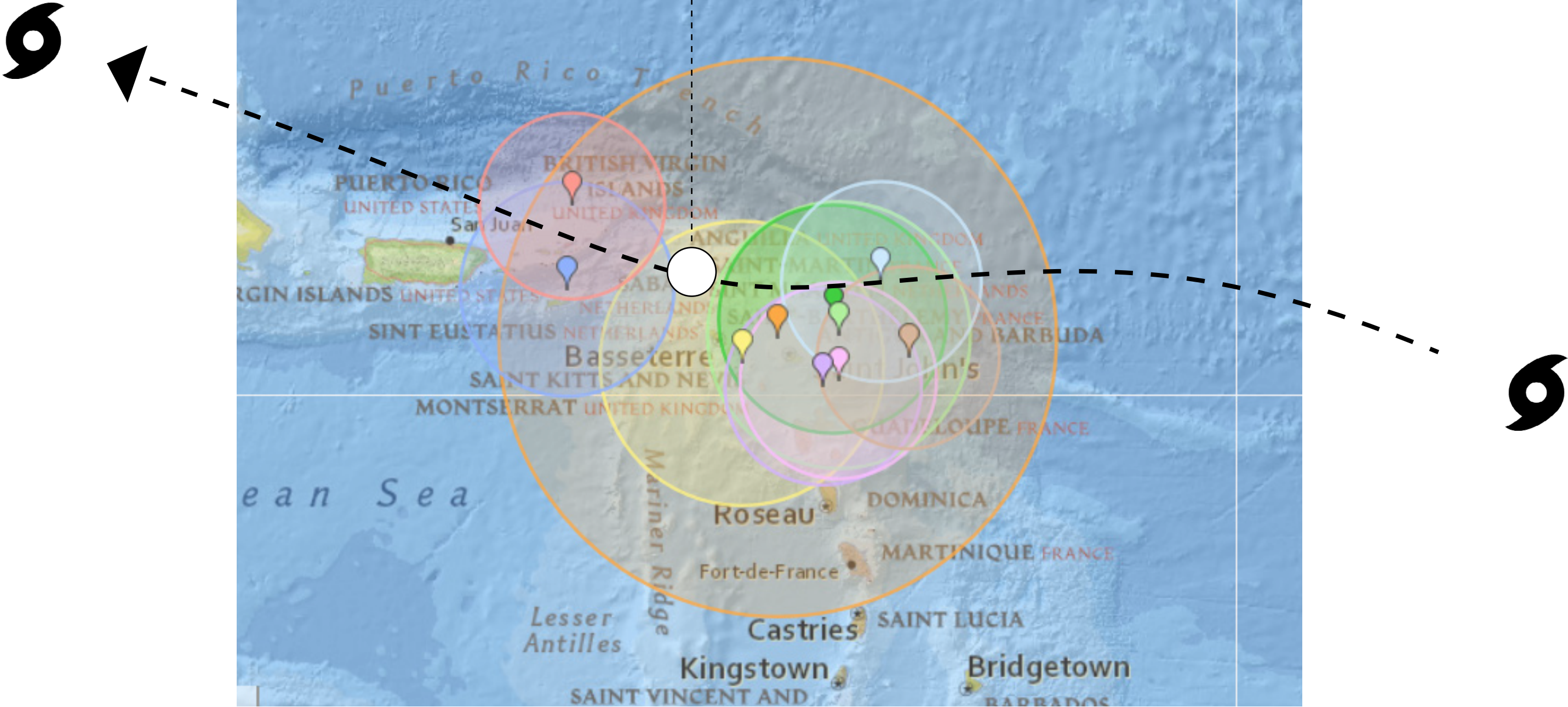
## CHAPTER I - INTRODUCTION







Sint Maarten, natural disasters; hurricanes and earthquakes





## **Superorkaan Irma richt enorme ravage aan op Sint Maarten**

Correspondent Kees Broere voelt in Philipsburg, de hoofdstad van Sint Maarten, hoe orkaan Irma het eiland komt opvreten. Code Rood. De superstorm richt woensdag enorme schade aan op de Caribische eilanden.

## **Op Sint Maarten heeft nog lang niet iedereen een veilig dak boven het hoofd**

Sint Maarten is nog uiterst kwetsbaar. Ruim een half jaar na de verwoestende orkaan Irma hebben lang niet alle inwoners een veilig dak boven het hoofd. En dat terwijl het nieuwe Caribische orkaanseizoen over een paar weken weer begint, voor zes maanden lang. Ook politiek is het eiland nog steeds niet op orde.

## **Jaar na orkaan Irma is op Sint Maarten 'nog geen dak hersteld' met Nederlands geld voor wederopbouw**

Ruim een jaar na de verwoestende orkaan Irma is op Sint Maarten met het Nederlandse geld voor de wederopbouw 'nog geen dak op het eiland hersteld'. Dat schrijft de Nederlandse Algemene Rekenkamer in een donderdag verschenen onderzoek naar de besteding van de in totaal 550 miljoen euro die voor het autonome Caribische land beschikbaar is.

## **27 maanden na orkaan Irma wil Sint Maarten weten: wanneer begint het herstel?**

Twee jaar en drie maanden na de orkaan Irma is nog maar een fractie van de beschadigde huizen en gebouwen op Sint Maarten opgeknapt. Waarom verloopt de wederopbouw zo traag?



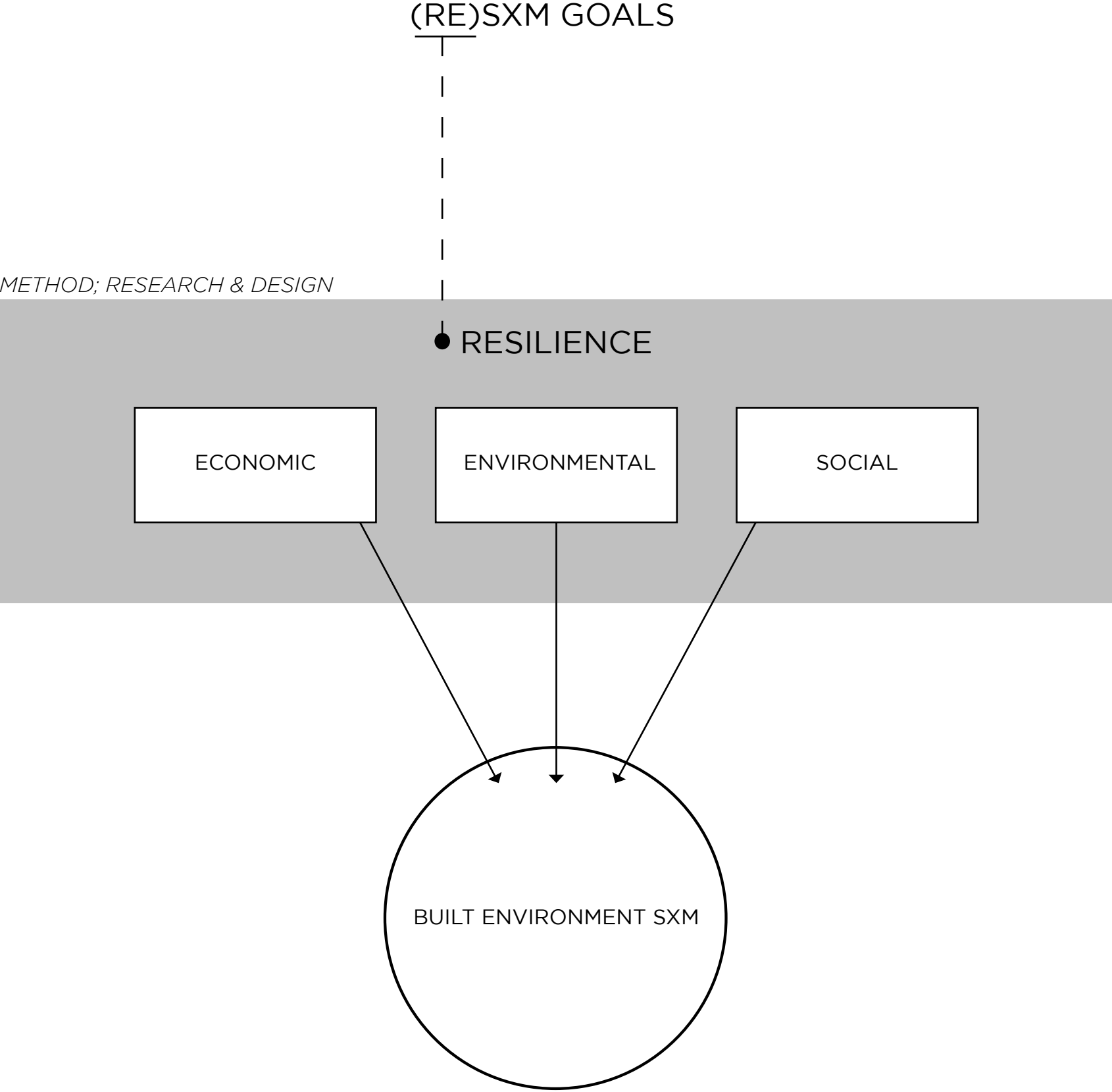


source; volkskrant



(RE)SXM







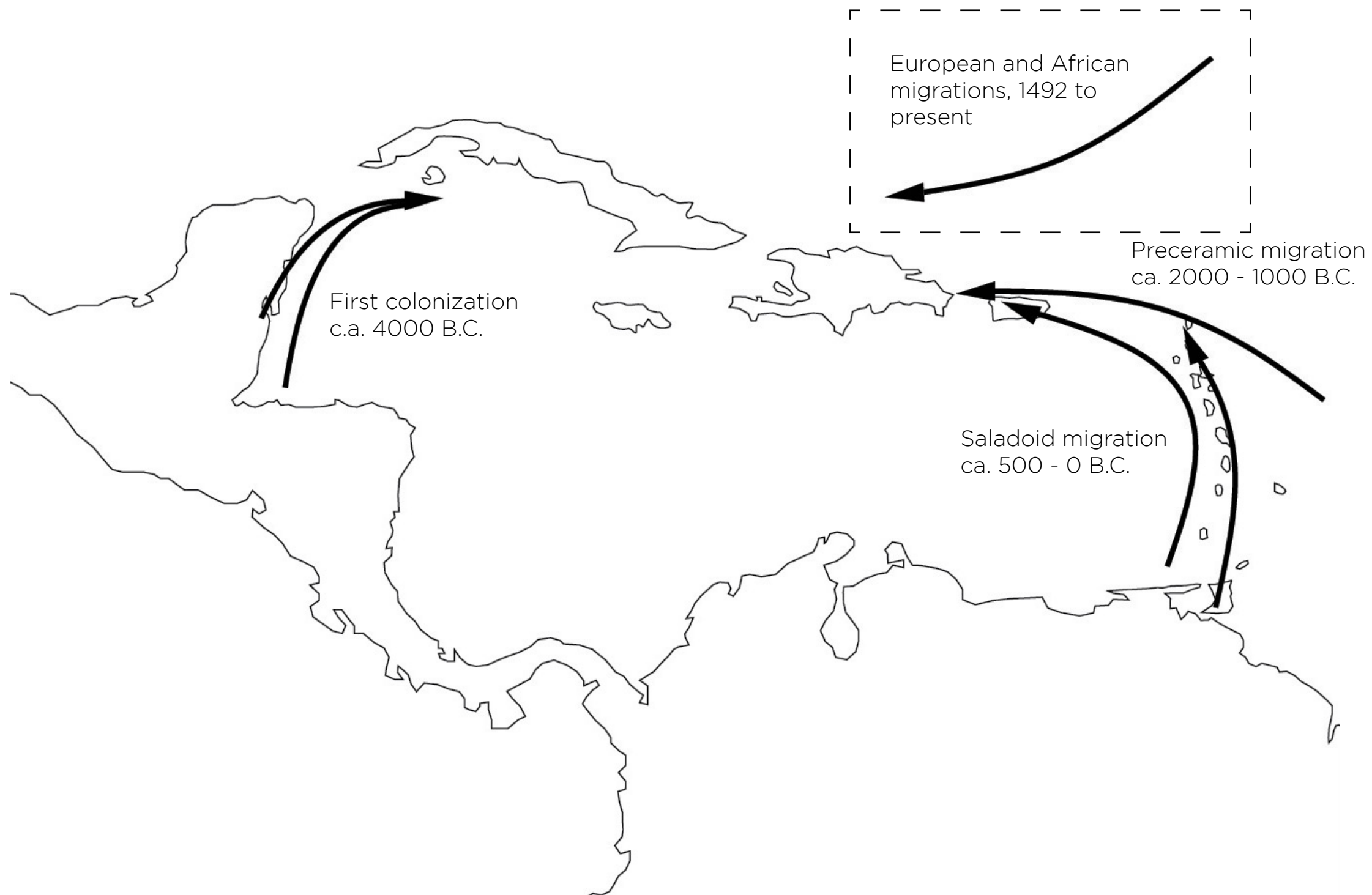
# (RE) SXM

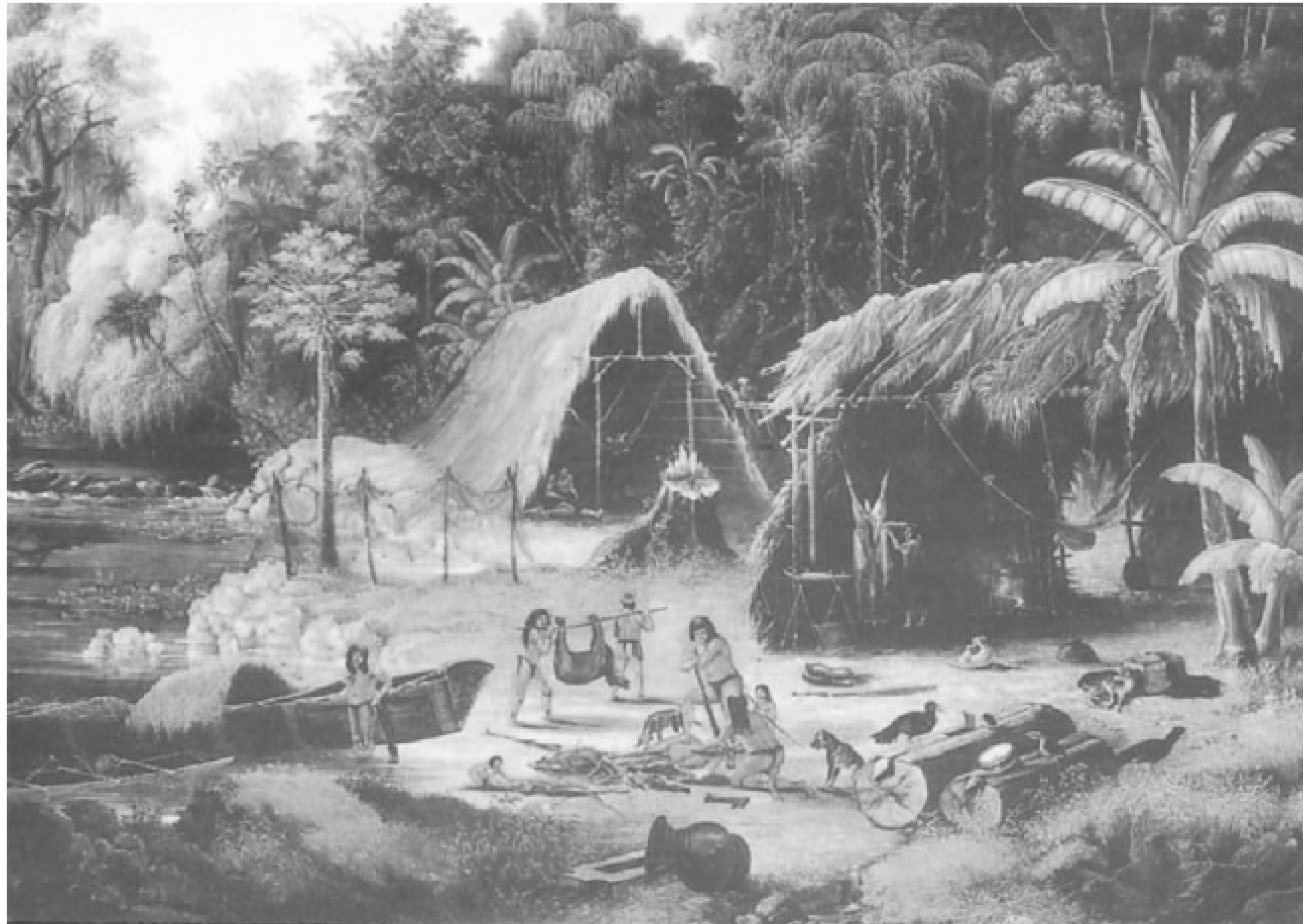
The Circular(re)Construction Initiative | Researchbook  
Collective research towards opportunities for the  
build environment of Sint Maarten

Architectural Engineer  
2019 | 2020

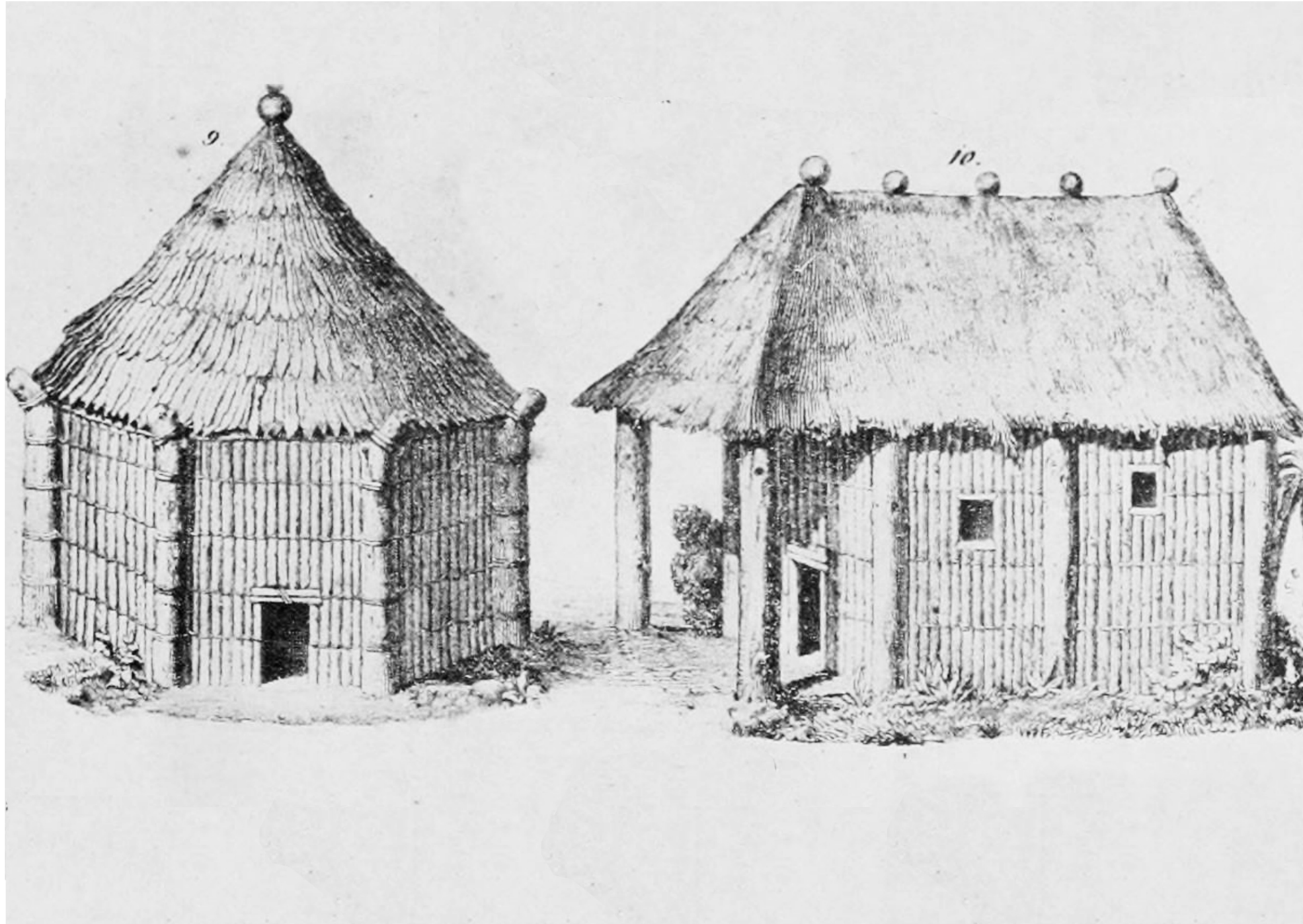


## CHAPTER II - TIMELINE / PROBLEM STATEMENT





Taino Indians



Taino Architecture





1493 - Columbus discovers Caribbean





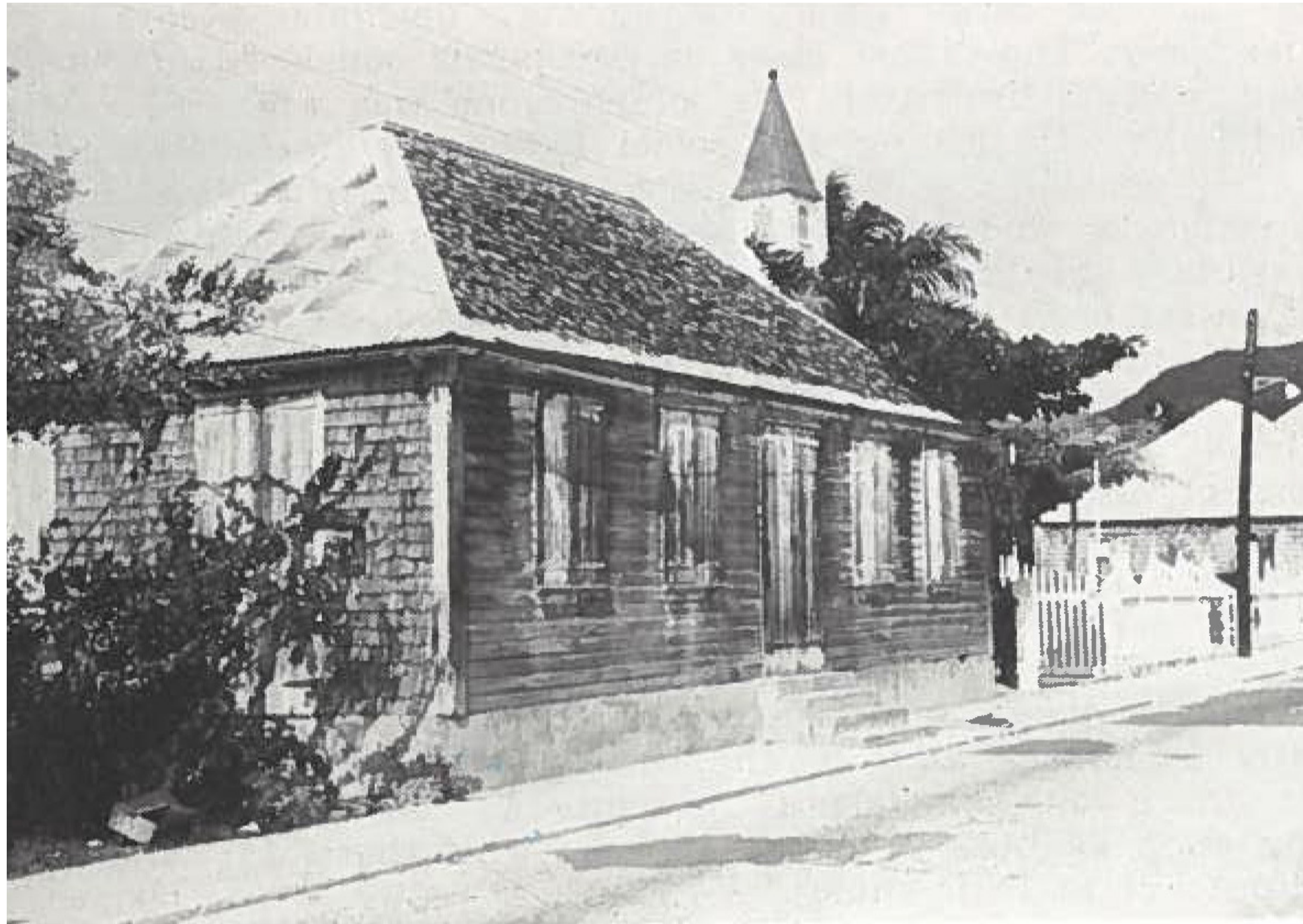
1631 - Dutch colonialization





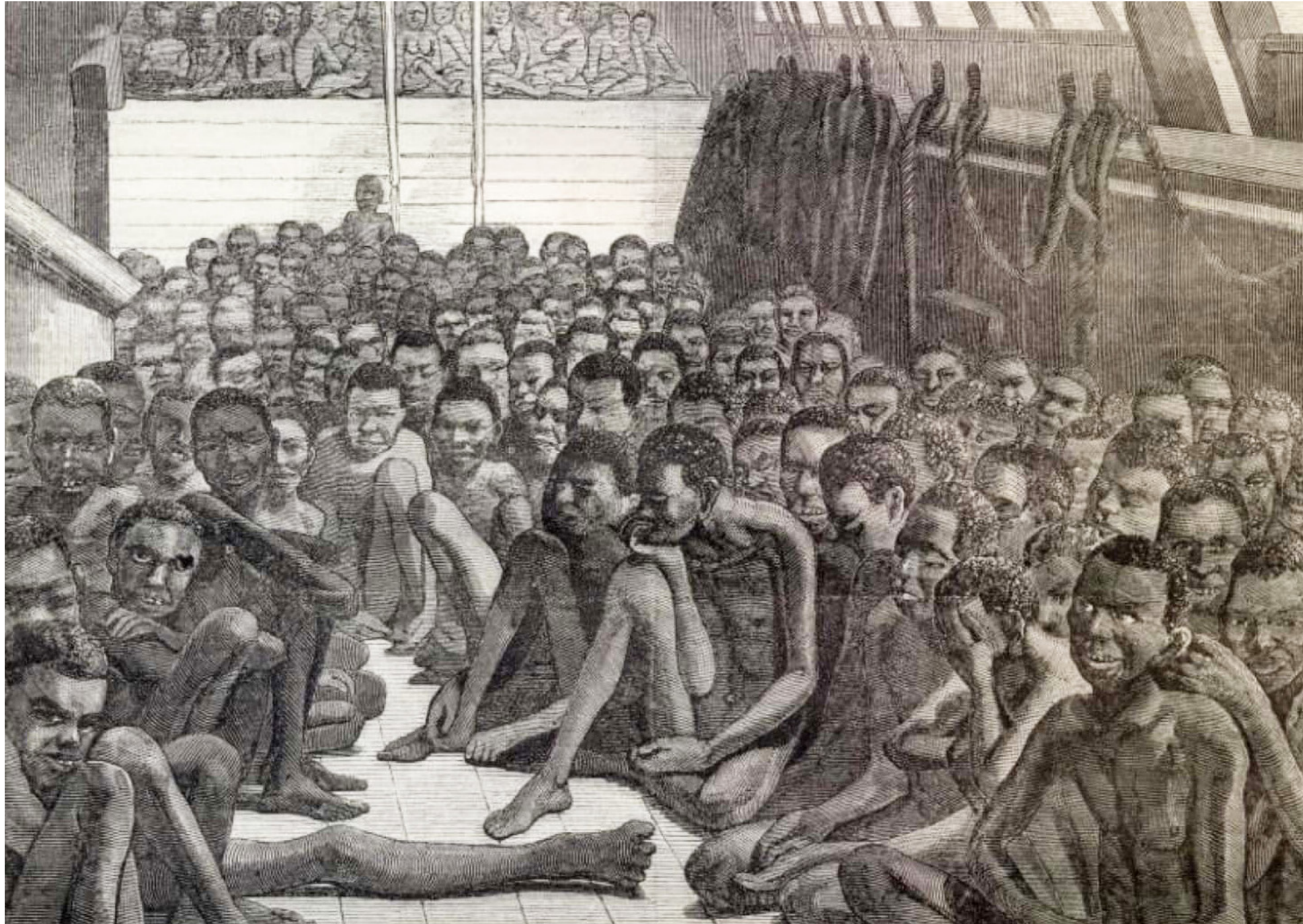
1631 - Initial Dutch architecture; brick houses





Brick is replaced by limestone and wood imported from North America





Plantocracy; the Dutch bring slaves to do the work



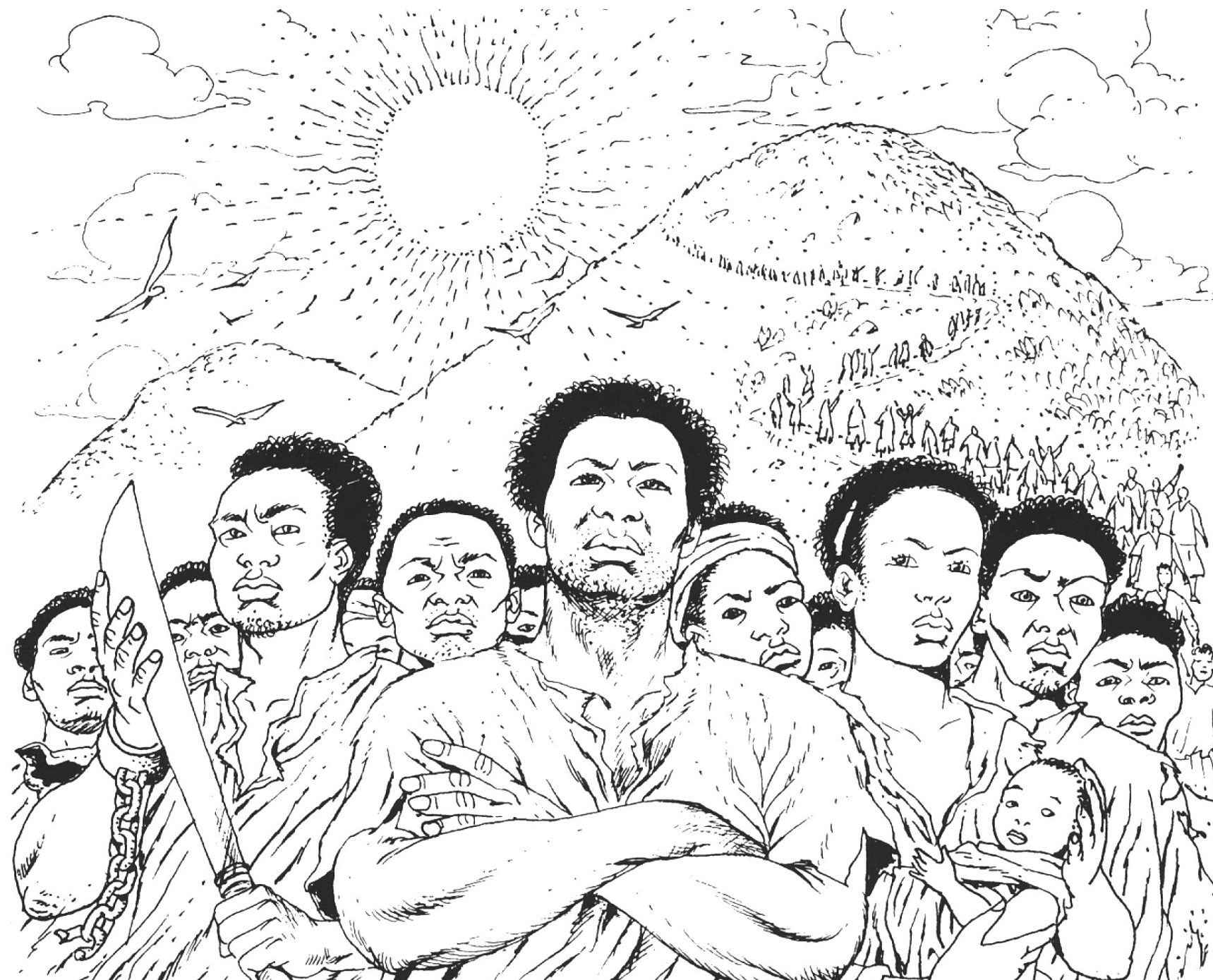


The slaves are forced to work on the sugarcane plantations





And harvest the salt in the salt pond



1848 - The slaves rebel



The island is economically declining; wooden shingles are replaced by corrugated iron





The island starts to depend on tourism for income. Wood is replaced by concrete.





