

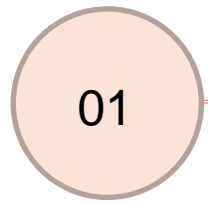
REUSE OF PLASTIC AS A BUILDING PRODUCT

Recycling plastic waste into a low-cost building component for internally displaced persons (IDP) camp resettlement housing in Nigeria



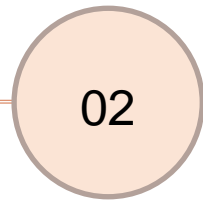
MSc thesis by Maimuna Bala Shehu

CONTENT



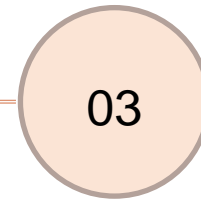
RESEARCH

- Research Definition
- Understanding a foreign background
- IDP camps
- Plastic waste



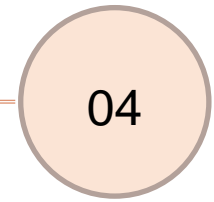
DESIGN

- Design brief
- Material design
- Bioclimatic design
- Architectural application



BUSINESS MODEL

- Nigerian waste cycle
- Production line
- Long term development



CONCLUSION

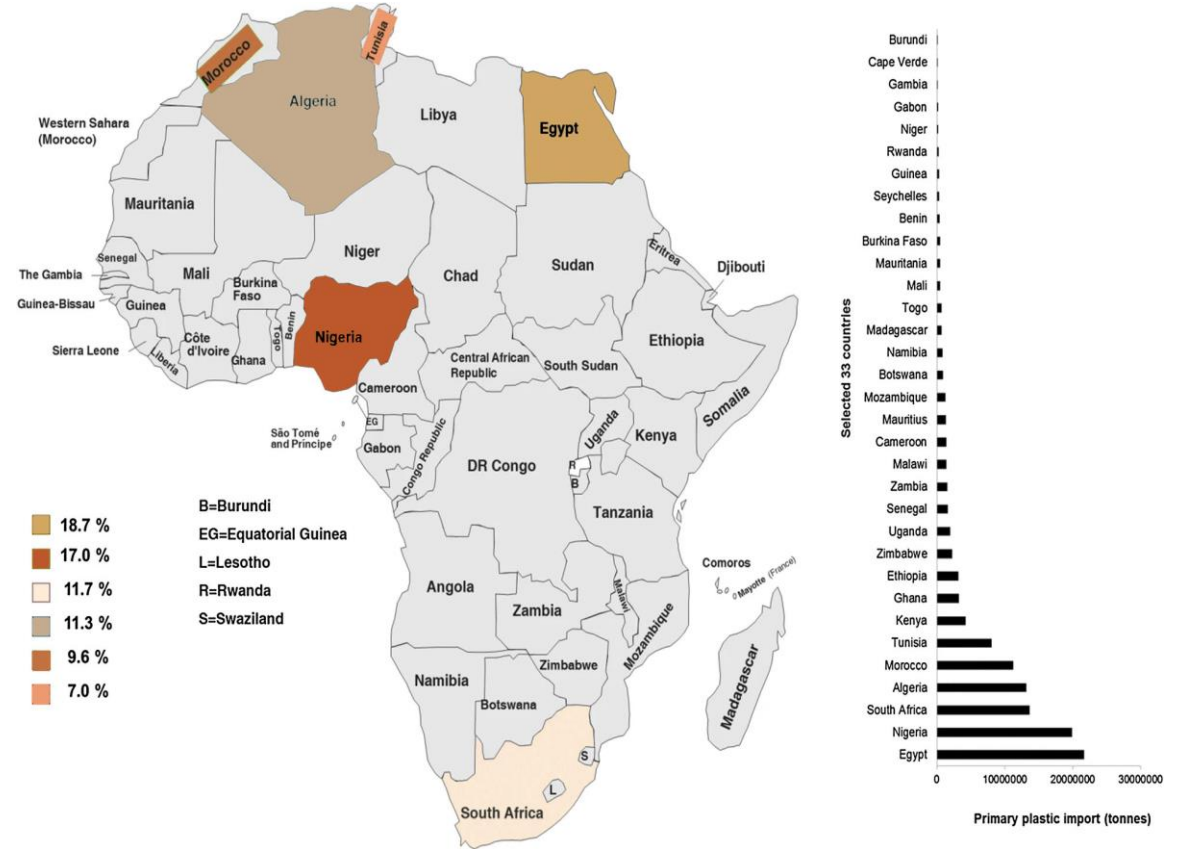
- Conclusions
- Limitations
- Recommendations

RESEARCH PROBLEMS



KUCHINGORO IDP CAMP, ABUJA

Due to the destruction of the initial shelters of internally displaced persons, it becomes one of the primary necessities which they require.



PERCENTAGE OF PLASTIC WASTE IMPORTATION TO AFRICA

Less than 12% of plastic in Nigeria are recycled, with about 80% ending up on dumpsites or landfills. Nigeria produces about 22 million tonnes of plastic, Abuja alone produces 2.5 million tons of plastic a year.

RESEARCH QUESTION

"How can **waste plastic** materials be **recycled** to make **temporary, low-cost building components**, that **improve** the living conditions of **IDPs** in **Nigeria**? "

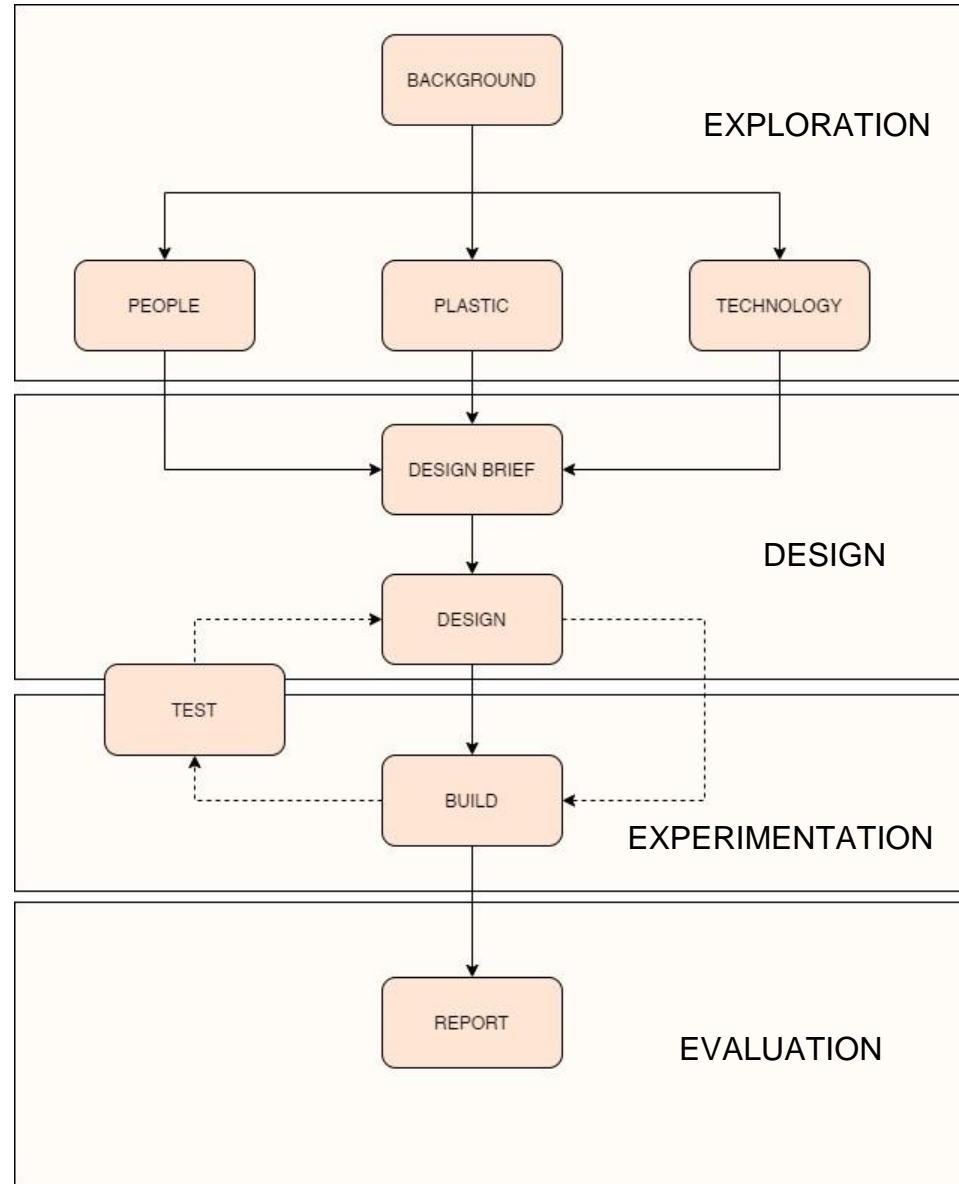
RESEARCH OBJECTIVE

The general objective of this research is to improve the living conditions of an IDP camp called Kuchingoro located within the Federal Capital Territory (Abuja), Nigeria, by making a building component made out of plastic waste.

Sub-Objectives

- Providing a working system for IDPs, which may help them earn a living.
- Gain knowledge from local building technology
- Design with climatic conditions as a consideration
- Develop a sustainable alternative for utilising plastic waste.

RESEARCH FRAMEWORK

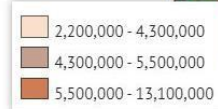
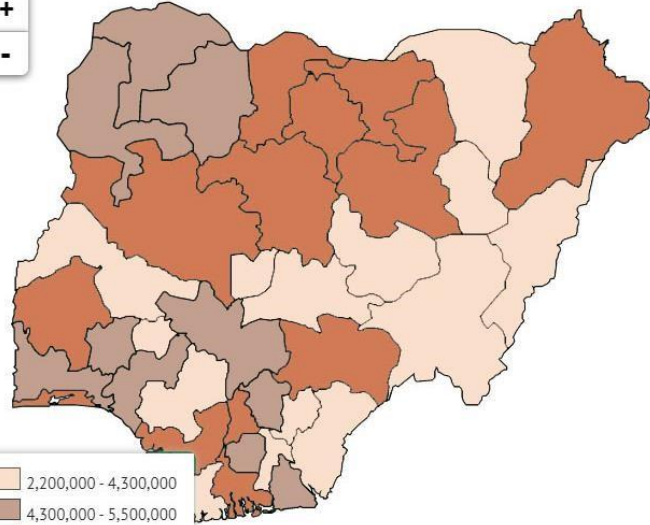


GEOGRAPHICS AND DEMOGRAPHICS

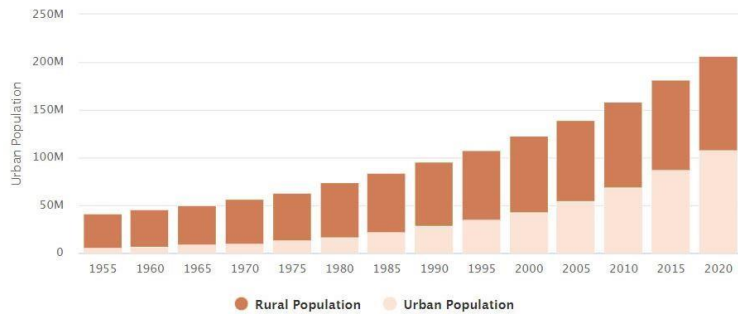


Total Population

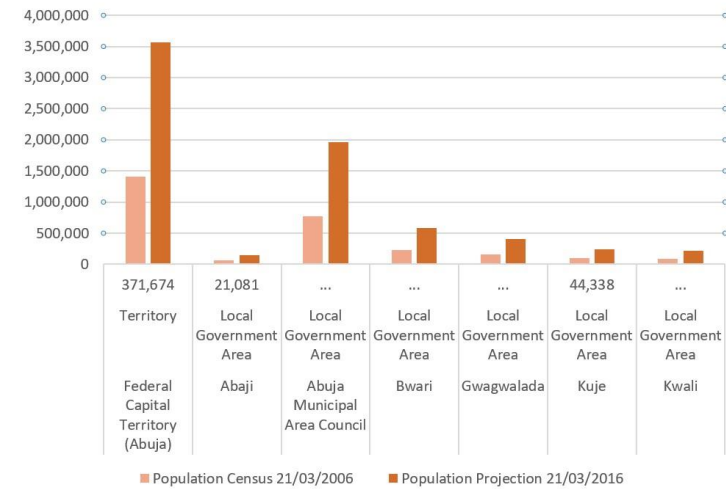
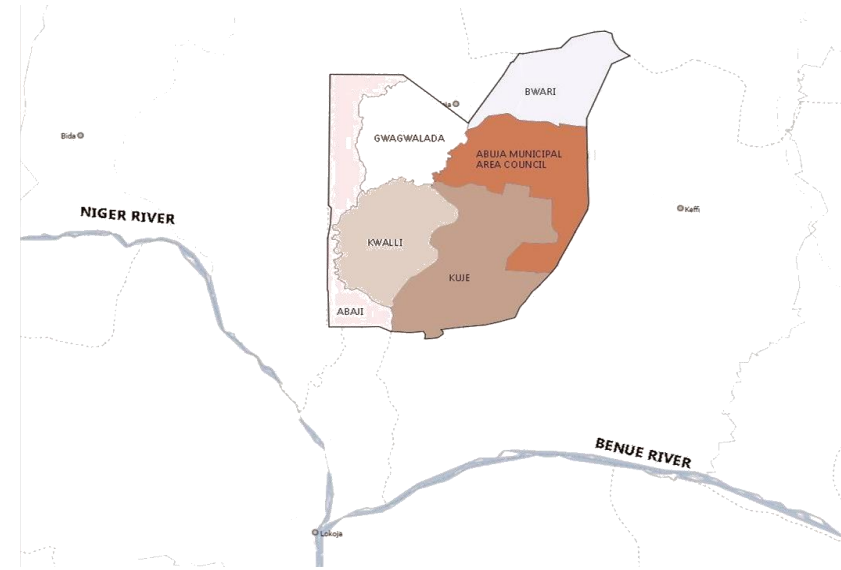
Persons



Nigeria Urban vs. Rural Population from 1955 to 2020

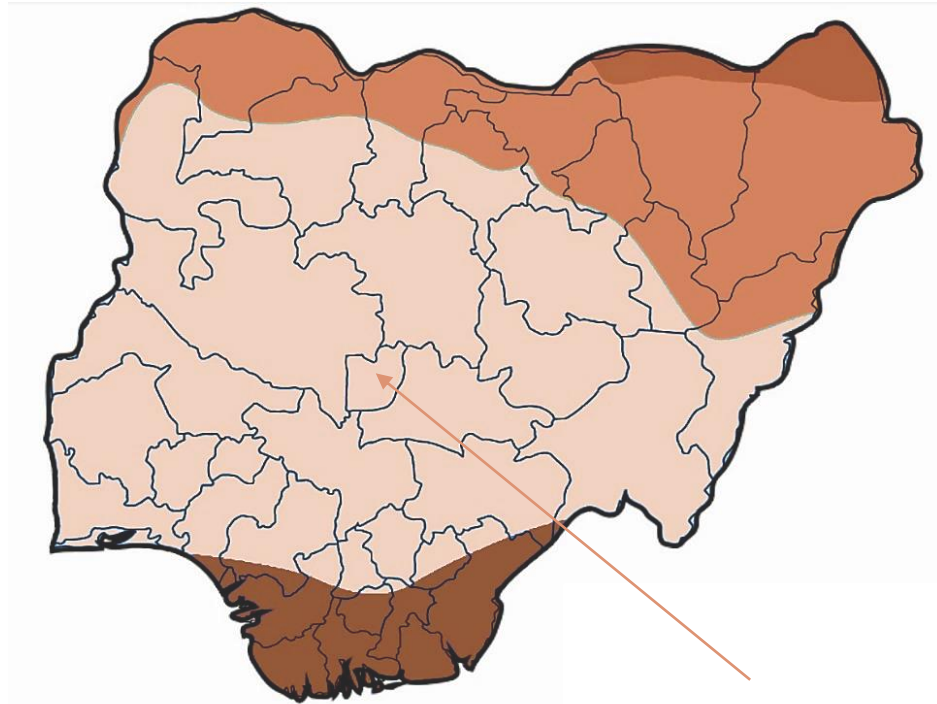


NIGERIA



ABUJA

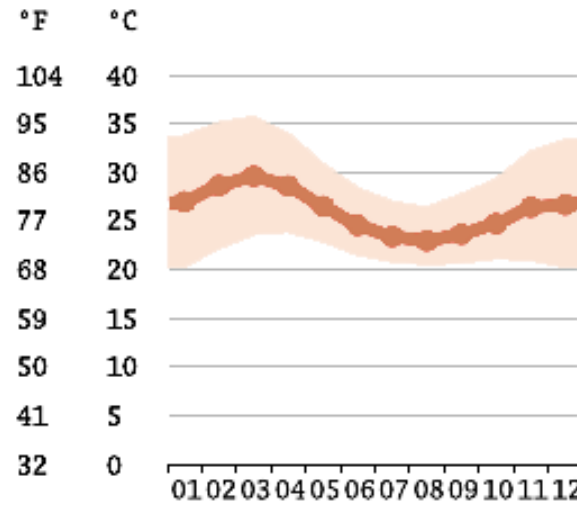
CLIMATE



ABUJA

- Warm desert climate (BWh)
- Warm semi-arid climate (BSH)
- Monsoon climate (Am)
- Tropical savanna climate (Aw)

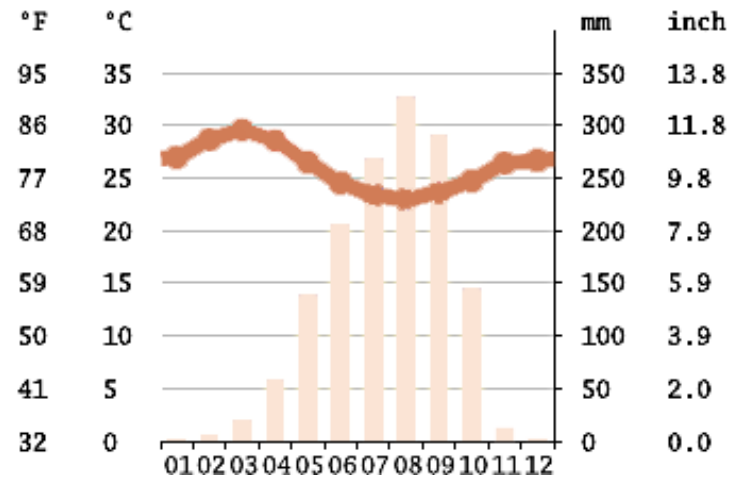
ABUJA AVERAGE TEMPERATURE



AVERAGE TEMPERATURE-
25.7 °C

MAXIMUM
TEMPERATURE- 35.5 °C

ABUJA CLIMATE GRAPH // WEATHER BY MONTH

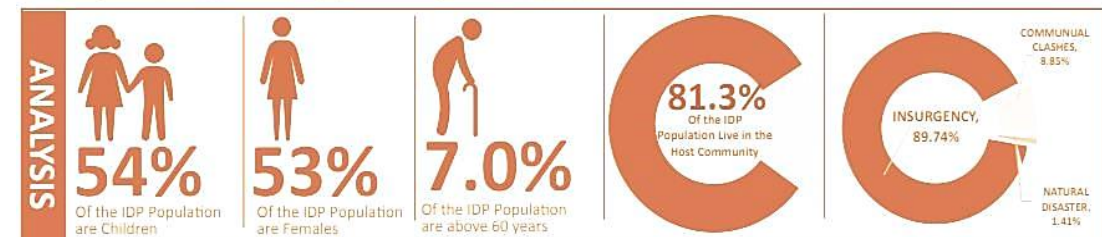
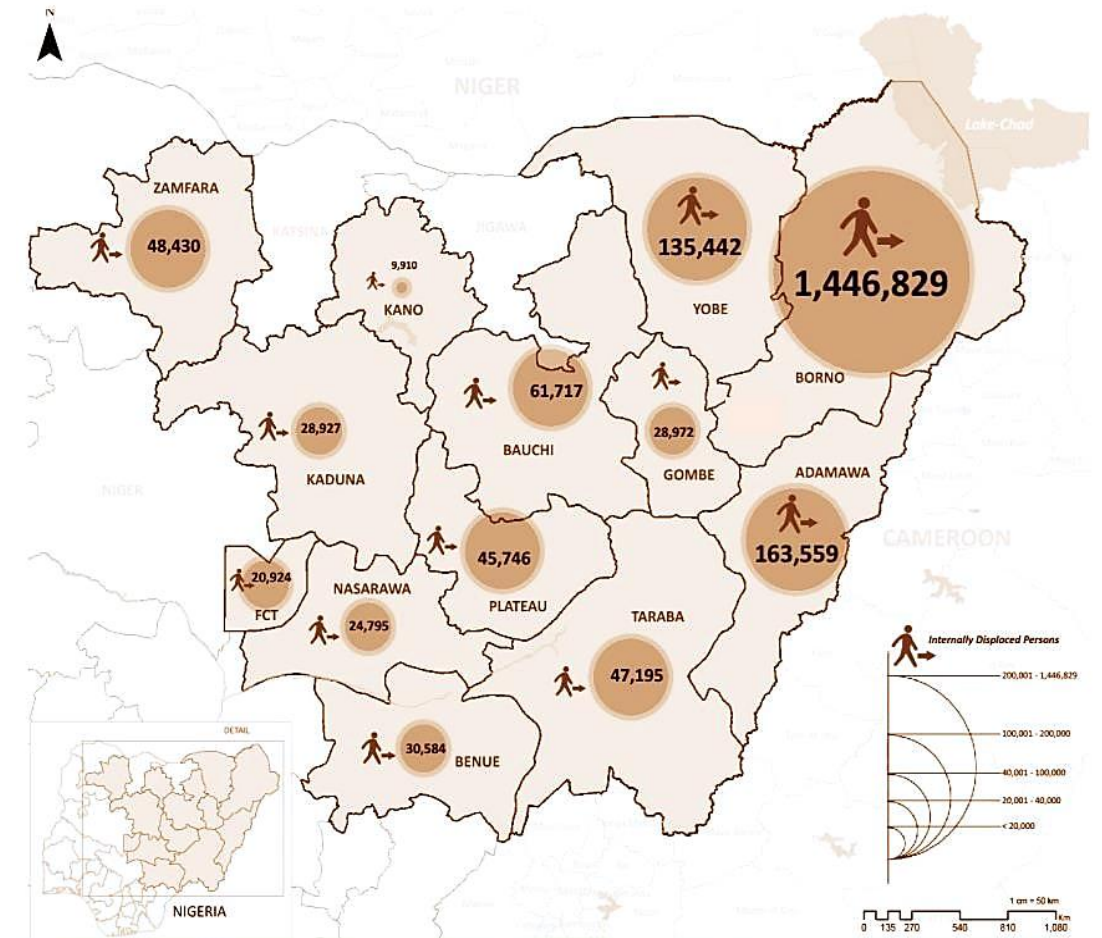
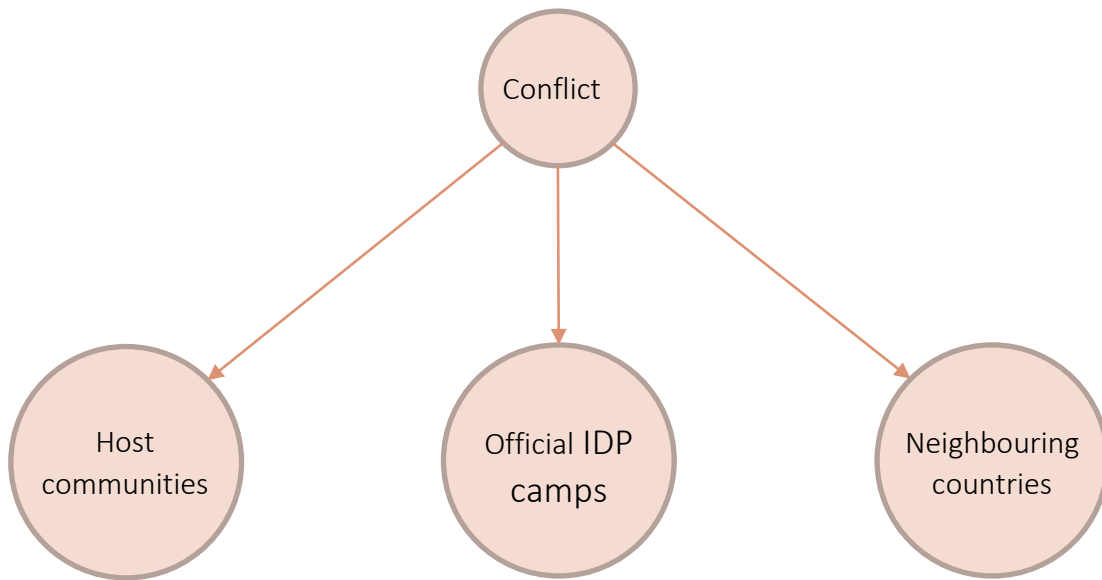


1389MM OF RAINFALL
EVERY YEAR

IDP CAMPS

BACKGROUND

Internally displaced persons (IDPs), according to the United Nations Guiding Principles on Internal Displacement, are "persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or to avoid the effects of armed conflict, situations of generalised violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognised state border." (Handbook for the Protection of Internally Displaced Persons, 2010).



DISPLACEMENT FIGURES



According to the Zonal Coordinator for NEMA, the IDP settlements are informal and should be classified as "locations" They cannot be referred to as camps because they do not comply with the UNHCR requirements. Therefore, there is no official housing policy for them.













S/NO	DESCRIPTION	MINIMUM STANDARD
1	Covered living area	3.5sqm per person Minimum ceiling height of 2m
2	Camp settlement size	45sqm per person
3	Fire safety	Minimum of 2m between structures or two times the height of the structure
4	Gradient of campsite	1 to 5%
5	Drainage	Appropriate drainage must be put in place, especially in locations that experience drainage difficulties in rainy seasons.

UNHCR REQUIREMENTS

ECONOMICS



Prices in the Netherlands vs Nigeria - Cost of Living Comparison

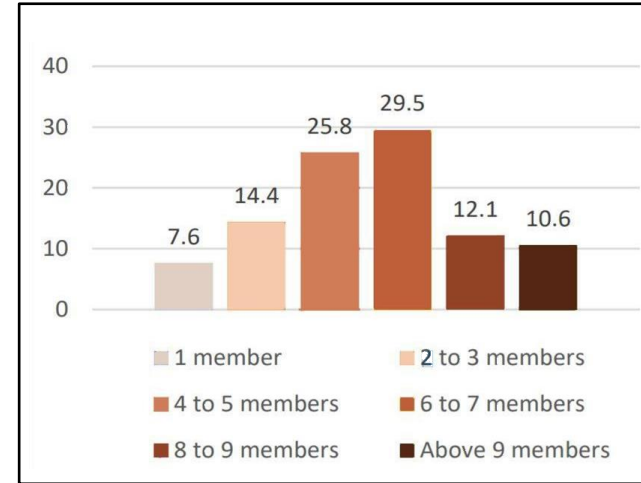
	Cost of living One person	€1382	€666
	Cost of living Family	€3292	€1702
	One person rent	€796	€383
	Family rent	€1298	€898
	Food Expenses	€371	€173
	Fast food meal, equiv, McDonald's	€7.45	€3.92
	Monthly salary after tax	€2262	€143
	Apartment price in city centre 1m2 or 10ft2	€3649	€436
	House price to buy in Suburbs. 1m2 or 10ft2	€2716	€184
	Local transport ticket	€2.87	€0.35
	Gas/Petrol	€1.52	€0.31
	GDP per capita	€43754	€1674



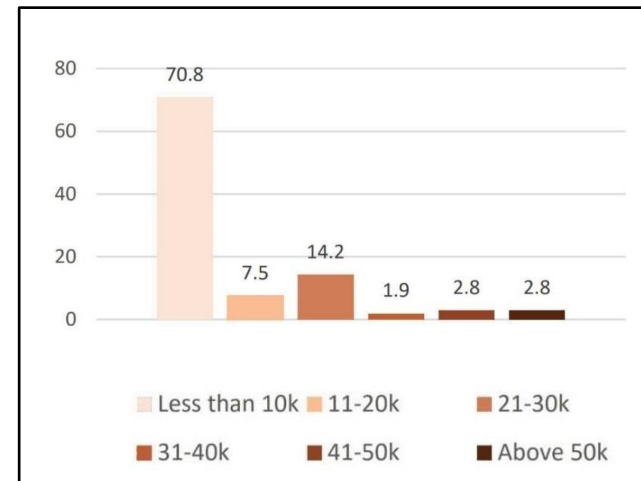
€1000
Netherlands



€482
Nigeria



NUMBER OF
PEOPLE PER
HOUSEHOLD



AVERAGE
MONTHLY
INCOME PER
PERSON

NGN 10,000 = EUR 21.87

MINIMUM WAGE= NGN 30,000 (EUR 65.61)

KUCHINGORO IDP CAMP



TYPICAL BUILDINGS IN THE CAMP



WOOD PLANKS



CONTAINER CONSTRUCTION



ZINC SHEETS



CONCRETE WALL

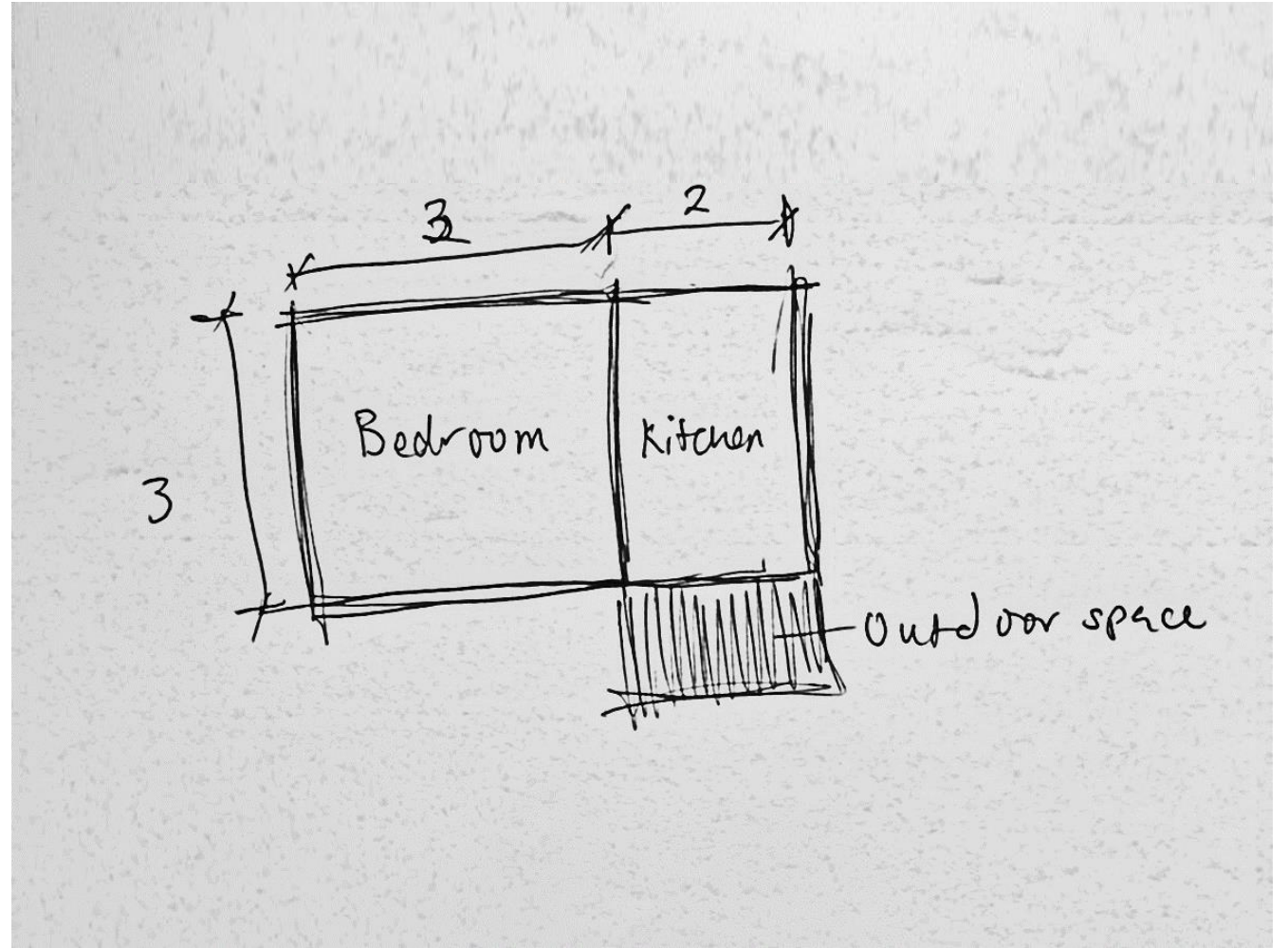


LIVING SHACKS (BACHA)

INTERVIEWEE HOME



NAOMI YOHANNA'S KITCHEN WITH TOP WINDOW

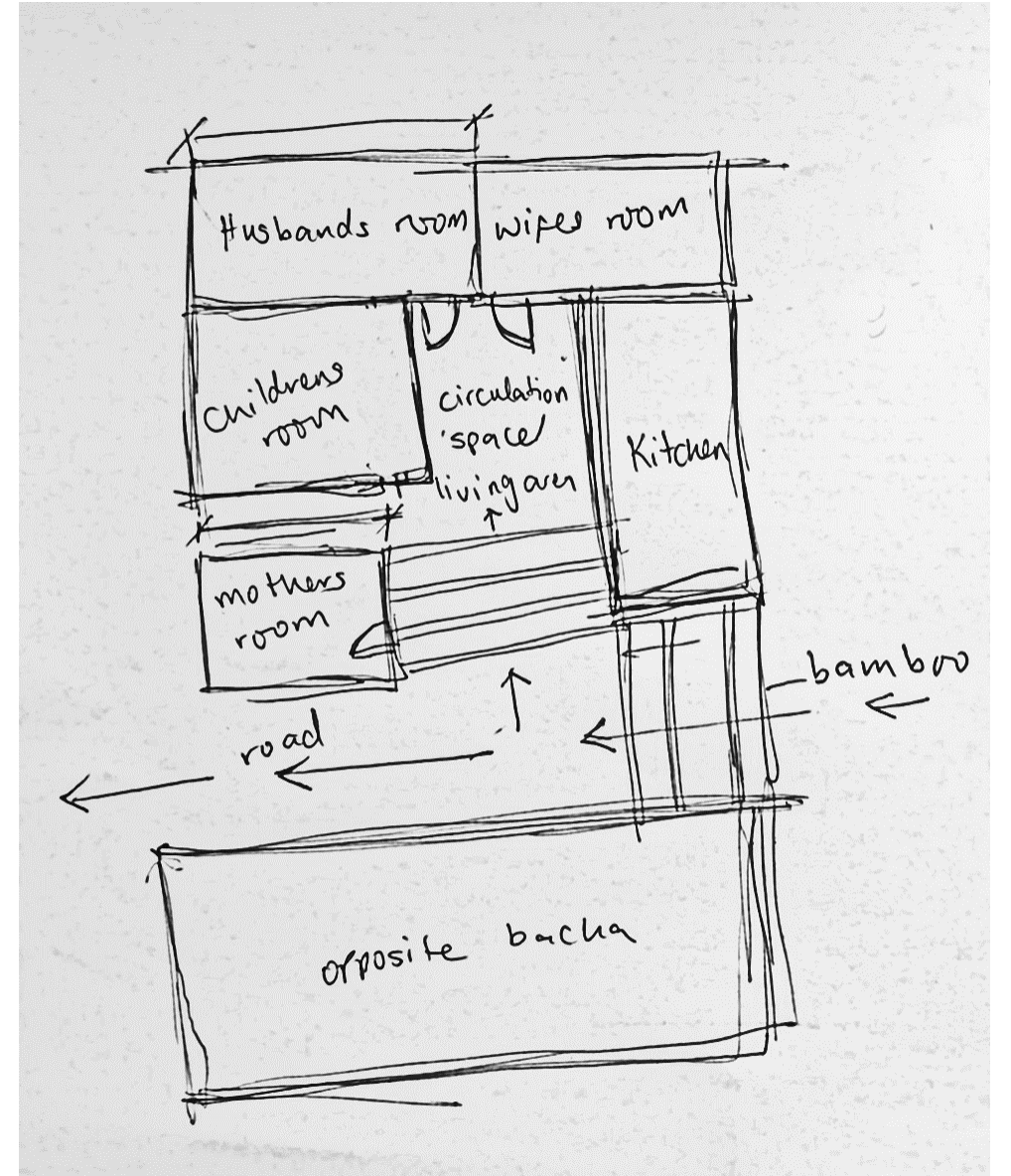


PLAN OF NAOMI'S HOME

INTERVIEWEE HOME



YOHANNAS HOME

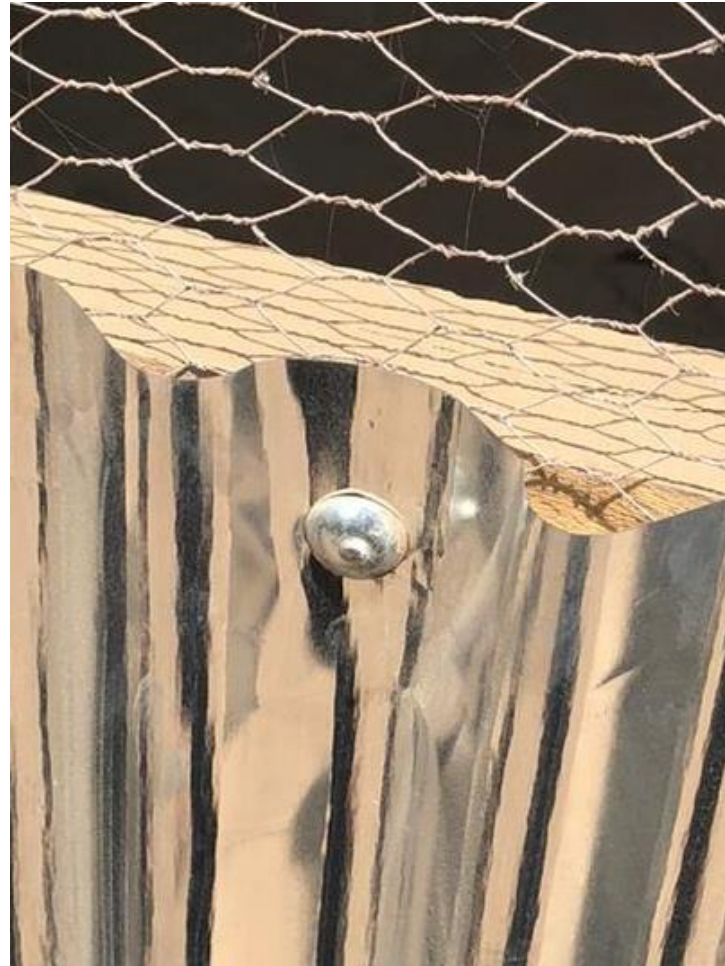


SKETCH OF YOHANNAS HOME

CONNECTIONS



BAMBOO POLE FOR CONNECTION TO
ELECTRICITY



ALUMINIUM CAPPED NAILS NAILS



NAILS CONNECTION BENT TO SECURE
PLASTIC SHEET

BACHA CONSTRUCTION PROCESS



WOODEN FRAME WITH LOGS



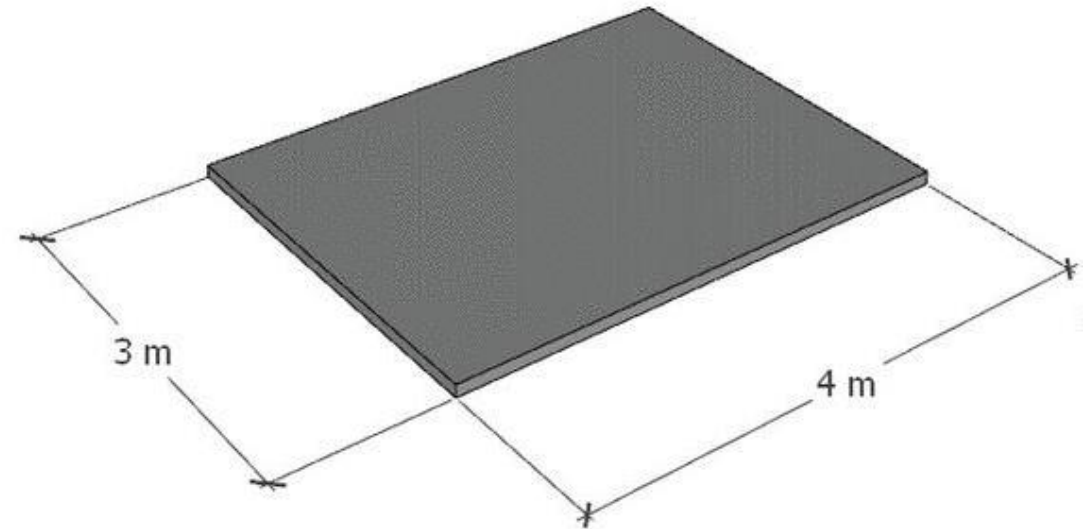
WOODEN FRAME WITH SAWN
WOOD



CEMENT BAGS AS FIRST LAYER



SECOND LAYER OF PLASTIC
SHEETS/TARPULIN



LOCAL CONSTRUCTION METHODS



CONCRETE BLOCKS



COMPRESSED EARTH BLOCKS



LOCAL CLAY BLOCKS

MATERIAL COMPARISON



Building Material	Density (kg/m ³)	Price (Naira)	Thermal conductivity λ (W/mK)	Rc value (m ² K.W)	Rc value including transision (0.13+0.04)
1mm Zinc sheet	6500	1500	112.2	0.000008	0.17
10-12mm plywood	550	5500	0.13-0.35	0.03-0.04	0.20-0.21
0.50 mm Polyethylene bags	950	600	0.33	0.002	0.21
3mm Single wall Cardboard	-	-	0.06	0.05	0.23
150mm Compressed earth bricks (laterite/clay)	1600	1500	0.76	0.20	0.37
225mm Concrete block	1800	2750	0.80	0.28	0.45