The tourism architecture currently, concrete





Domestic architecture now; concrete blocks





Domestic architecture now; concrete blocks





Domestic architecture now; shacks

until 1631

1631 ----- 1848

1848 ----- 1950

1950 ----- 2020

taino

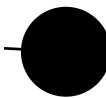
plantocracy

economic decline

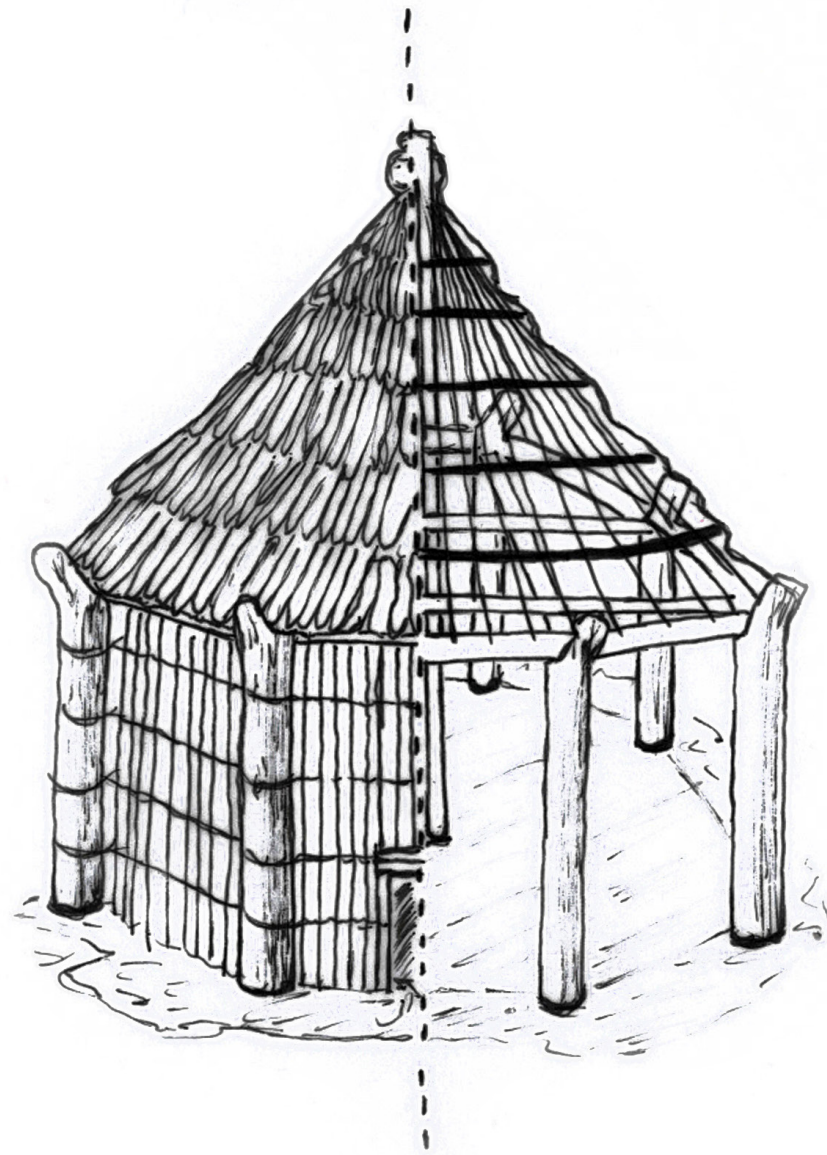
tourism



comparison



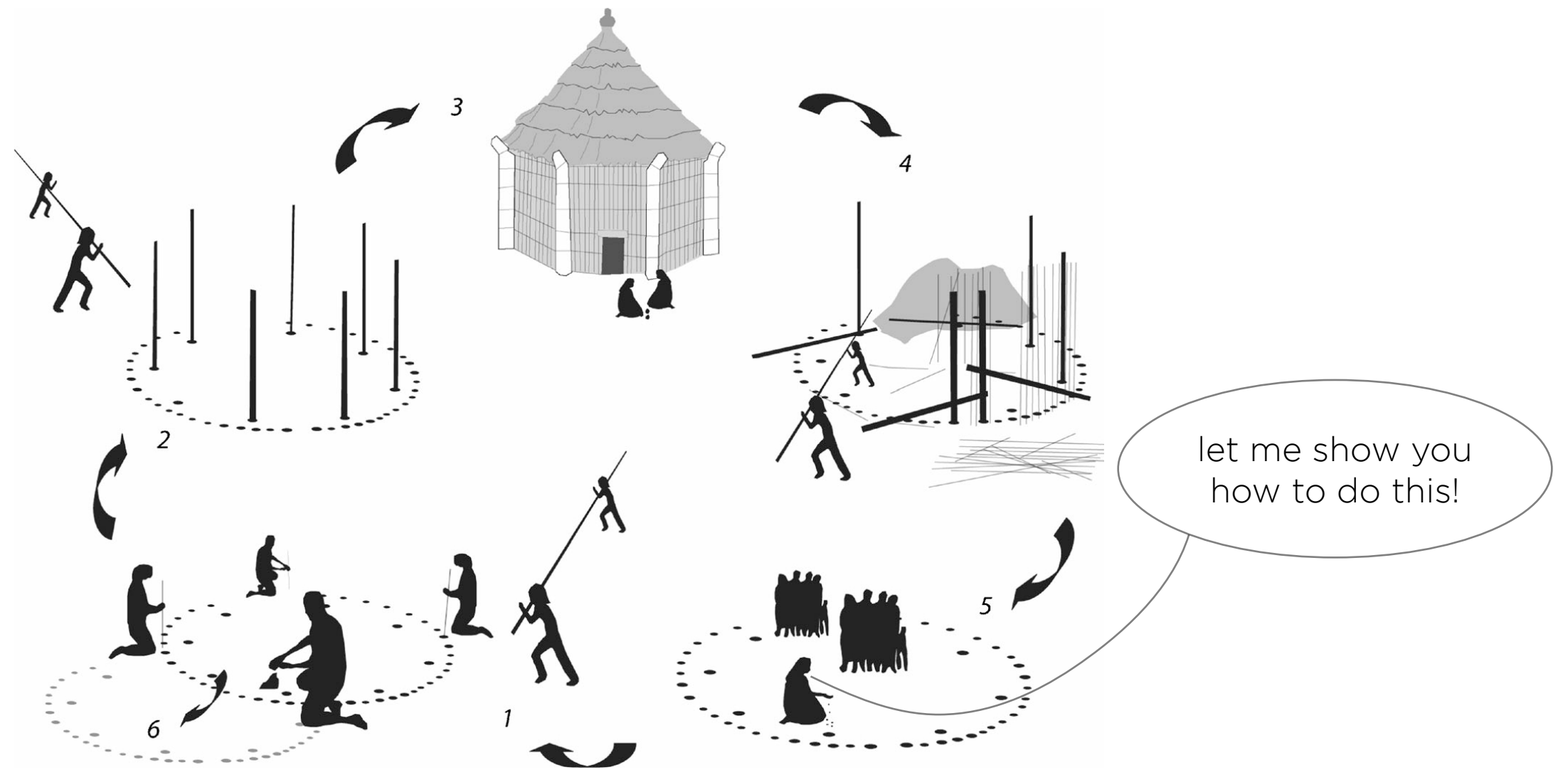




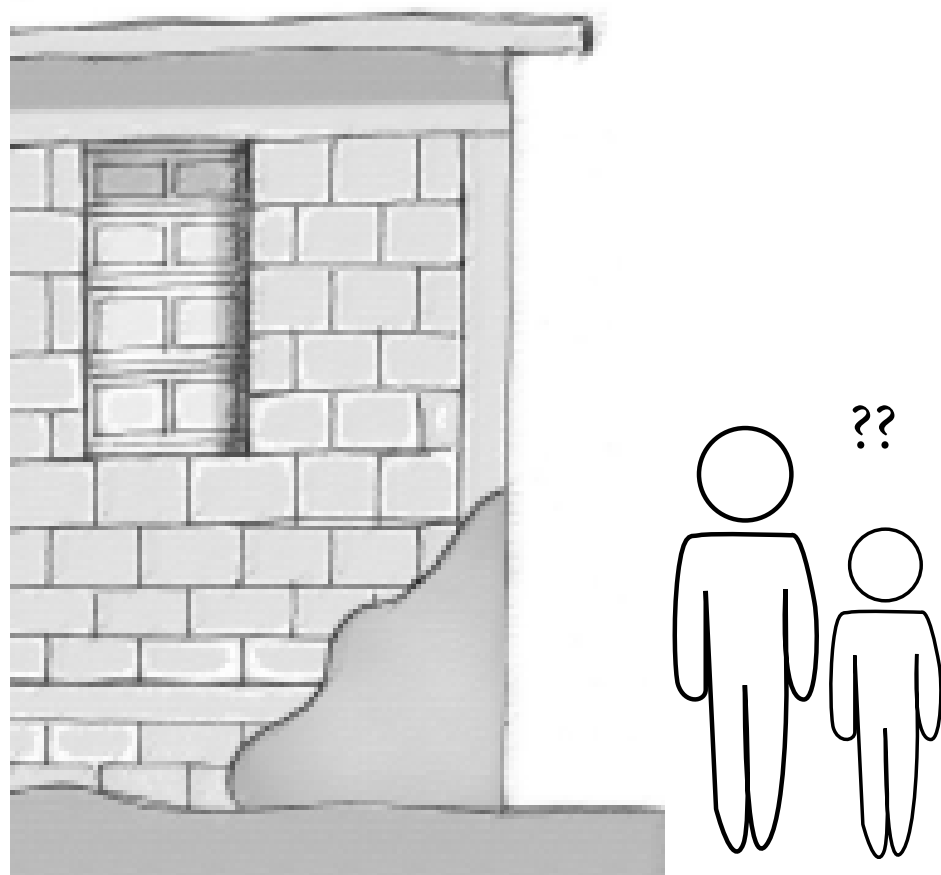
LOCAL MATERIALS

ADAPTED TO THE HURRICANES AND  
EARTHQUAKES

BUILDING AS COMMUNAL PROCESS THAT  
TEACHES BUILDING KNOWLEDGE AND  
SKILLS + FOSTERS SOCIAL BONDS







ALL MATERIALS ARE IMPORTED

SOMEWHAT ADAPTED TO HURRICANES,  
NOT TO EARTHQUAKES, CAN GET 40  
DEGREES INSIDE

A LOT OF CONFUSION AROUND HOW TO  
(SELF)BUILD





source; volkskrant



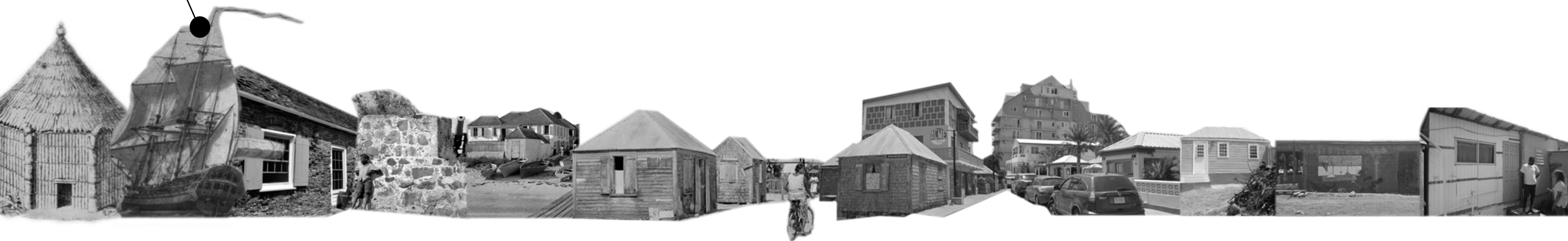
## ● MAIN PROBLEM

A general lack of adequate building knowledge and skills due to the early introduction of foreign building methods and materials

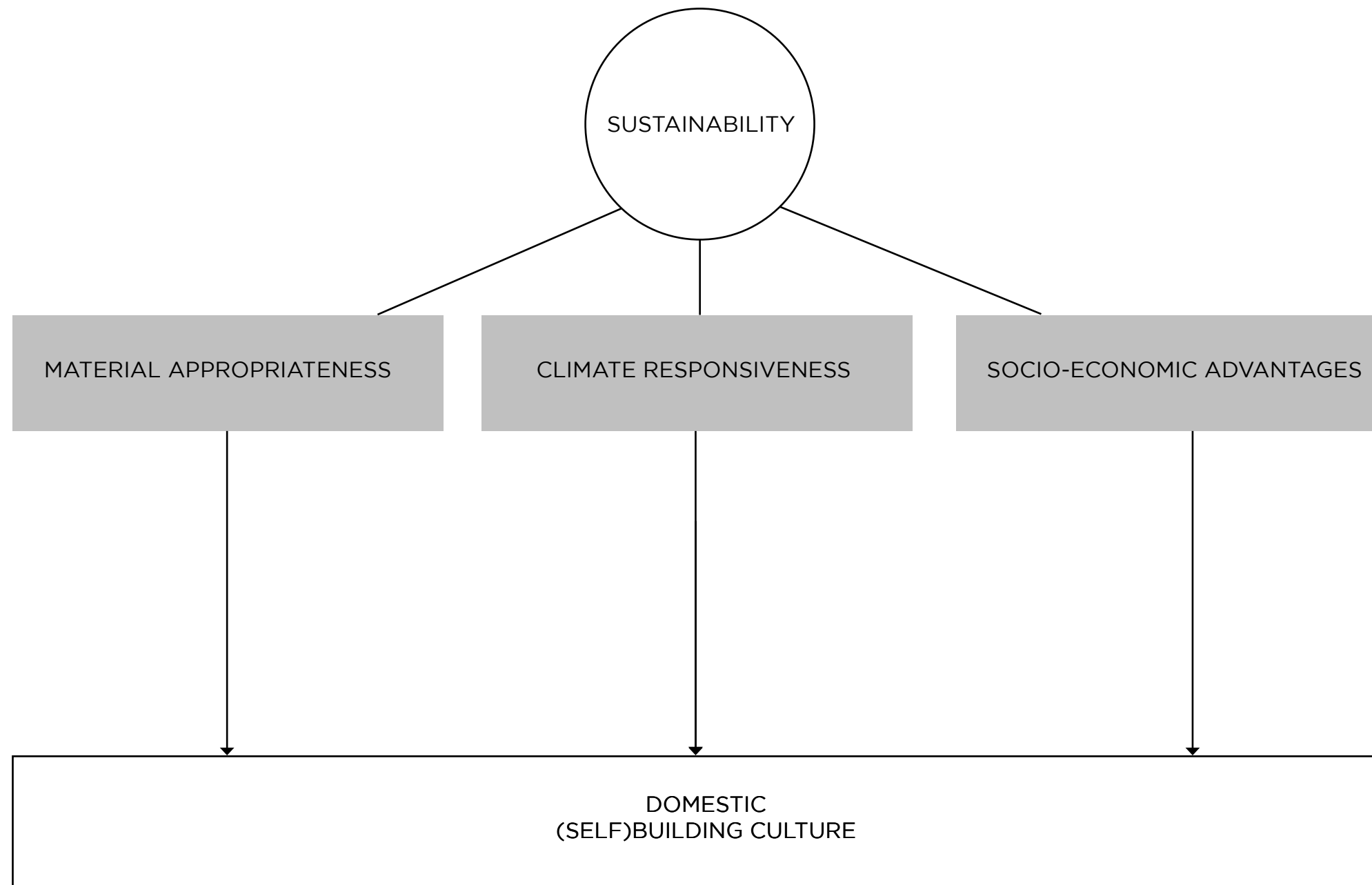
## RESULTING IN 3 THINGS

a building culture that shows;

1. A lack of climate responsiveness - specifically in how to deal with reoccurring hurricanes and earthquakes
2. A lack of material appropriateness - all materials used are imported and mostly non-renewable
3. A lack in strategies for developing, transmitting and disseminating local (and appropriate) building knowledge and skills



How can an urban-architectural intervention stimulate a transition towards a more sustainable domestic (self)building culture on a neighborhood scale in Sint Maarten?



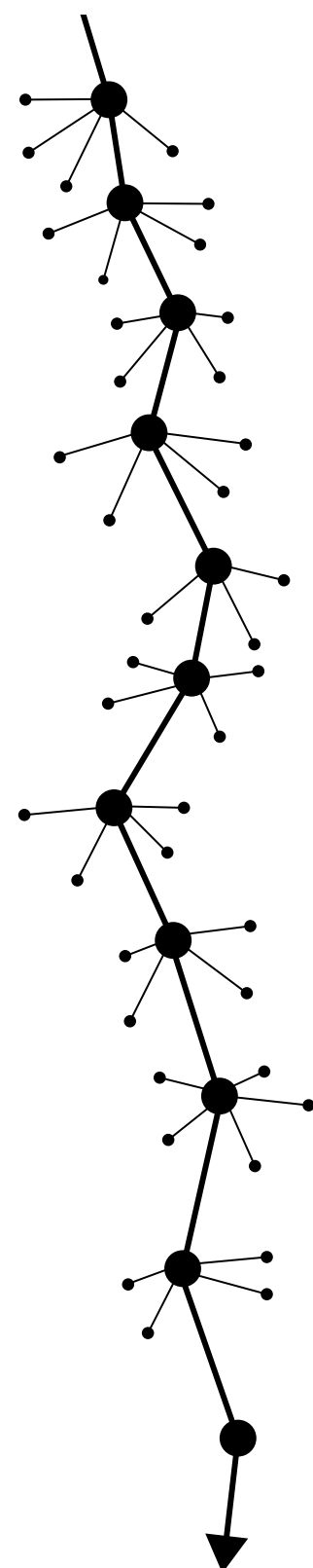
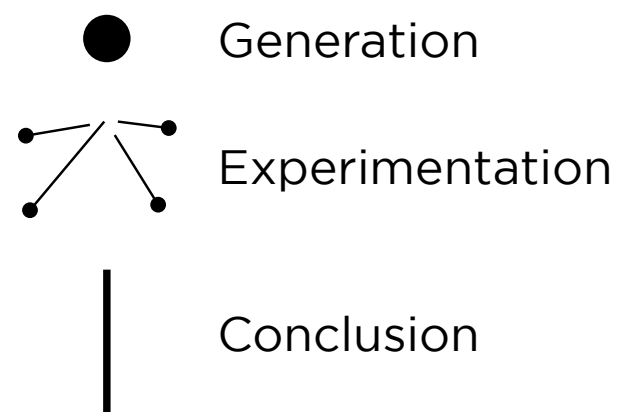


## CHAPTER III - THEMATIC RESEARCH

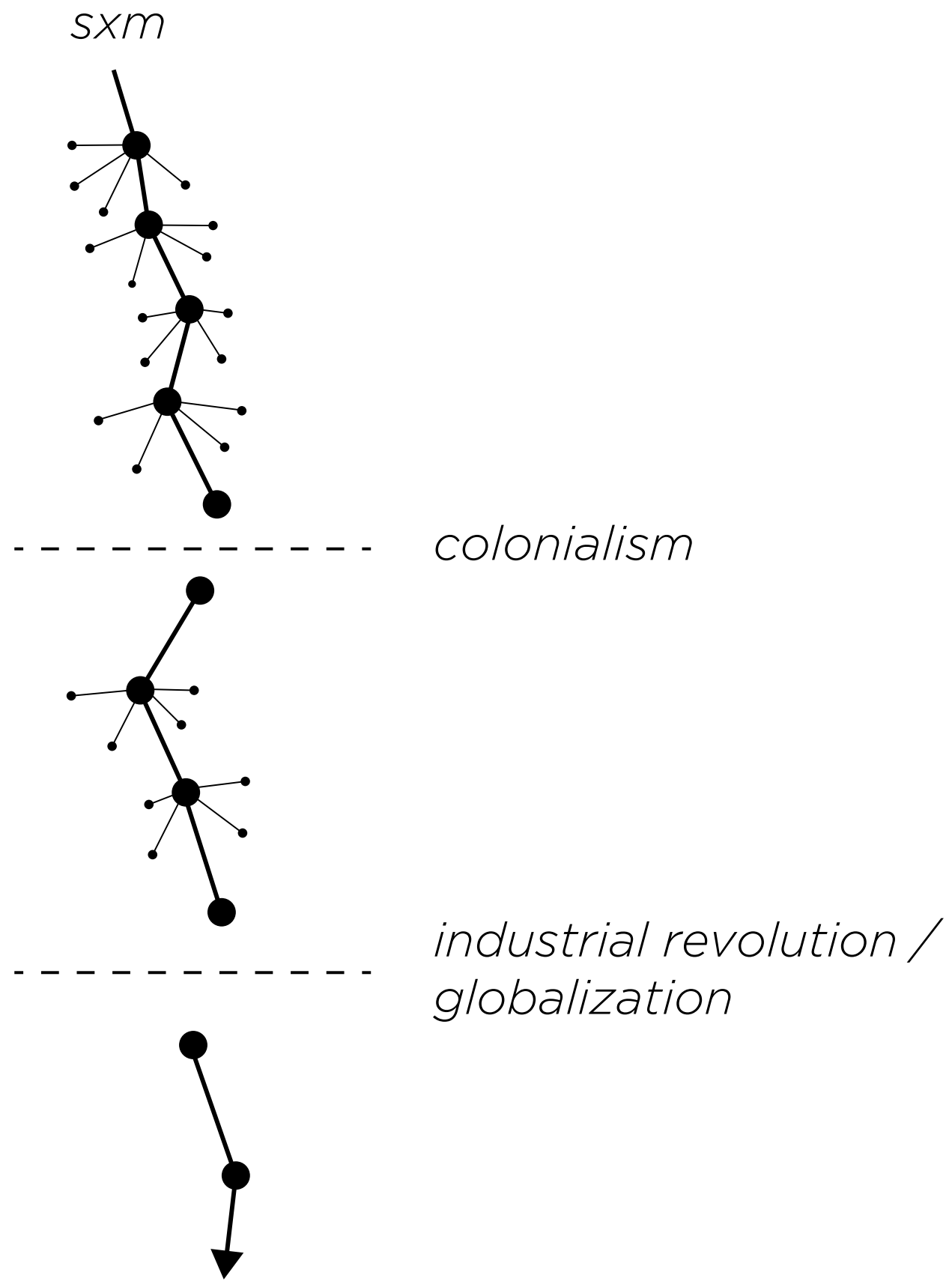
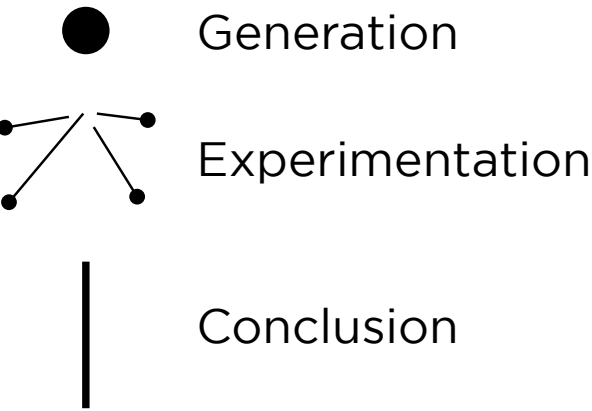
*Building traditions embody conclusions of many generations' experimentation with the same problem, rendering vernacular architecture the practical embodiment of centuries of wisdom and experience*

*(Rudofsky, 1965, Fathy, 1973, Oliver, 1997, Piesik, 2017).*

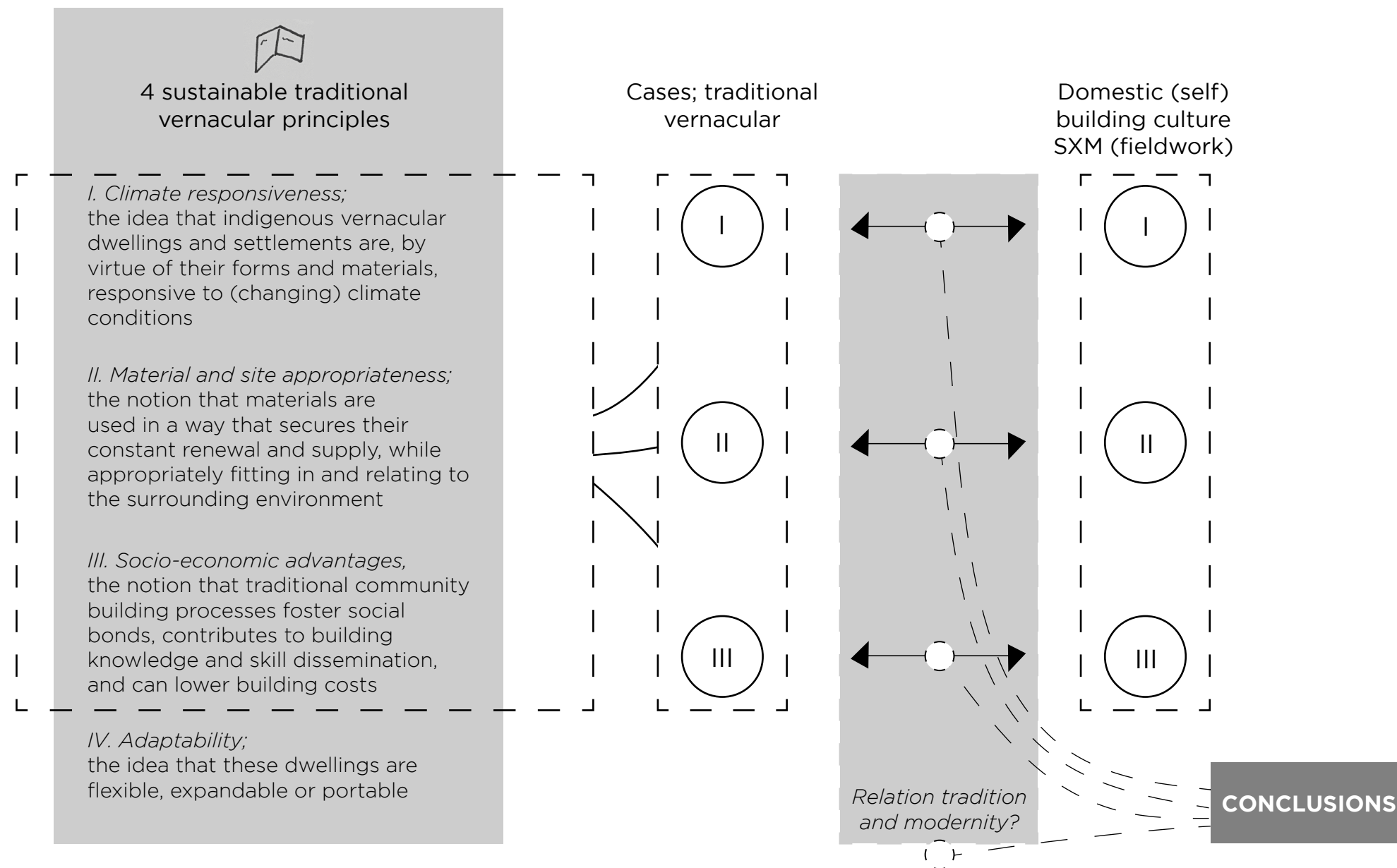




*Result; a specialized architecture in relation to the climate*



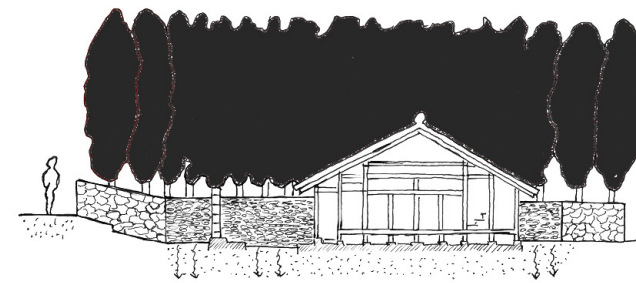
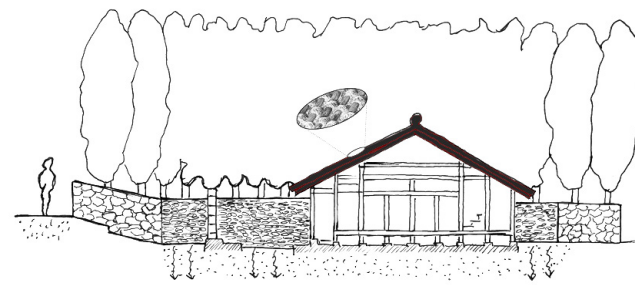
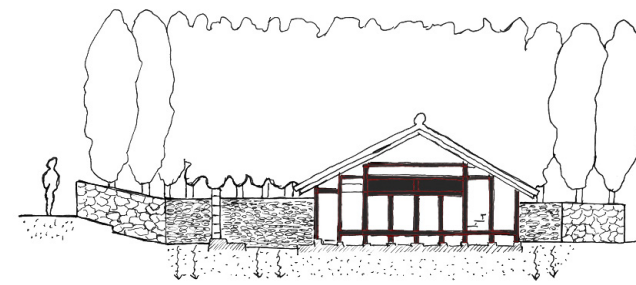
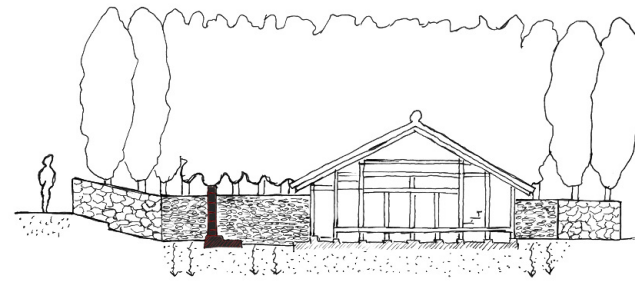
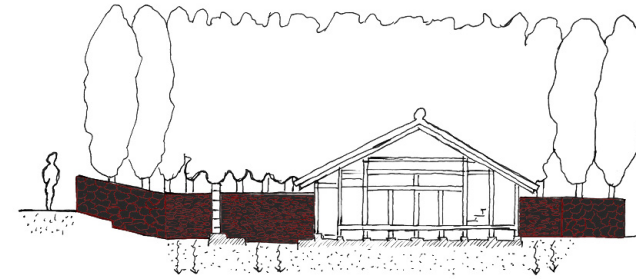


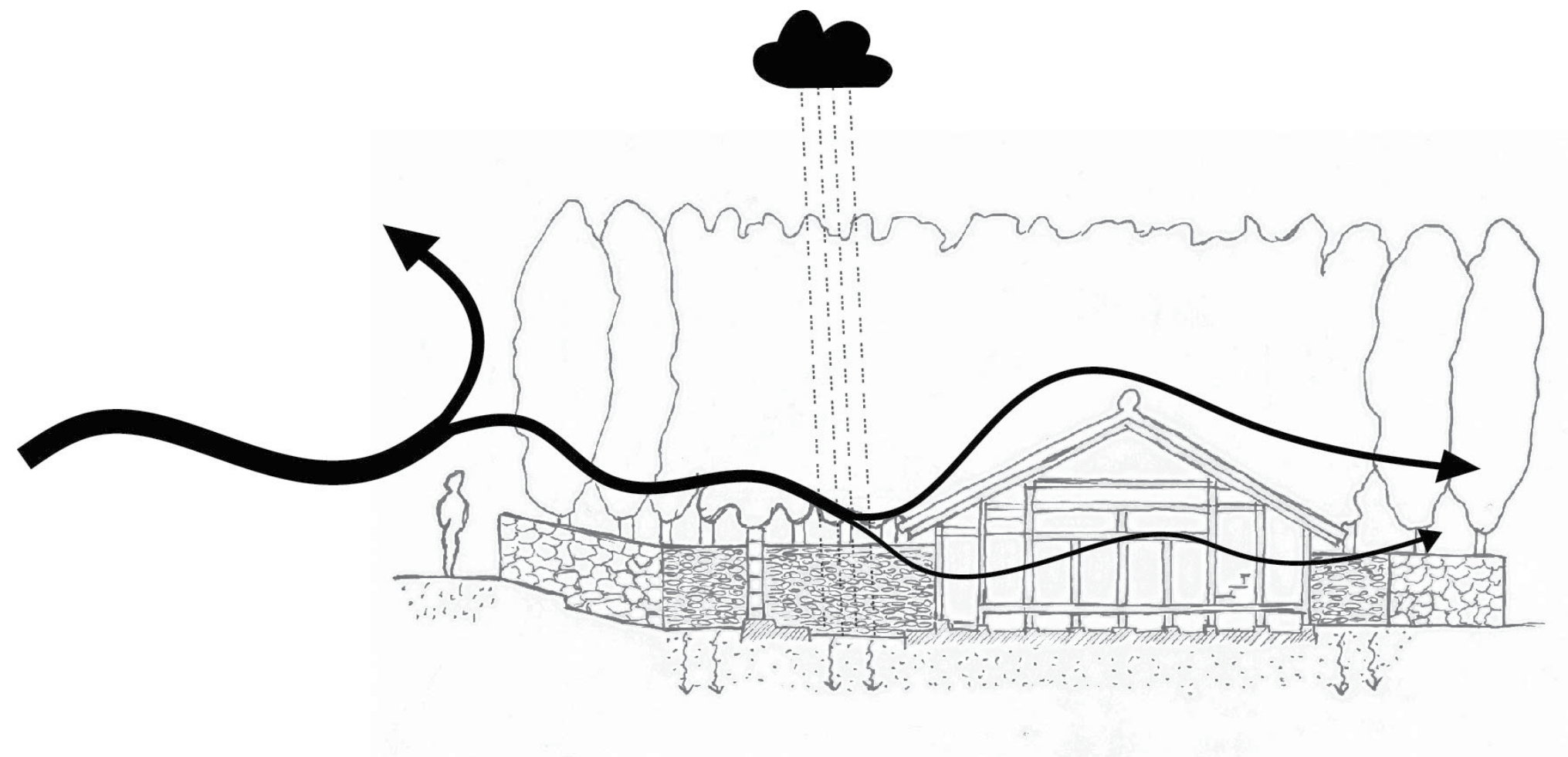


## Okinawa - Japan



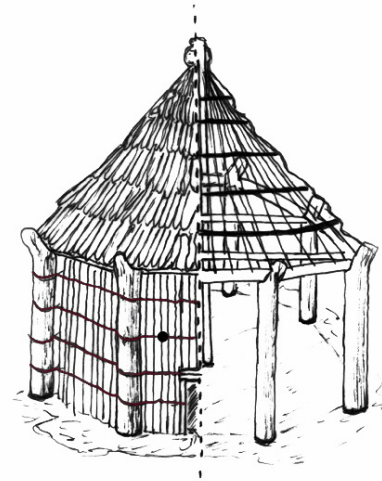
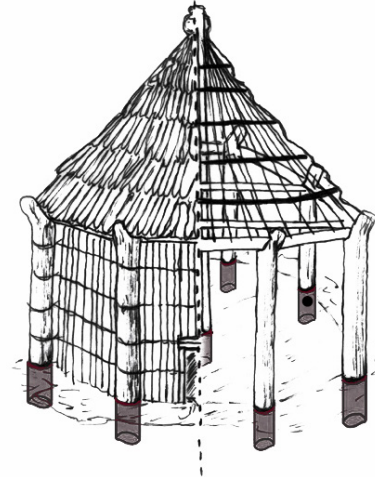
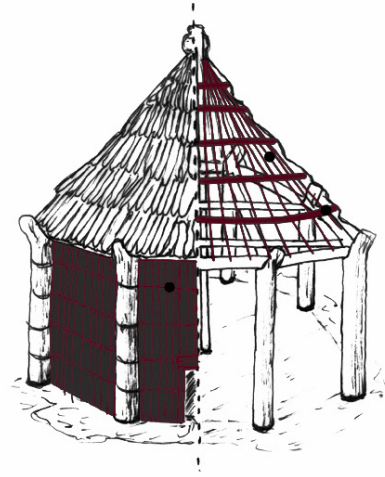
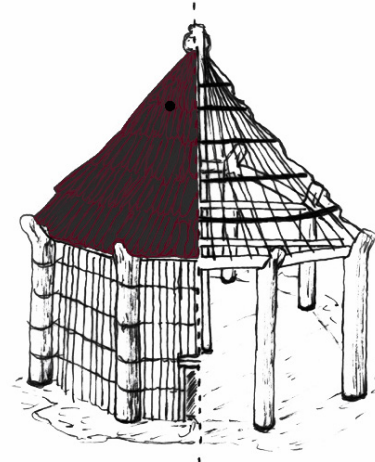