PLASTIC WASTE IN NIGERIA



LANDFILL



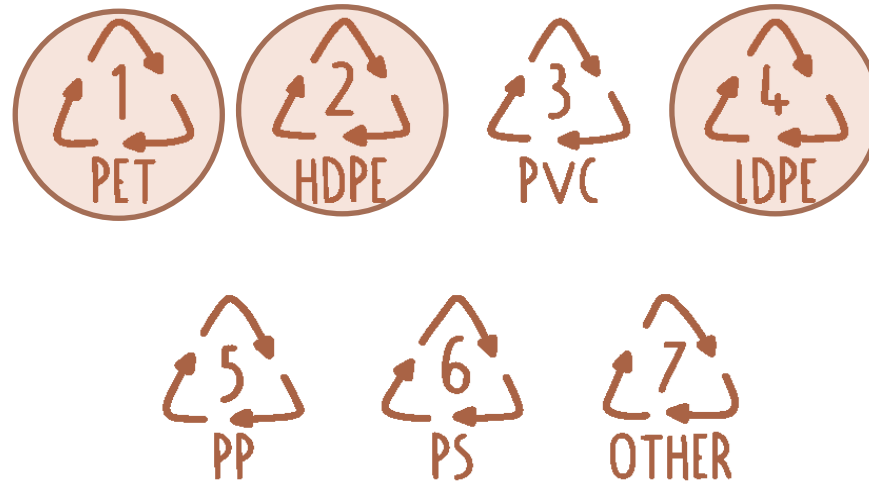
OCEAN DUMPING



BURNING



BOTTLES



MAJOR PLASTIC TYPES



WATER SACHETS

PRECEDENTS



PLASTIC BRICKS



PRETTY PLASTIC TILES



REPLAST BRICKS



IFRIQUE COLLECTION



MOLADI



BLOQUEPLAS

PLASTIC RECYCLING INITIATIVES IN ABUJA



Waste



Sorting



Shredding

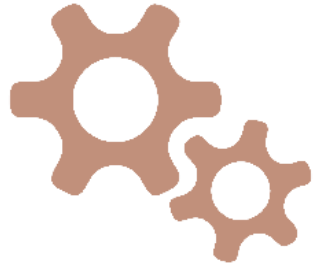


Weaving



...giving life to waste





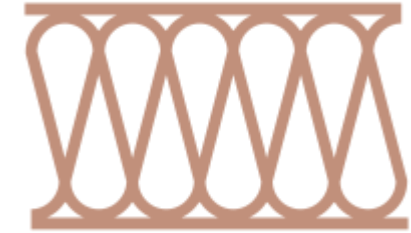
PRODUCTION METHOD

- Low investment
- Low tech



DURABILITY

- Last at least 1-2 years
- Watertight
- UV durable



INSULATION

- Insulation value should be comparable to that of a brick wall (0.37 m²K/W)



BUILDING METHOD

- Local methodology
- Incremental
- Demountable
- At least 60% LDPE, HDPE and or PET



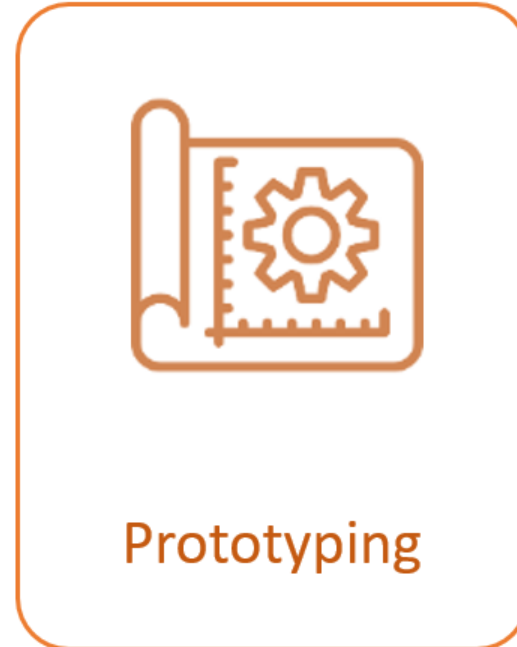
COST

- The bacha should cost around NGN20,000-30,000 (EUR 43.47- 59.53)



SIZE

- Weight should be able to be carried by maximum two people <25 kg.
- Minimal wall thickness <200mm
- Comply with UNHCR guidelines



MATERIAL COMPARISON



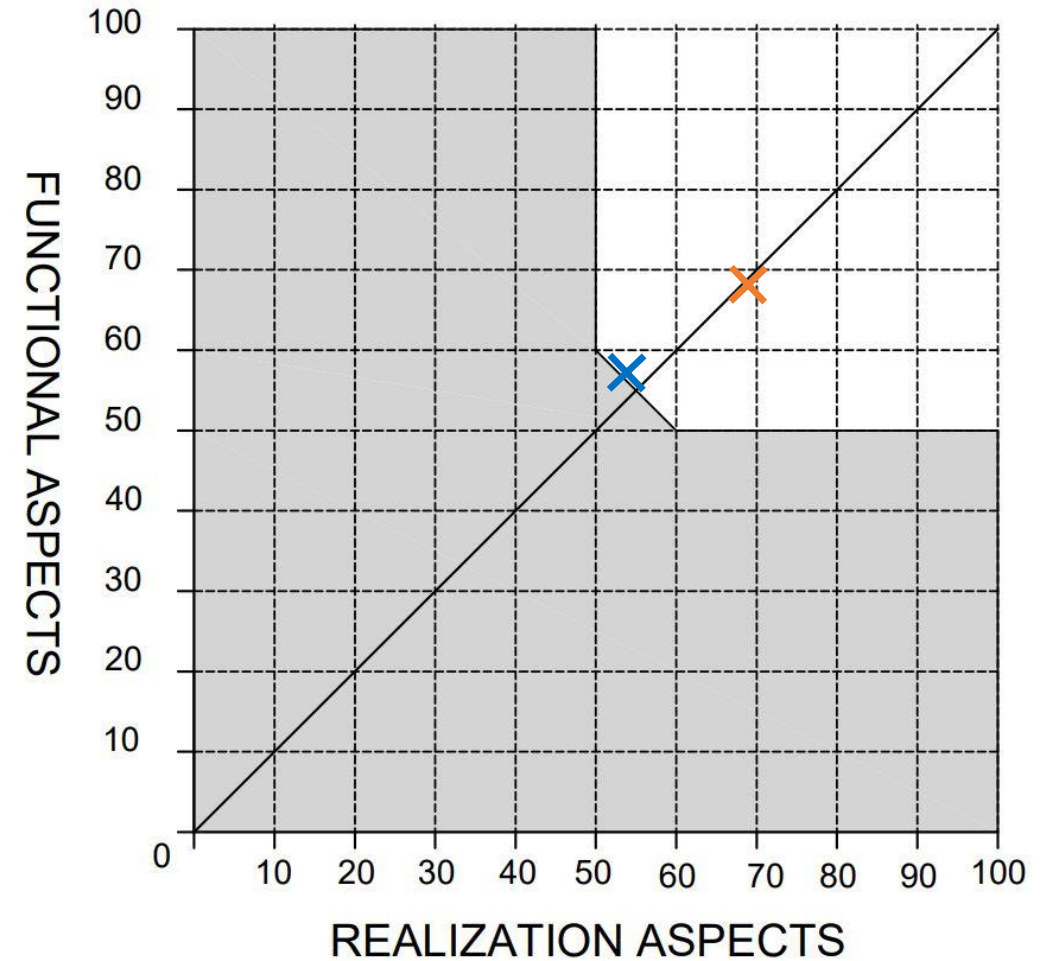
Material Properties	LDPE	HDPE	PET
Density	917 - 932	952 - 965	1290 - 1390
Tensile Strength Mpa	13.3 - 26.4	22.1 - 31	55 - 60 Mpa
Compressive strength Gpa	10.8 - 17.4	18.6 - 24.8	50 - 60 Mpa
Price USD/kg	1.74 - 1.79	1.61 - 1.65	1.37 - 1.59
Flammability	Highly flammable	Hightly flammable	Highly flammable
Fracture Toughness MPA.m ^{0.5}	1.21-3.39	1.52 - 1.82	4.42 - 5.64
Melting point °C	98 - 115	130 - 137	260 - 280
Thermal conductivity W/m.°C	0.322 - 0.348	0.461 - 0.502	0.19
Embodied energy MJ/kg	76.2 - 84.1	74.9 - 82.5	51.5-62.9
CO2 footprintt production kg/kg	2.86 - 8.86	2.65 - 2.92	1.45-1.6
Recycle fraction current %	8.02 - 8.86	8.02 - 8.86	20-22%
Water resistance	Excellent	Excellent	Excellent
UV resistance	Poor	Fair	Poor

MATERIAL COMPARISON

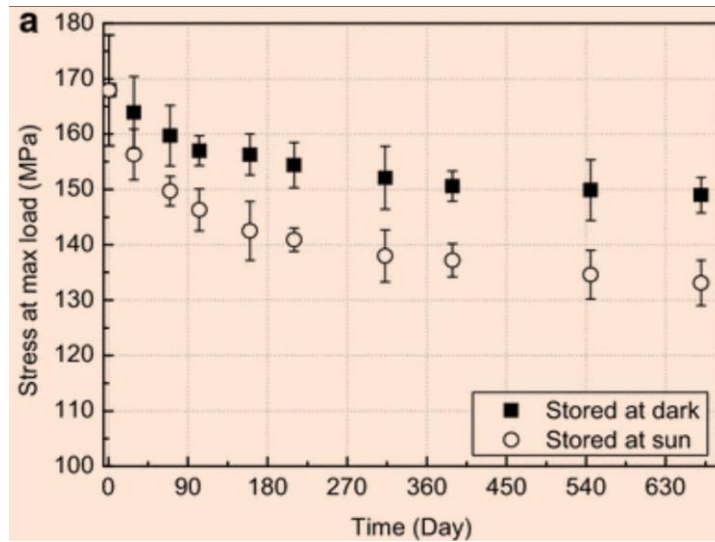
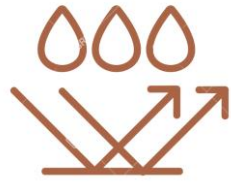
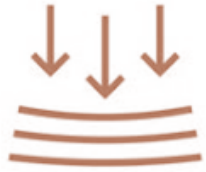


Functional aspects	Weegfactor (1-3)	HDPE	PET	Max. score
Density	3	3	4	15
Tensile strength	3	2	4	15
Compressive strength	3	2	4	15
Flammability	3	1	1	15
Fracture toughness	3	2	4	15
Melt temperature	3	2	4	15
Thermal conductivity	3	3	4	15
Water resistance	3	5	5	15
Water absorption	3	5	2	15
Flammability	3	1	1	15
UV degradation	3	2	1	15
Opacity	3	5	2	15
Opacity	3	5	2	15
Total score		84	102	150
Maximum percentage score		56%	68%	100%

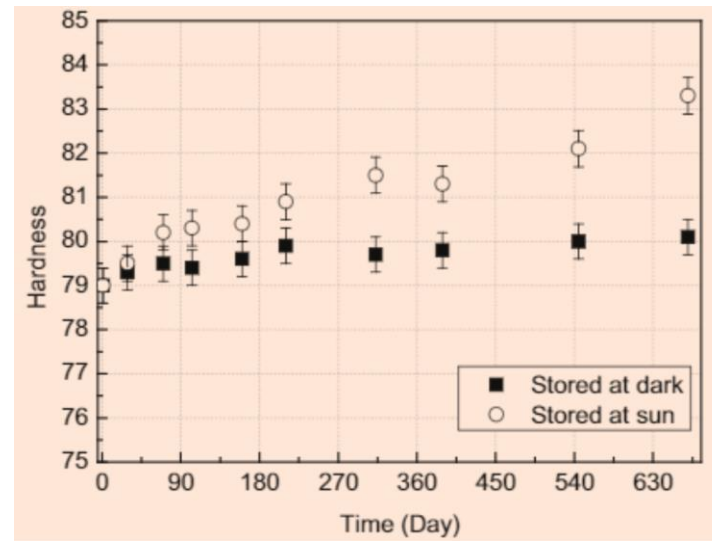
Realization aspects	Weegfactor (1-3)	HDPE	PET	Max. score
Availability	3	4	4	15
Cost	3	3	4	15
Ease of collection	3	3	4	15
Ease of shredding for use	3	3	3	15
Ease of reprocessing	3	2	3	15
Processing machines availability	3	2	3	15
Plastic washing ease	3	2	3	15
Total score		57	72	105
Maximum percentage score		54%	69%	100%



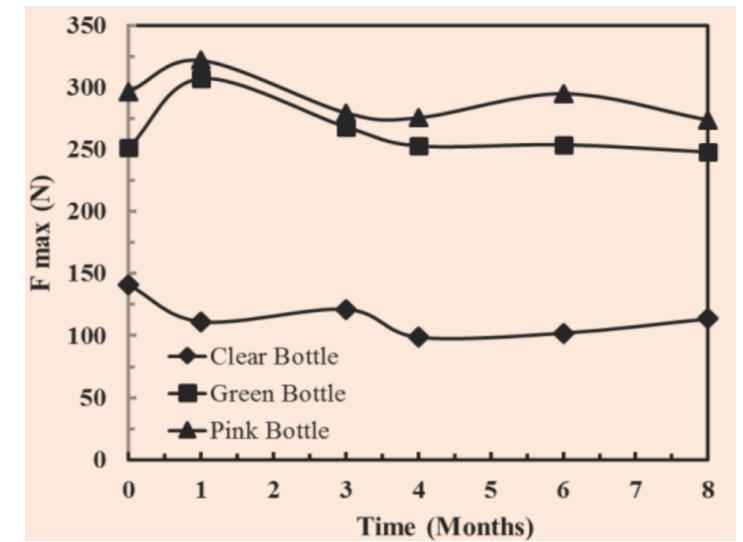
PET CHARACTERISTICS



STRESS AT MAXIMUM LOAD

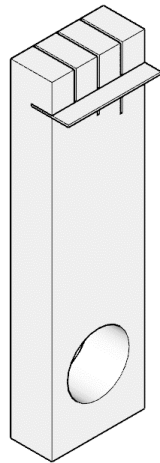
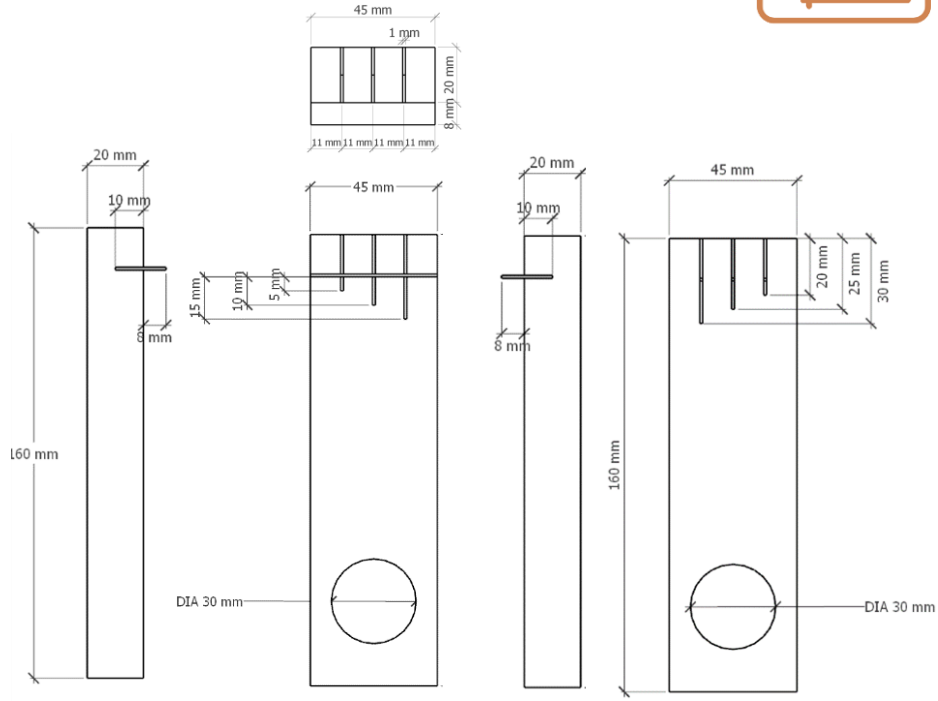
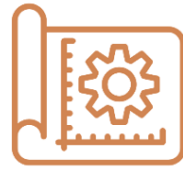


HARDNESS OF PET SAMPLES AS A FUNCTION OF TIME



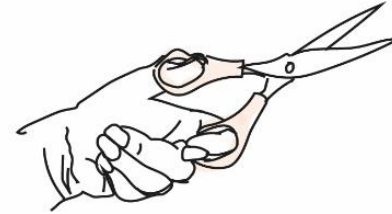
MAXIMUM TENSILE FORCE (KN) OF PET BOTTLES AT VARIOUS EXPOSURE TIME

PROTOTYPING

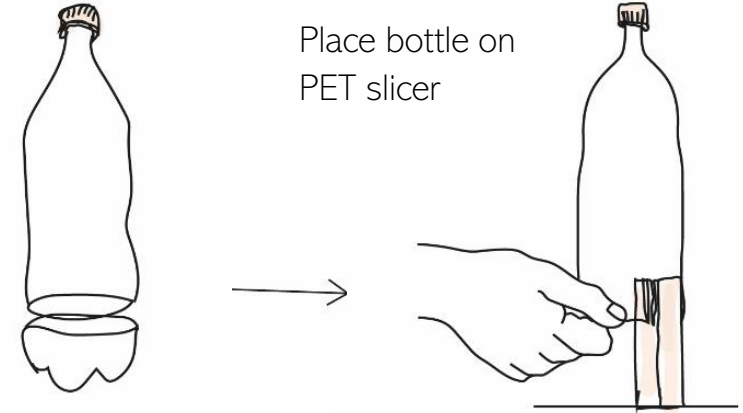


PET SLICER

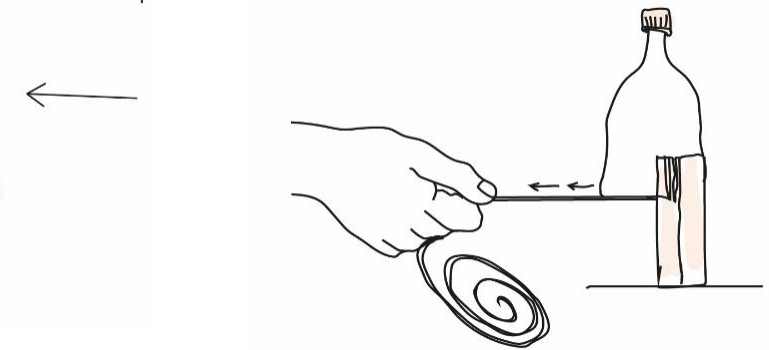
Slice bottle end



Place bottle on
PET slicer



Pull
continuously to
produce



PROTOTYPING



PET SLICER WITH 5MM, 10MM, 15MM SPACES. G-CLAMP ATTACHED, STICK TO GUIDE THE SLICER



PET SLICER FOR 10MM THREAD

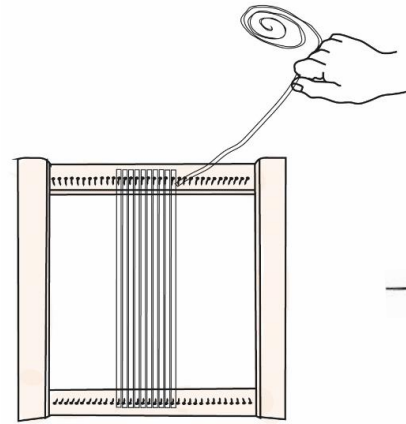
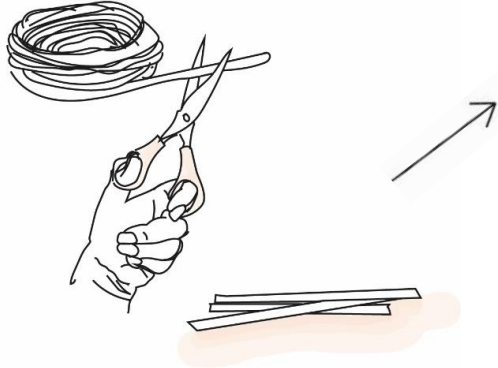


10MM SLICED THREAD

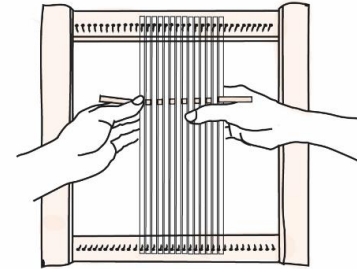
PROTOTYPING



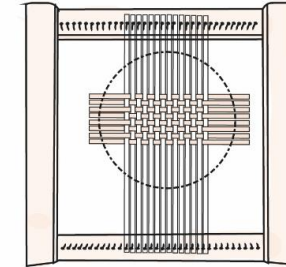
Slice PET thread into strips



Start weaving it by passing the thread horizontally, these are the weft threads



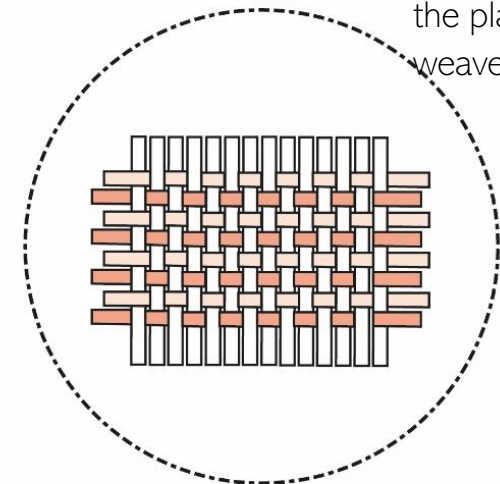
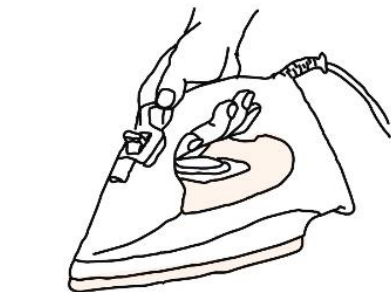
The weft threads are passed over and under each warp thread, with each row alternating



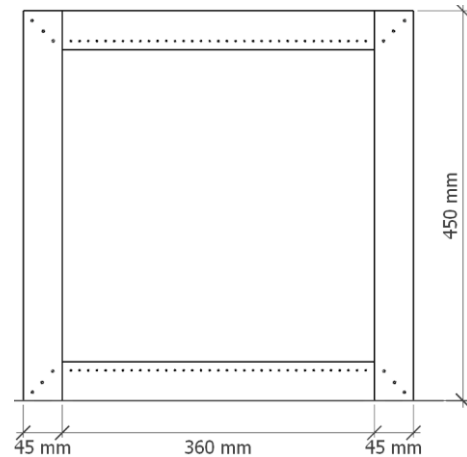
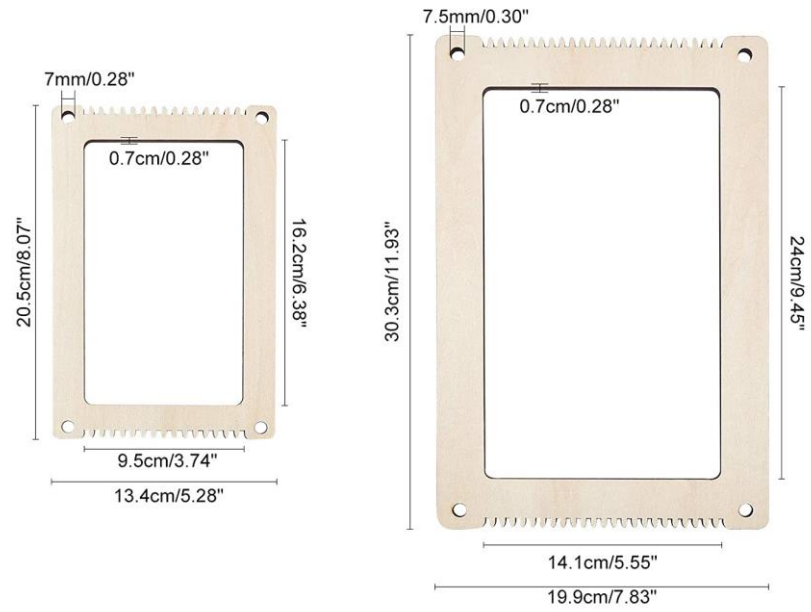
Attach the strips to the pins in the loom or loop them around vertically. This is the warp thread

This weave technique is called the plain or tabby weave

Iron the PET to make it stiff



PROTOTYPING



PROTOTYPING



BEFORE HEAT



PLACE ON METAL SURFACE



IRON PLACED ON TOP



WOVEN PLASTIC RESULT



USING BAKING PAPER ON BOTH SIDES



USING WEAVING ON DIFFERENT AXIS



WEAVING WITH ROPE

HEAT TEST AND MEASUREMENT



CAST IRON SKILLET
PAN



STAINLESS STEEL
INDUCTOR



INFRARED
THERMOMETER

201.4°C



125°C



230.2°C



156.3°C



249.9 °C





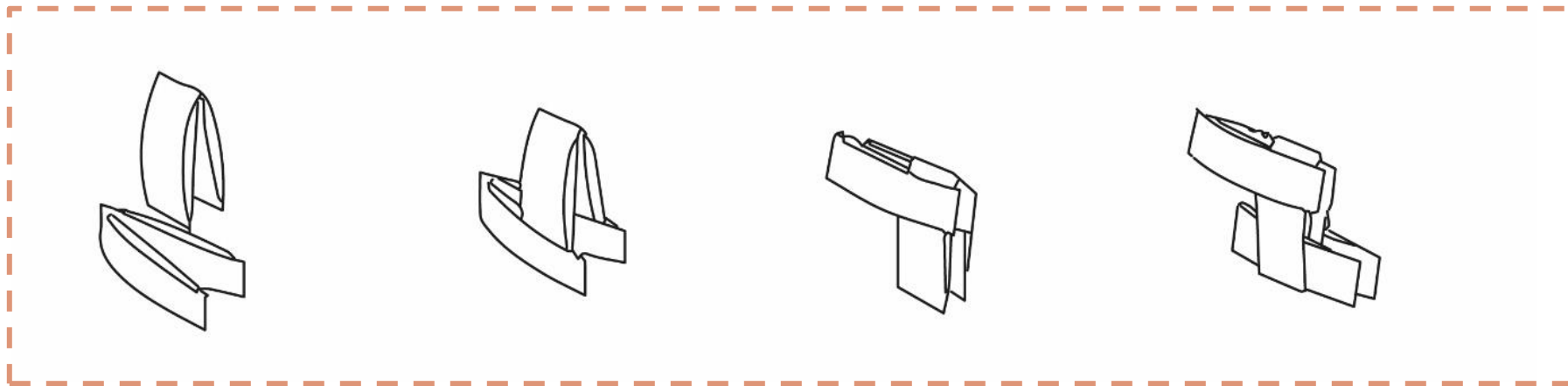
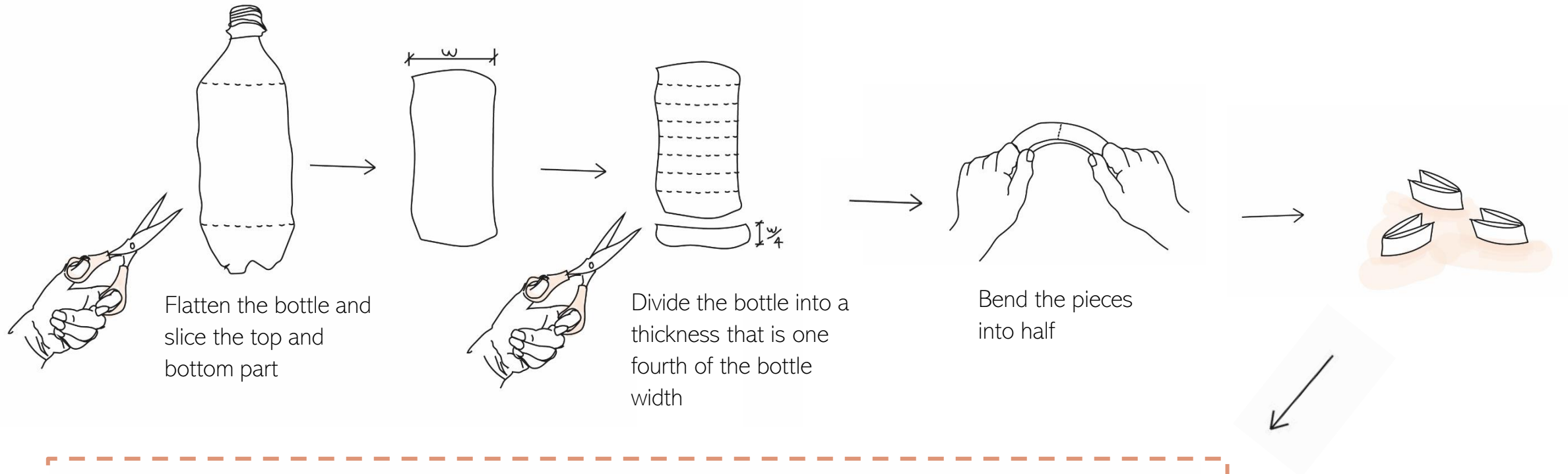
WOVEN PIECE



PRESSED AT 210 DEGREES

PROTOTYPING

ZIG-ZAG WEAVING



Follow the interlocking technique to make the weave

PROTOTYPING

ZIG-ZAG WEAVING



TEMPERATURE OF IRON IS TAKEN



VISUAL COMPARISON BETWEEN PET WITHOUT HEAT AND WITH IRON HEAT



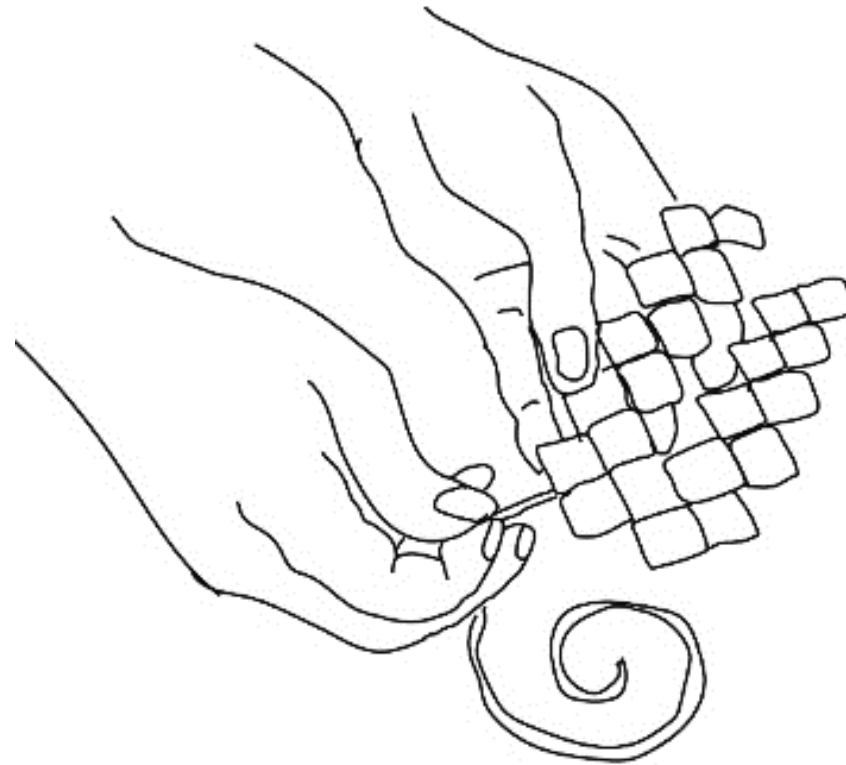
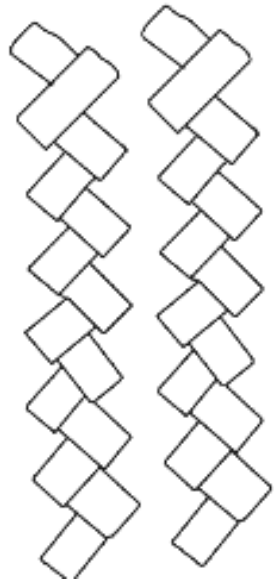
TEMPERATURE OF CAST IRON SKILLET



WOVEN PIECE AFTER HEATED CAST IRON IS APPLIED

PROTOTYPING

ZIG-ZAG WEAVING

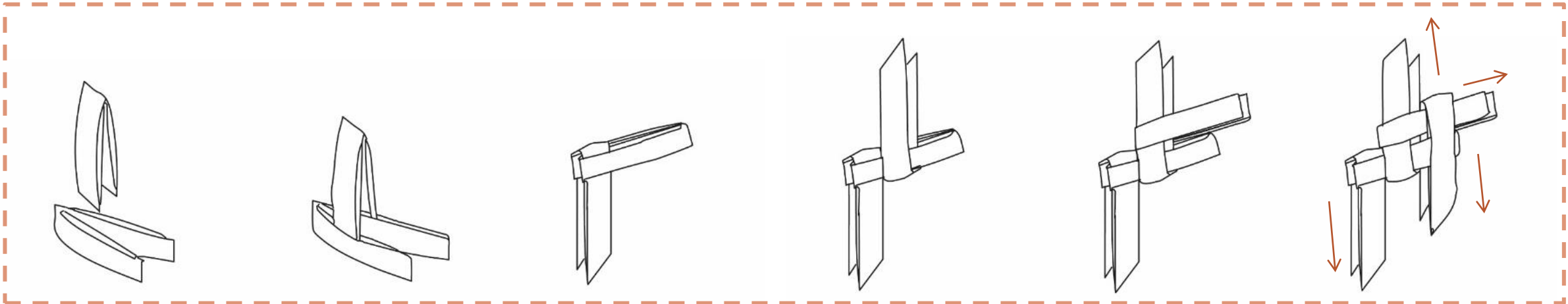
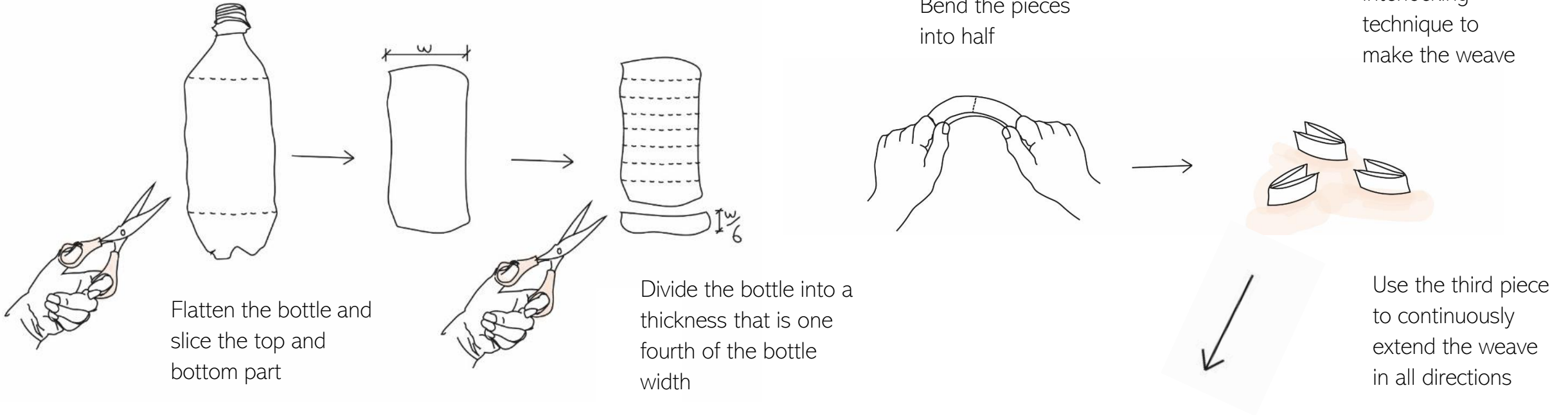


MAKE ANOTHER PIECE AND CONNECT THEM THROUGH THE HOLES USING PET THREAD

PROTOTYPING



ZIG-ZAG WEAVING



PROTOTYPING

ZIG-ZAG WEAVING-



WEAVING ONE LAYER



MULTIPLE WOVEN LAYERS



MULTIPLE WOVEN LAYER WITH IRON HEAT APPLIED

PHYSICAL TESTING

RESULTS



A1



A2



B1



B2



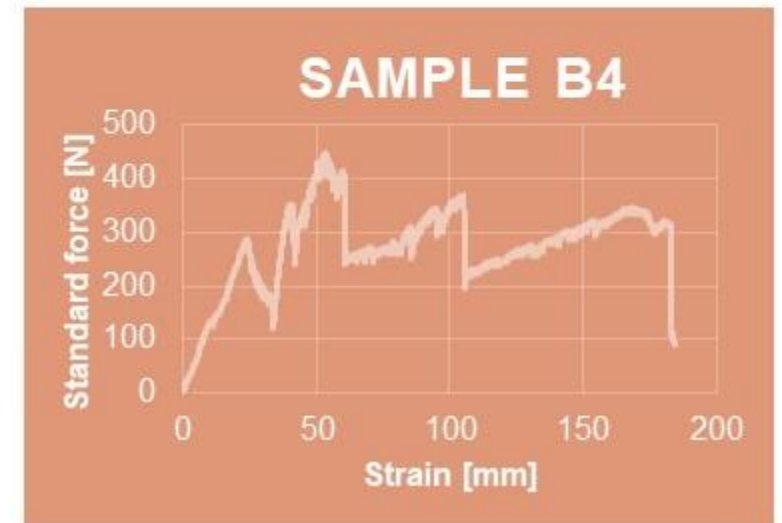
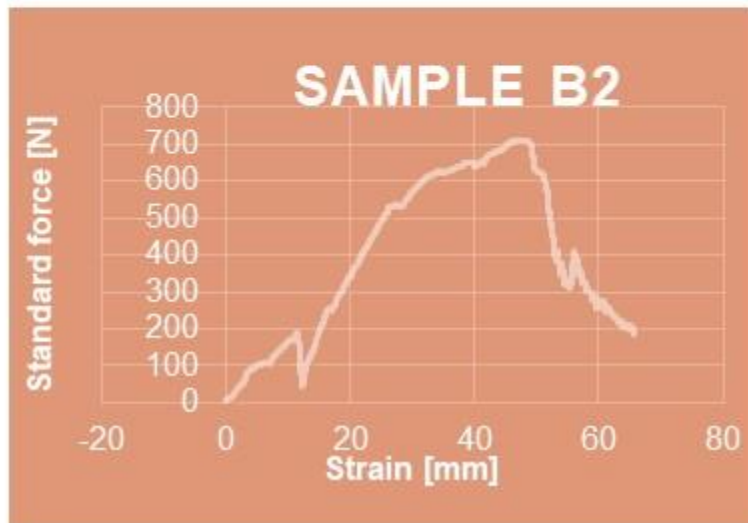
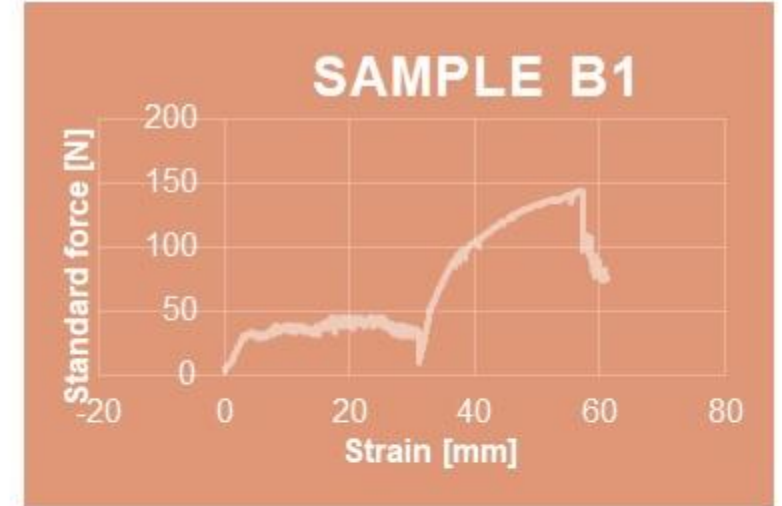
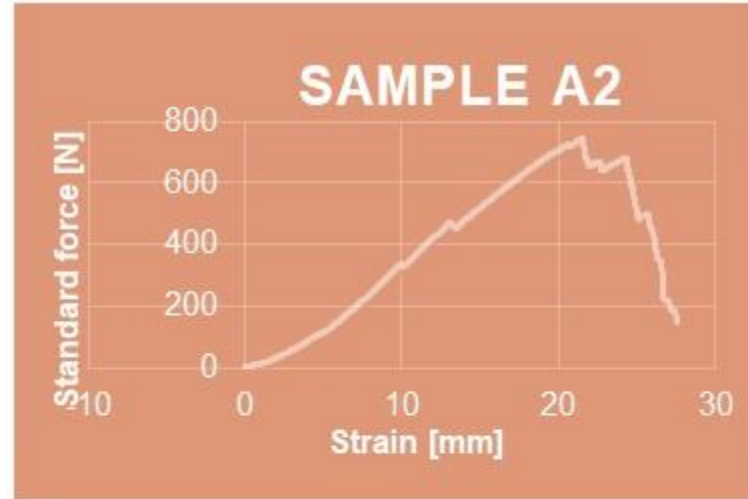
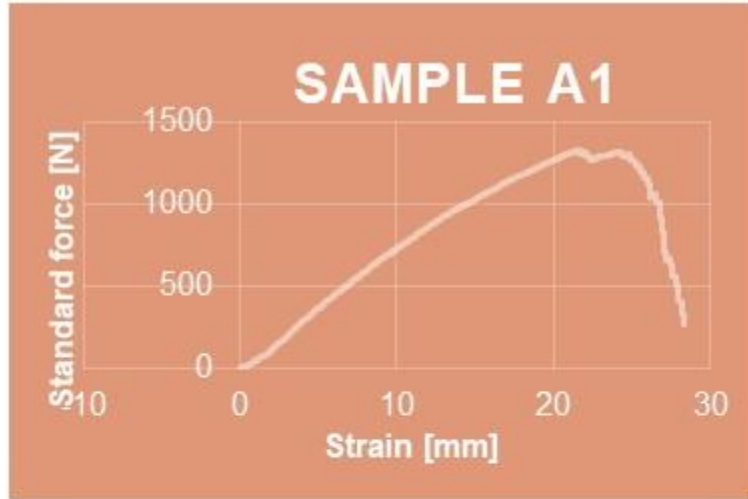
B3