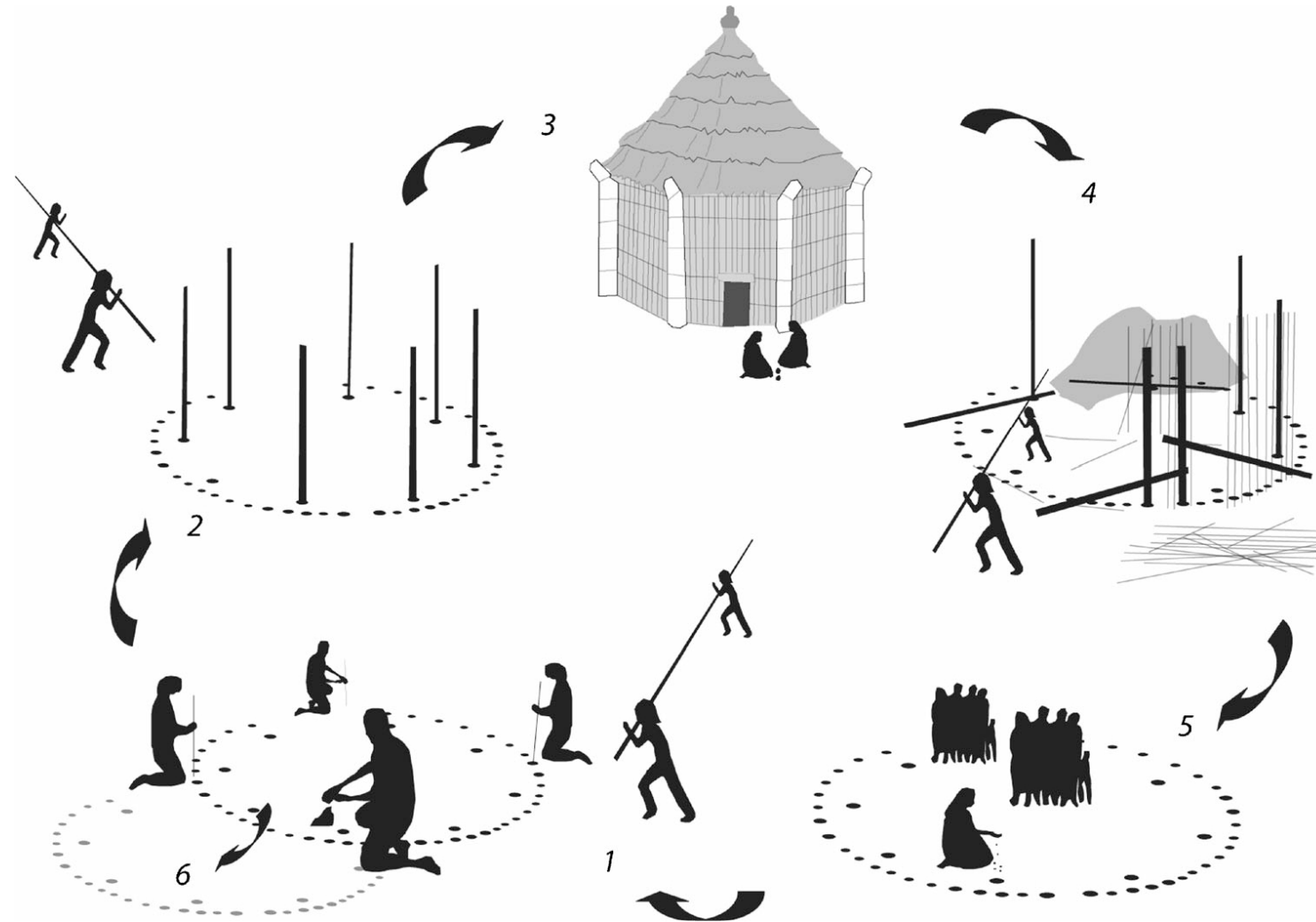
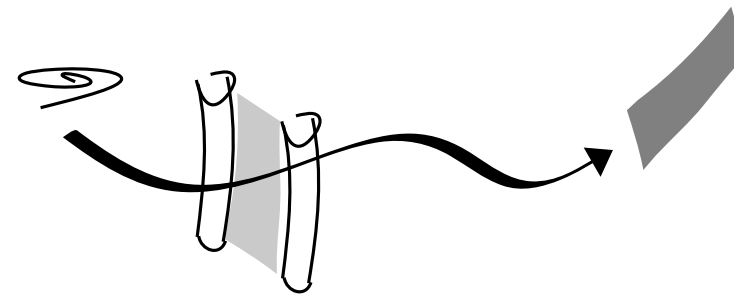






## Caney - Caribbean





source: Samson, 2010



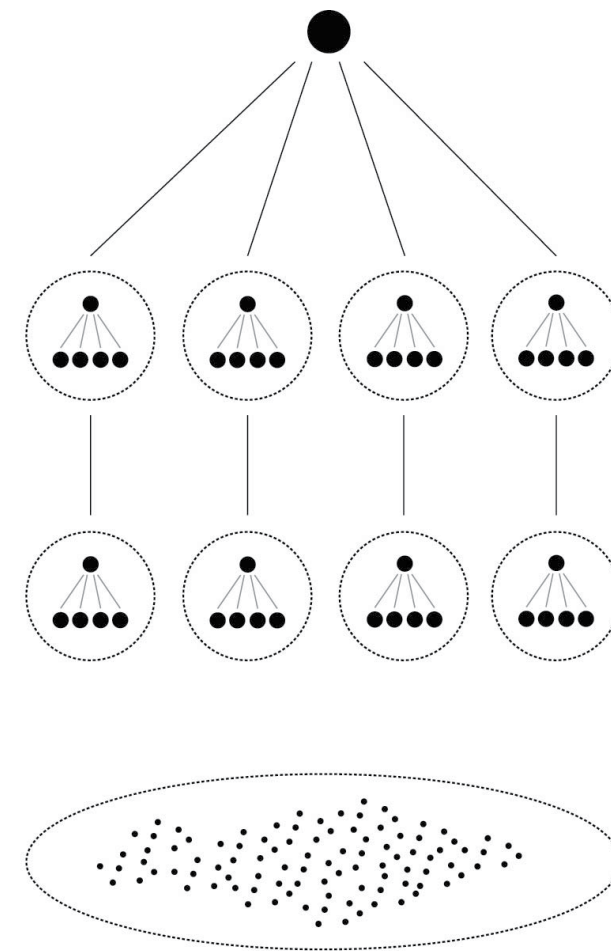
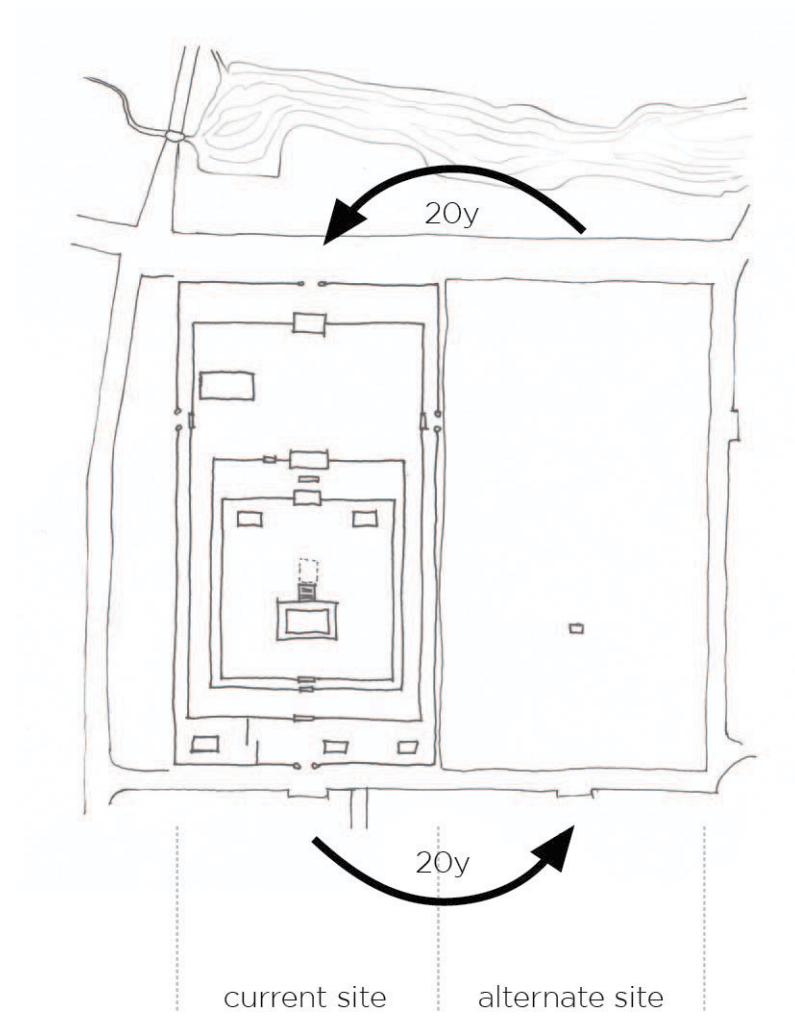
Ise shrine - Japan









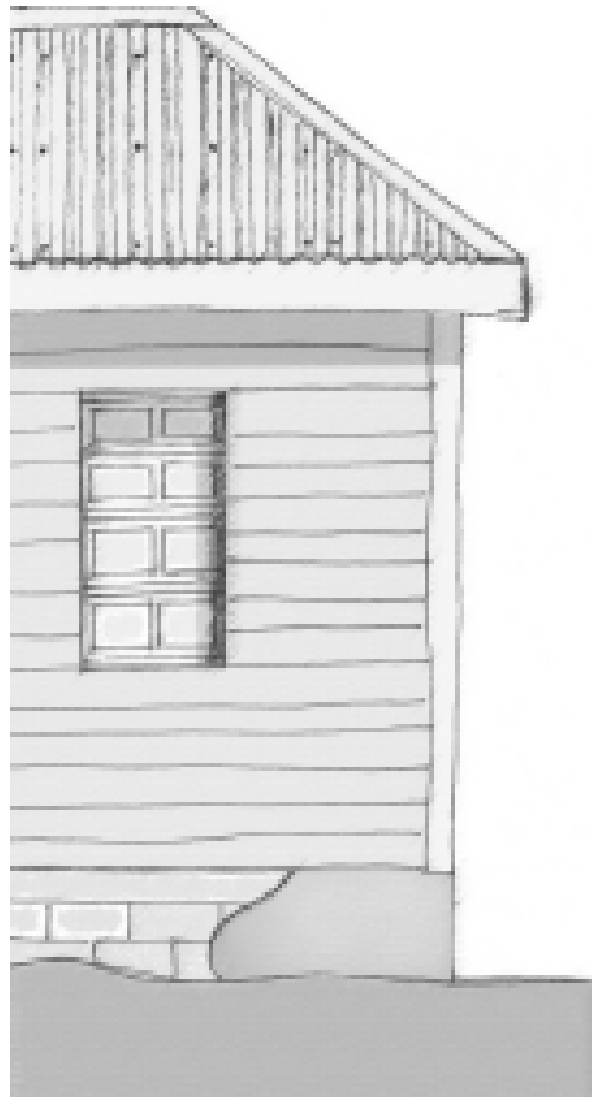




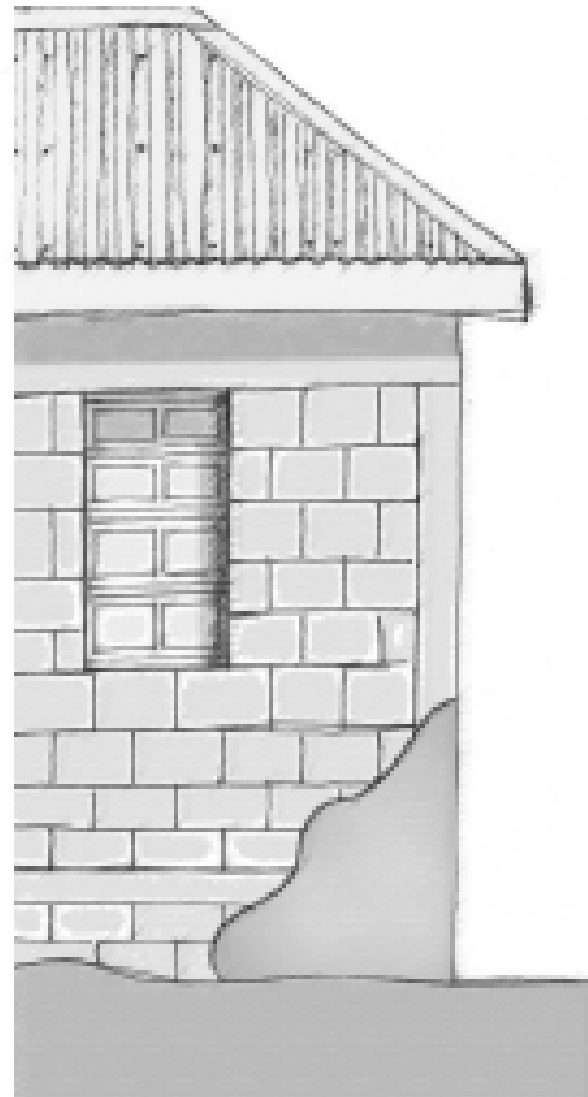




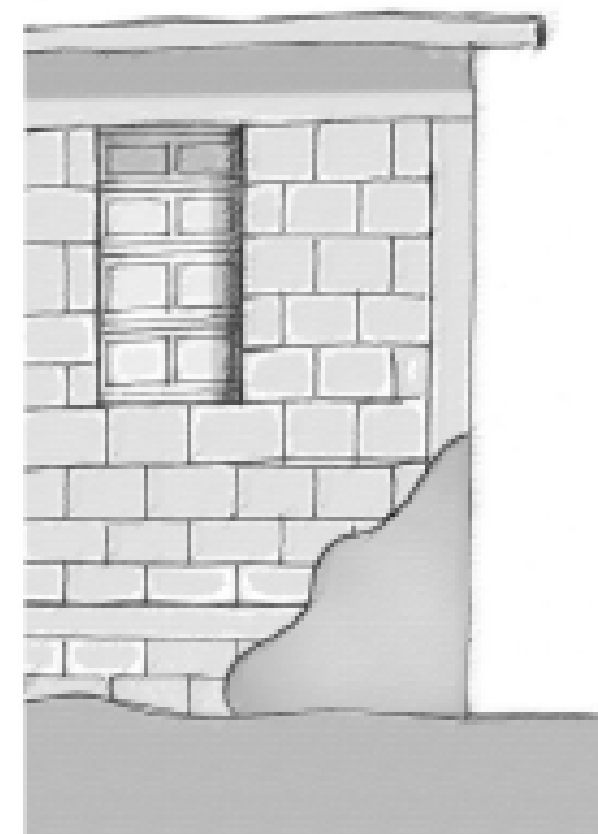




TYPE 1

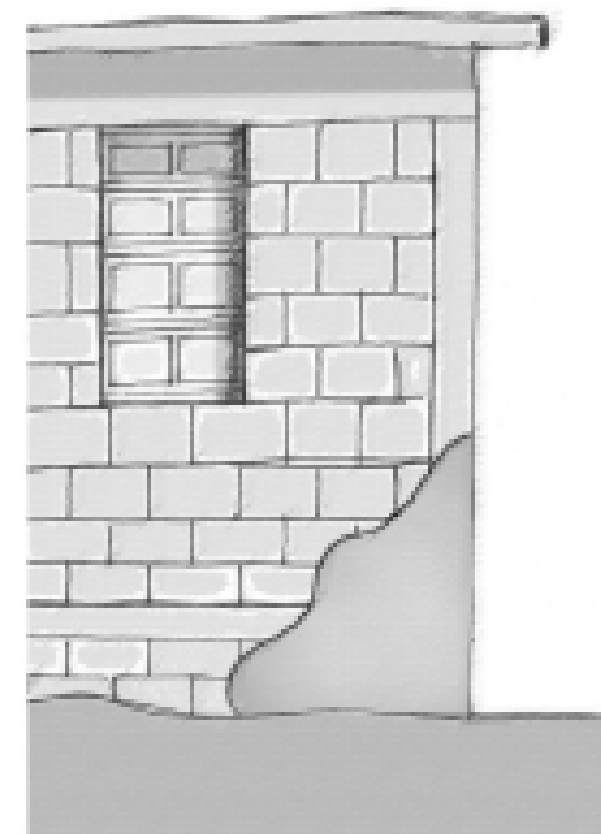
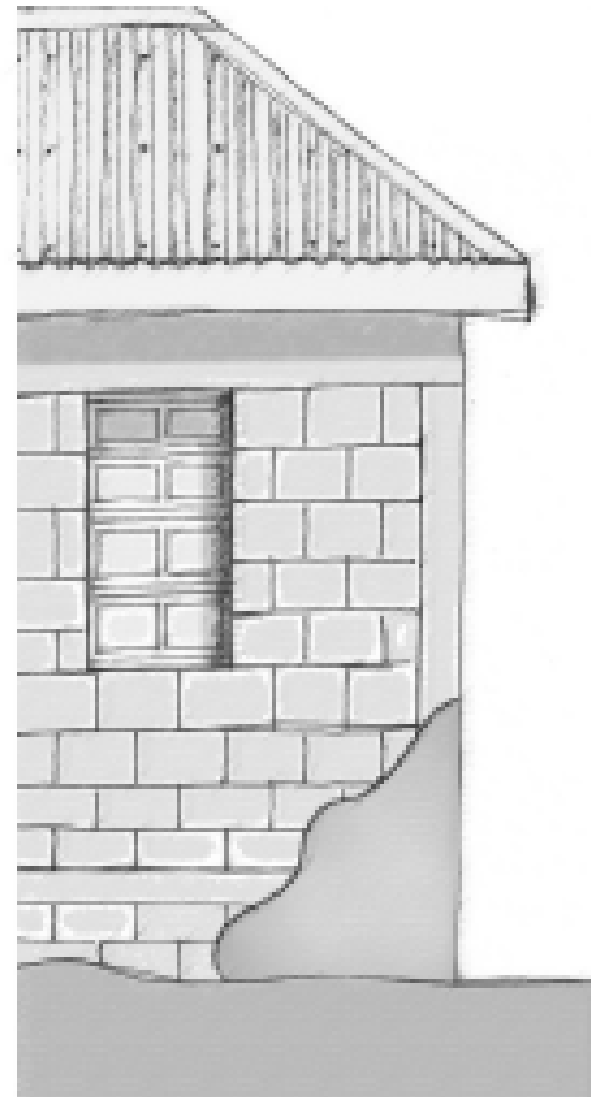
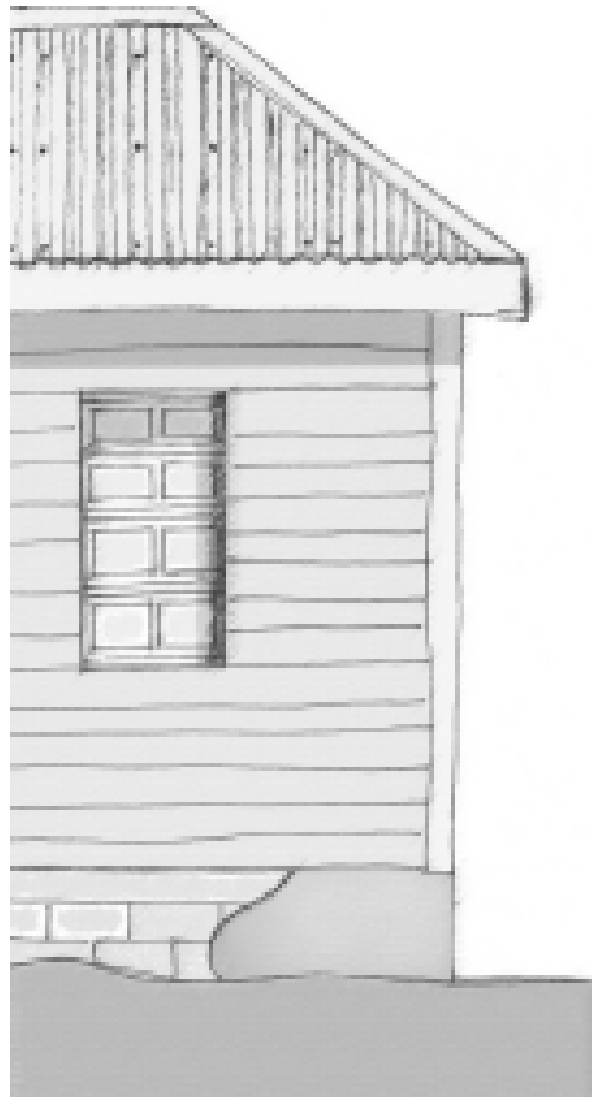


TYPE 2



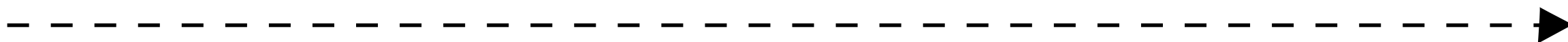
TYPE 3










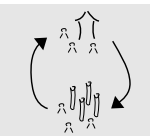
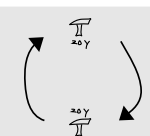

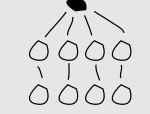




*Time*

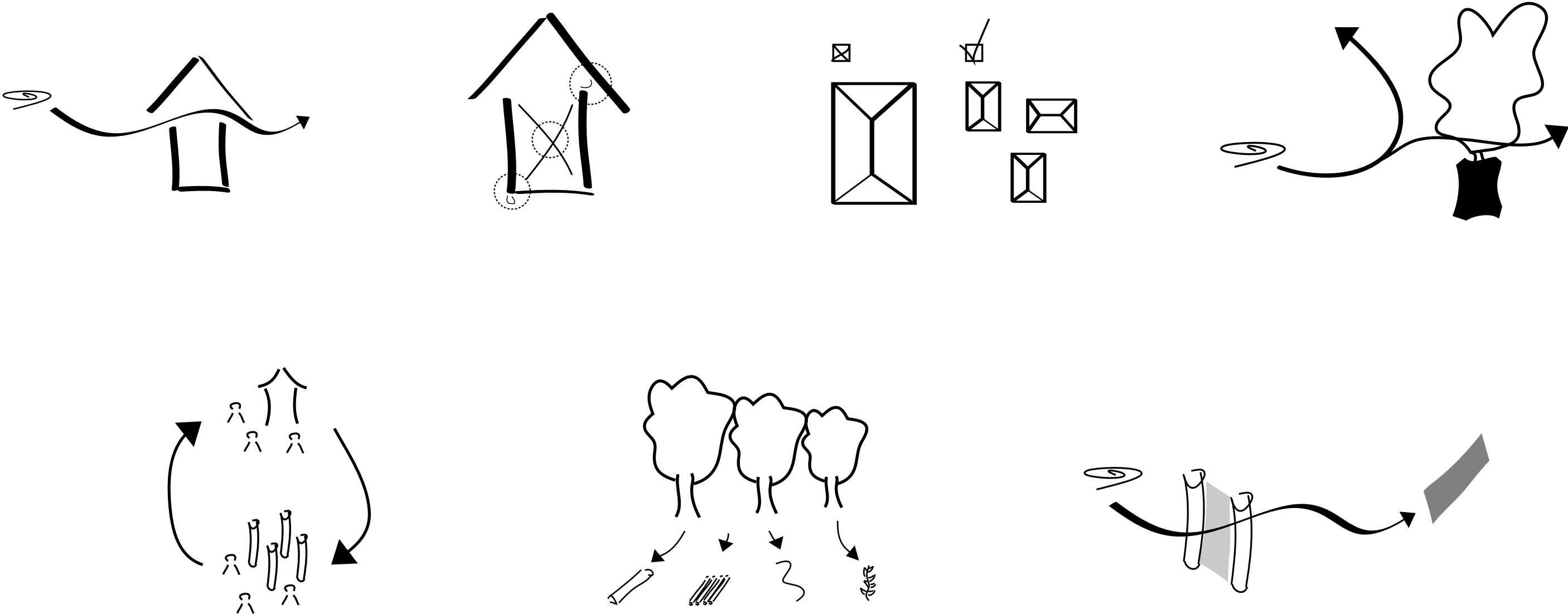
BUNKERIZATION



Climate responsiveness		Potential for SXM <i>low</i> <i>high</i>	Notes
1. Consider geo-topographic relation to reduce wind impact		<div><div></div><div></div></div>	General lack of space
2. Allowing wind to pass through structure reduces chances of roof-uplifting		<div><div></div><div></div></div>	Consider what happens to interior
3. Vegetation and other objects around perimeter of plot can reduce wind impact (windbreak)		<div><div></div><div></div></div>	Consider tree species, uprooting. Consider workload of stone wals
4. Lowering ground level in relation to street level can reduce wind impact (soil should be porous)		<div><div></div><div></div></div>	Soil in SXM is not porous. Drainage could be made, but might clog easily
5. Qualitative construction with special attention to anchorings, bracings and connections		<div><div></div><div></div></div>	Educate people how to do this
6. A heavy roof could resist uplift		<div><div></div><div></div></div>	Is disadvantageous in earthquakes
7. Avoid large structures (catch more wind), rather make several smaller structures		<div><div></div><div></div></div>	Possible, but lack of space could be problematic
Material appropriateness			
1. Material availability; try to use local (regional) renewable building materials		<div><div></div><div></div></div>	Consider cultivation potentials, consider regional renewable materials, consider durability / preservation
2. Consider sacraficial, easily replacable elements. Consider more durable, reusable structural members.		<div><div></div><div></div></div>	Consider what happens to interior if elements are sacrificial. Consider what happens to these sacrificial elements
3. Consider a process of communal rebuilding (or repairing).		<div><div></div><div></div></div>	Could go hand in hand with maintainance needs
Socio-economic advantages			
1. Consider the perpertual rebuilding of structures		<div><div></div><div></div></div>	Could be way of disseminating knowledge and skills
2. Consider a division in work related to task-importance and difficulty		<div><div></div><div></div></div>	Could be communal strategy
3. Create a strategic setup to advice less experienced how to build (mostly based on practice, not theory).		<div><div></div><div></div></div>	Consider who would be specialists, and how they would relate to other builders



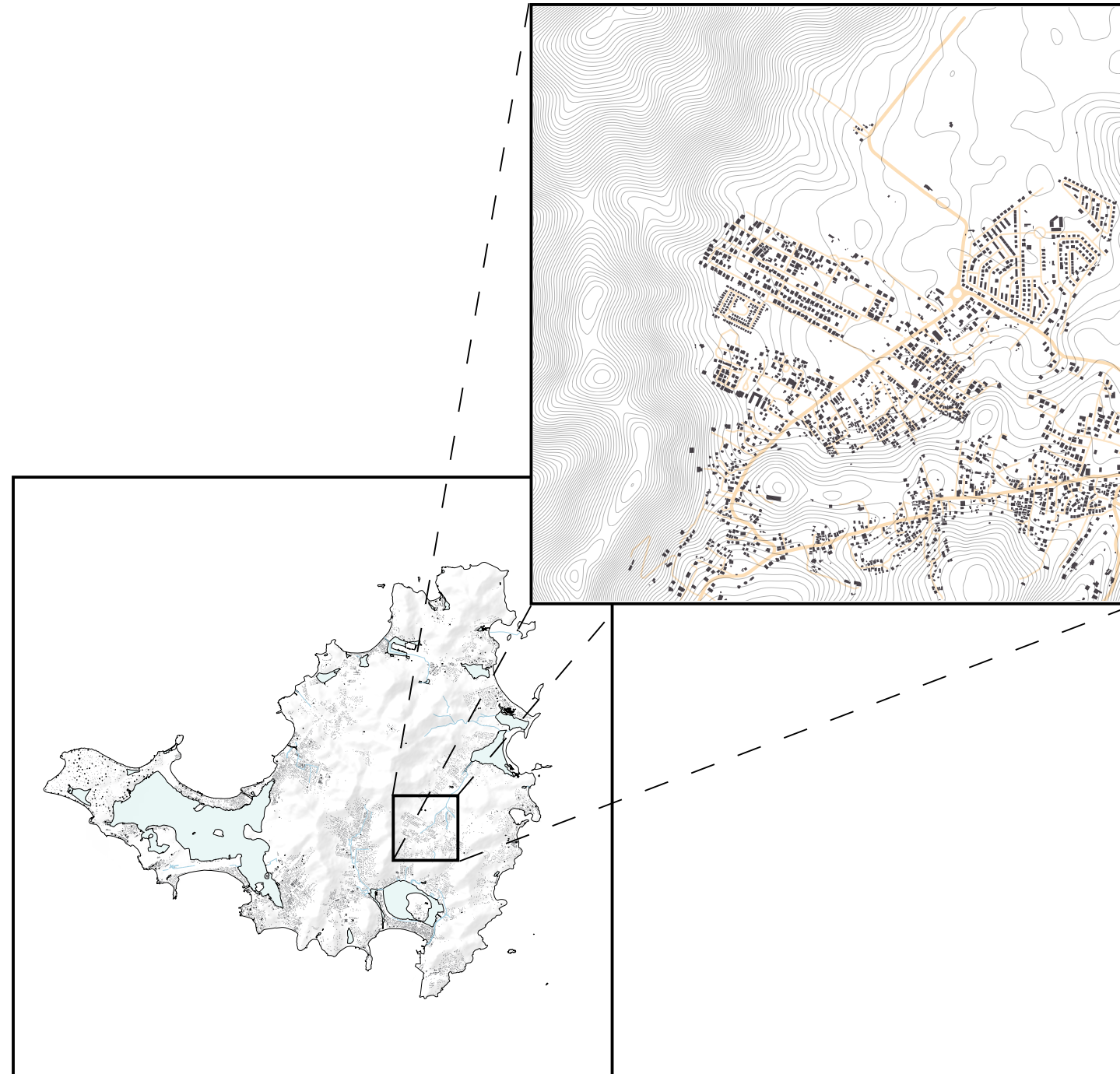
Most usefull for Sint Maartens building culture:



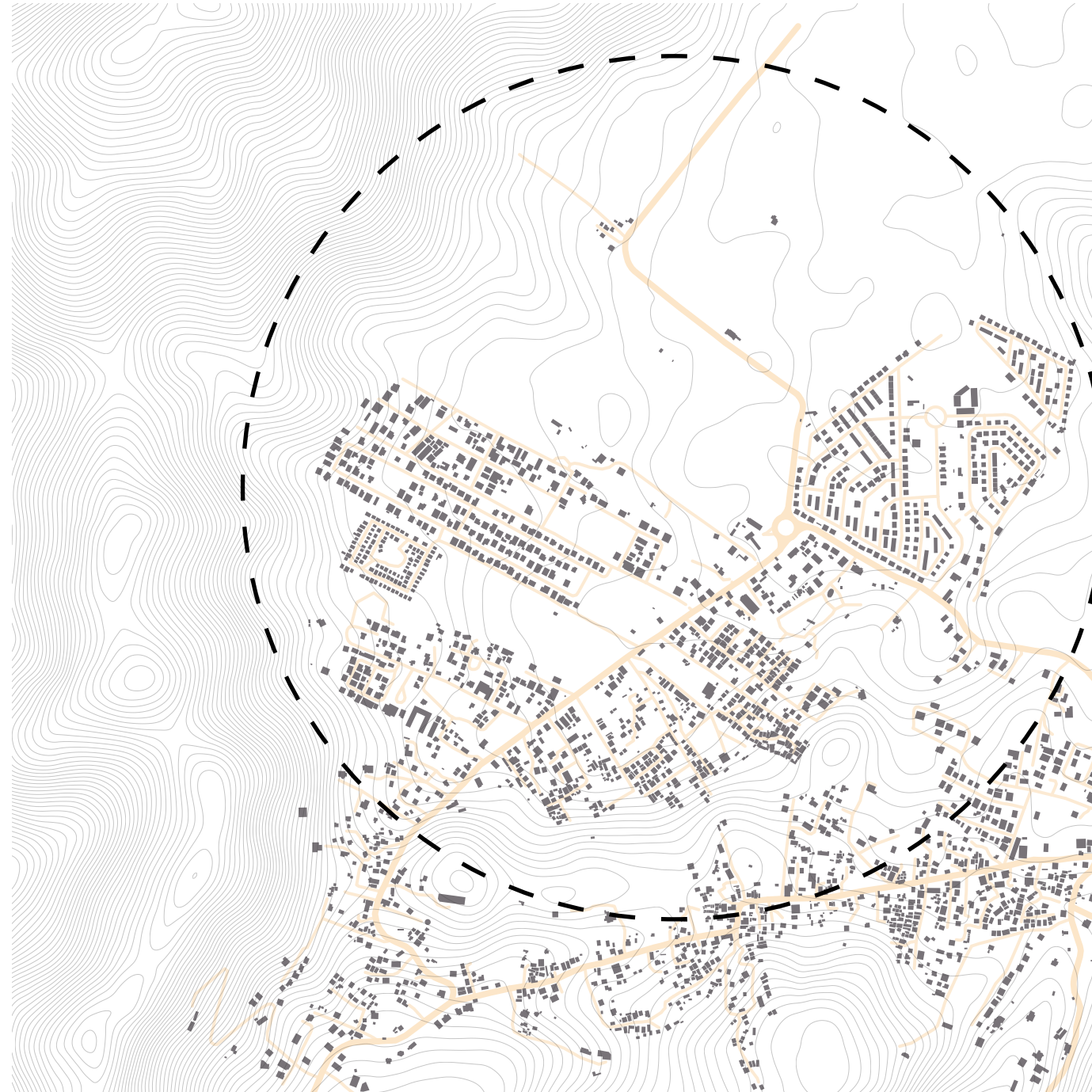
## CHAPTER IV - NEIGHBORHOOD / DESIGN CONCEPT