B4



RESULTS



PROTOTYPING



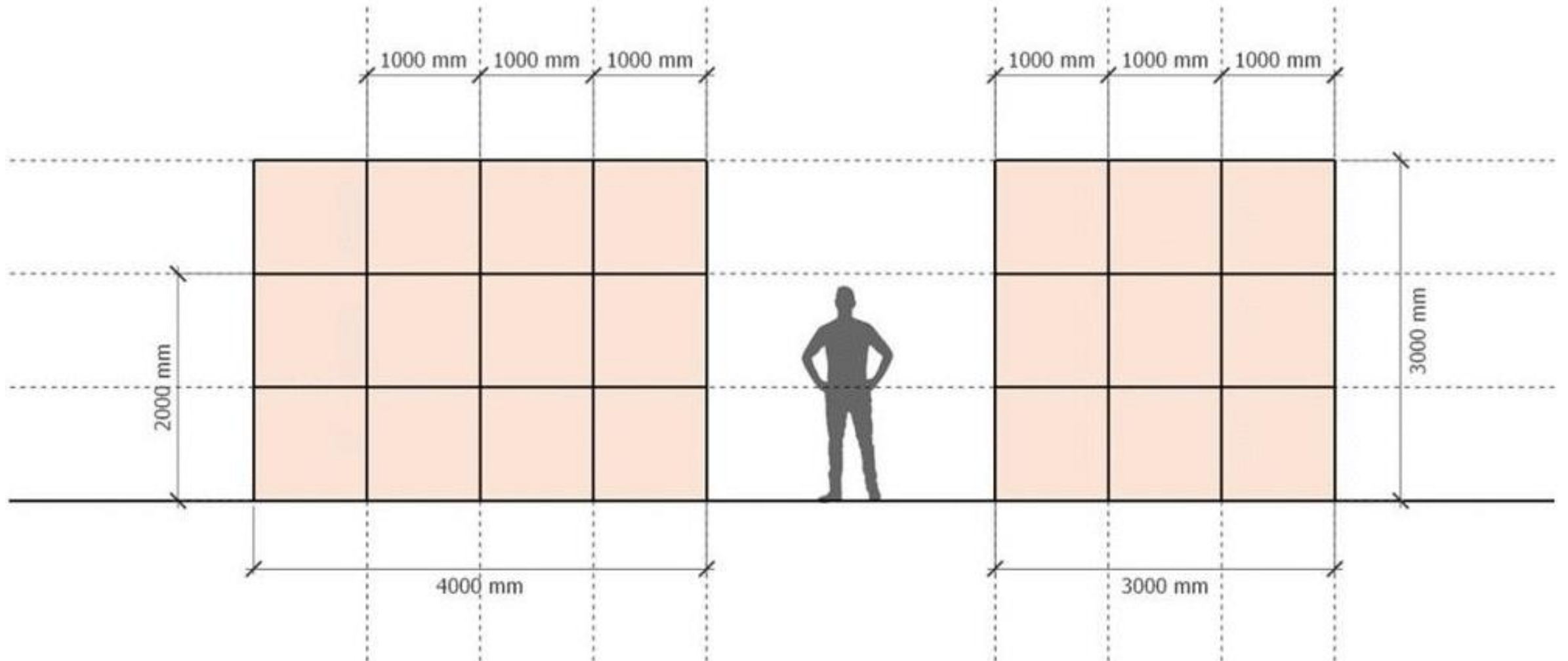
Sample number	s_M (MPa)
A1	35.98096
A2	18.63589
B1	3.602694
B2	17.81035
B3	23.72604
B4	11.20785



ARCHITECTURAL DESIGN

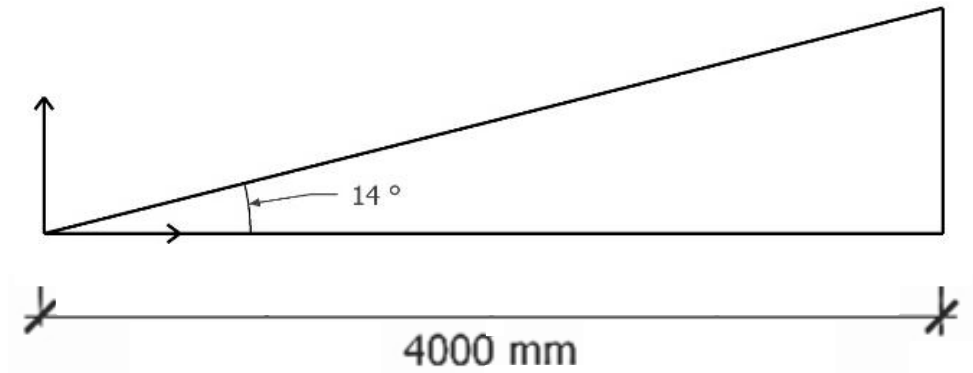
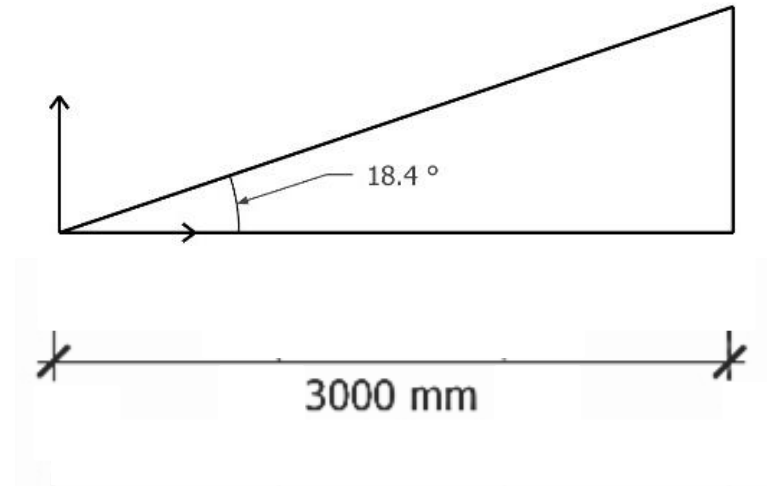
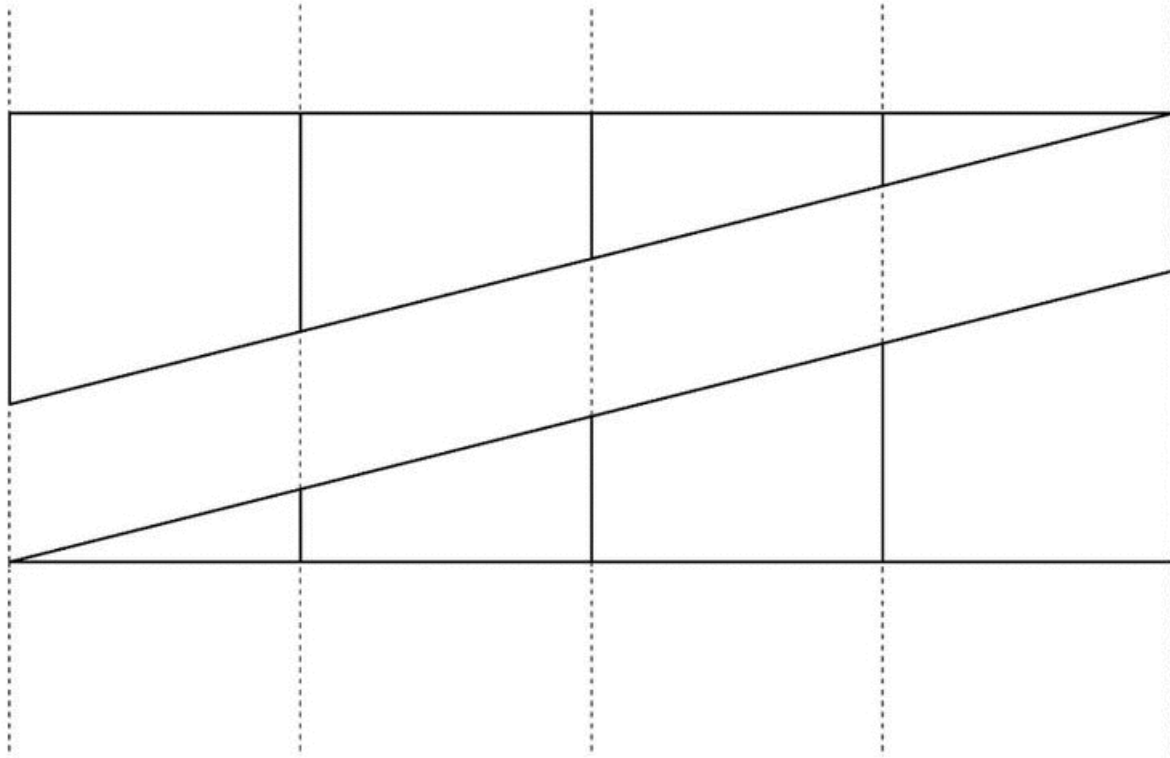


PANEL GEOMETRY



ARCHITECTURAL DESIGN

PANEL GEOMETRY

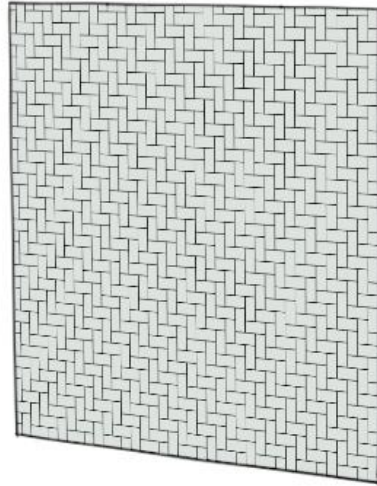


ROOF SLOPE ANGLES FOR BOTH DIMENSIONS

PANEL CONFIGURATION

A

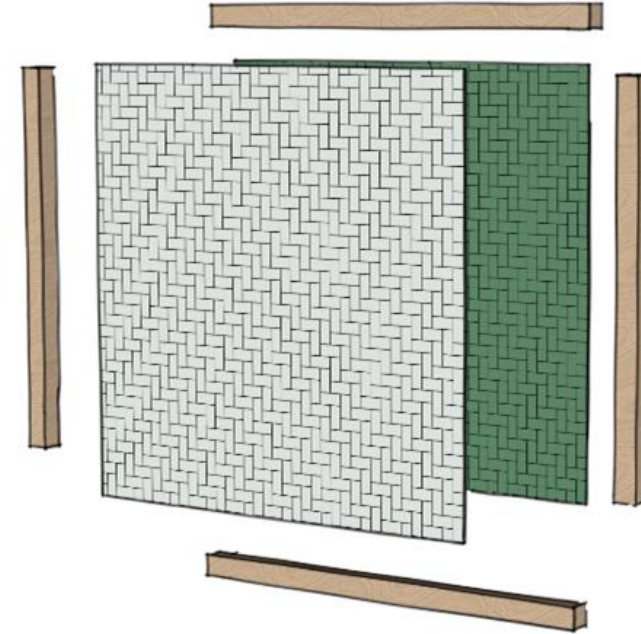
SHEET
PANEL



- Cost effective
- Simple connections
- Climate may not be improved

B

COMPOSITE
PANEL



- More expensive
- Design variation possibility
- Improved climate design

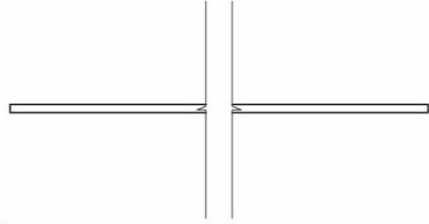
ARCHITECTURAL DESIGN



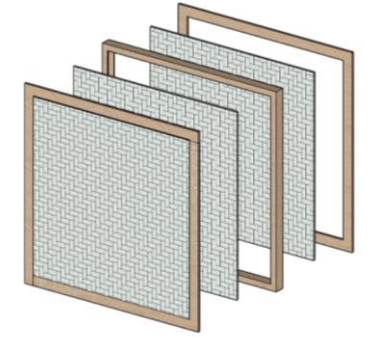
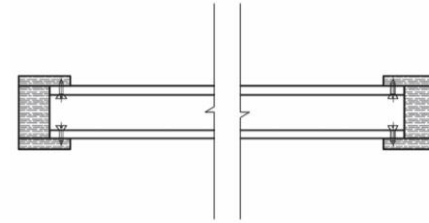
PANEL CONFIGURATION



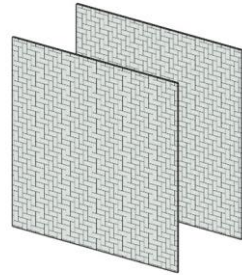
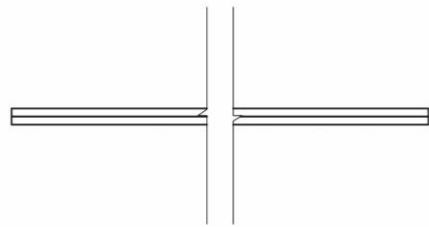
Option A1
Single Plastic layer



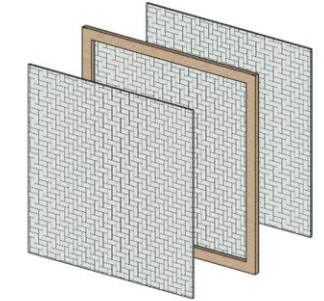
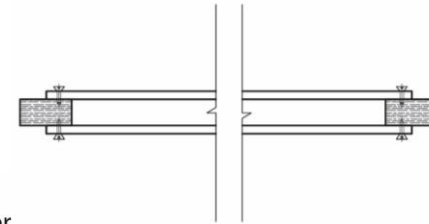
Option B1
Double layer with
cavity



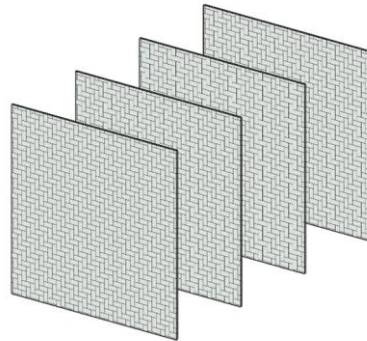
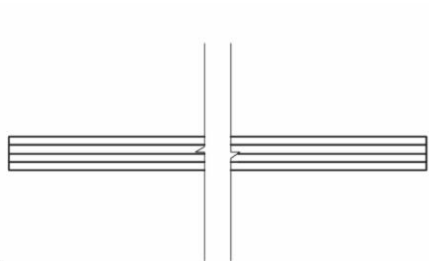
Option A2
Double Plastic layer



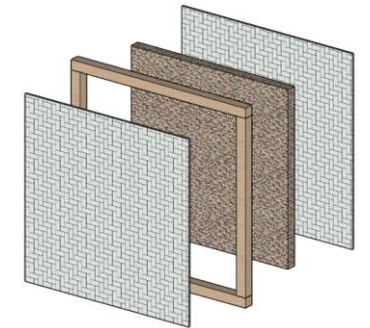
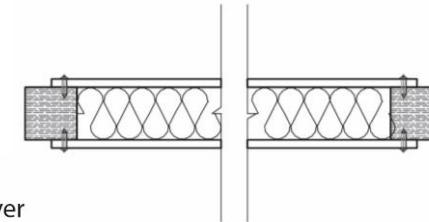
Option B2
Double plastic layer
with reduced cavity
and wood



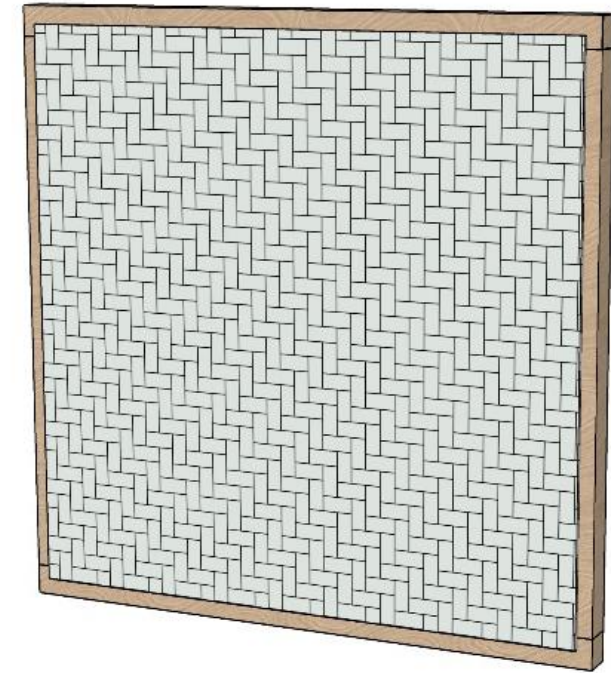
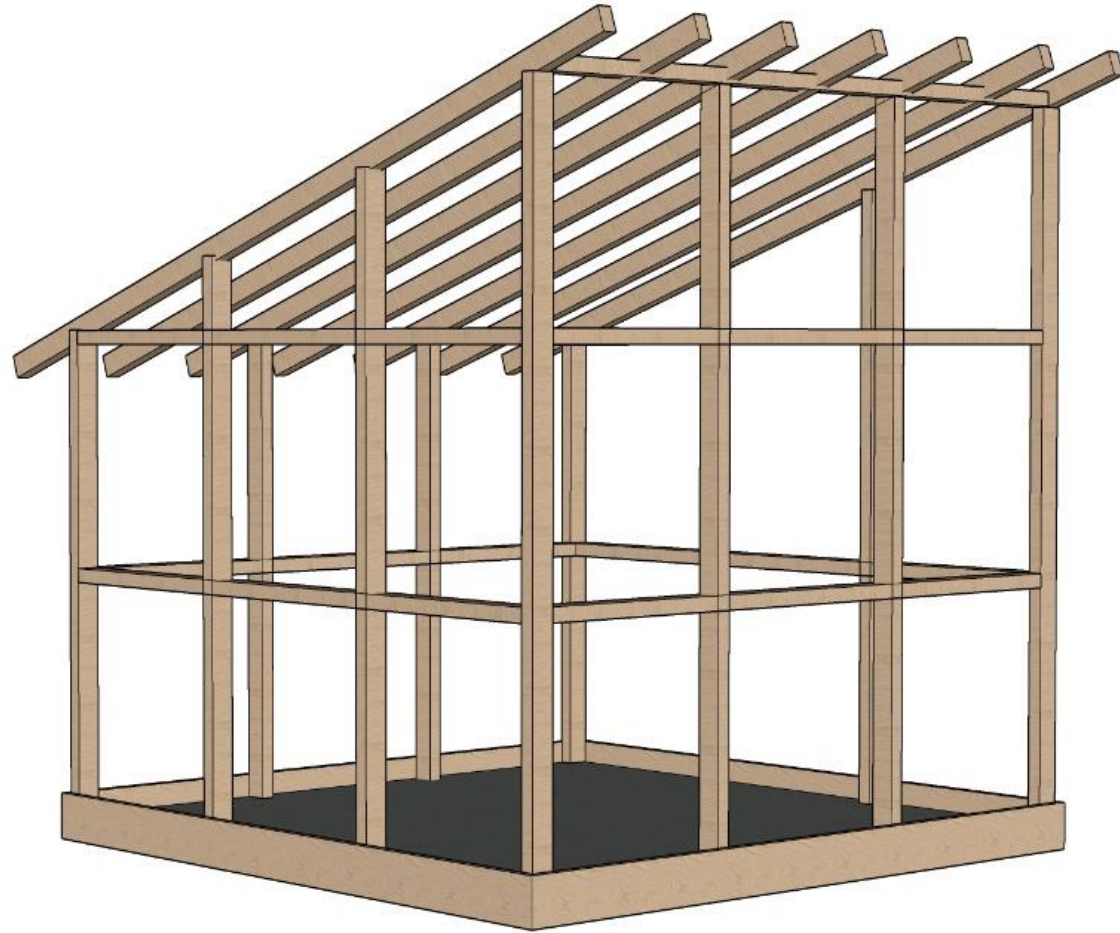
Option A3
Four plastic layers