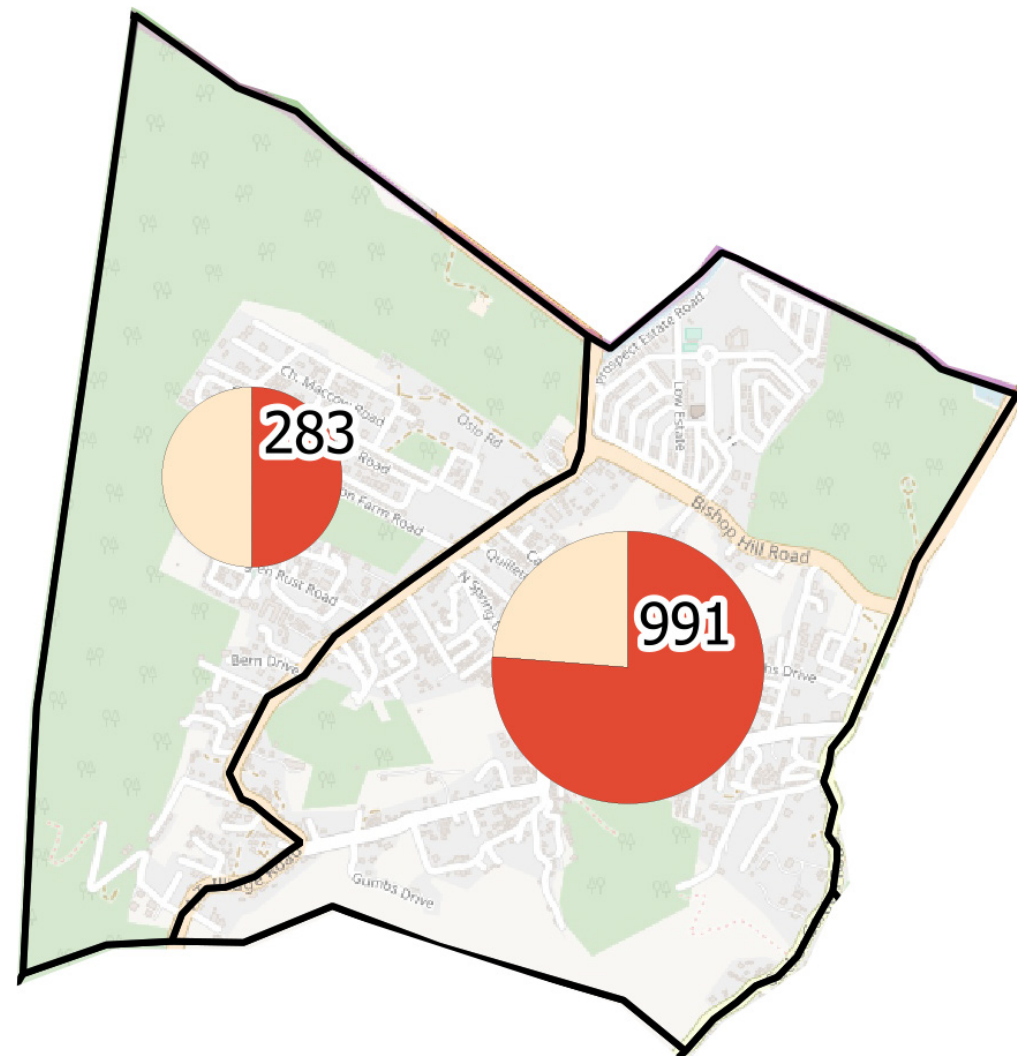
## Lower princes quarter



Dutch quarter, union farm, zorg & rust, belvedere







source; 510 (2017)

- 123 # Moderate/High/Complete Damaged
- % Moderate/High/Complete Damaged
- % Not/Slightly Damaged
- Size represents Total # of Buildings













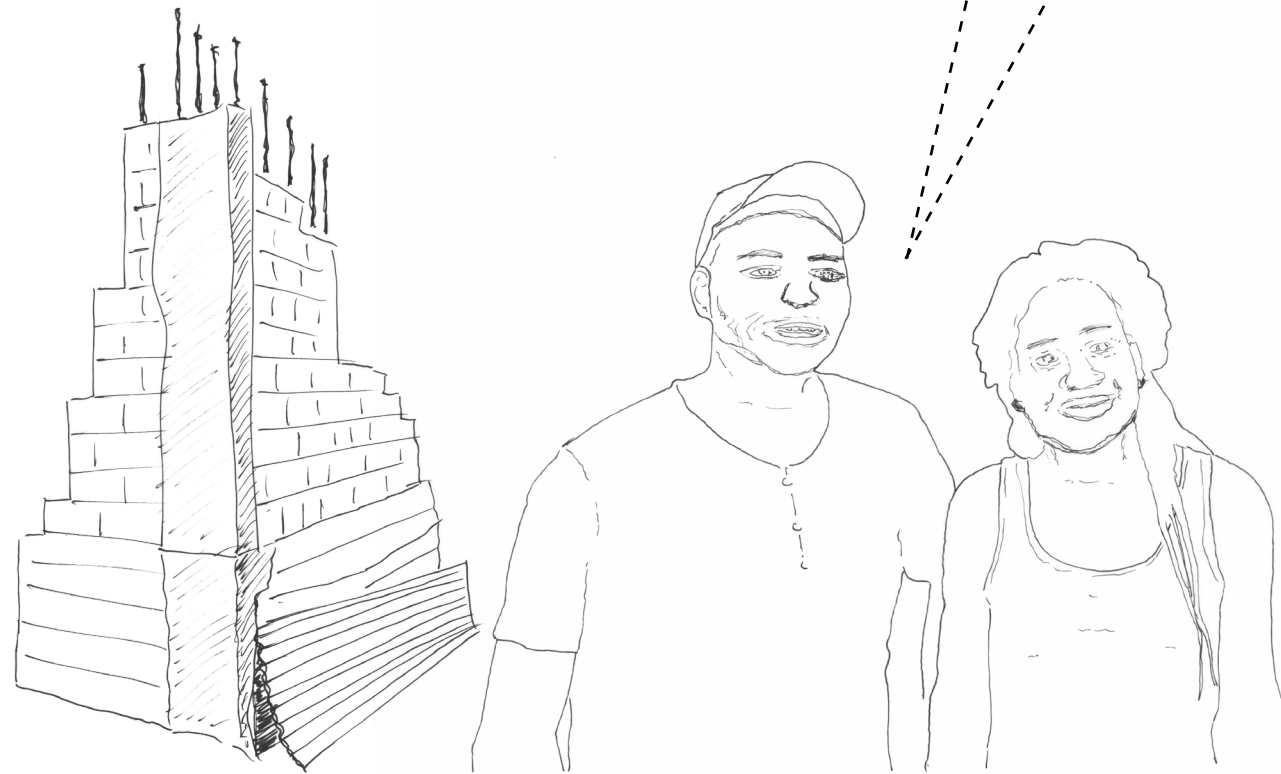


## Sketches of neighborhood

My house was destroyed by Irma | I don't have a job | I don't have money | I can build, but I need materials, materials, materials



During Irma a container flew into our house | Now we  
are trying to rebuild it with the help of the Red Cross  
| I would like to learn to build myself.

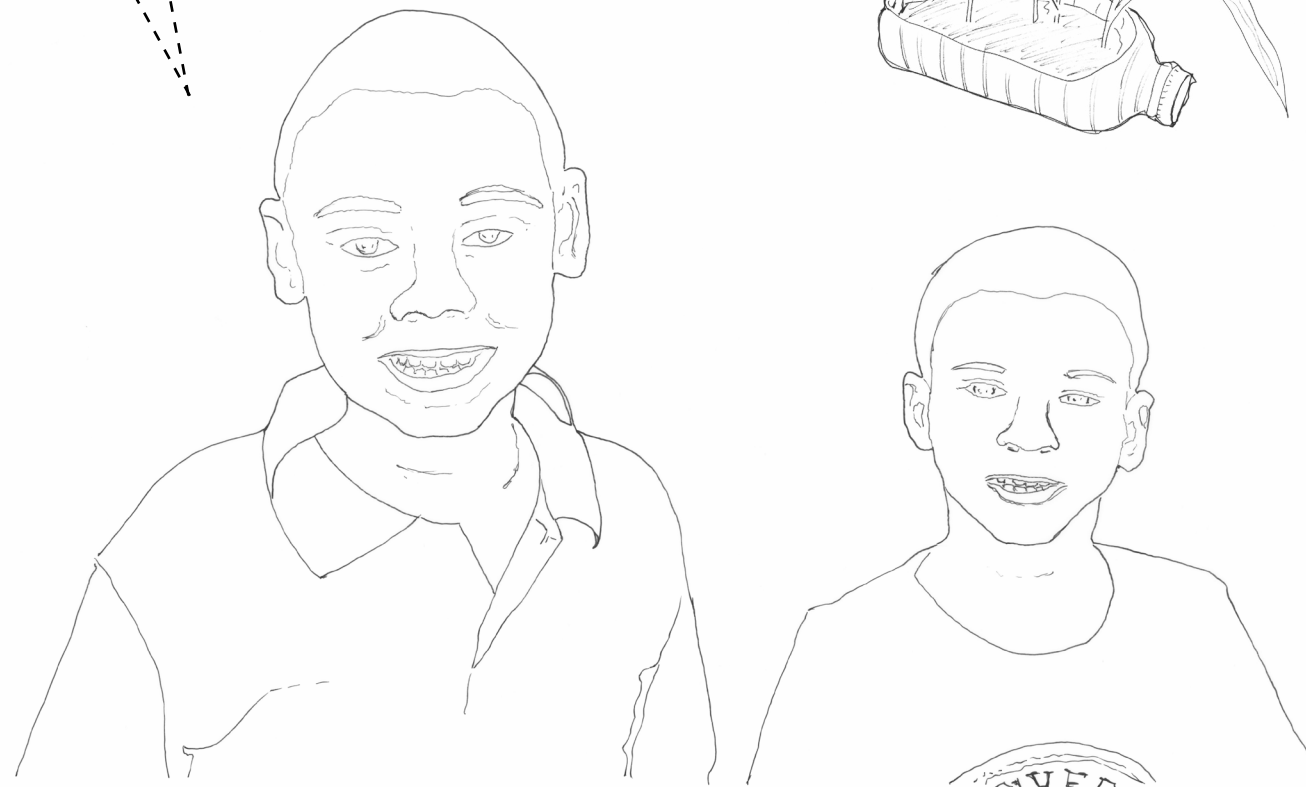




We could not find a job | Now we  
learn how to build via the Red Cross |  
And repair roofs in the neighborhood.



Our school closes at 1 pm | Together with  
the teacher, we grow plants in recycled  
plastic pots and cups





You know what agriculture means? | It means  
you have to agree with culture! | I have a  
restaurant and I farm my own vegetables.

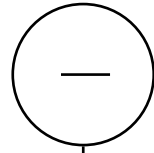


Sint Maarten does not have much meeting space  
| We meet in the shade under a seagrape | In the  
shade we share some jonnycakes an play dominos

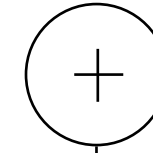




## Local Reality

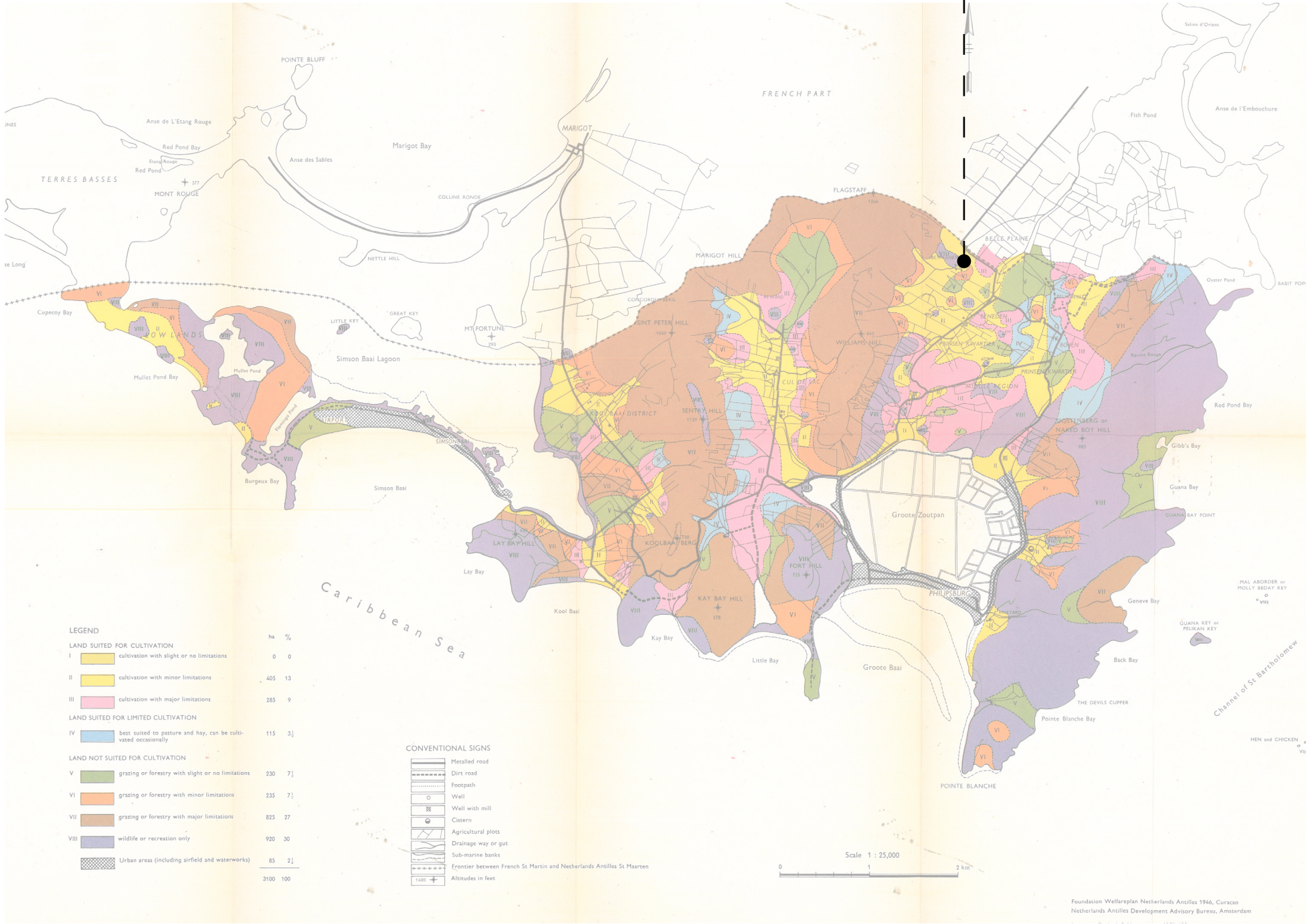


- HIGH UNEMPLOYMENT RATE
- BAD QUALITY HOUSING
- LACK OF PUBLIC SPACE
- NOT MUCH TO DO FOR CHILDREN



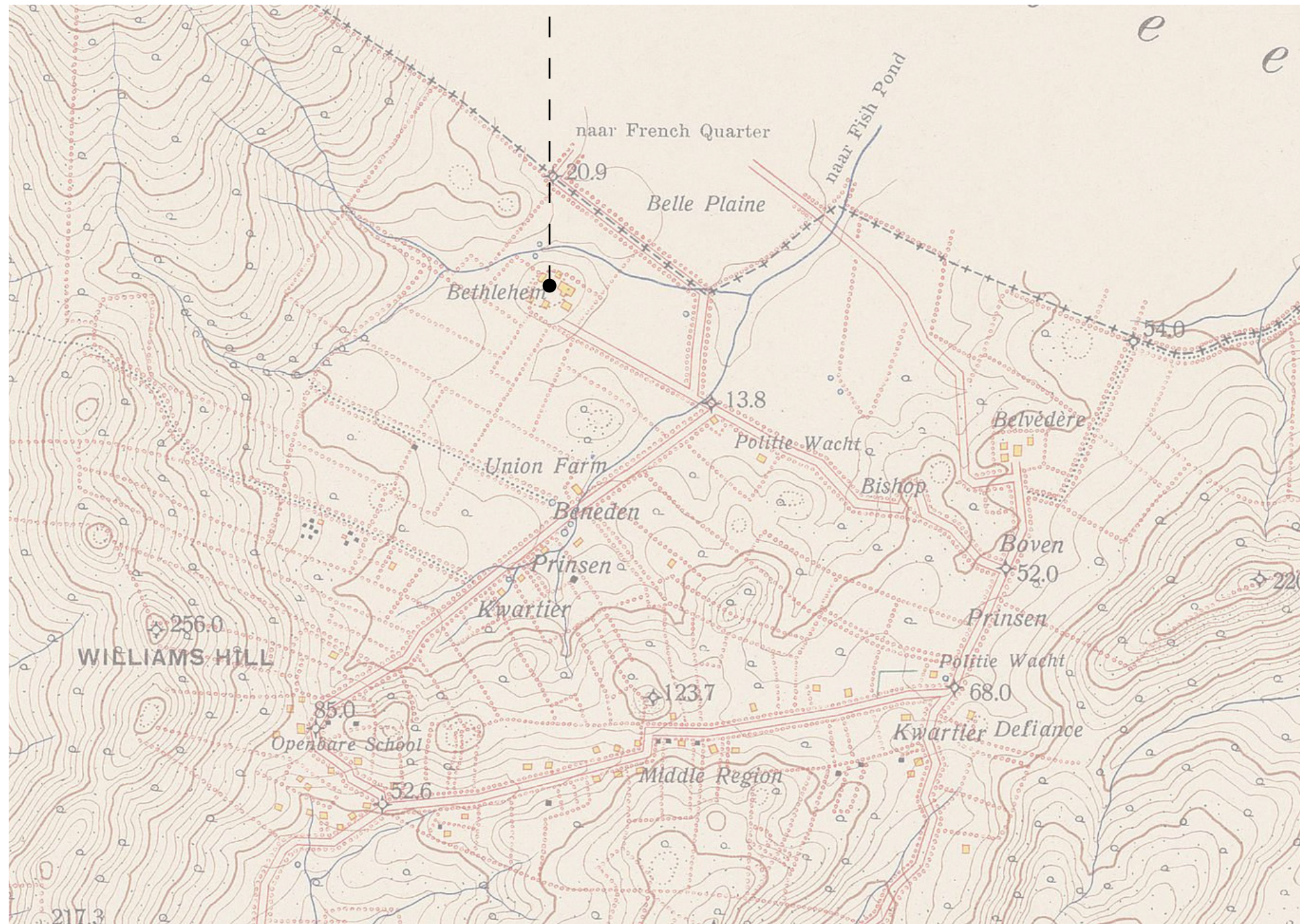
- ++ AGRICULTURAL INTEREST
- ++ INTEREST IN LEARNING HOW TO BUILD

Furtille soil





## Sugercane plantation



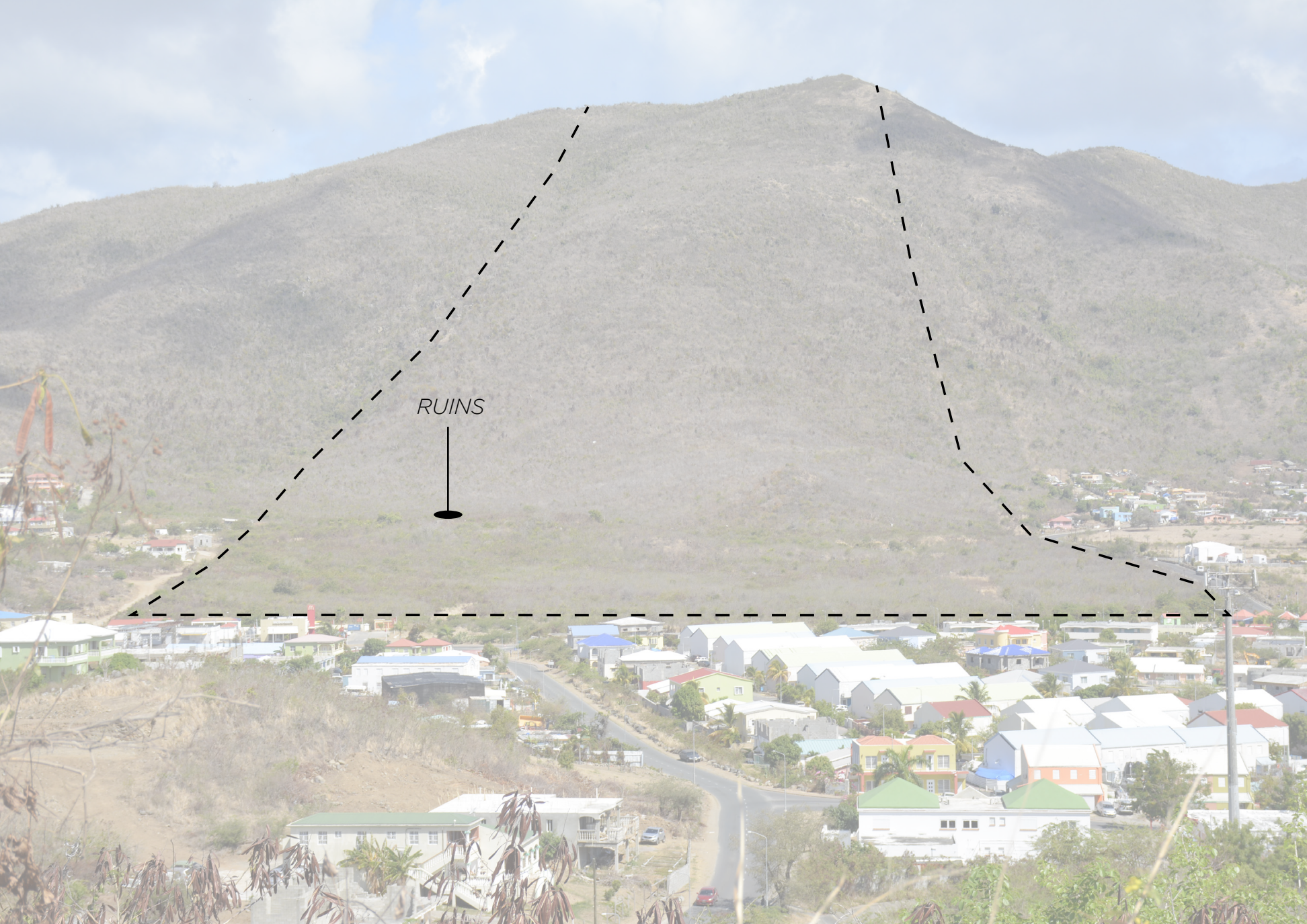
Historic map (1915, Werbata)



BETHLEHEM owned by BRED NV who wants to develop it into a public park

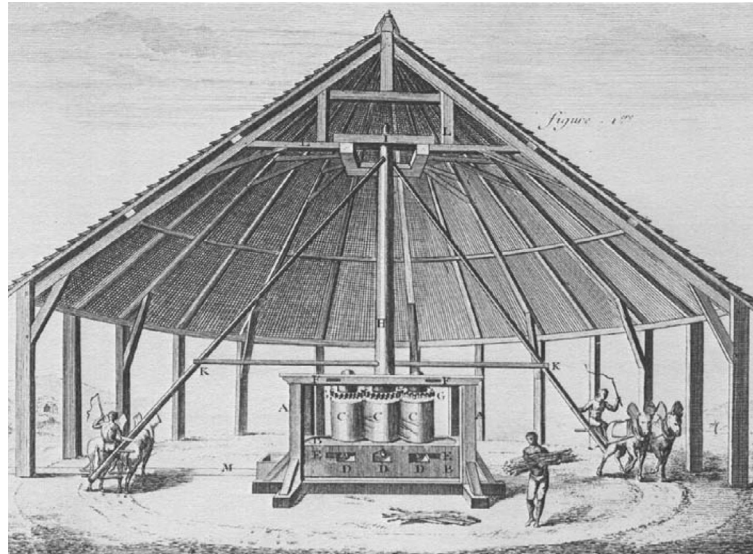








THEN

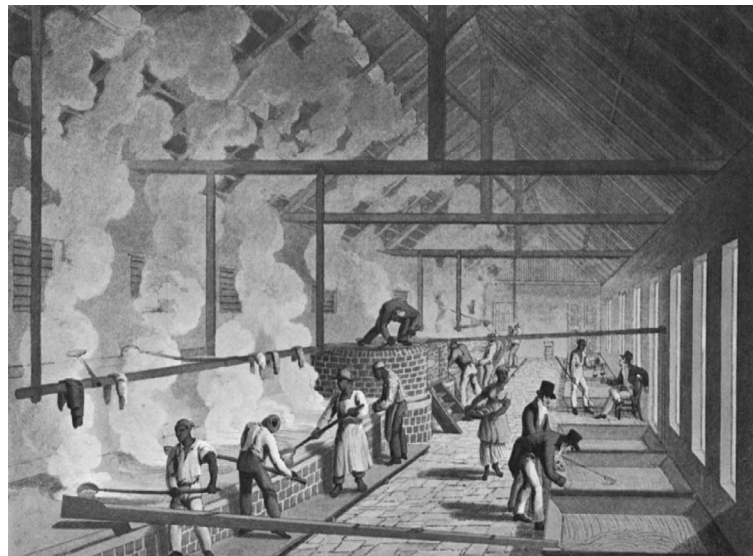


*Sugar cane crusher (dissapeared)*

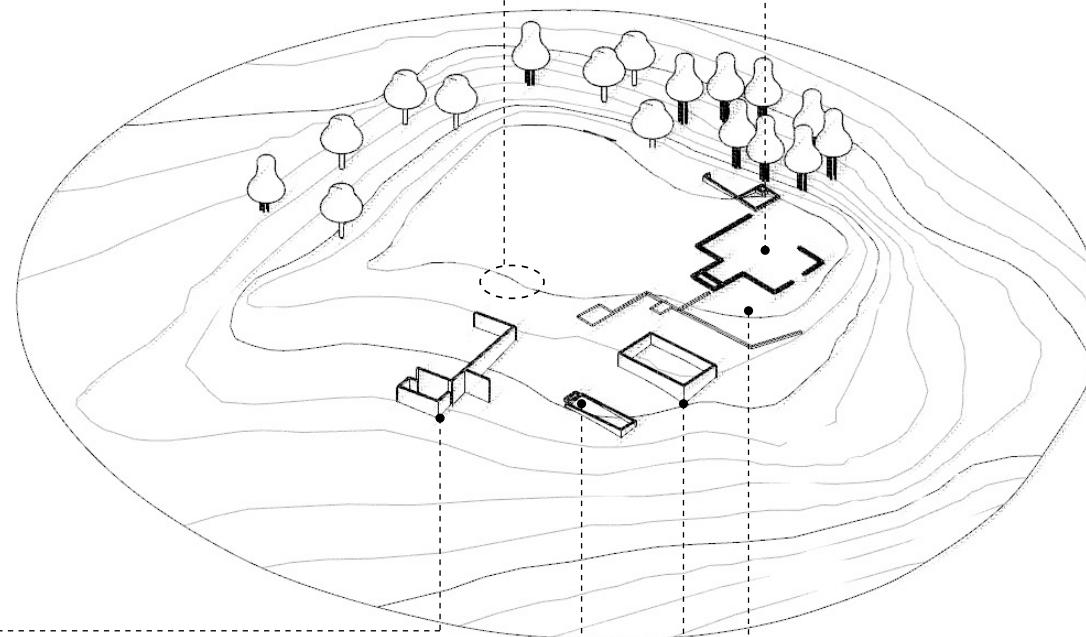
NOW



*Entrance to plantation house*



*Boiling house*

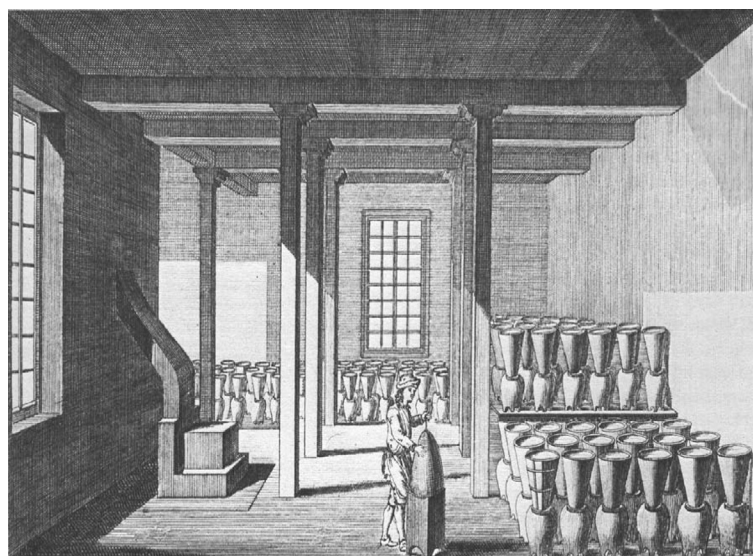


*Terrace*

*Cistern*



*Curing house*



*Curing house*



*Curing house*

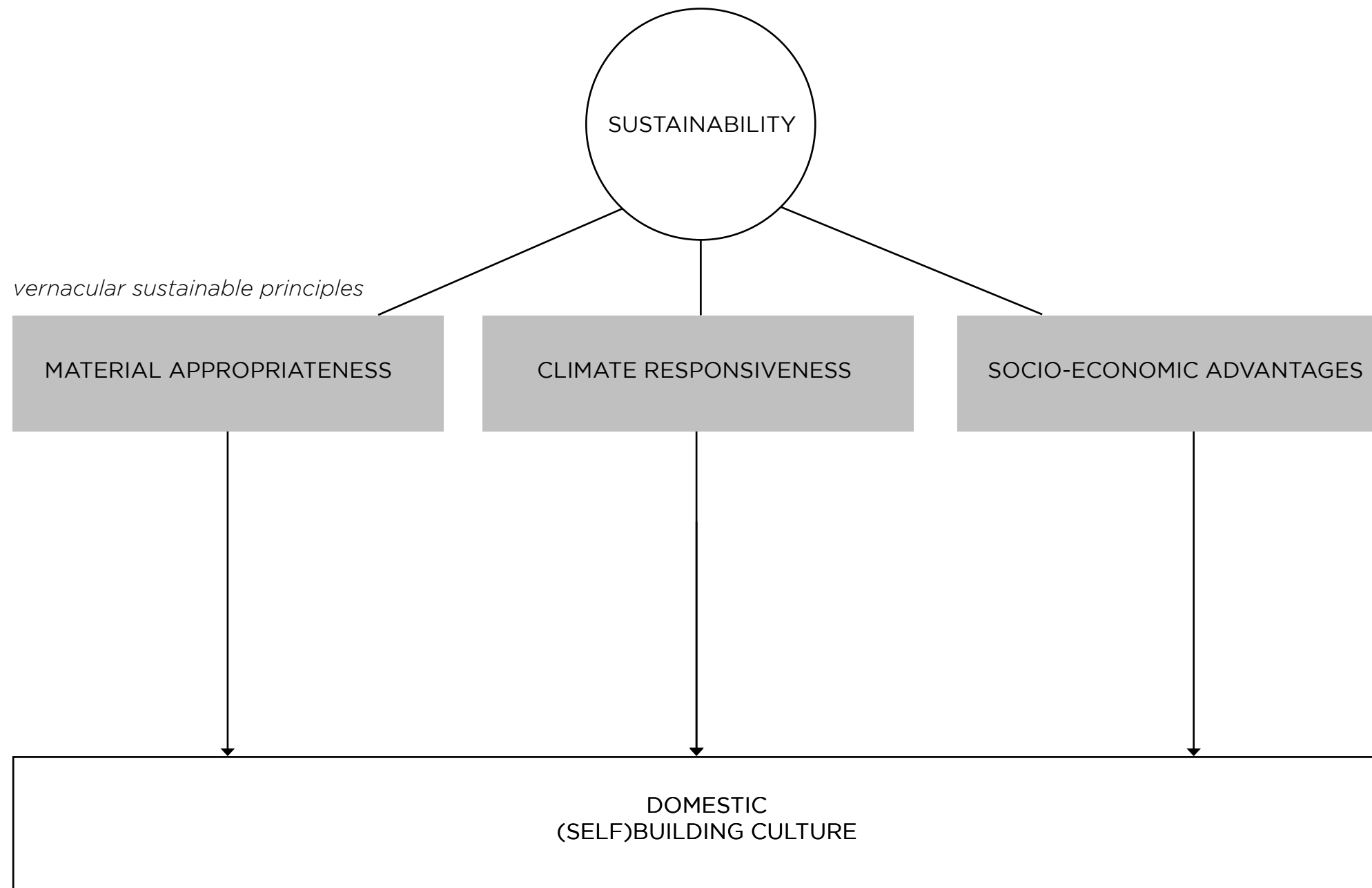




*Ruins - Curing house*

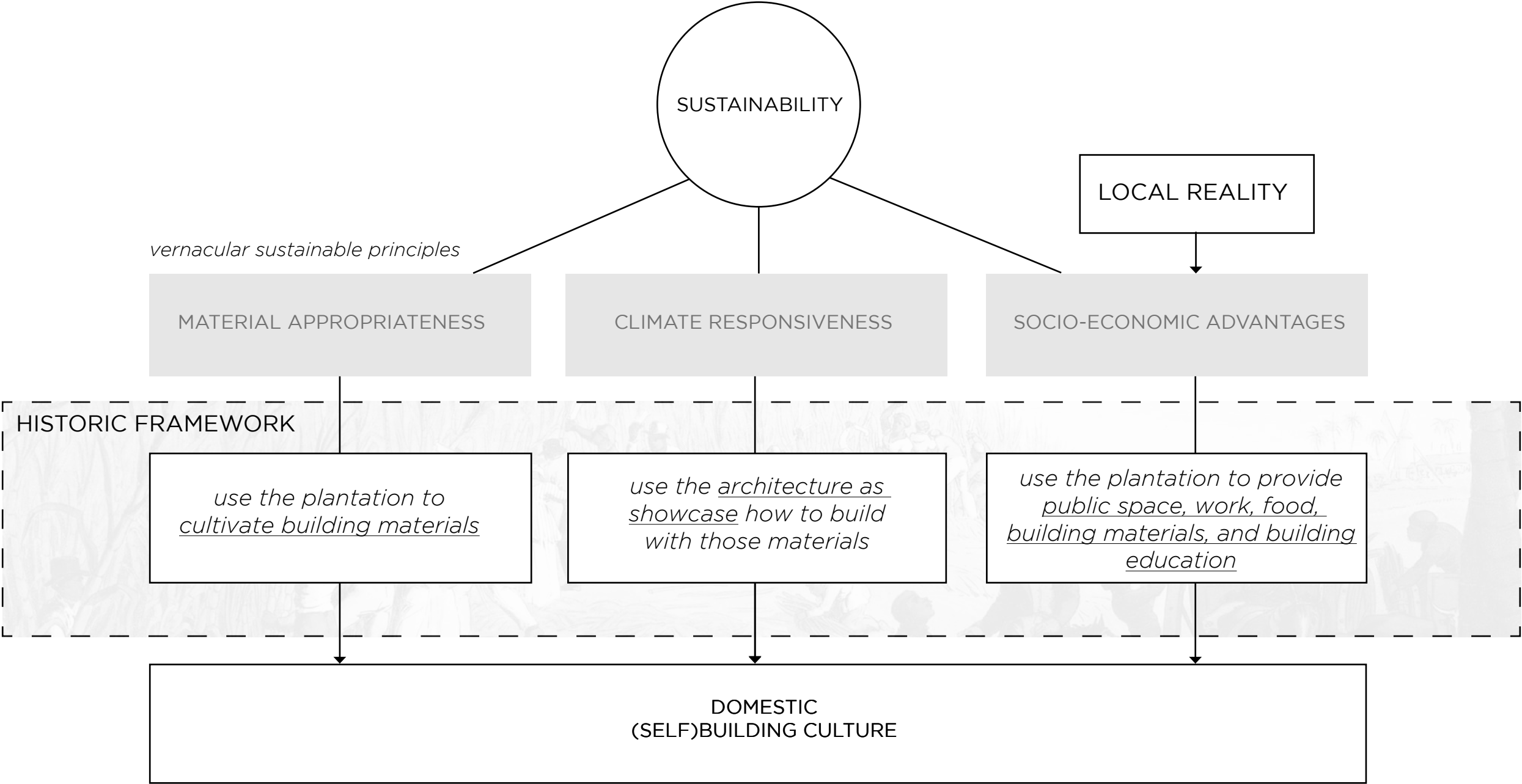


How can an urban-architectural intervention stimulate a transition towards a more sustainable domestic (self)building culture on a neighborhood scale in Sint Maarten?