Option B3
Double plastic layer
with wood and
insulation

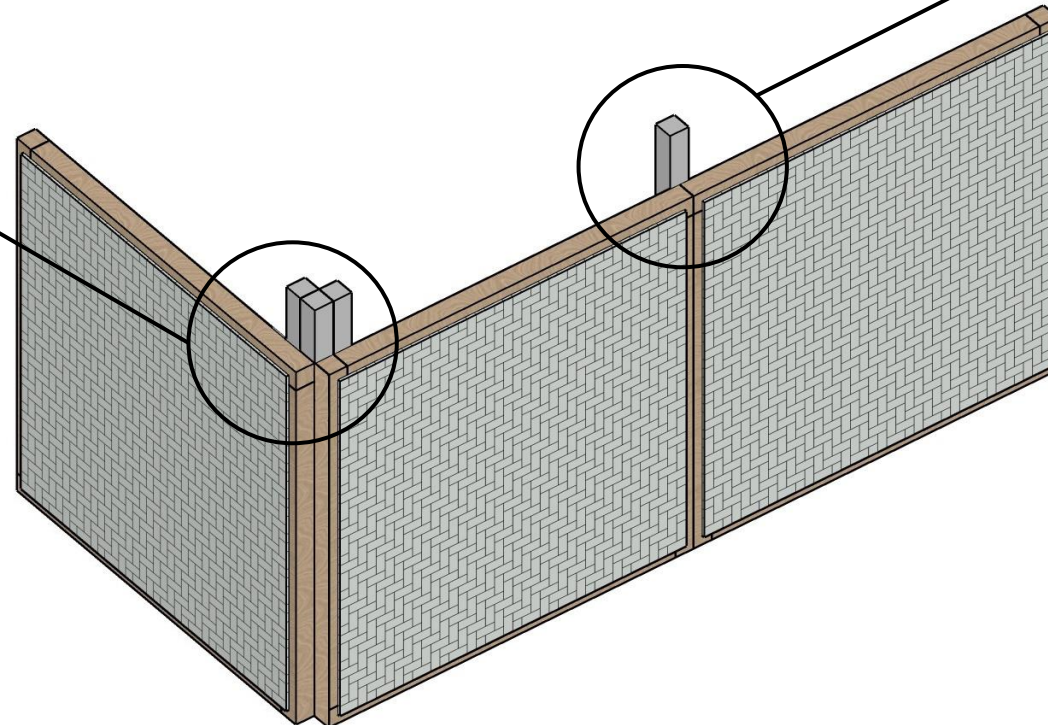
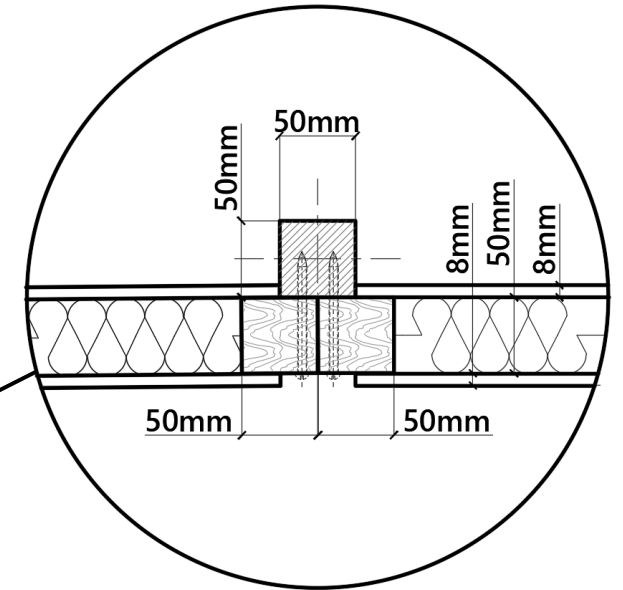
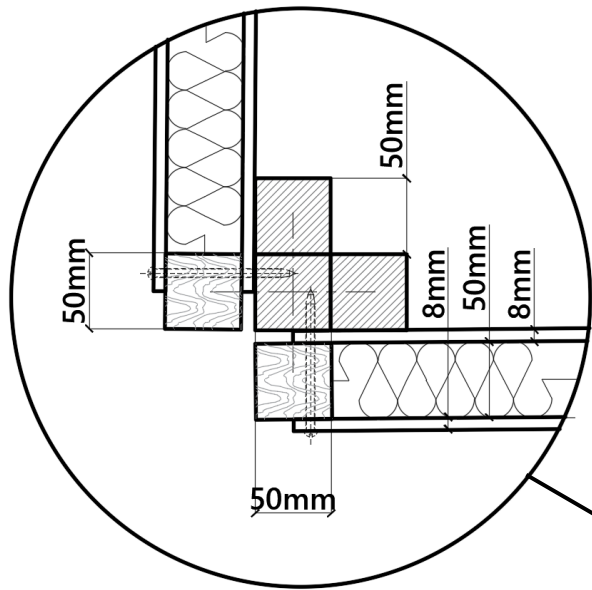


BUILDING SYSTEM



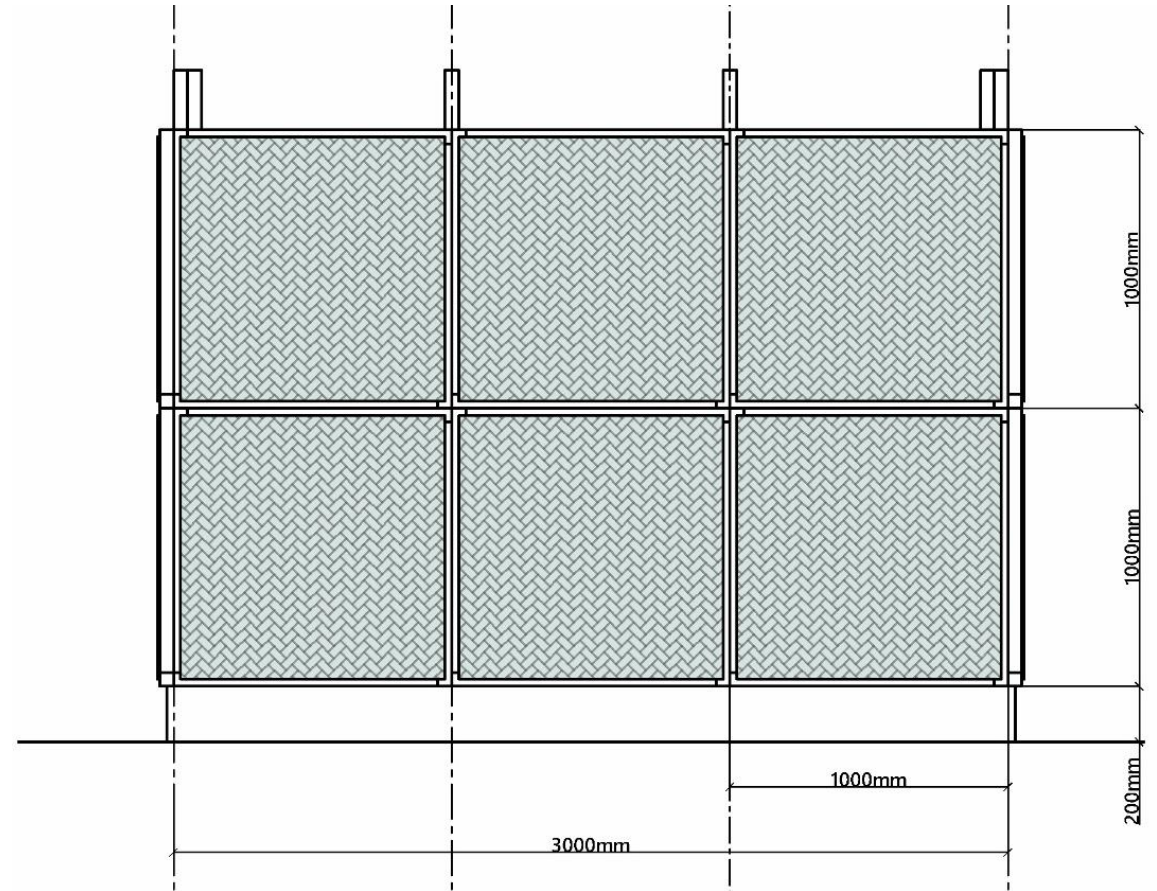
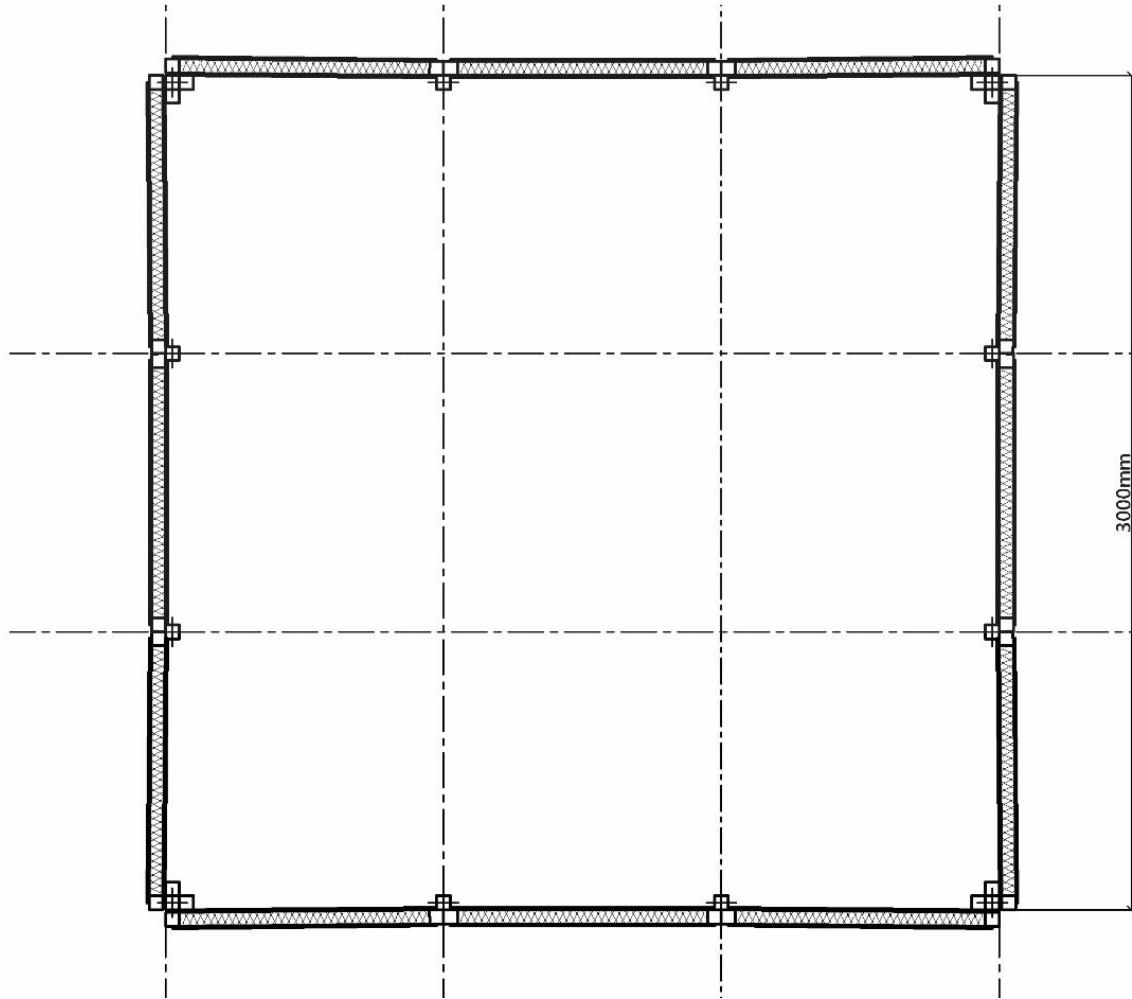
ARCHITECTURAL DESIGN

BUILDING SYSTEM

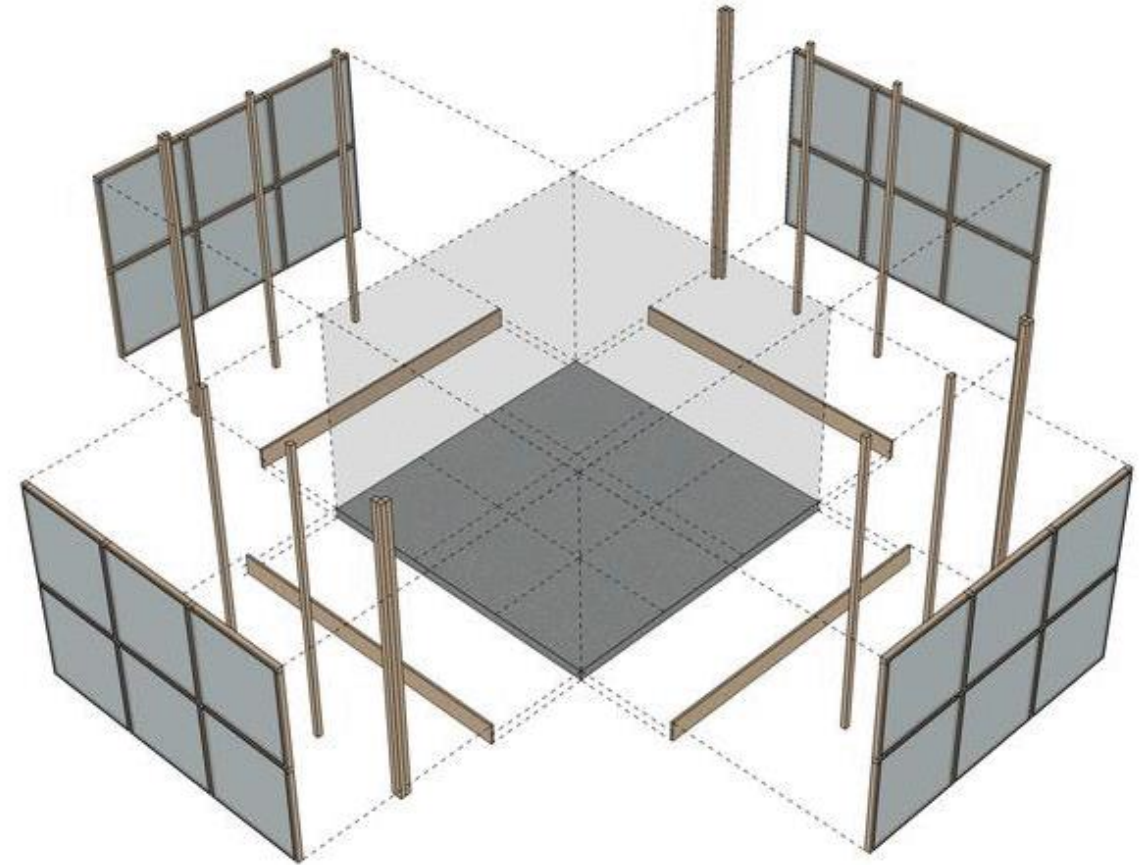
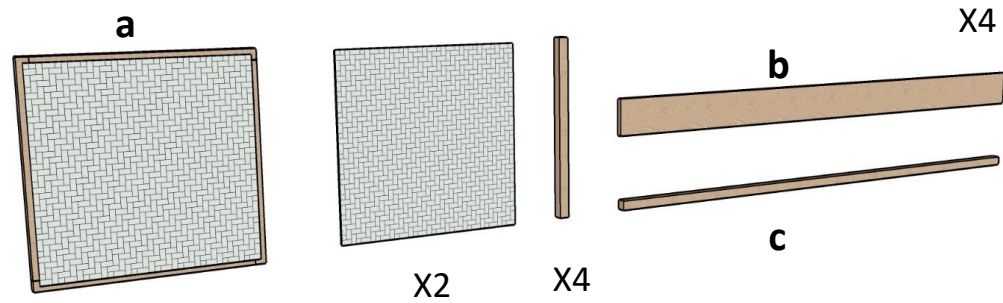


ARCHITECTURAL DESIGN

GRID AND ELEVATION



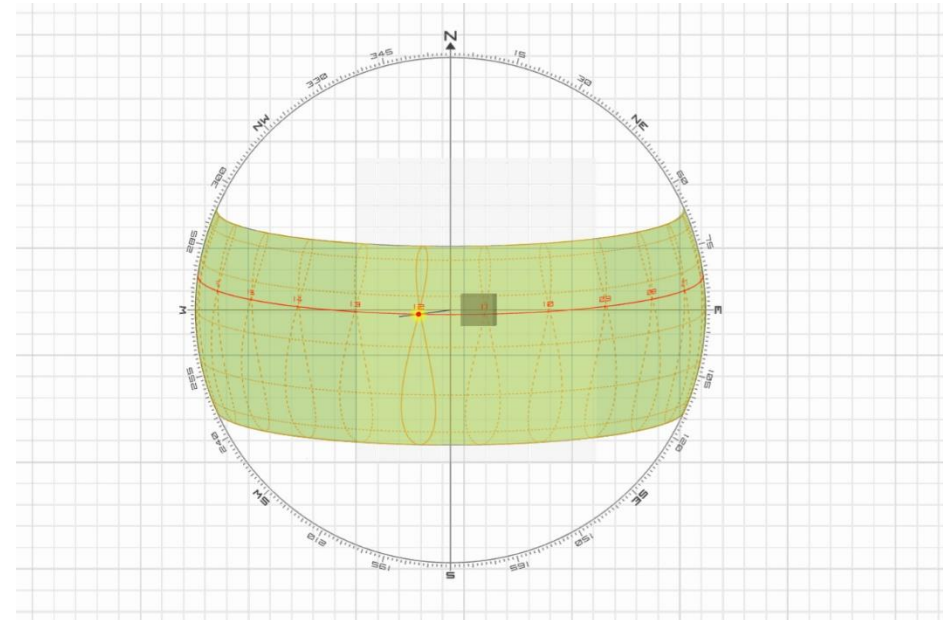
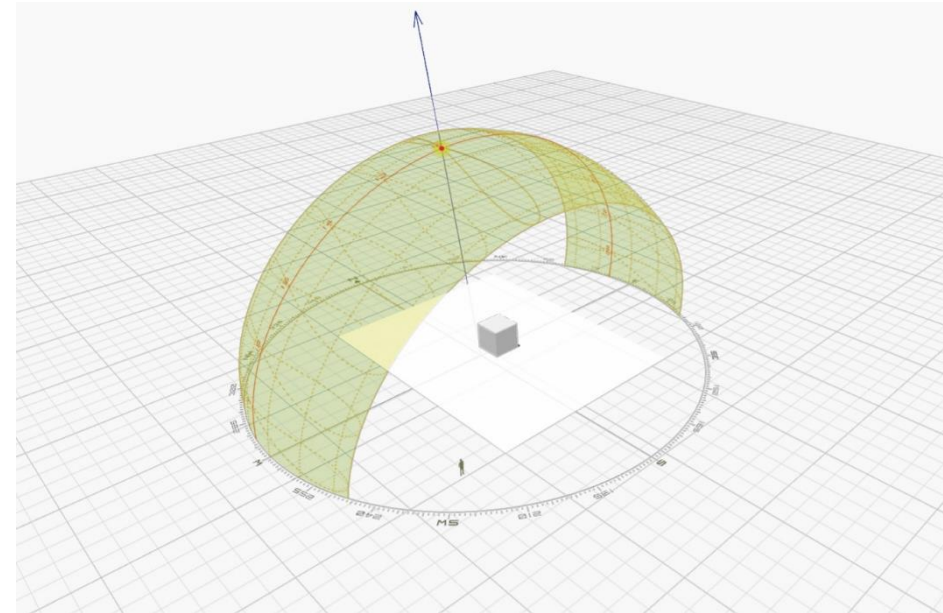
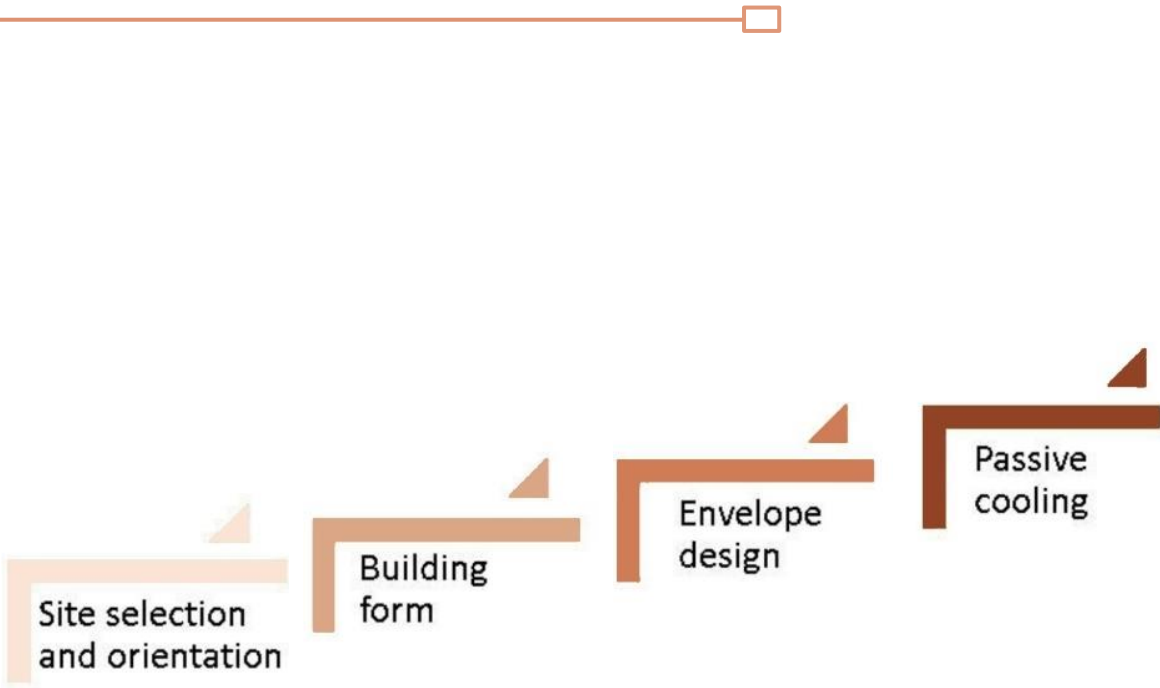
BUILDING SYSTEM