How can an urban-architectural intervention stimulate a transition towards a more sustainable domestic (self)building culture on a neighborhood scale in Sint Maarten?

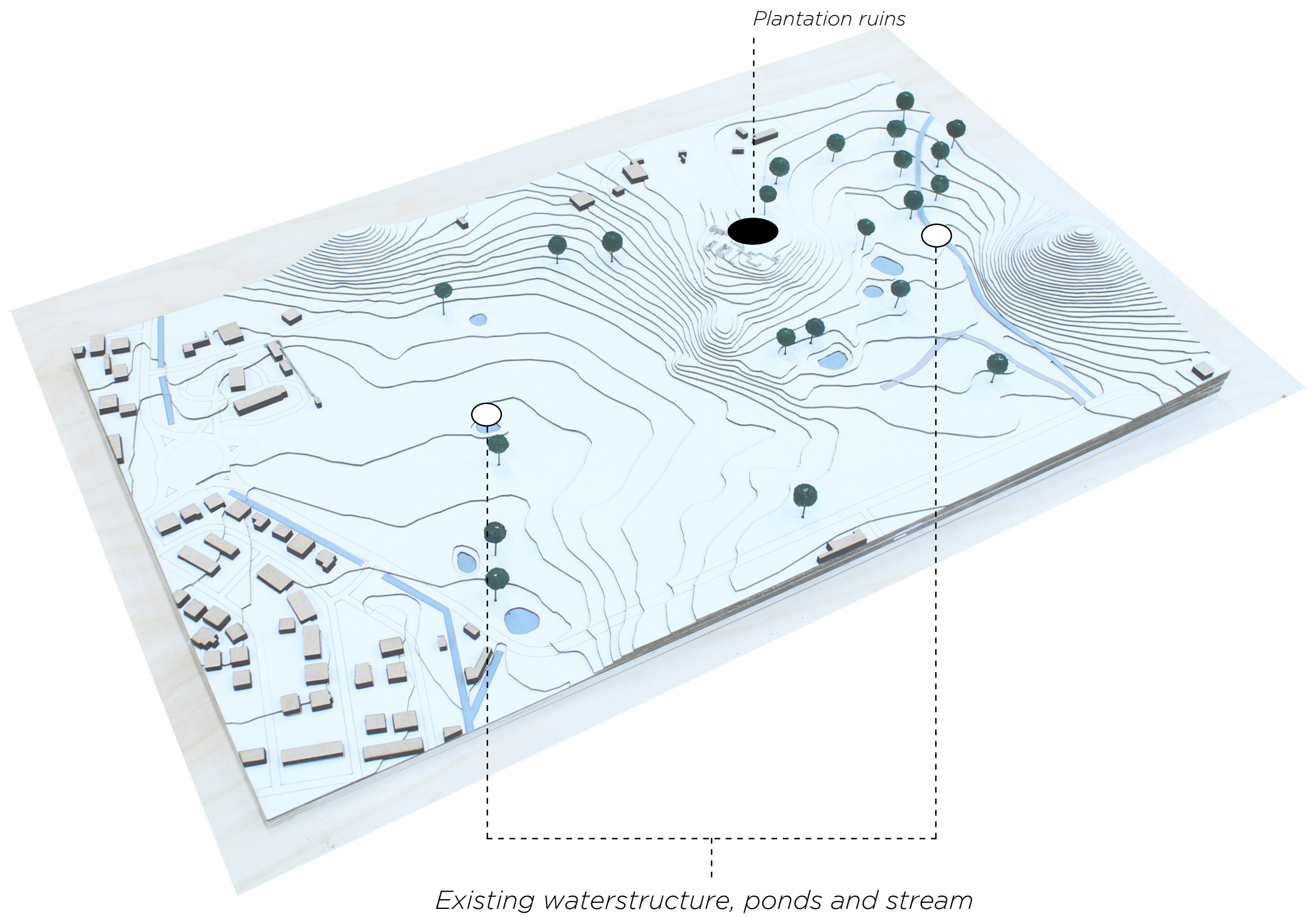


= from EXPLOITATION to ECOSYSTEM SERVICE

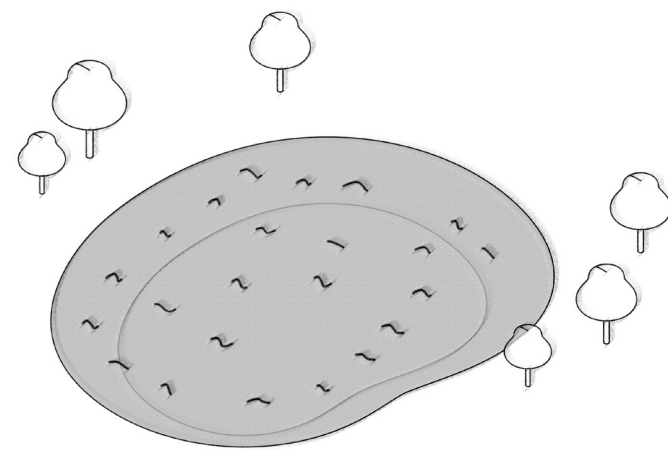
## CHAPTER V - PARK BETHLEHEM

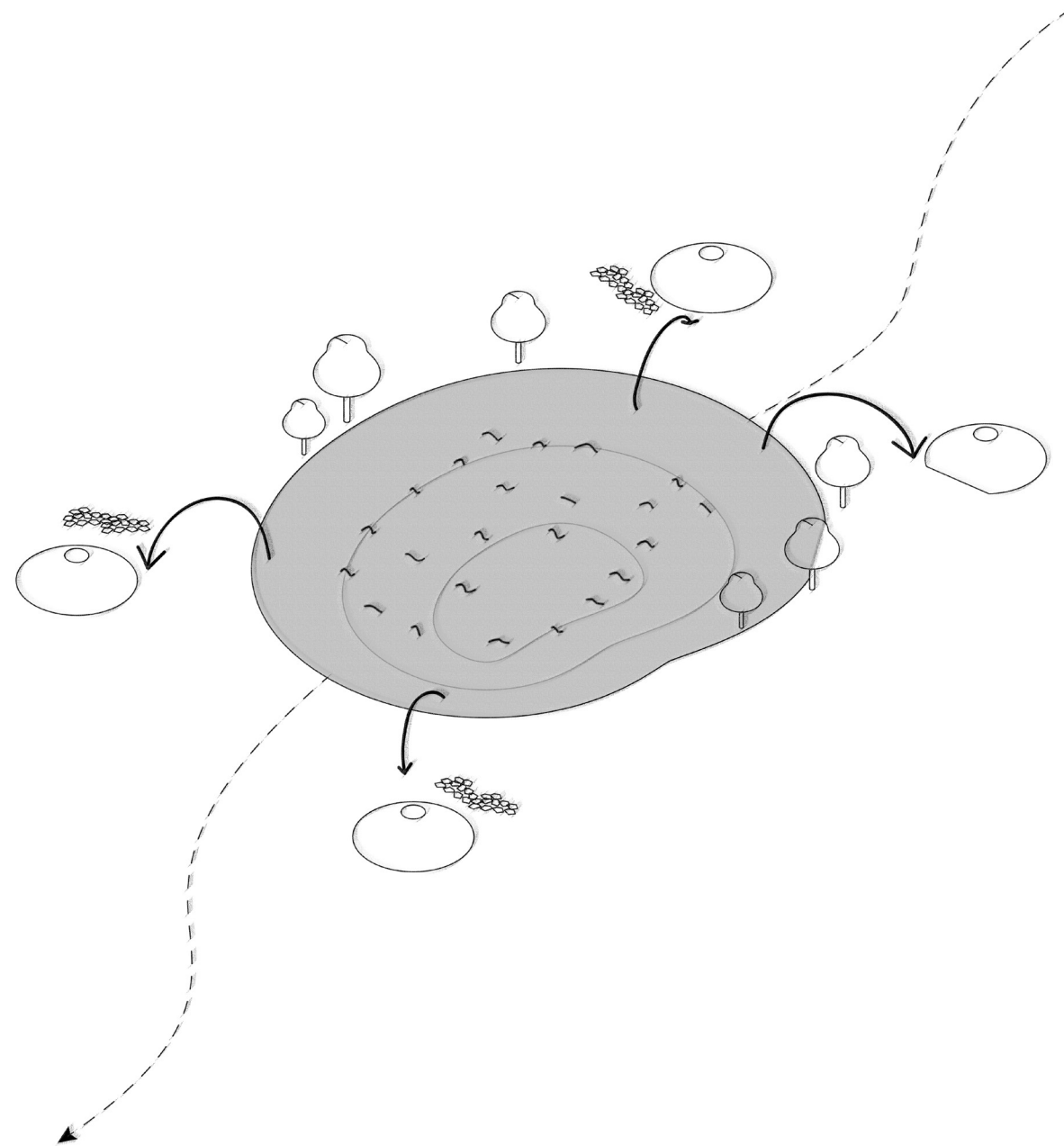


SHAPING CONDITIONS, WATER & GROWTH

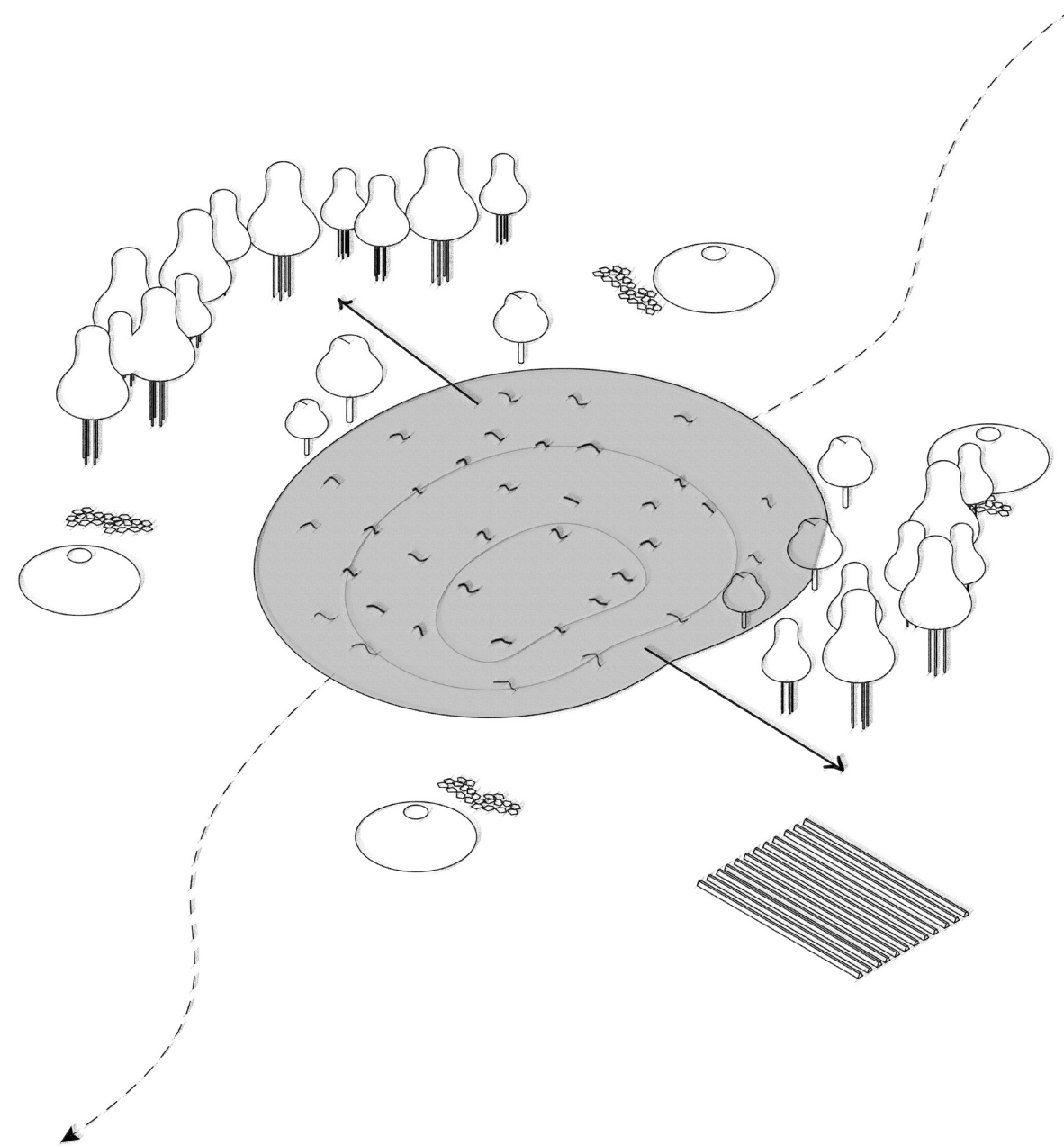


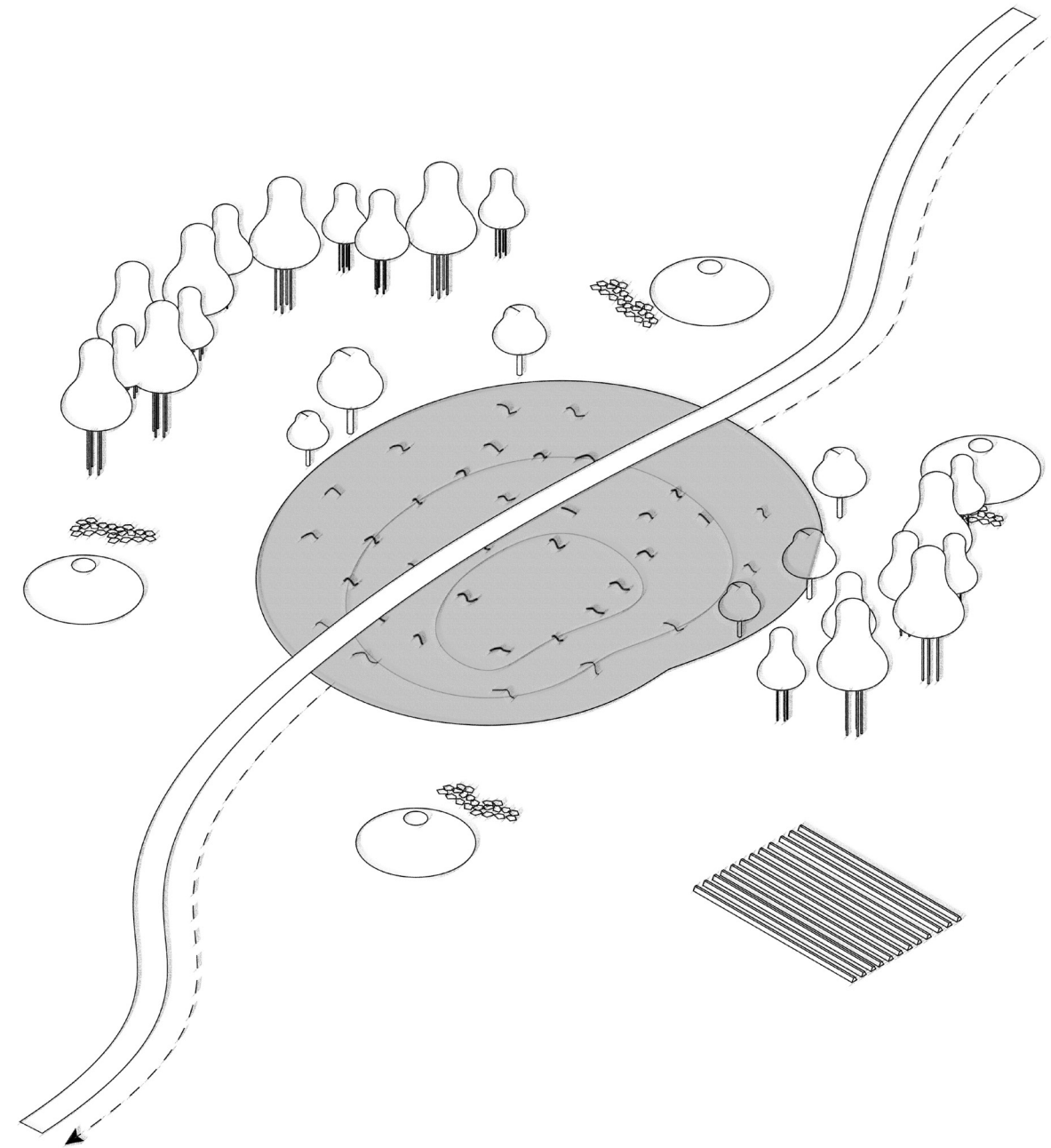




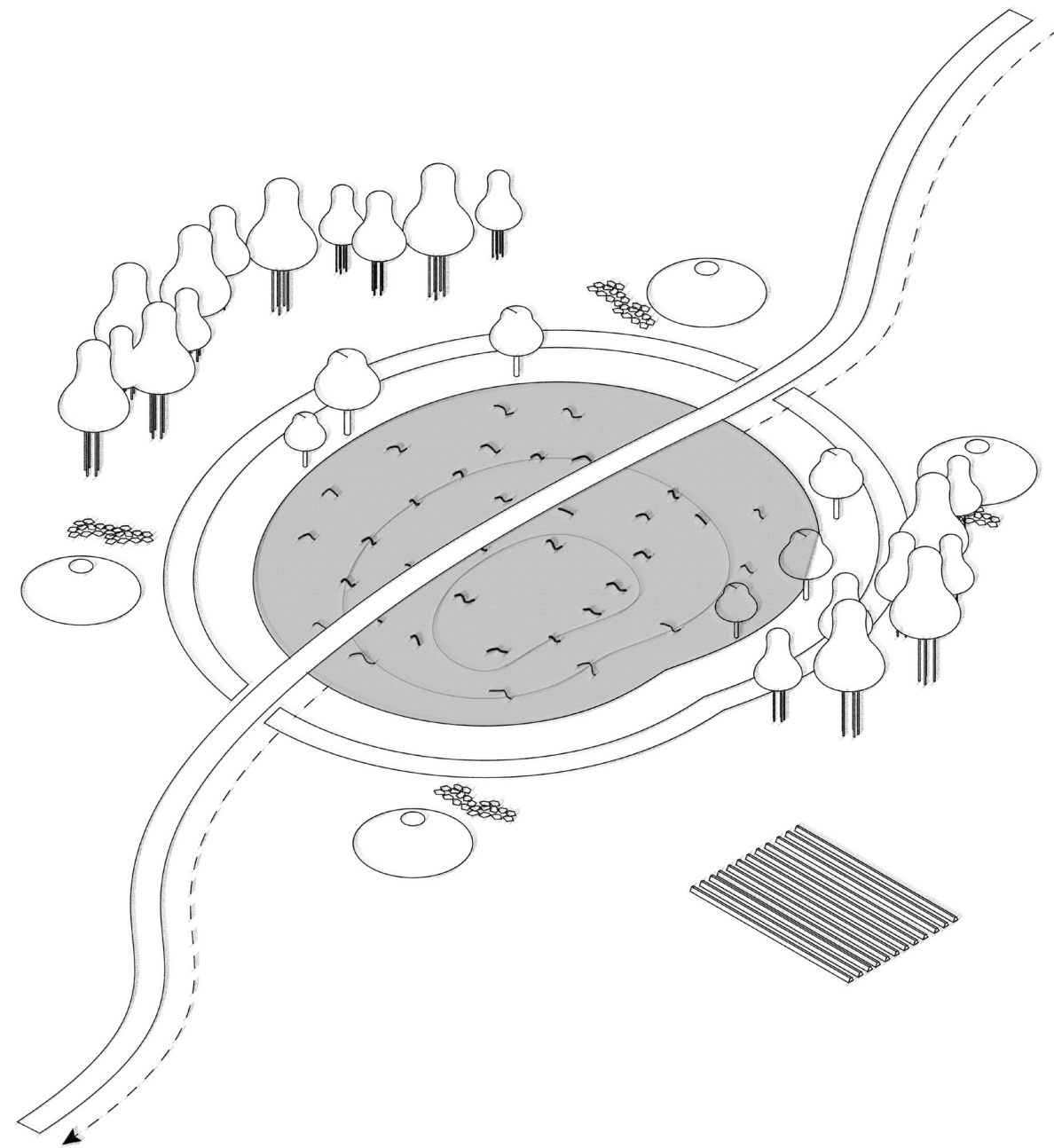


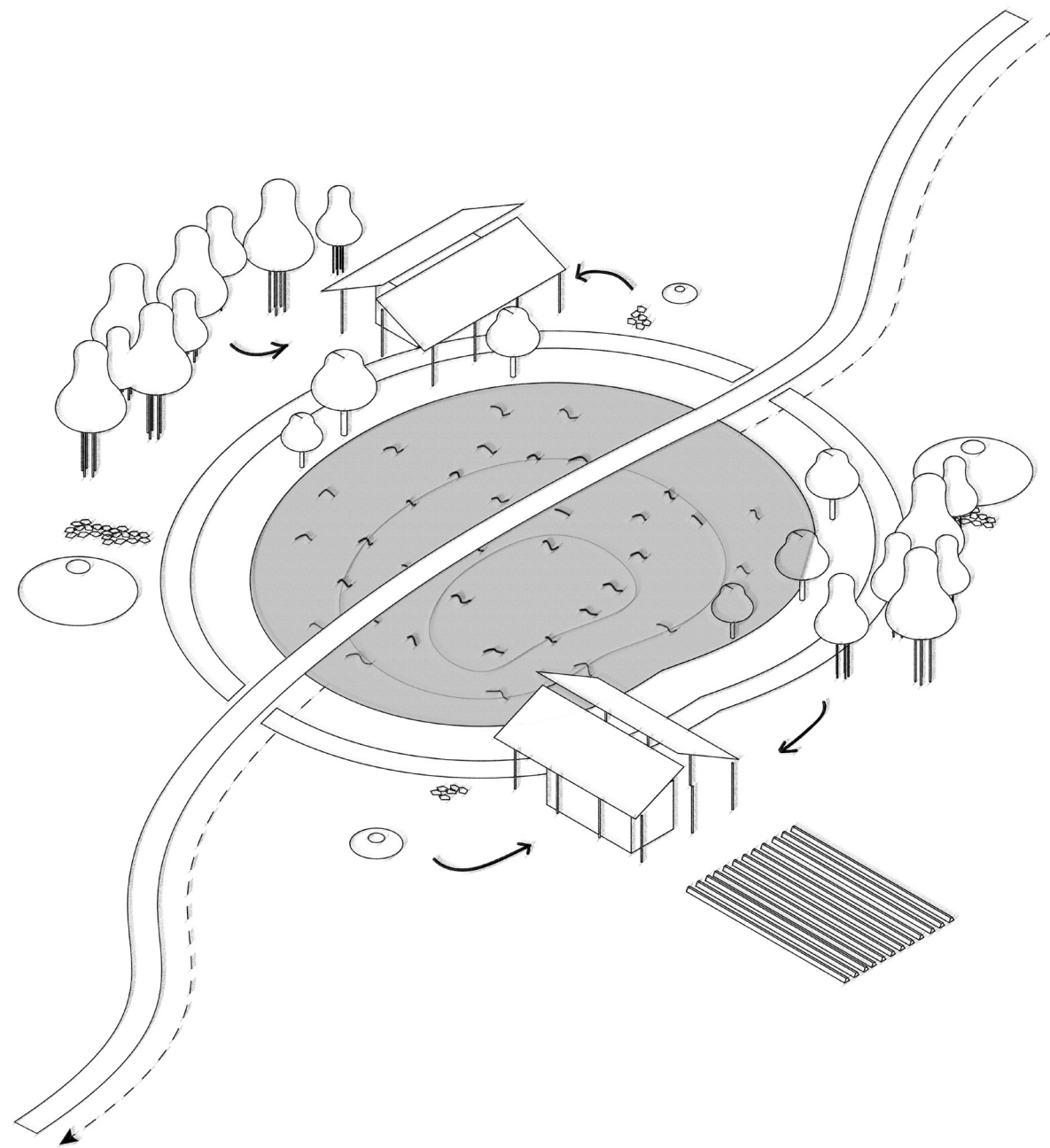




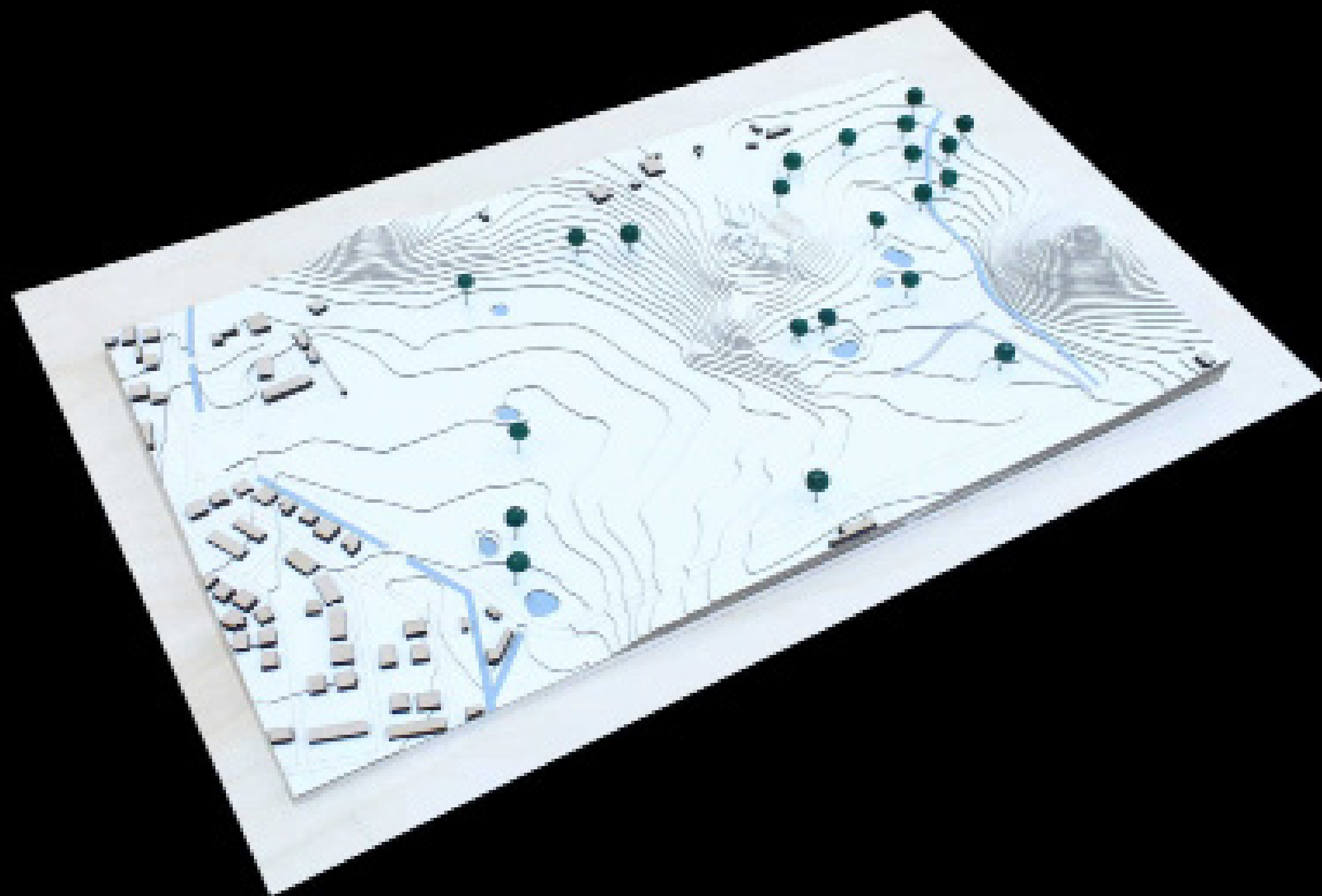


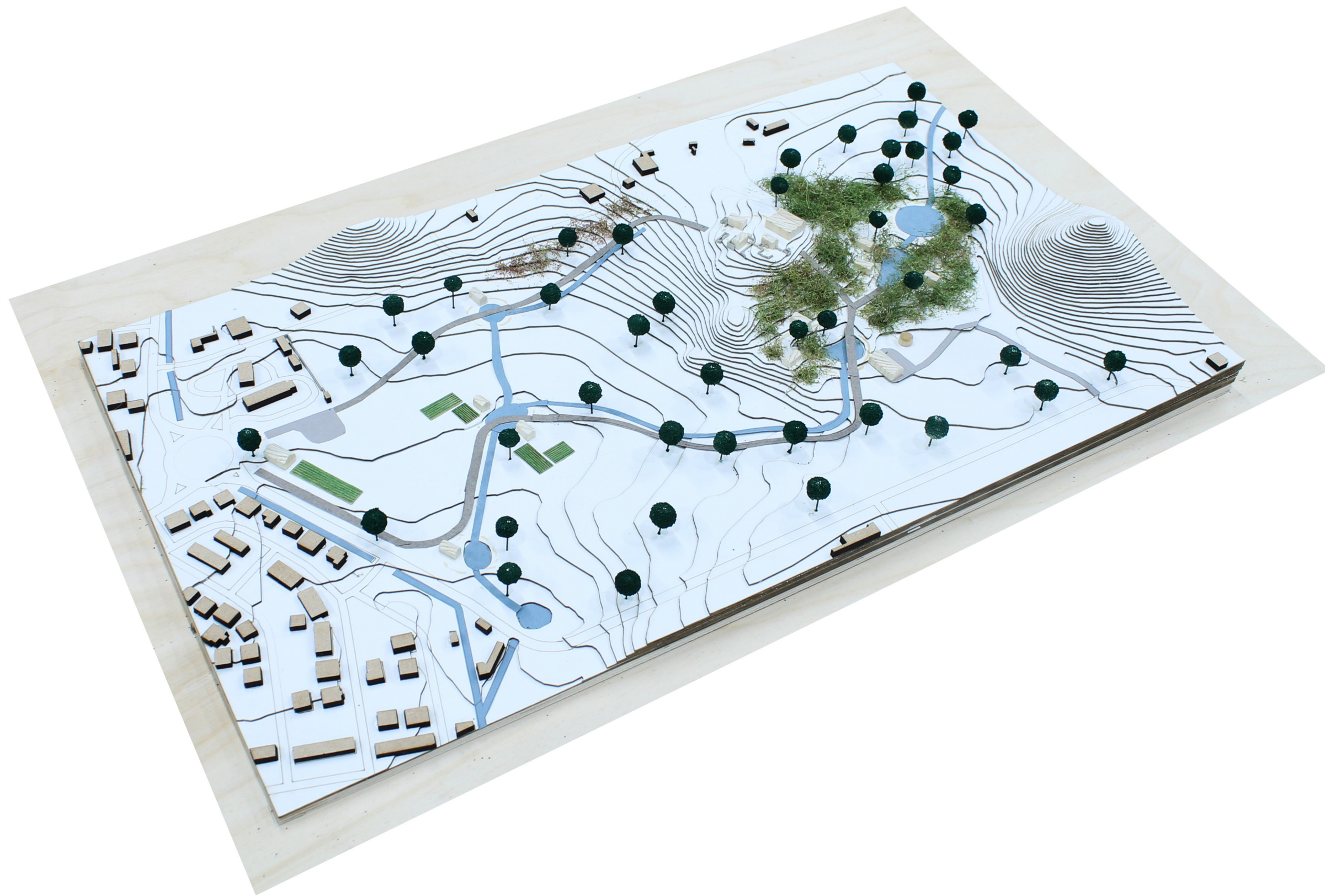






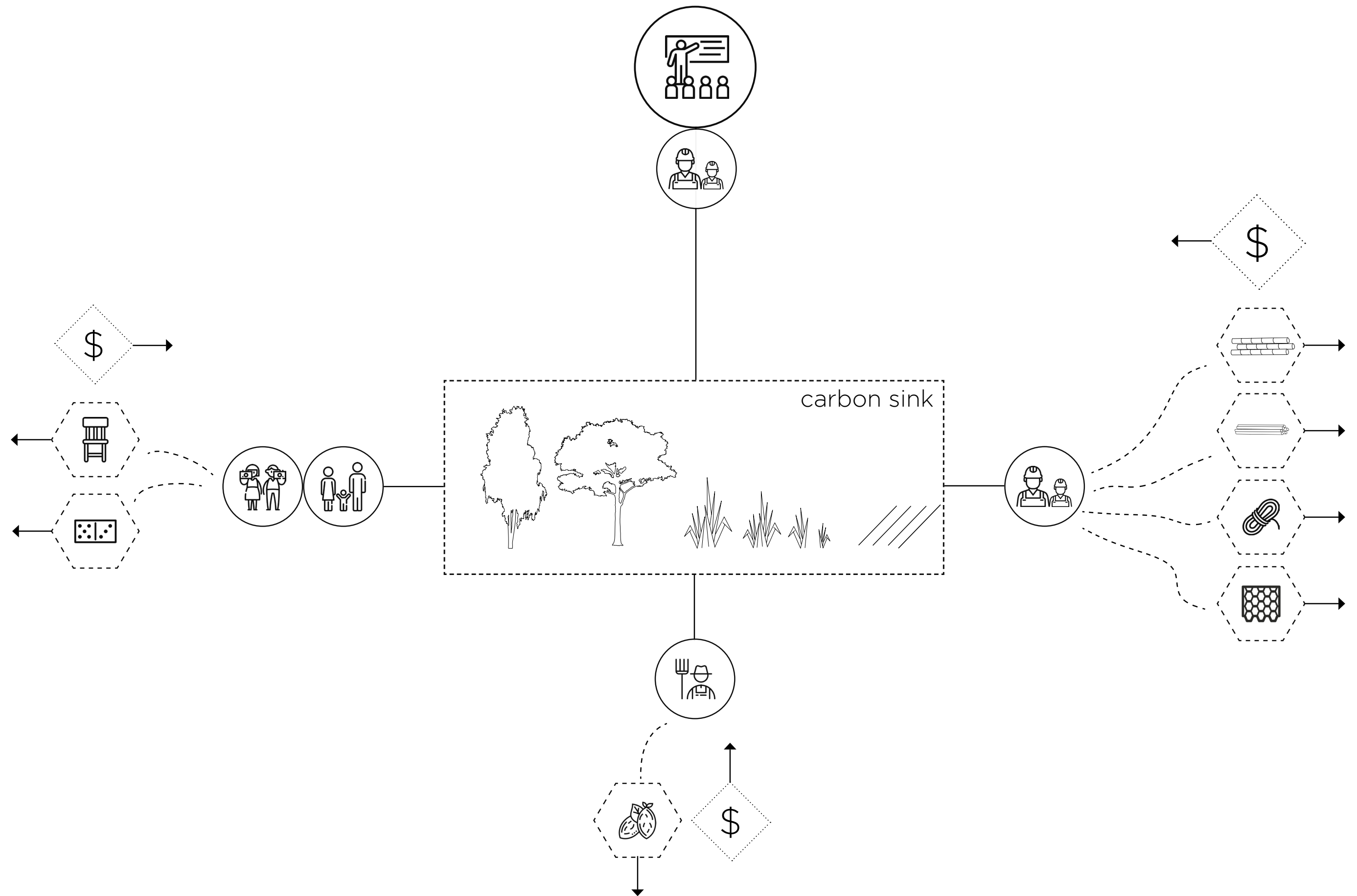




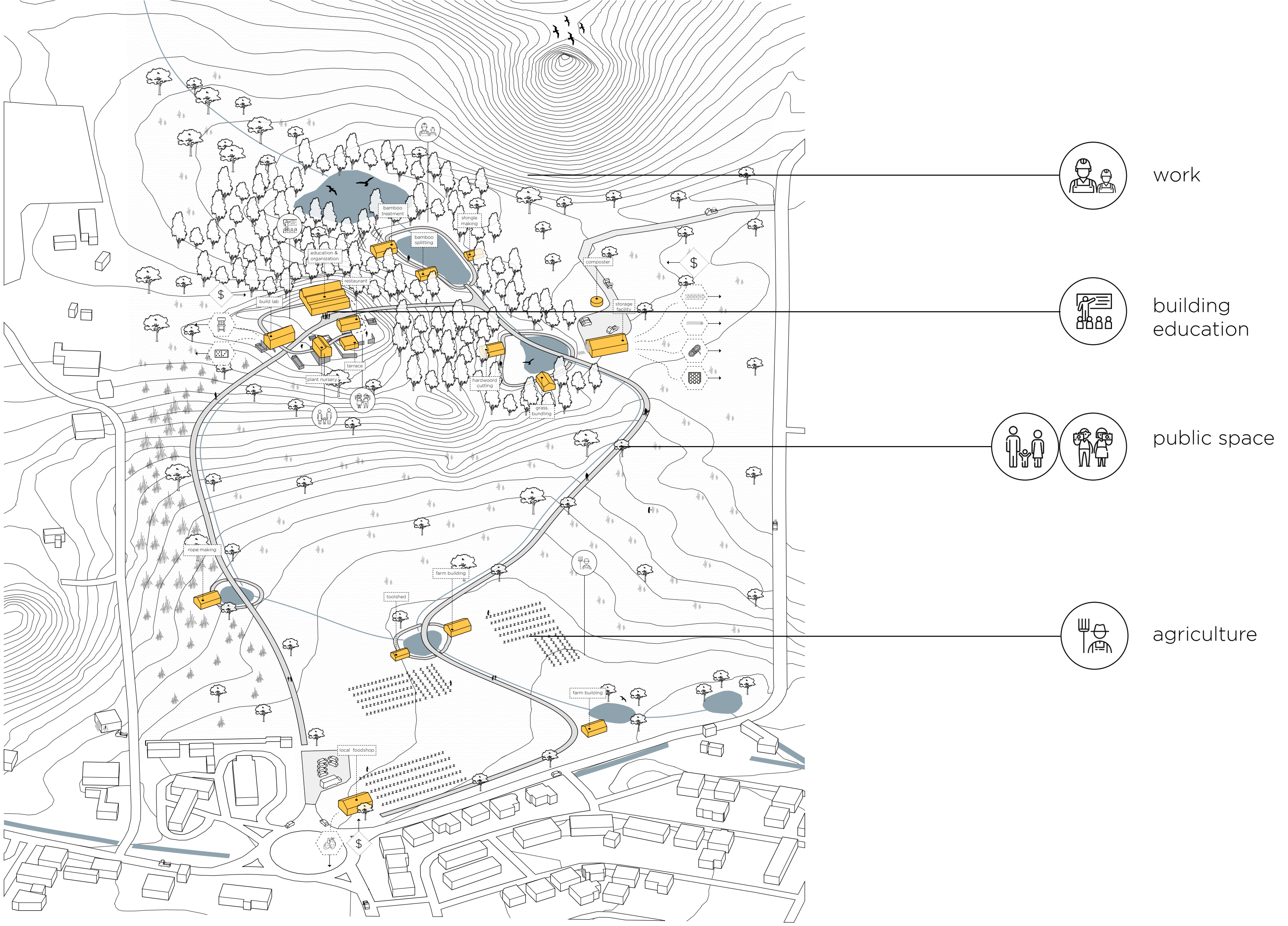




THE PARK AS A SOCIAL NETWORK AROUND CULTIVATING BUILDING MATERIALS, FARMING, AND BUILDING EDUCATION

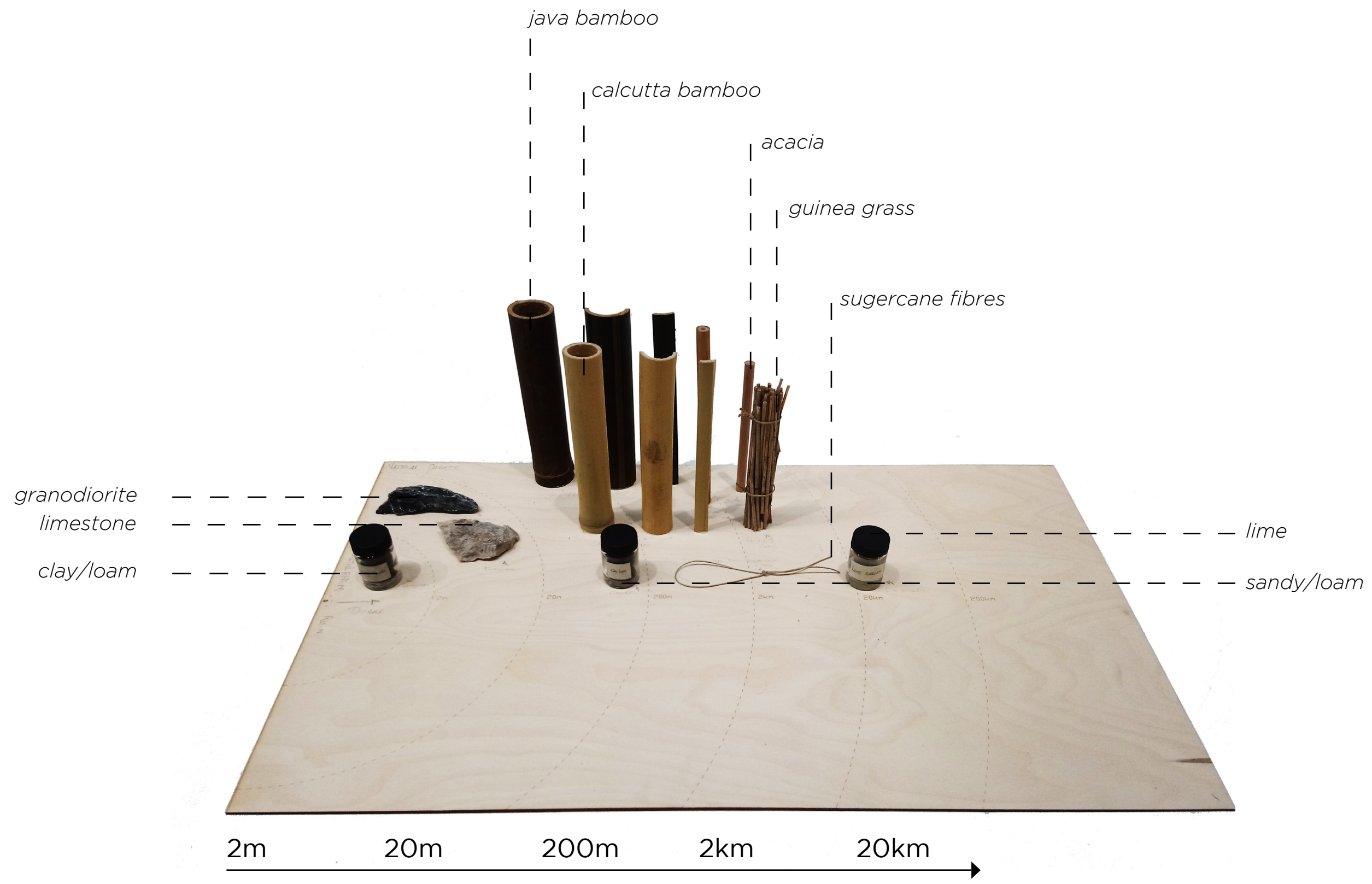






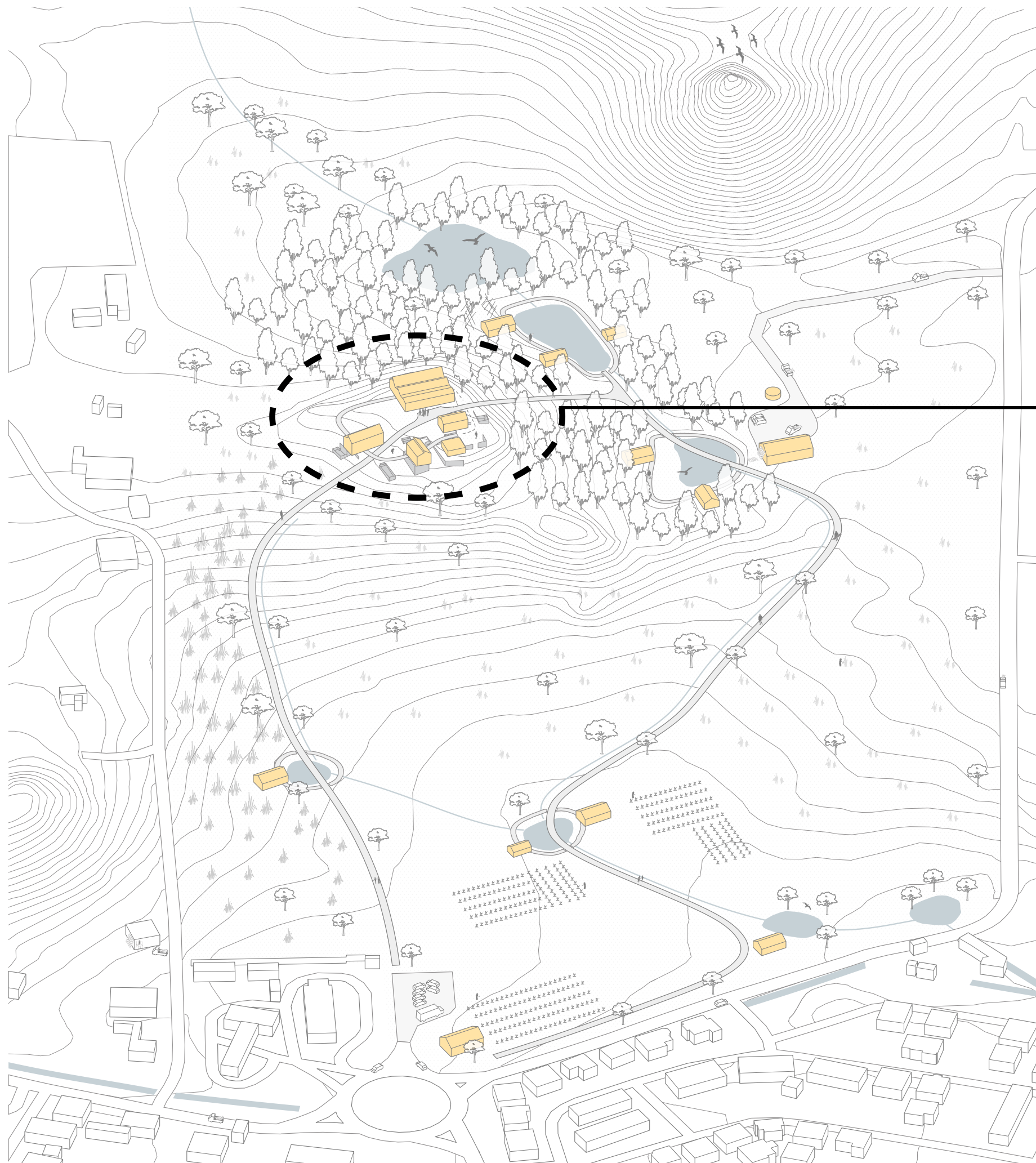
LOCAL MATERIALS AVAILABLE FROM THE PARK



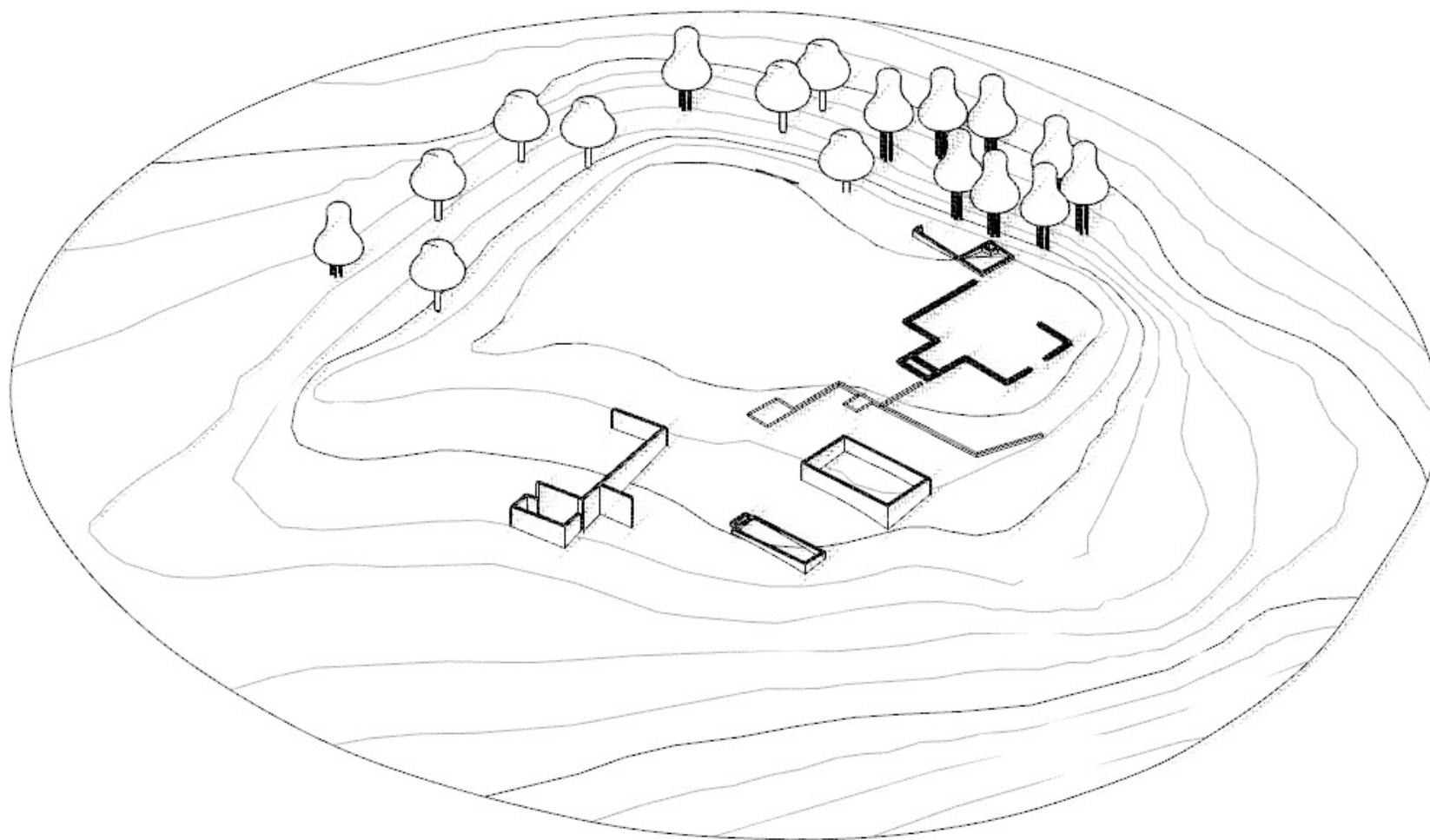


## CHAPTER VI - BETHLEHEMS ARCHITECTURE

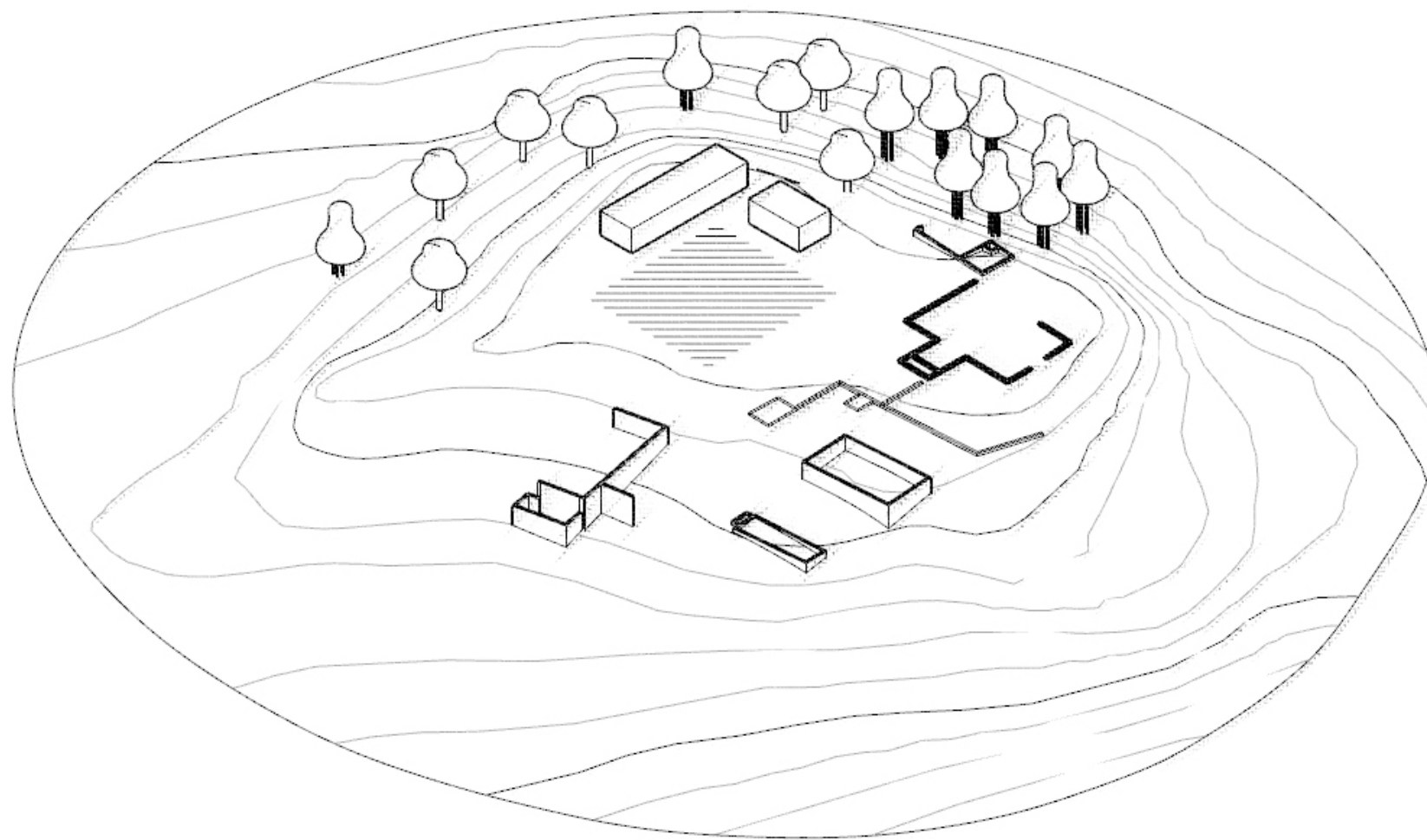


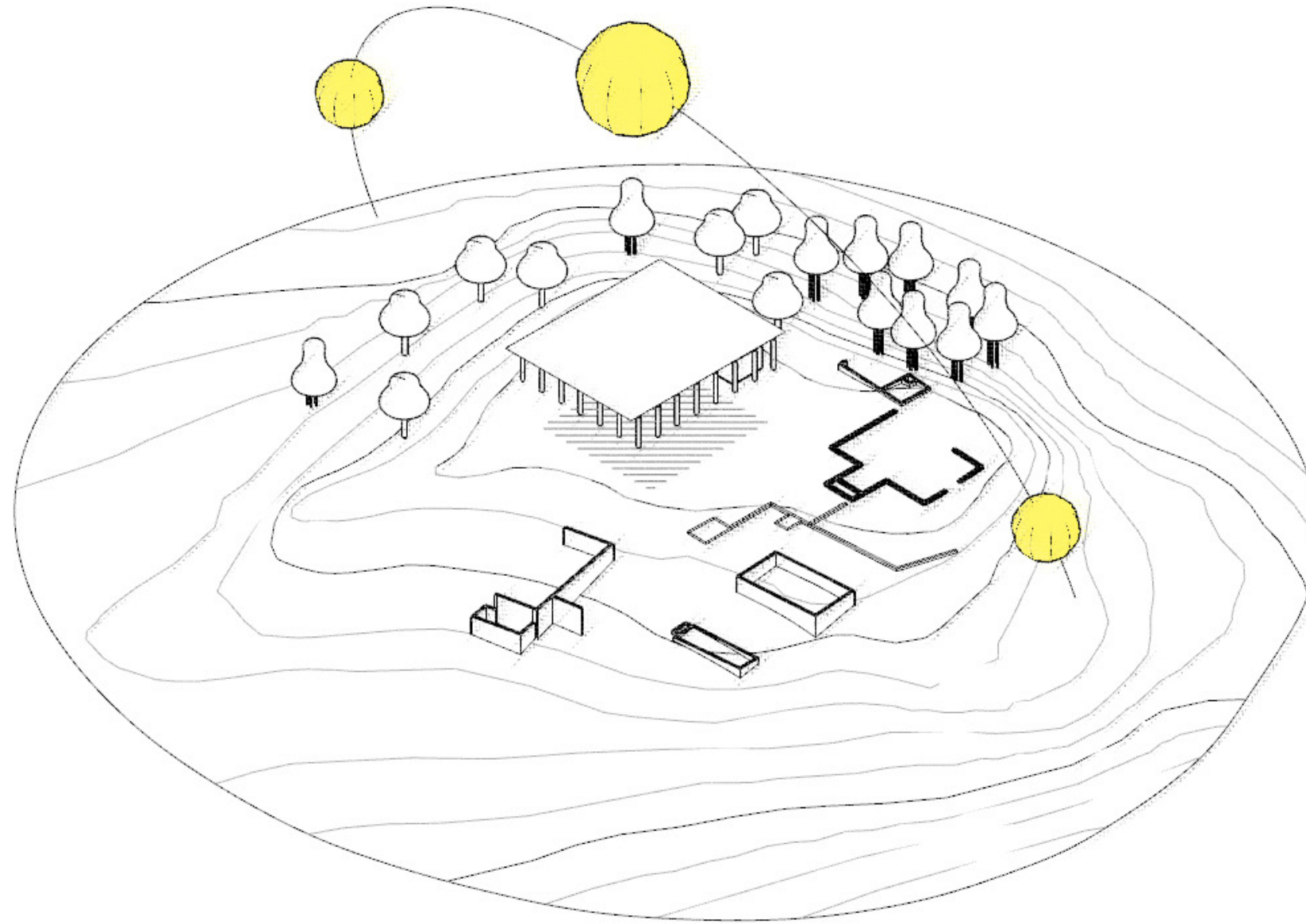


architectural focus

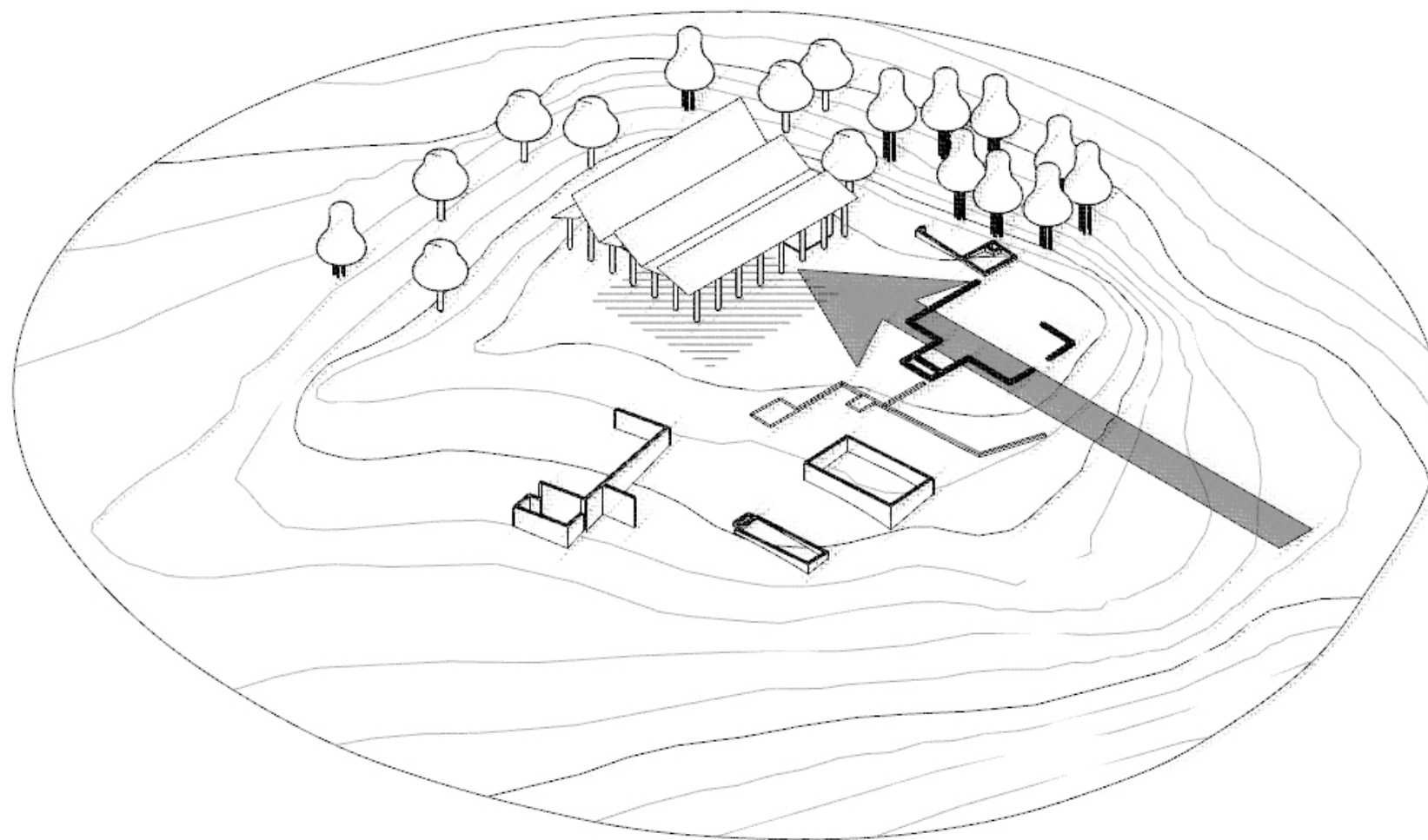


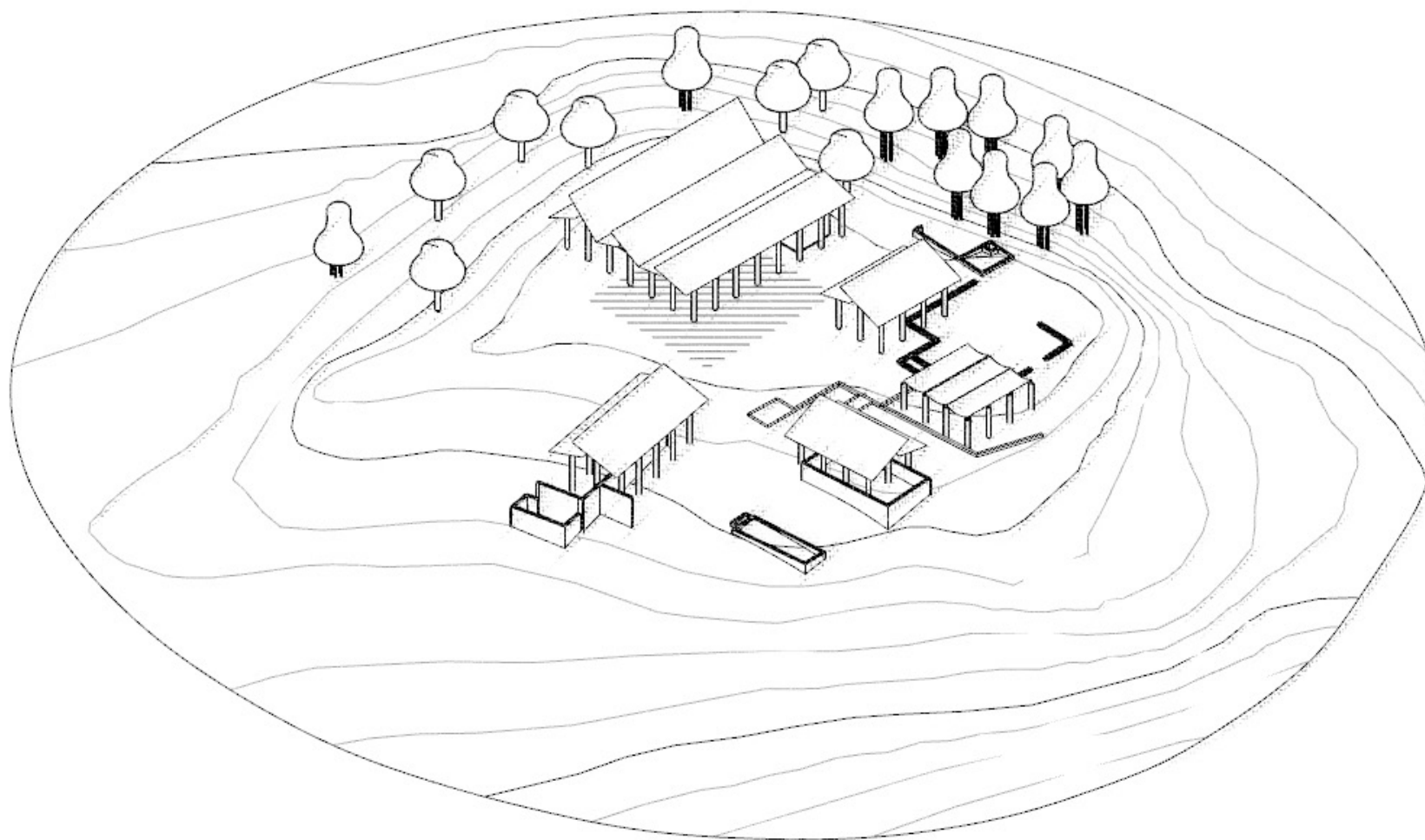


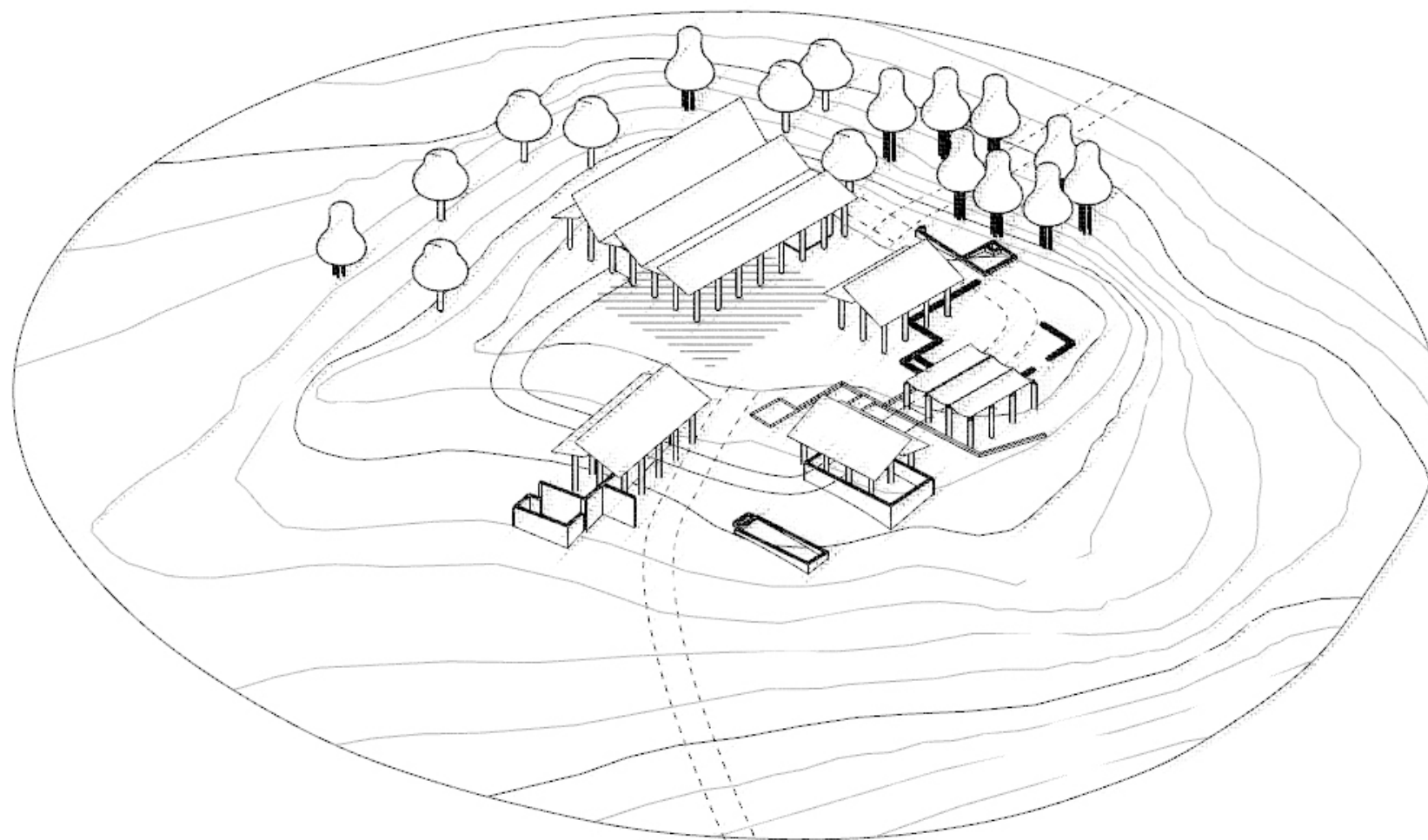




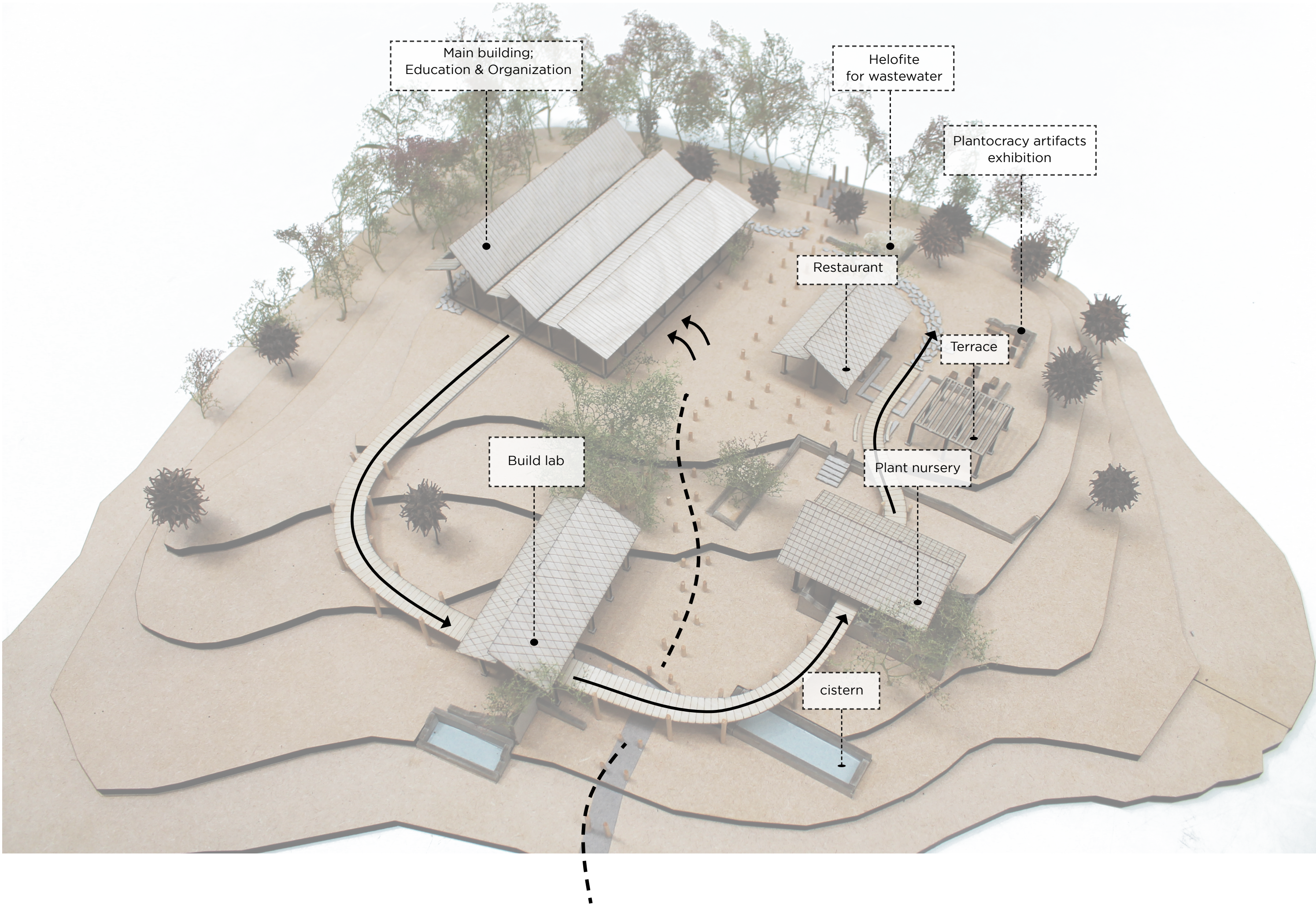












Main building;  
Education & Organization

Helofite  
for wastewater

Plantocracy artifacts  
exhibition

Restaurant

Terrace

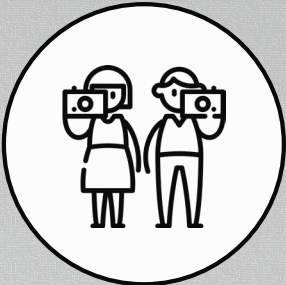
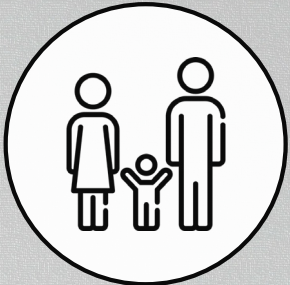
Plant nursery