There are four main components in this building system

- a. 950x950 woven PET panel, 50x50x950mm wooden panel
- b. 25x200x300mm base wooden panel
- c. different bar lengths 50x50mm thickness

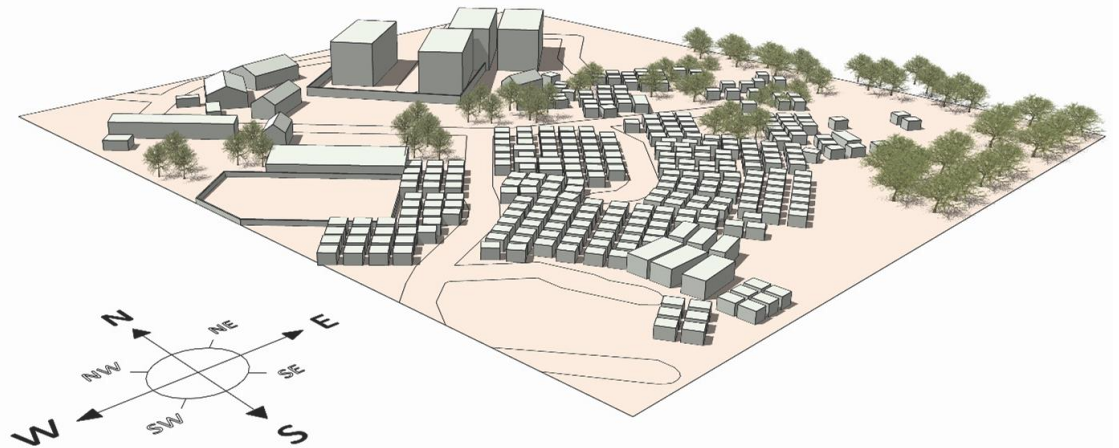
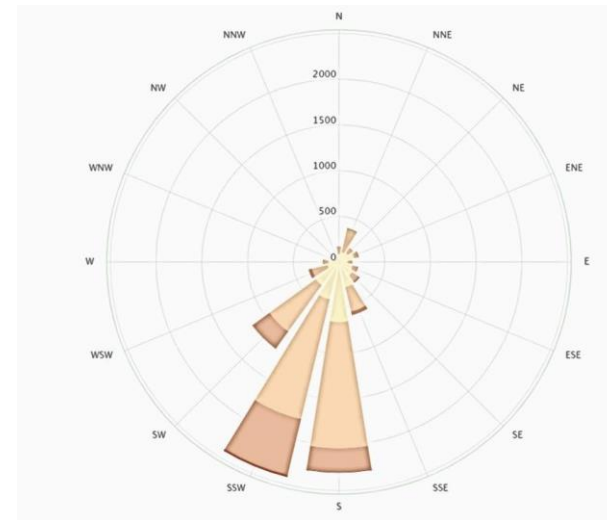
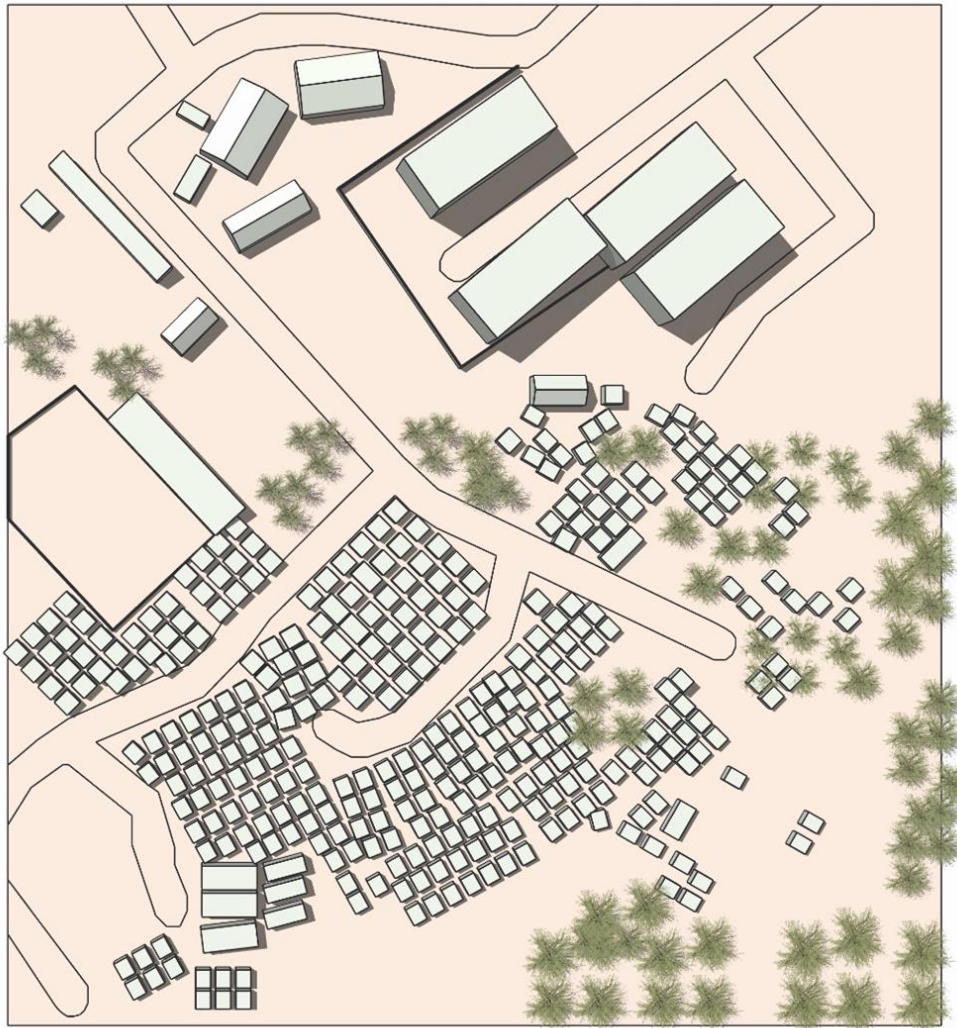
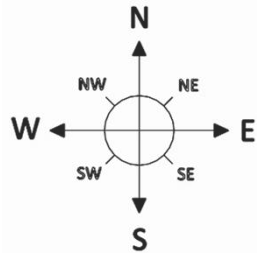
BIOCLIMATIC DESIGN

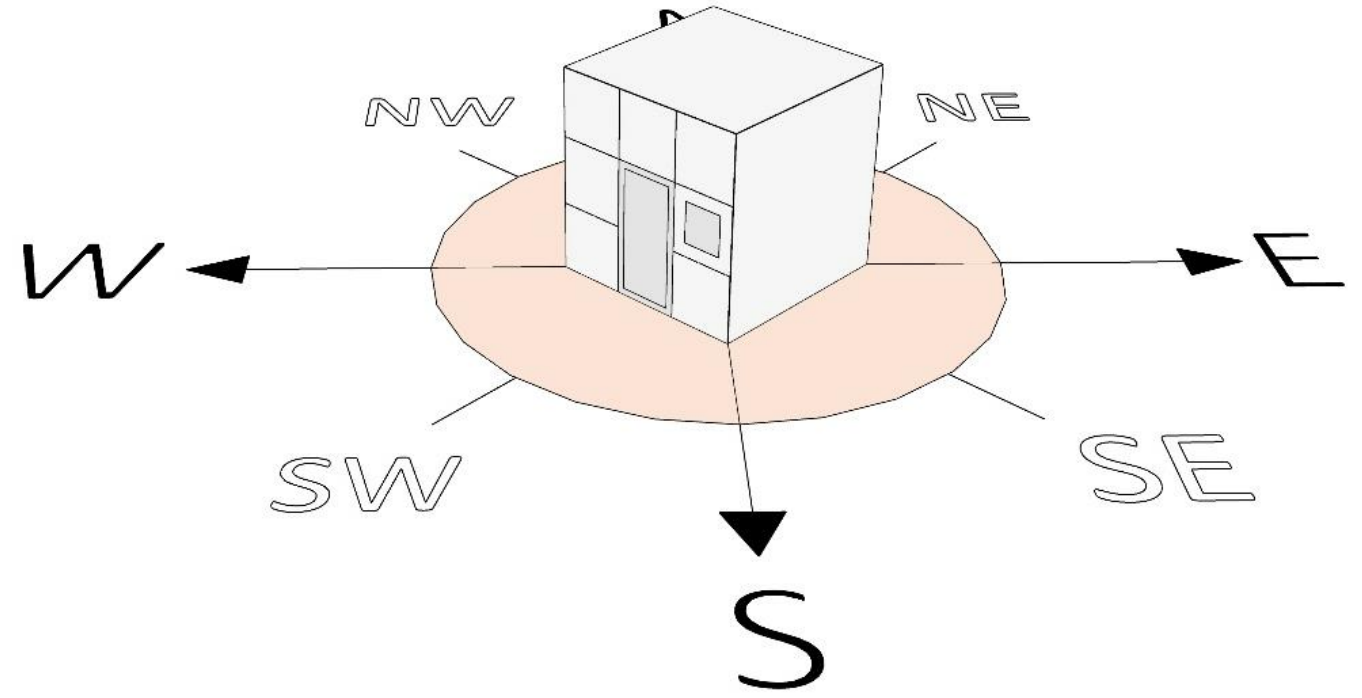
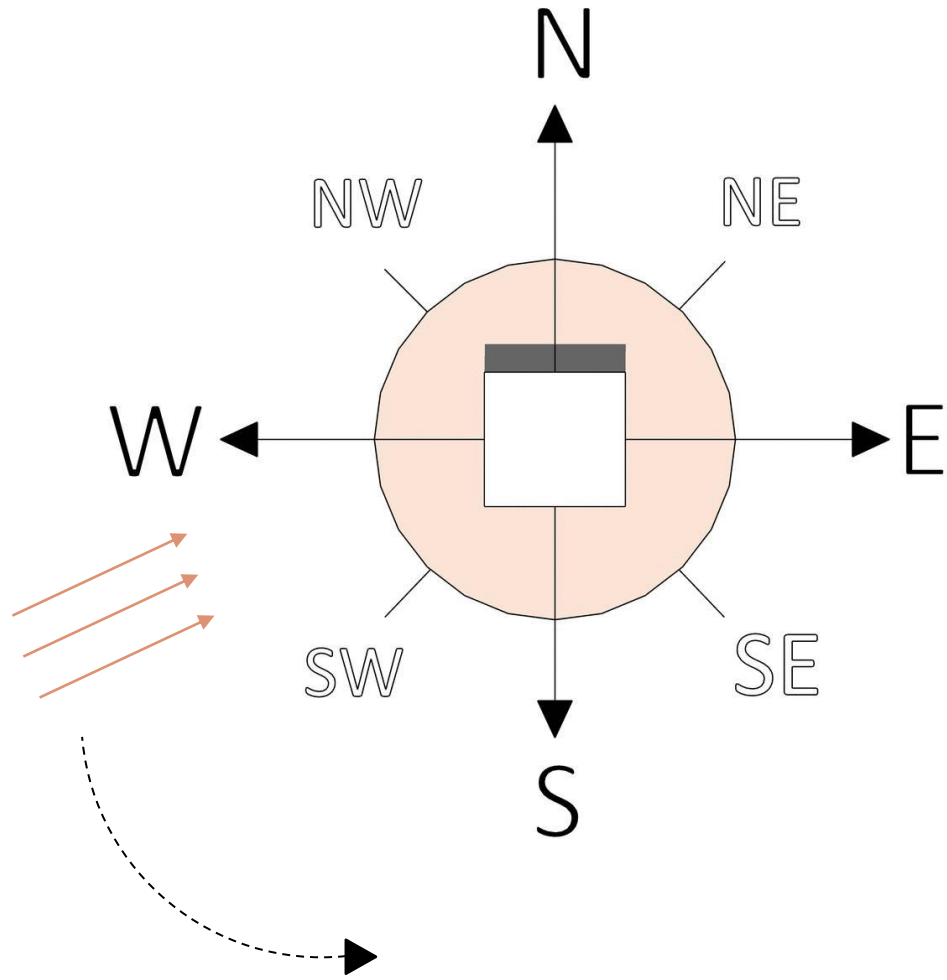


BIOCLIMATIC DESIGN

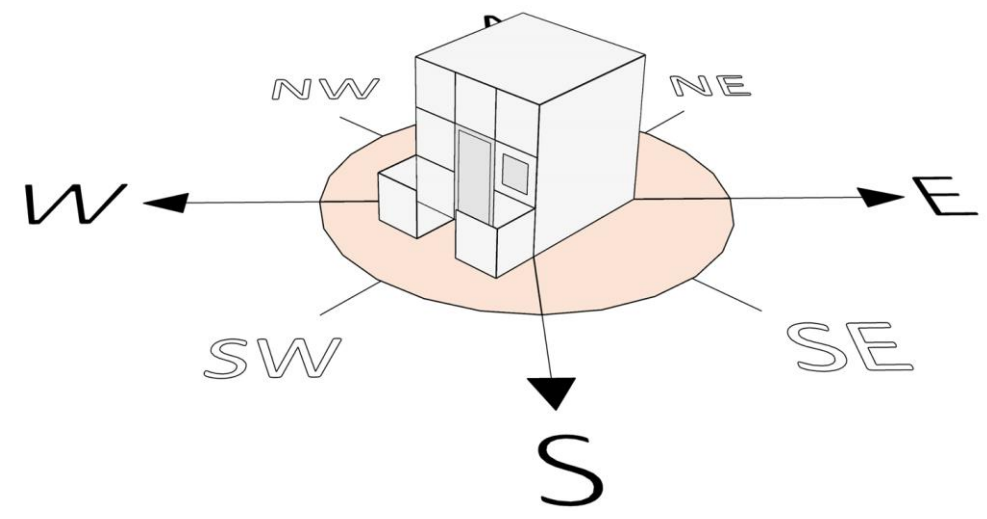
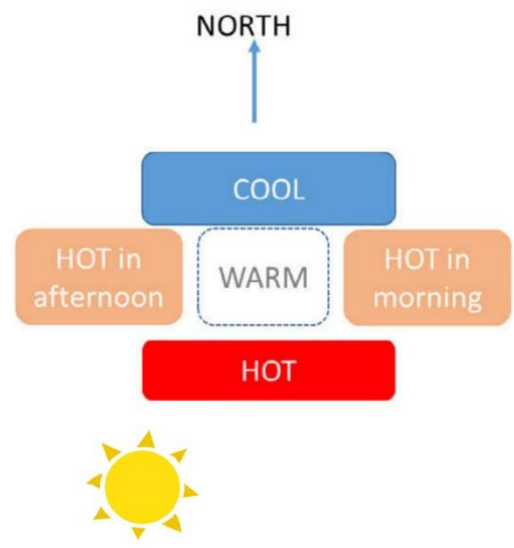
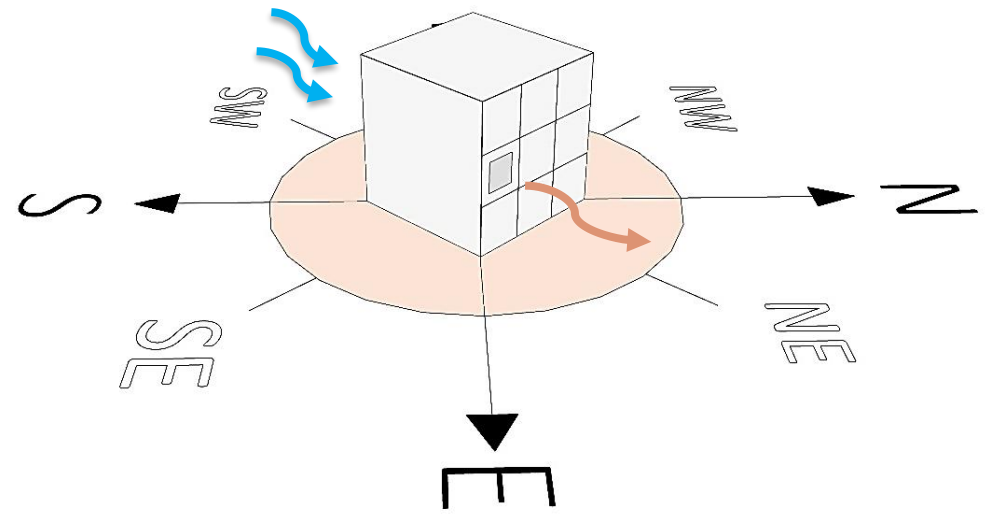
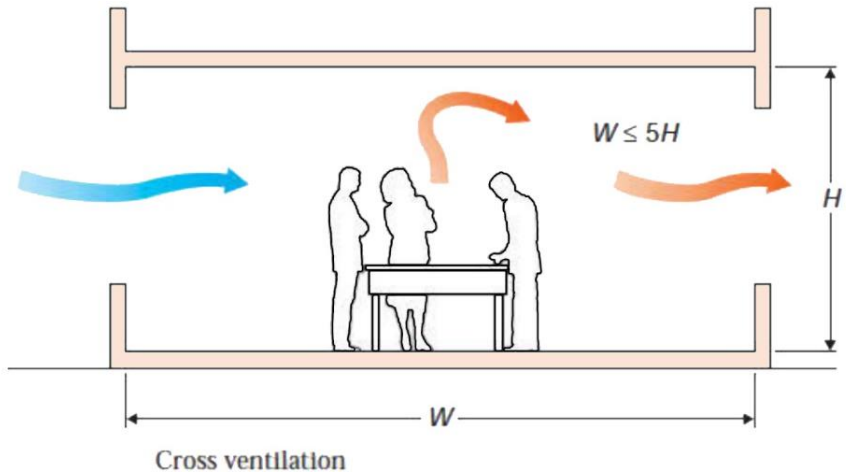
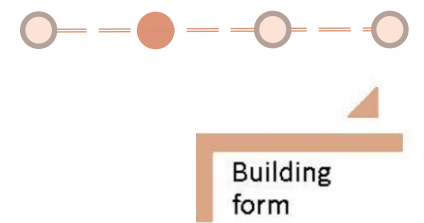