Build lab

cistern

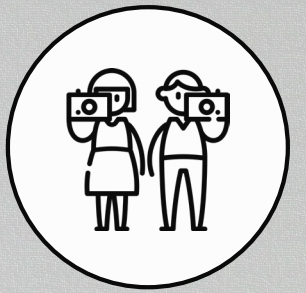
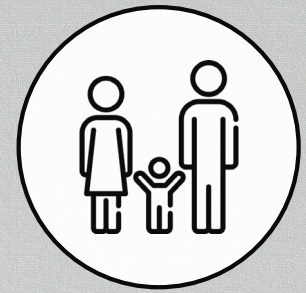


ENTRANCE



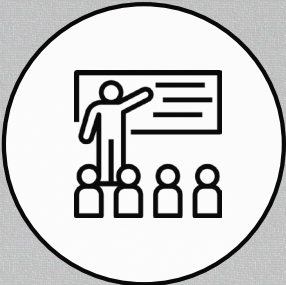


ENTRANCE



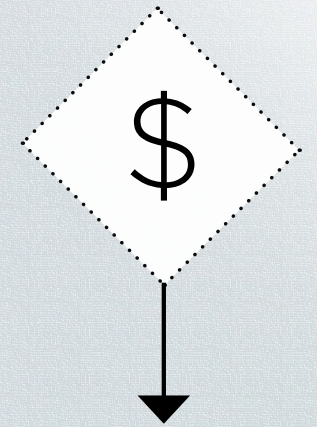
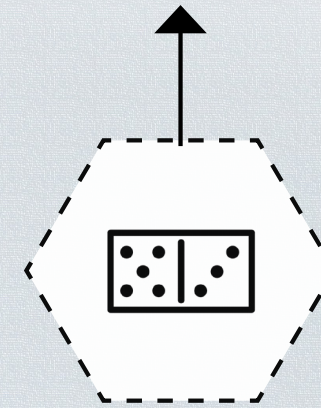
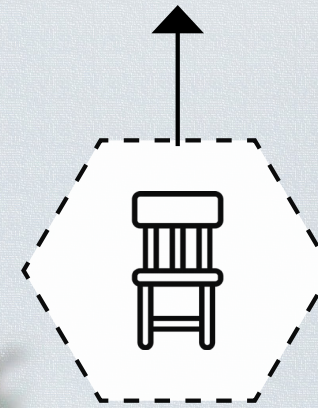
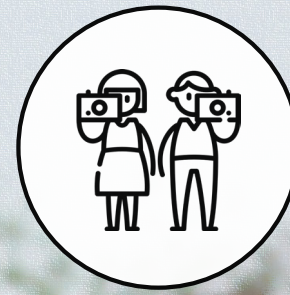
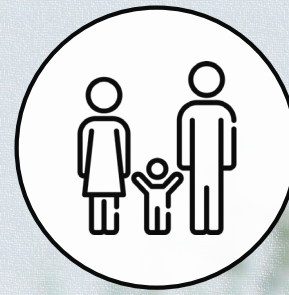


MAIN BUILDING



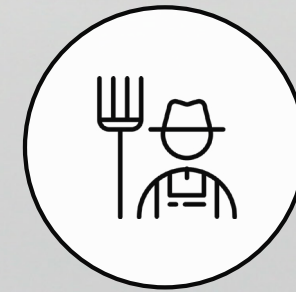
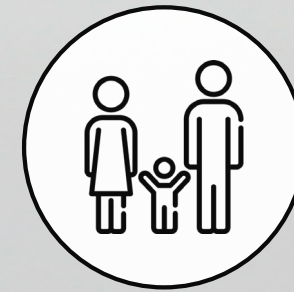


BUILD LAB



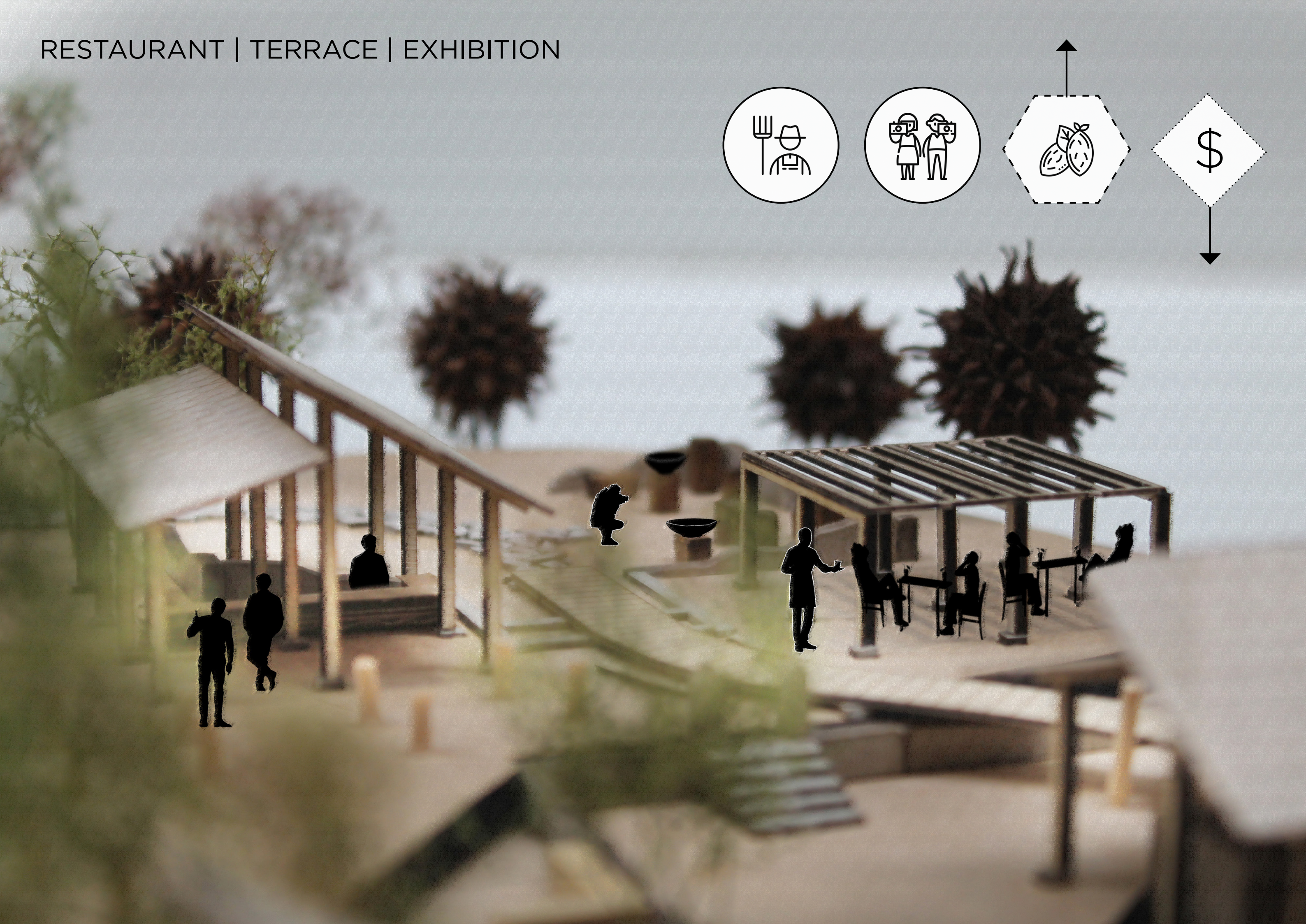
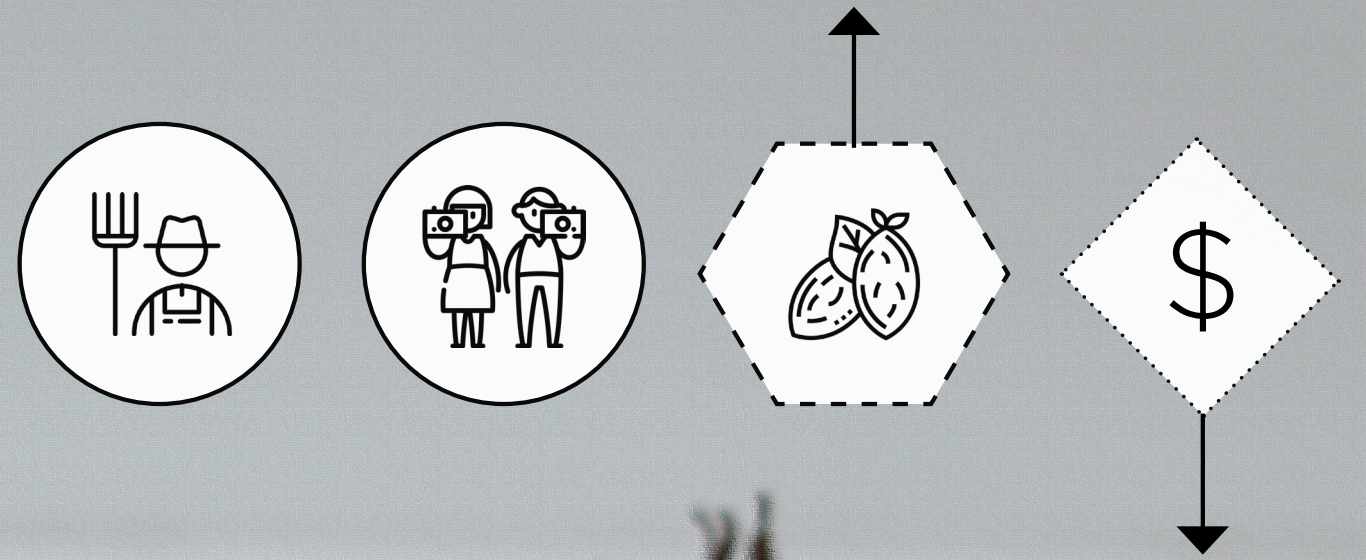


# PLANT NURSERY





RESTAURANT | TERRACE | EXHIBITION

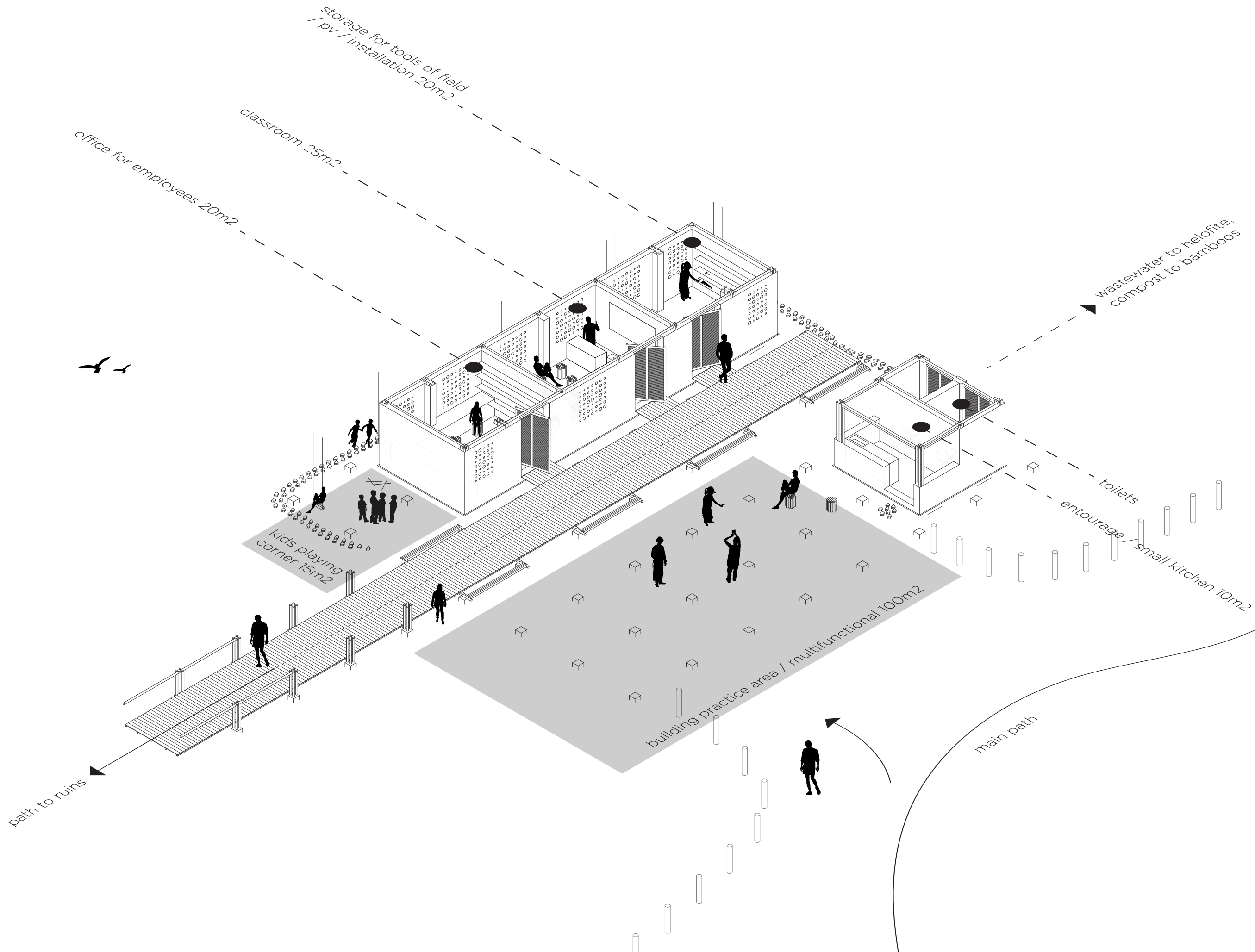




building focus





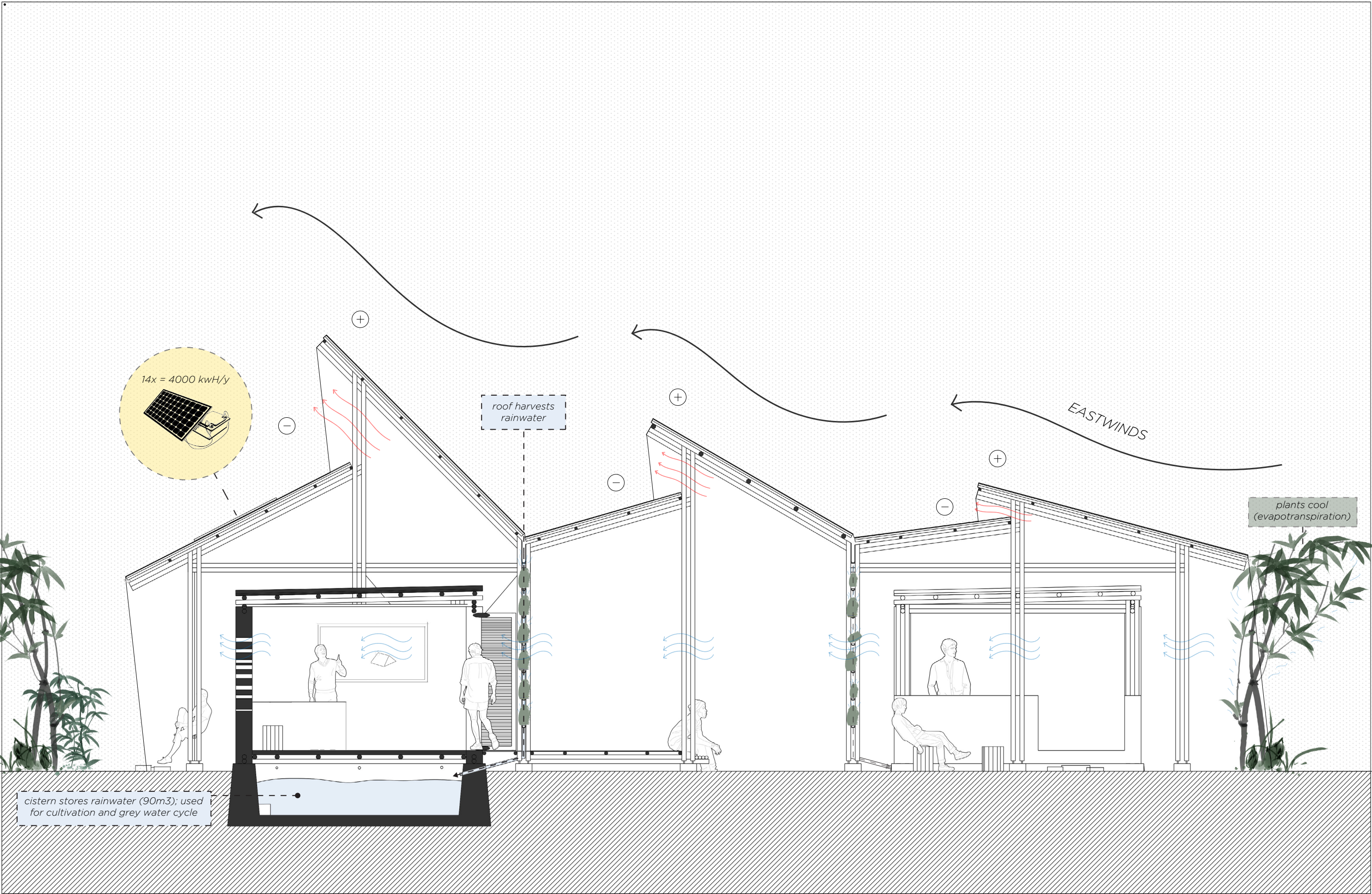


## CHAPTER VII - BETHLEHEMS BUILDING TECHNOLOGY

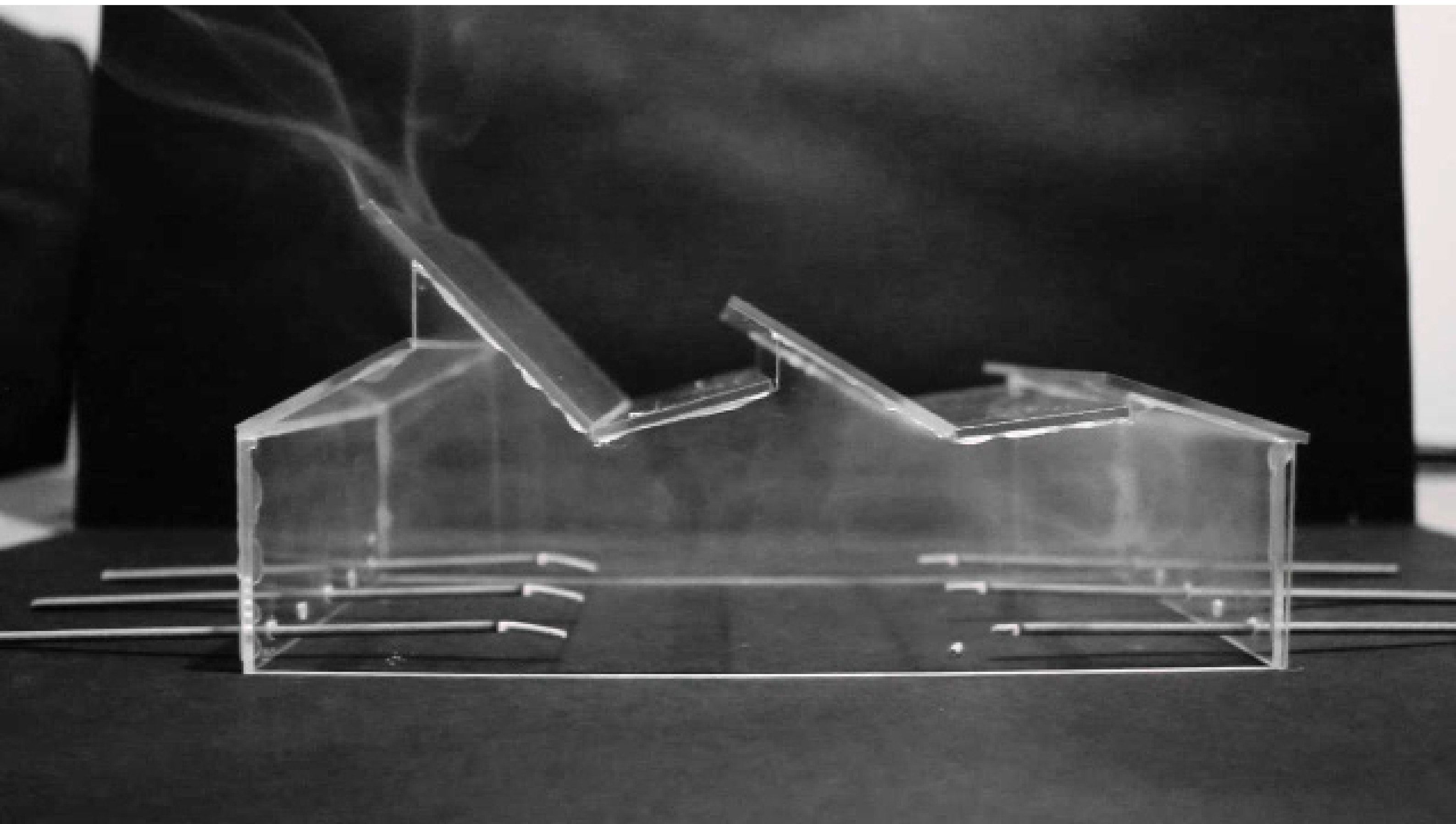


CLIMATE RESPONSIVE ARCHITECTURE

CLIMATE ADAPTION





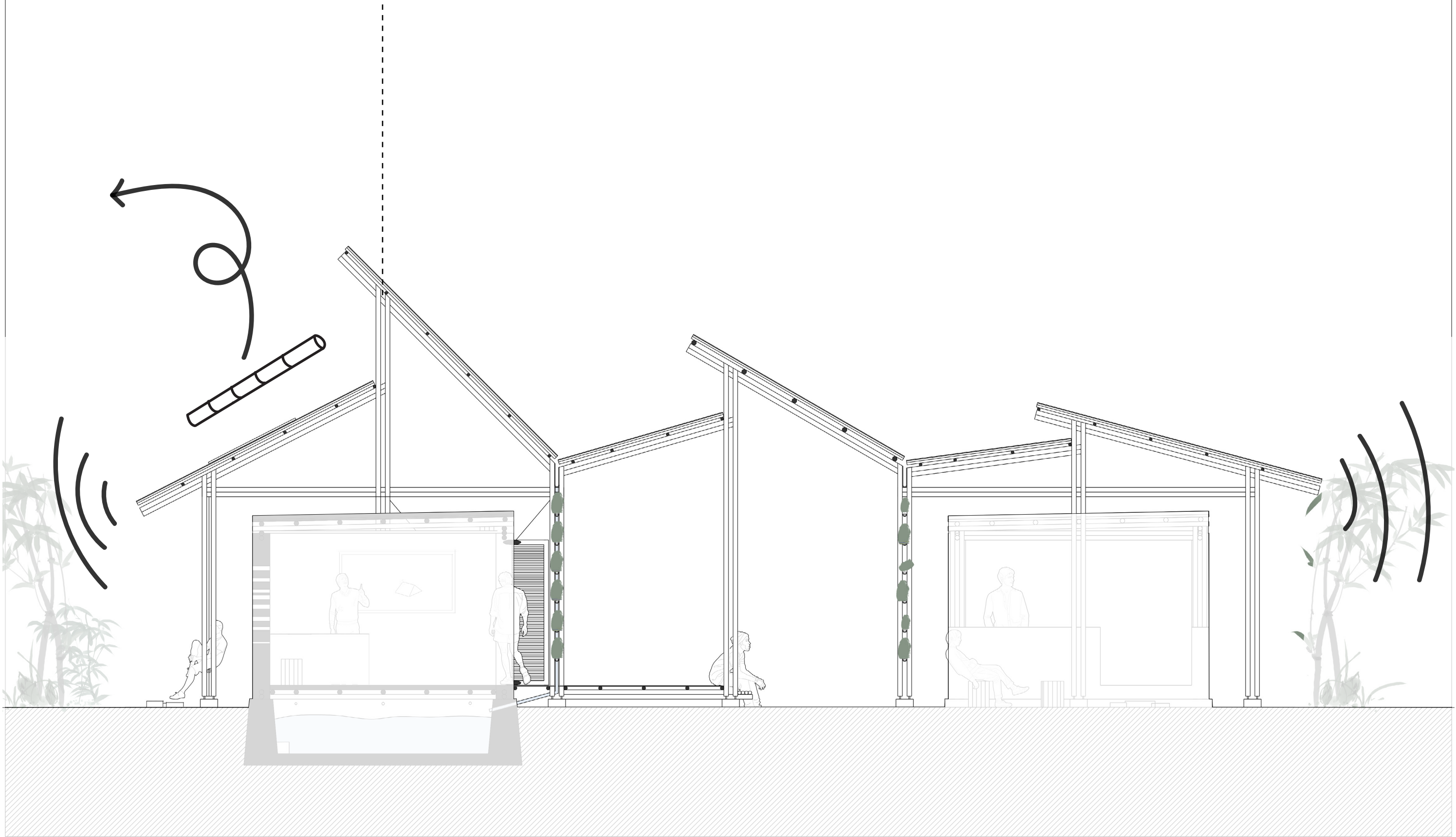


*Hurricane resistant | Earthquake resistant*



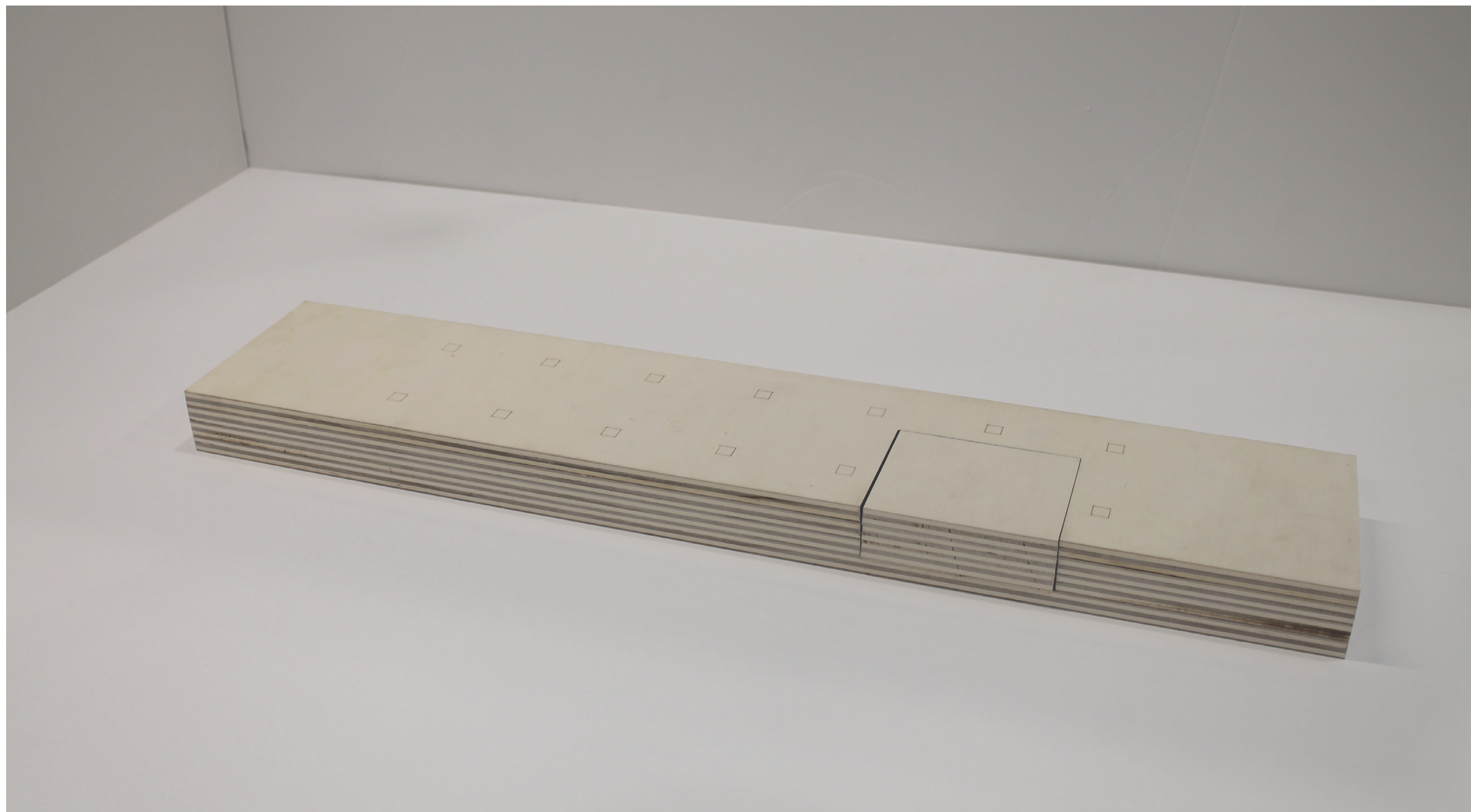


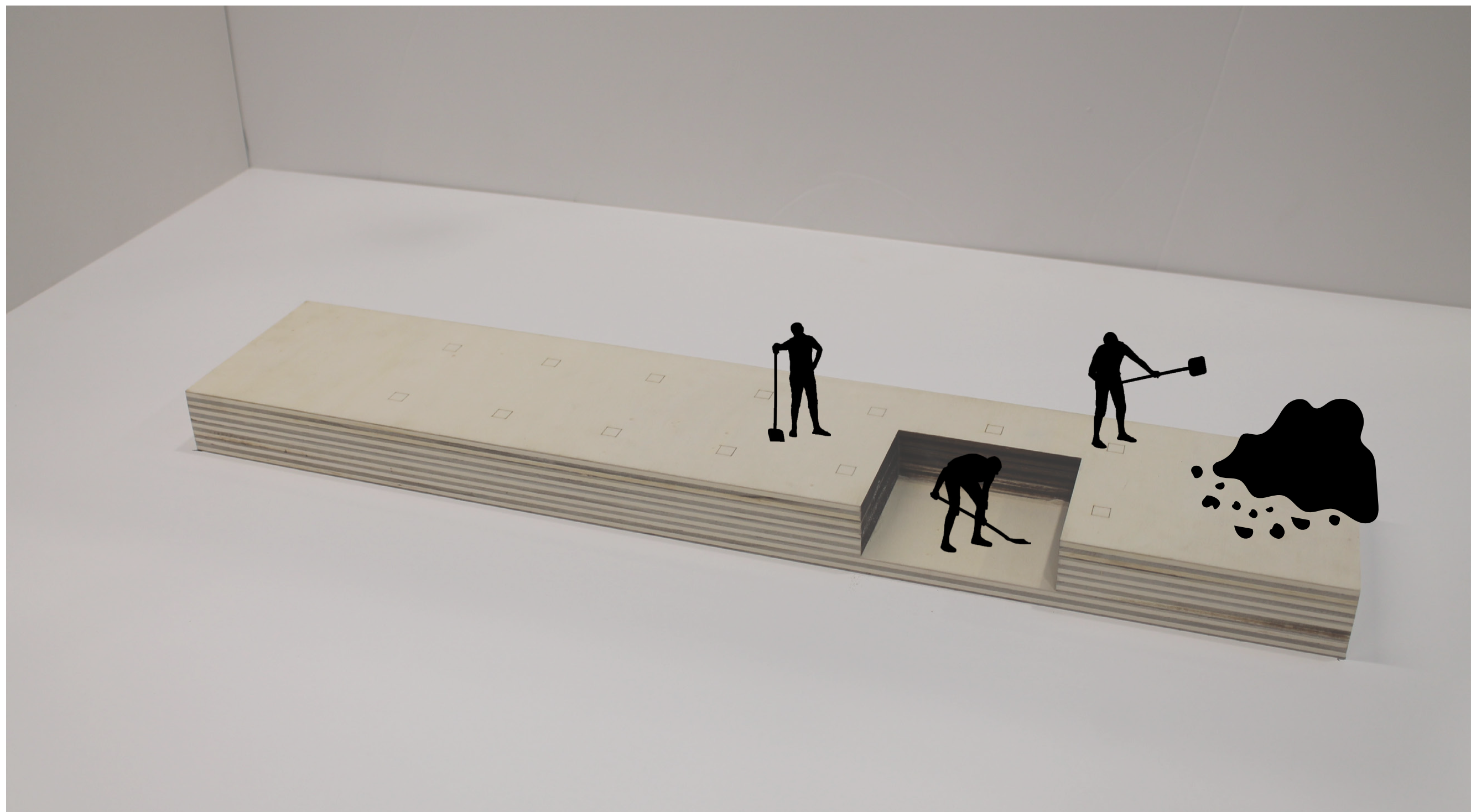
*Hurricane resilient | Earthquake resistant*



A COMMUNAL, LOW TECH WAY OF BUILDING  
WITH THE MATERIALS AVAILABLE FROM THE PARK

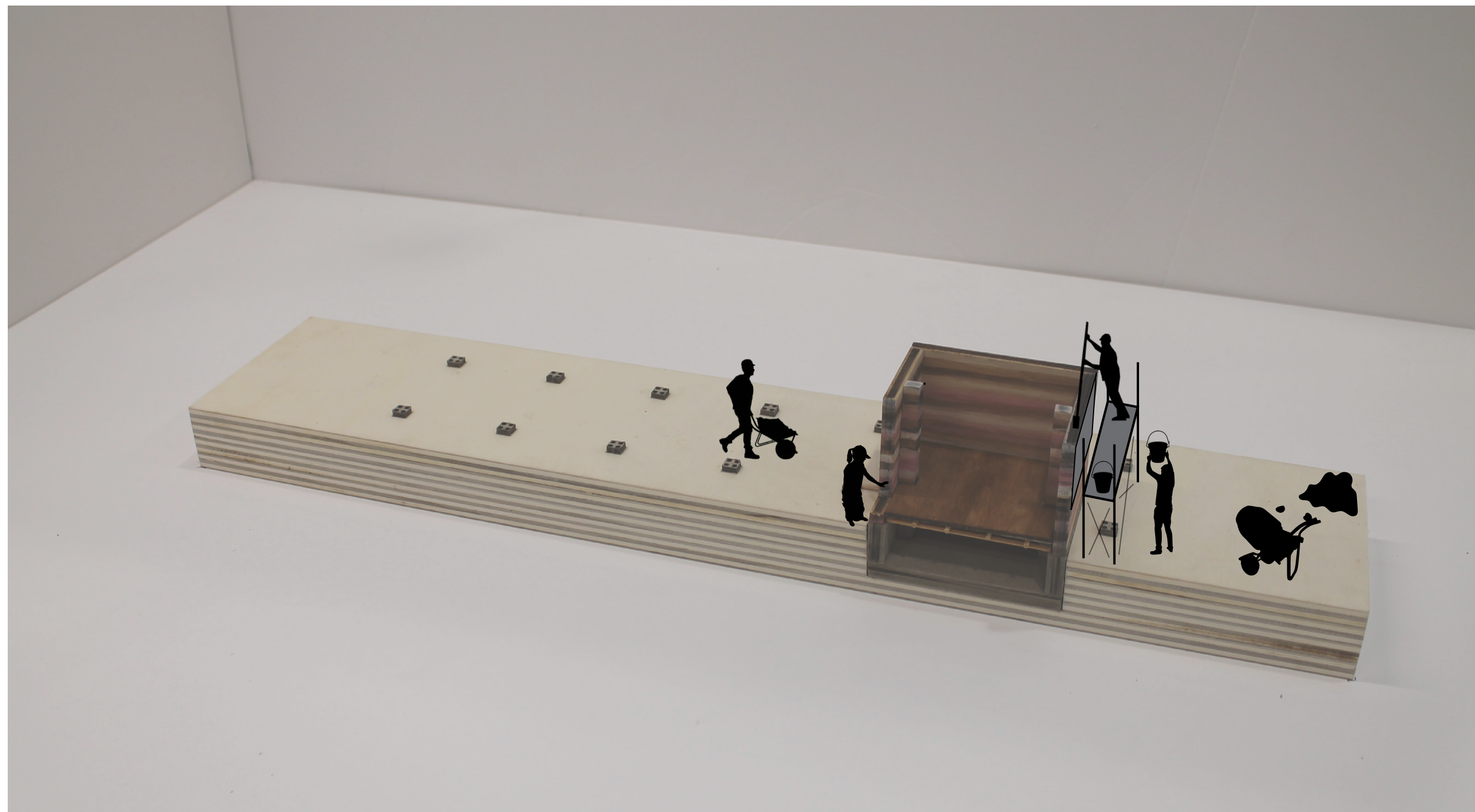




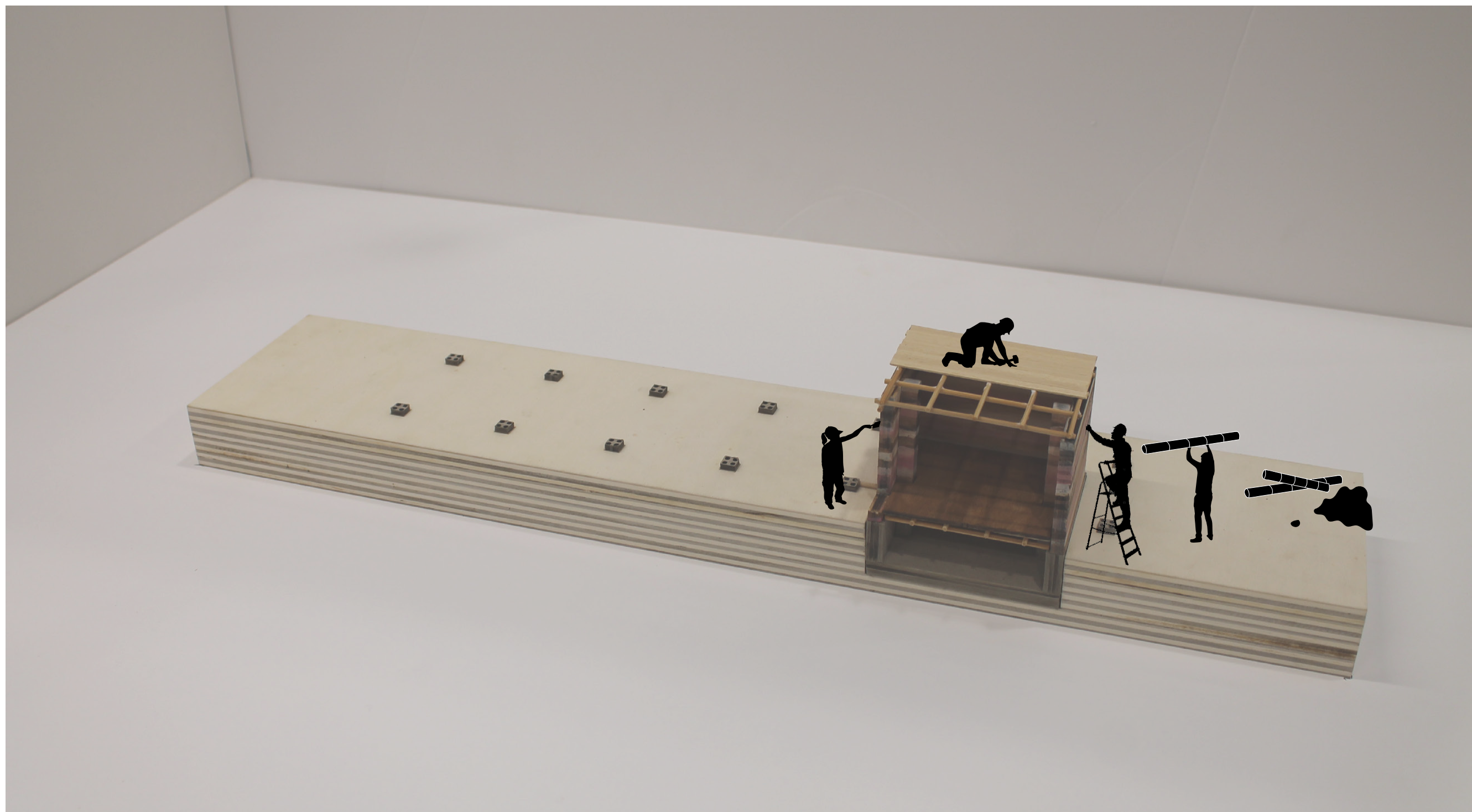


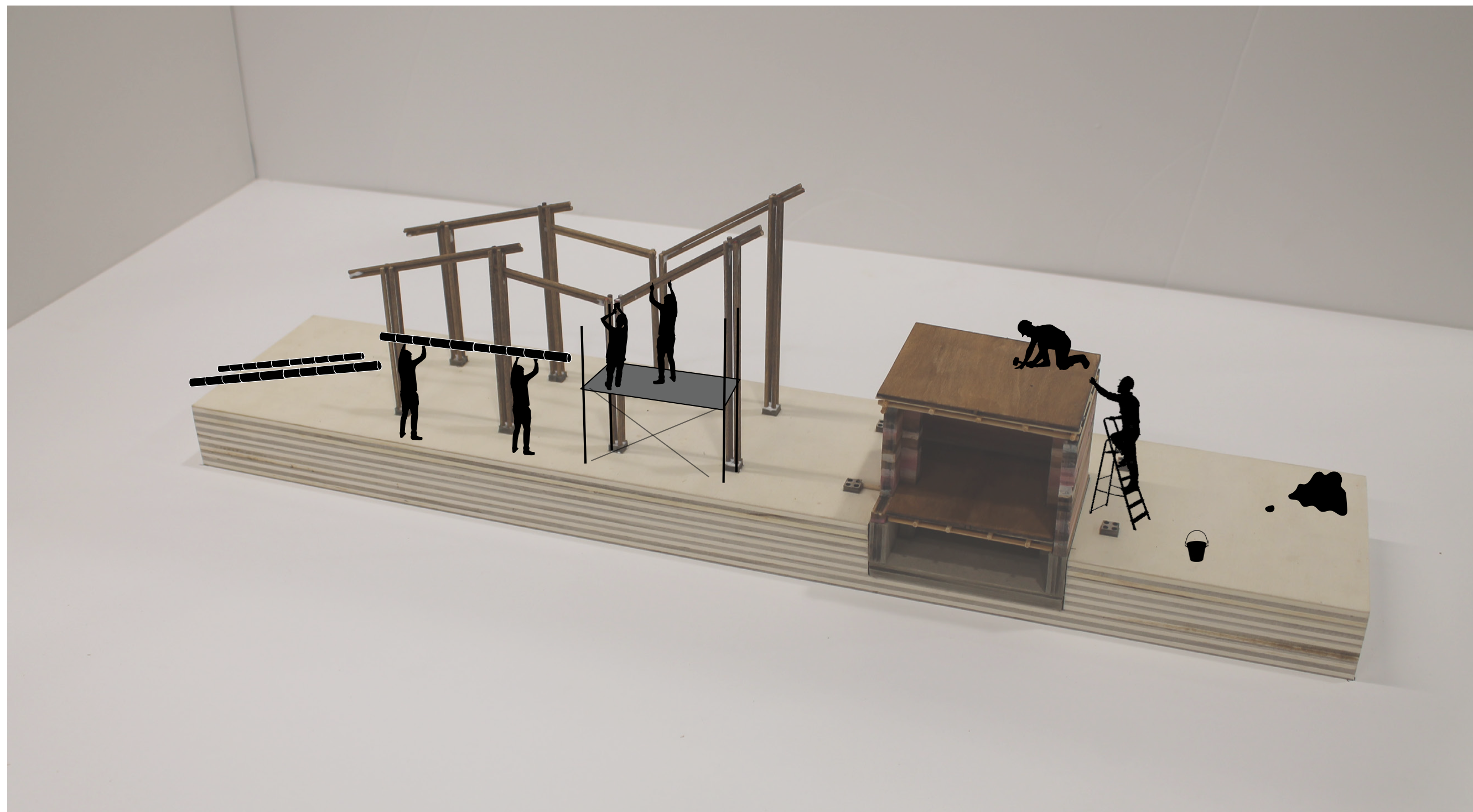








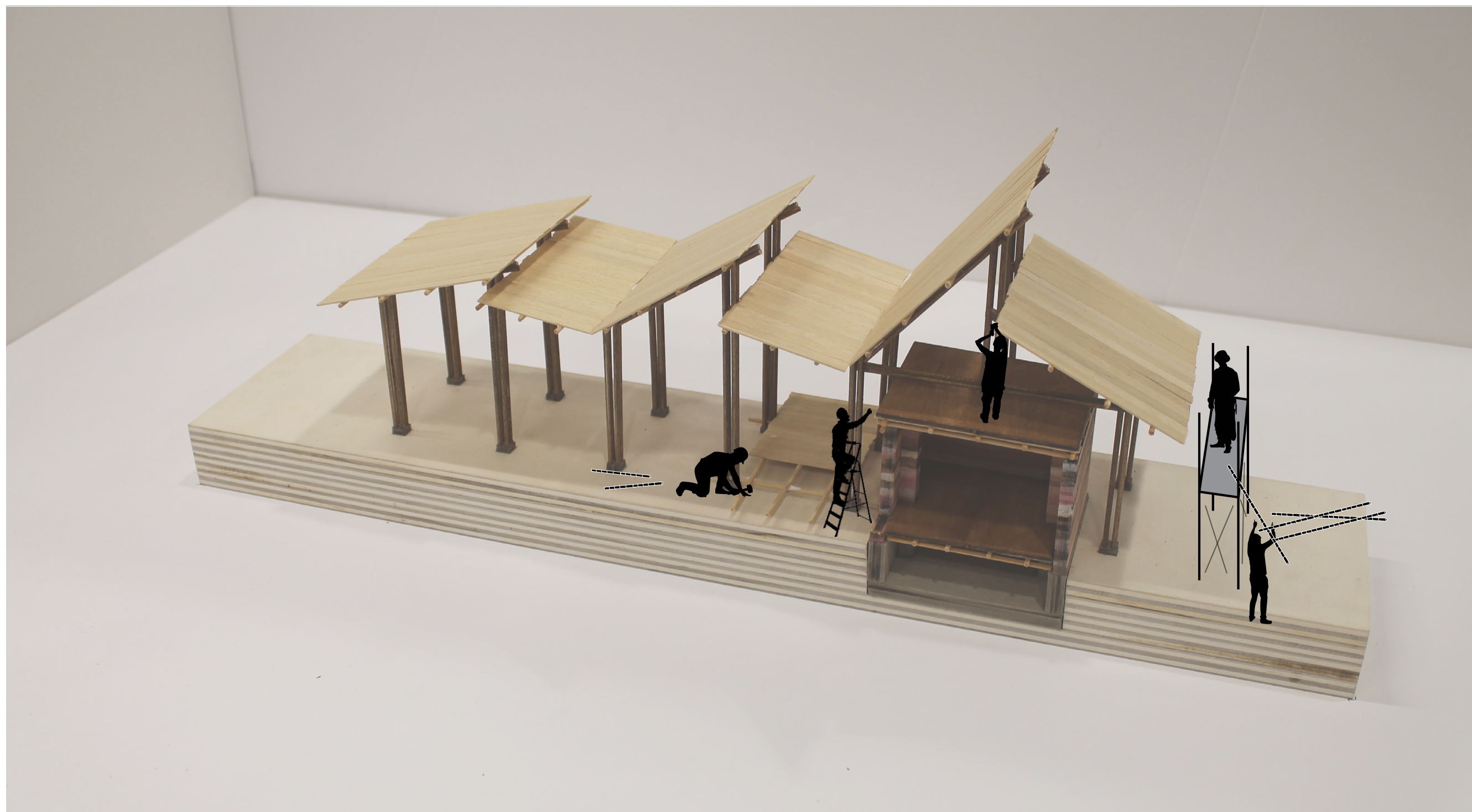




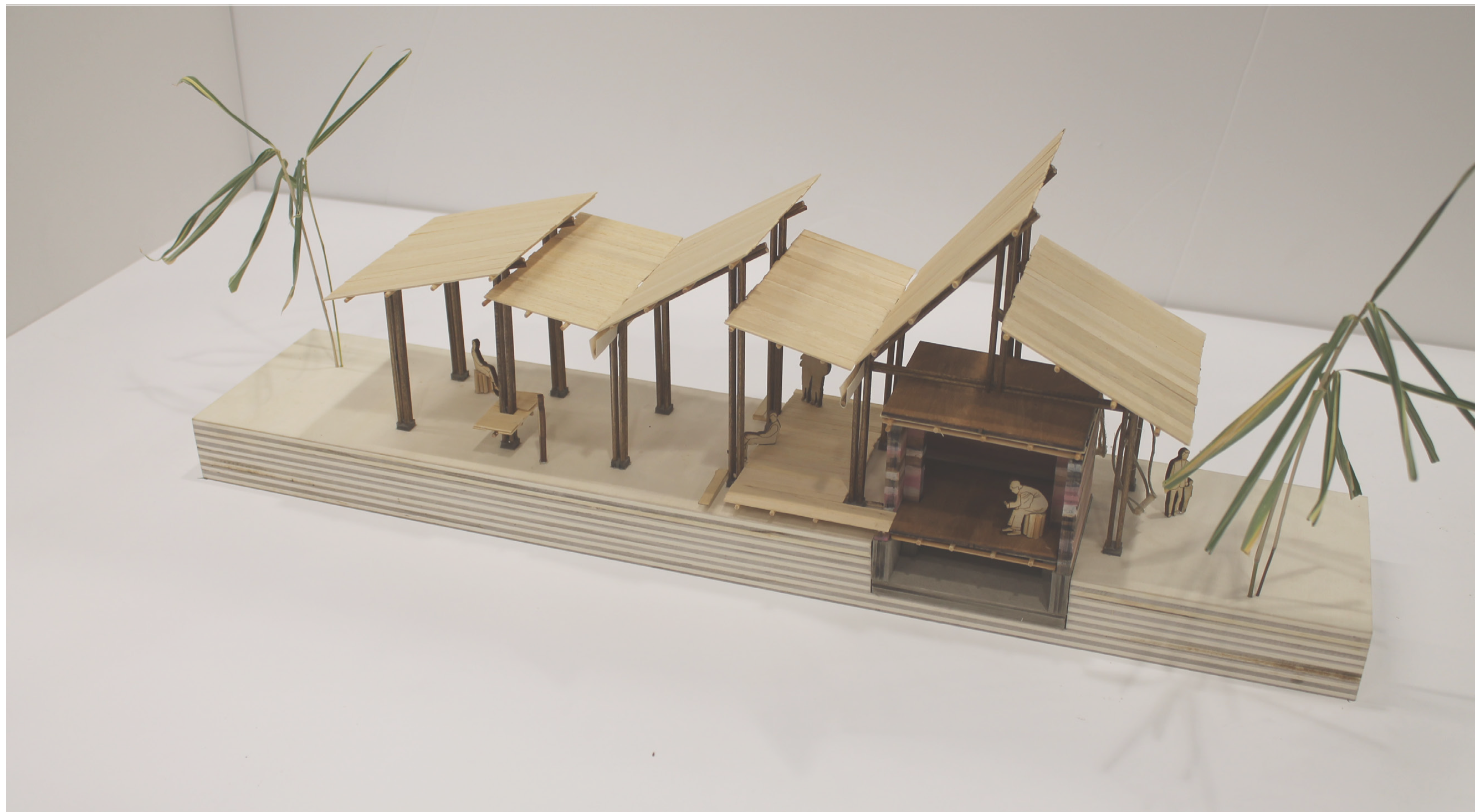






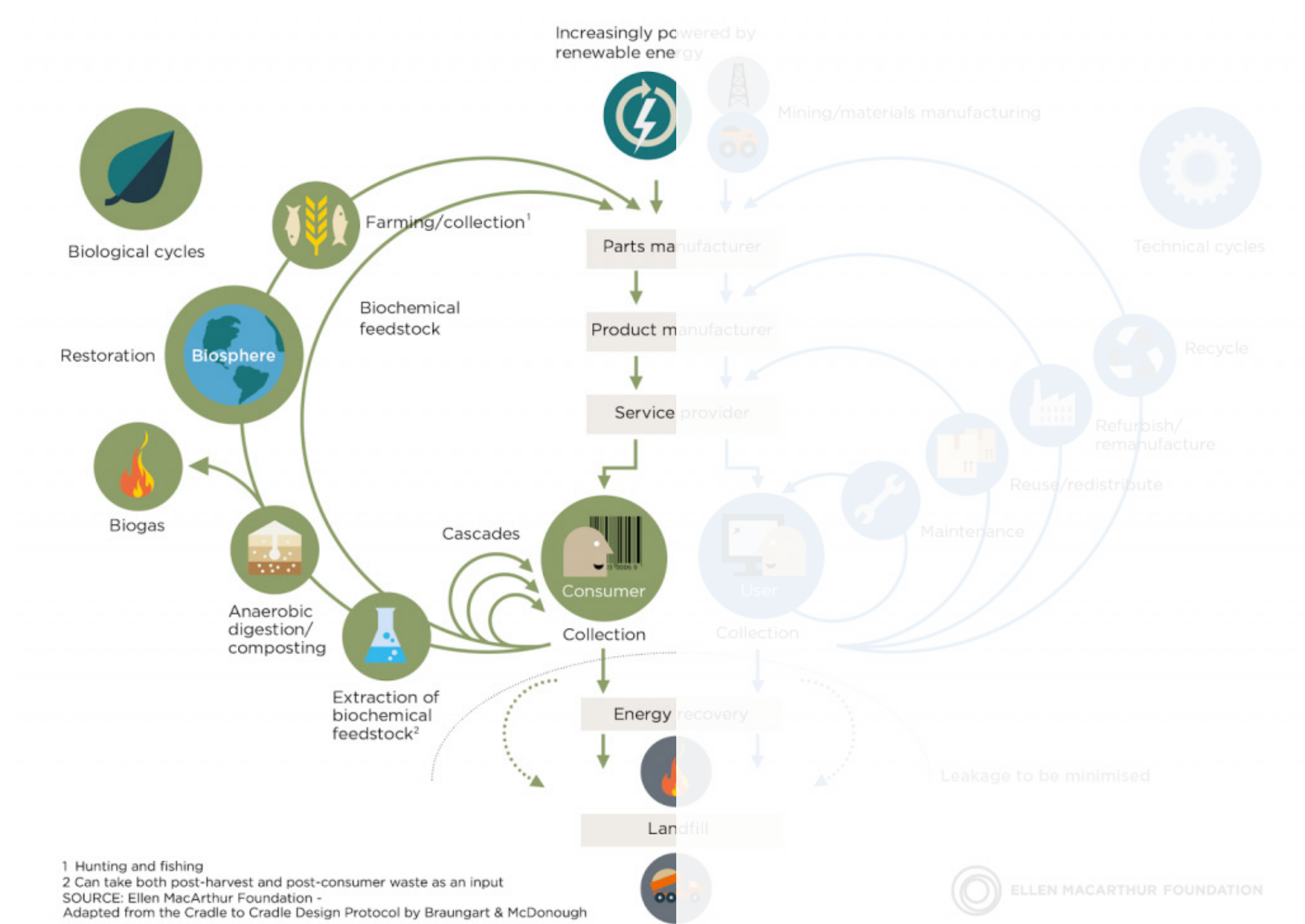


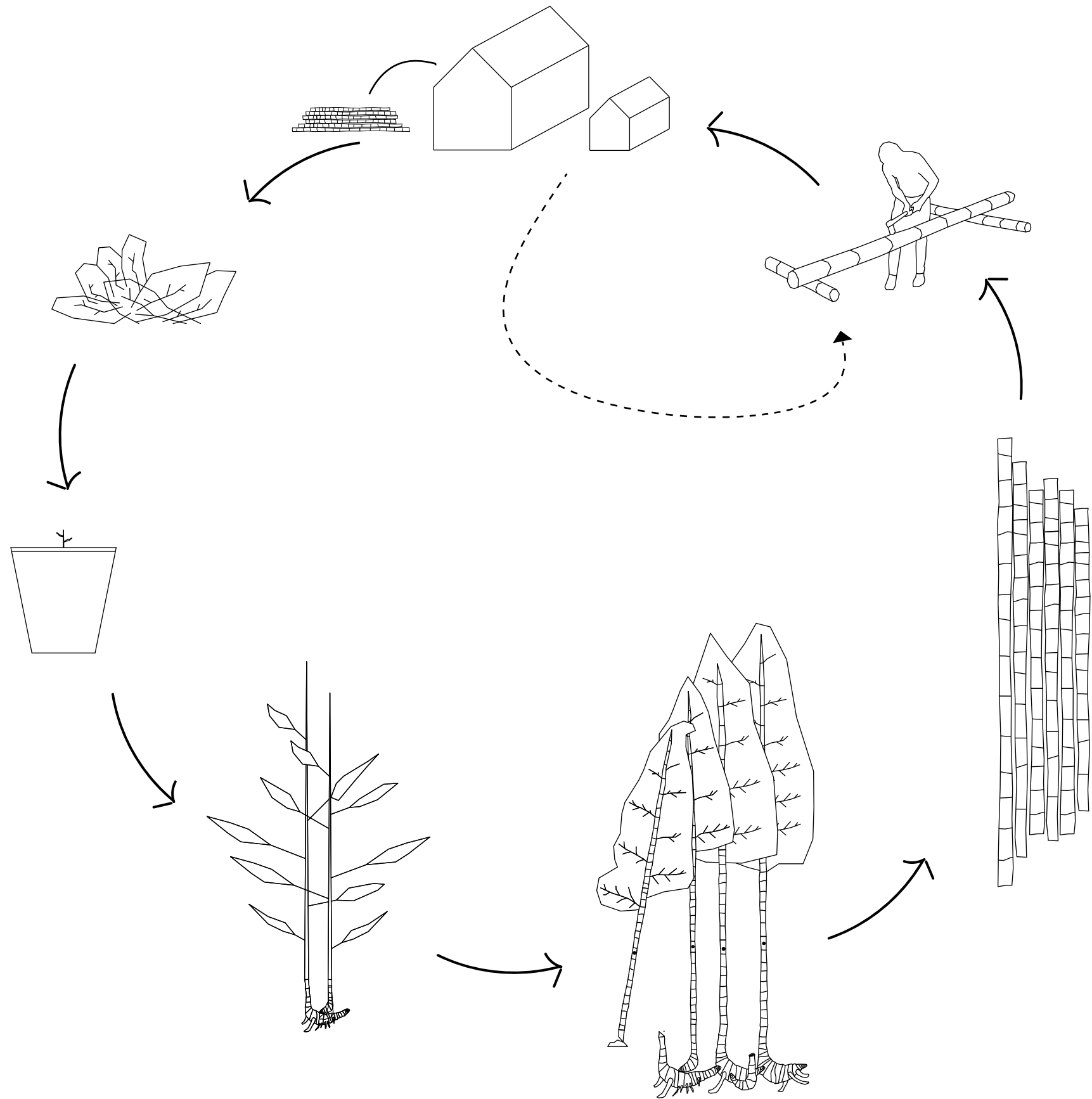




CIRCULARITY;  
A REGENERATIVE WAY OF BUILDING









## CHAPTER VIII - BETHLEHEMS IMPACT AND RELEVANCE

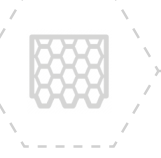
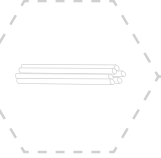
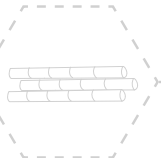
BUILDING EDUCATION



LOWERING CO2 BUILT ENVIRONMENT



WORK



BUILDING MATERIALS

INCOME



PUBLIC SPACE



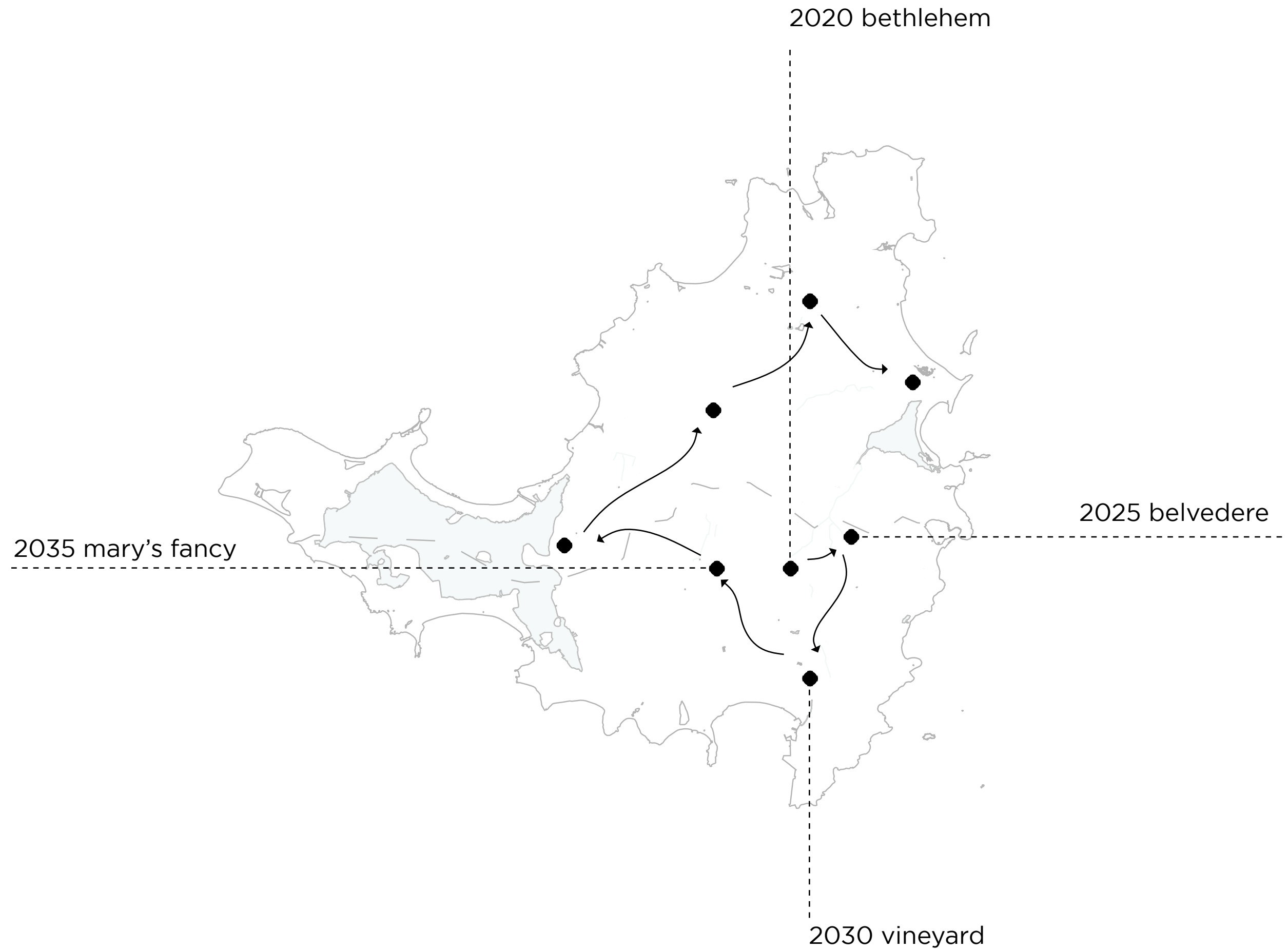
WORK



FOOD



# A local / regional heritage strategy

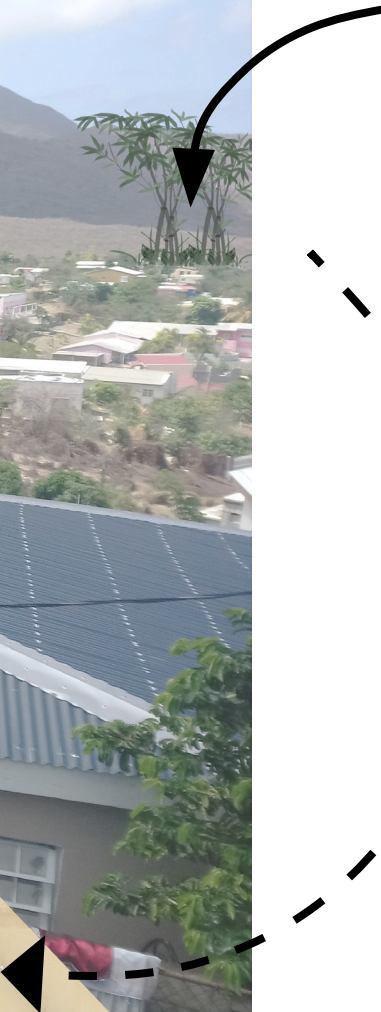








BETHLEHEM



## Relevance

“In relation to the current climate crisis, interventions similar to bethlehem can stimulate a transition towards a more sustainable building culture in terms of material use, climate response and education. I believe a lot of ground is to be gained here, especially in the developing countries that often perceive modernism as an ideal to strive towards, while overseeing the potential of their (ancestors) local and often specialized building cultures.”



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## Coming Soon

We are working on our website





THANK YOU! QUESTIONS?