Site selection
and orientation





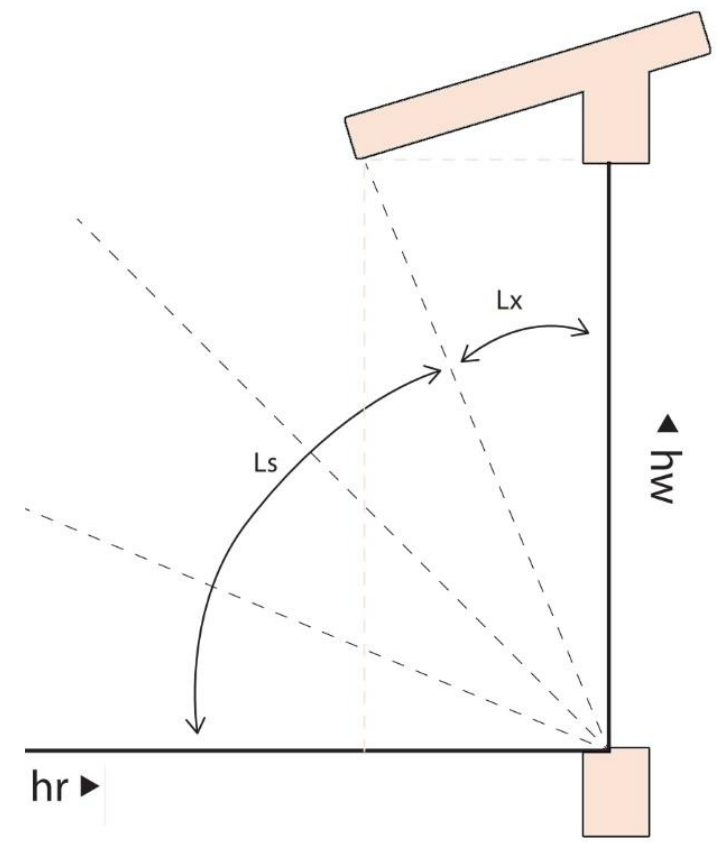
BIOCLIMATIC DESIGN



FORMULA FOR OVERHANG CALCULATION

Where L_s = Solar angle
 hr = overhang width
 hw = distance between the window start and gutter
 L_x = angle for overhang calculation

$L_x + L_s = 90$
 $L_x = 90 - L_s$
 $\tan L_x = hr/hw$
 $hr = hw * \tan (90 - L_s)$



Using the formula for overhang $hr = hw * \tan (90 - L_s)$

Hr 20° E/W of North
 North = $0.7 * \tan (90 - 62)$
 = 0.4m

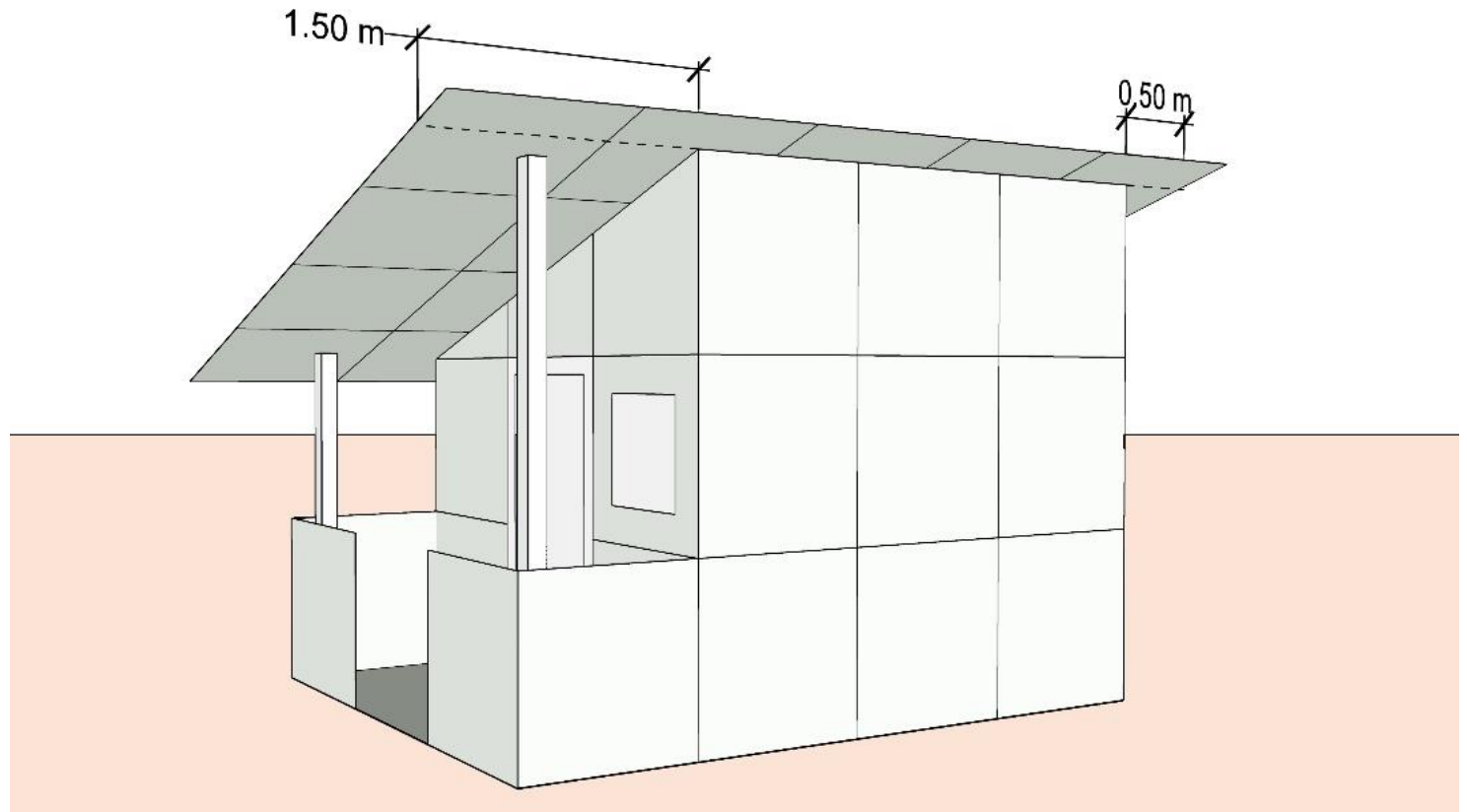
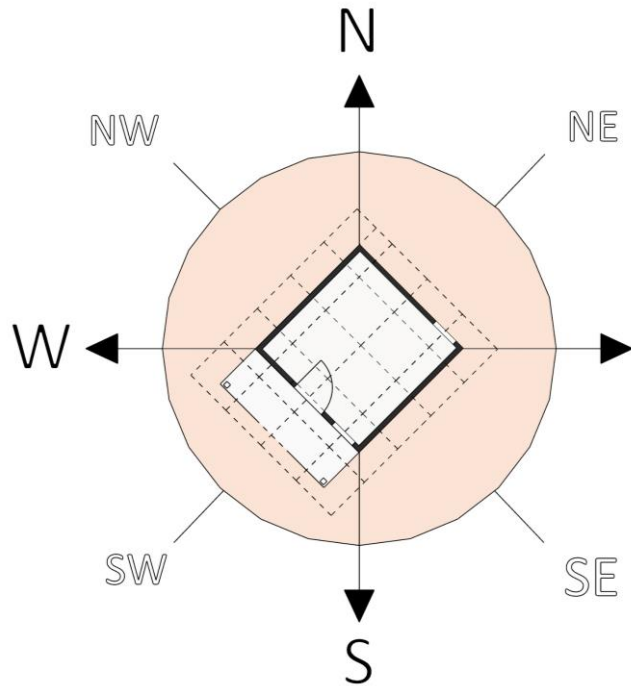
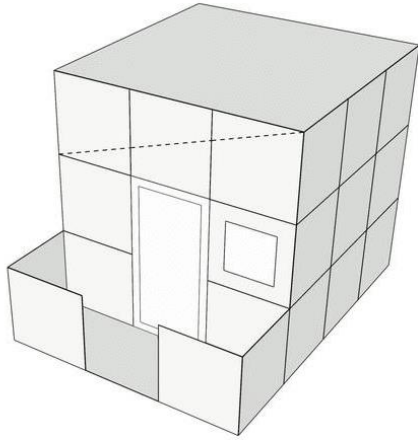
Hr E/W of South = $0.7 * \tan (90 - 49)$
 = 0.6m

Façade orientation	Due North	20° E/W of North	Due South	20° E/W of South
Abuja (Lat 6°N)	73°	62°	57°	49°

BIOCLIMATIC DESIGN

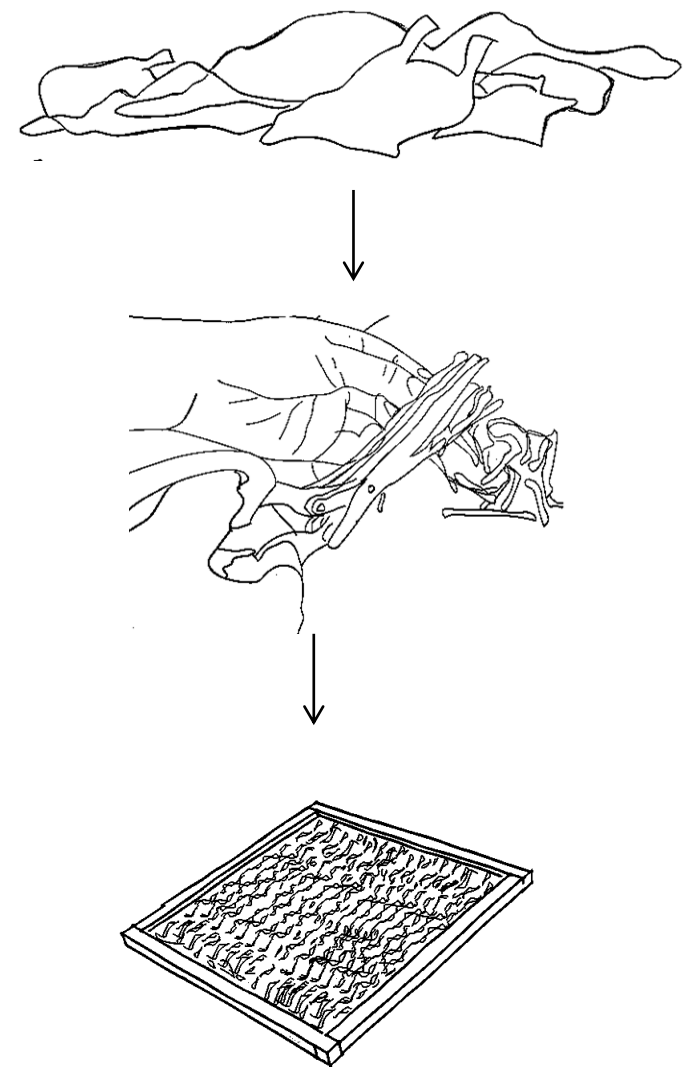
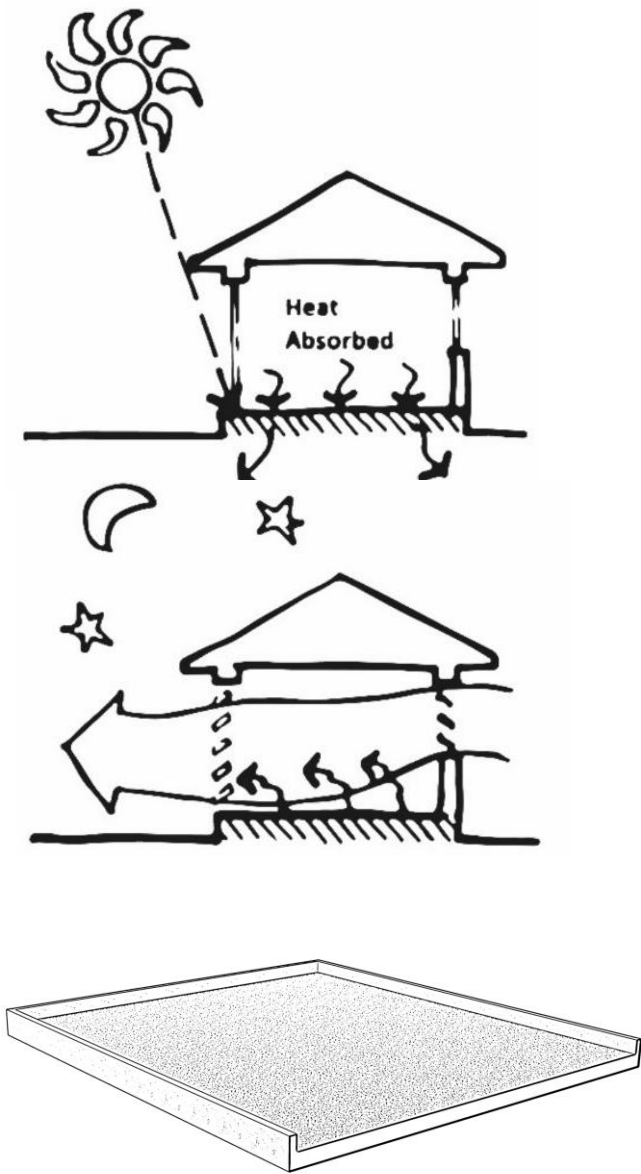


Envelope design





Passive cooling



Cross Section

Outer surface	
8.00mm	PET
50.00mm Polyethylene / Polythene, low density	
8.00mm	PET
Inner surface	

No Bridging	
U-Value surface to surface (W/m ² -K)	3.819
R-Value (m ² -K/W)	0.432
U-Value (W/m²-K)	2.316
With Bridging (BS EN ISO 6946)	
Thickness (m)	0.0660
Km - Internal heat capacity (KJ/m ² -K)	63.4640
Upper resistance limit (m ² -K/W)	0.432
Lower resistance limit (m ² -K/W)	0.432
U-Value surface to surface (W/m ² -K)	3.819
R-Value (m ² -K/W)	0.432
U-Value (W/m²-K)	2.316



TYPE A



TYPE B

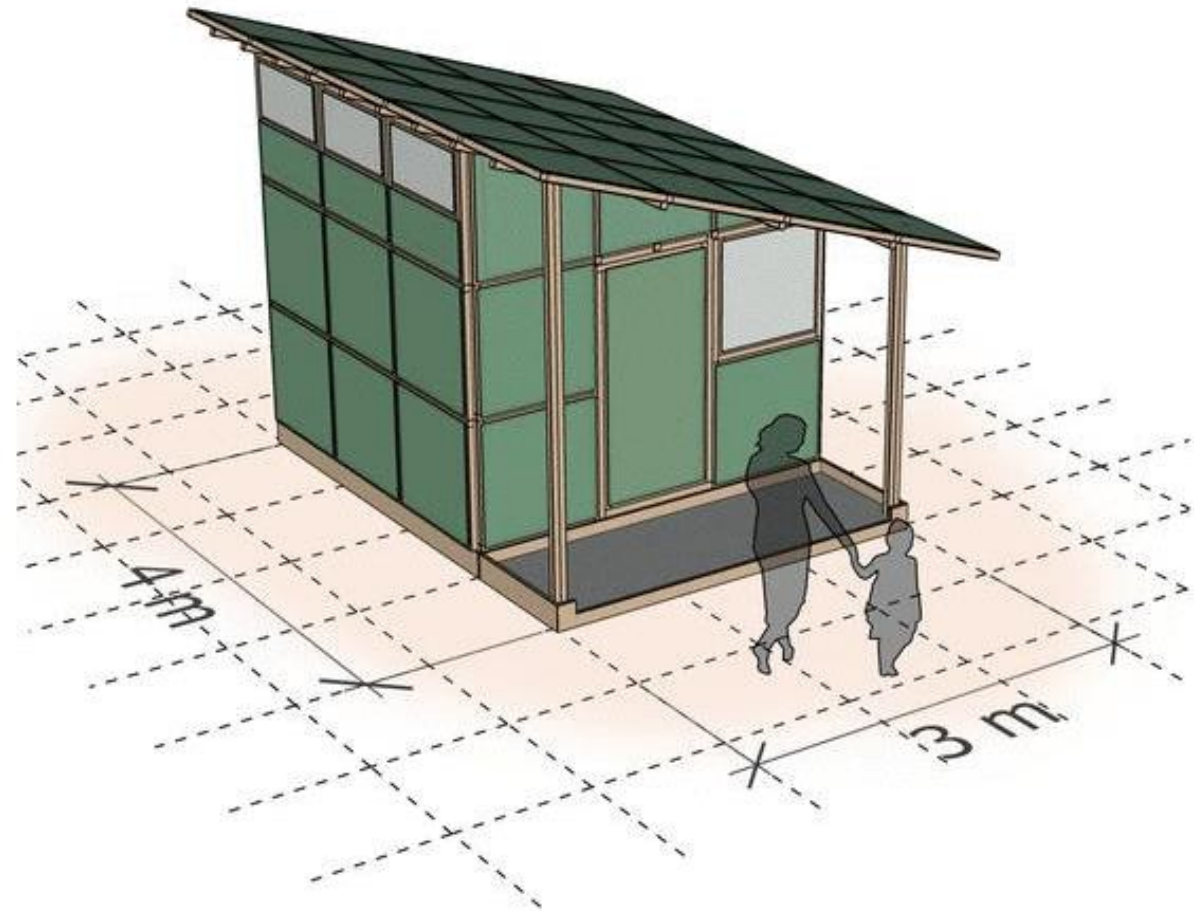
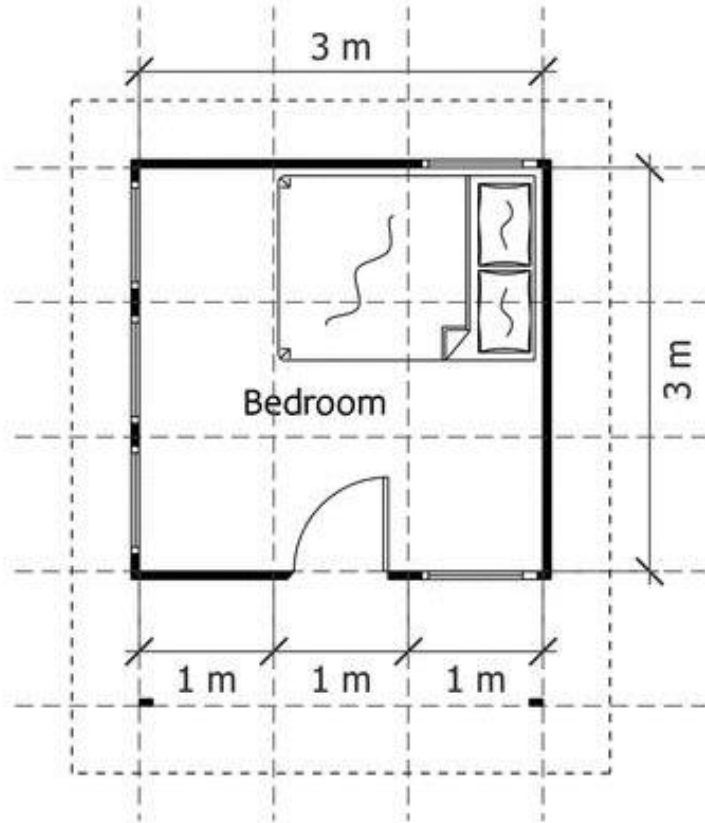


TYPE C

ARCHITECTURAL APPLICATION



TYPE A



A1

ARCHITECTURAL APPLICATION



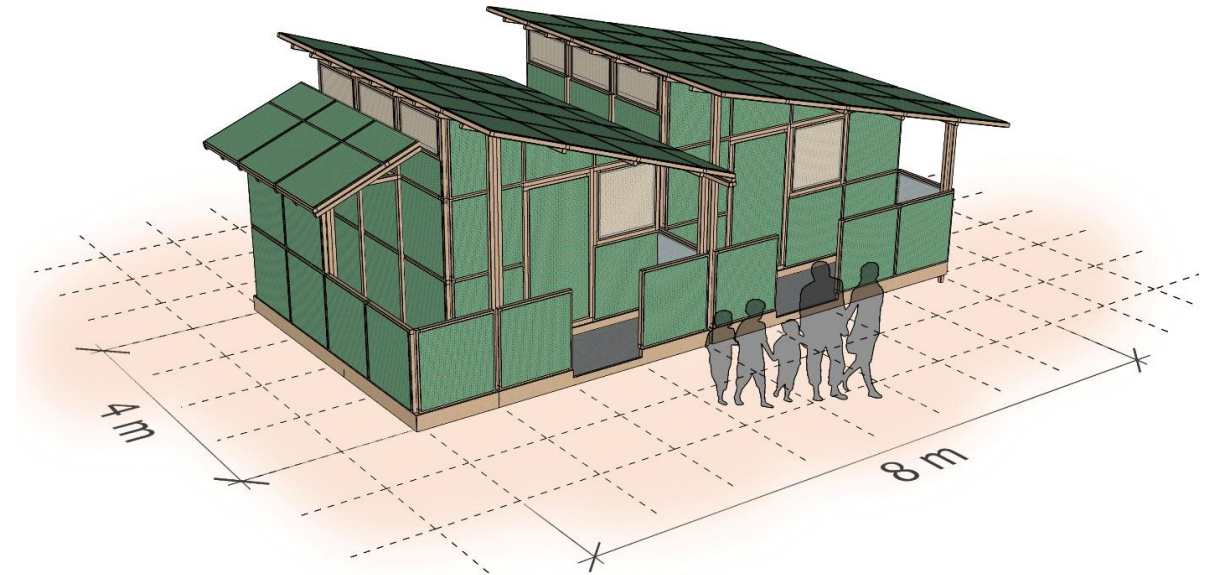
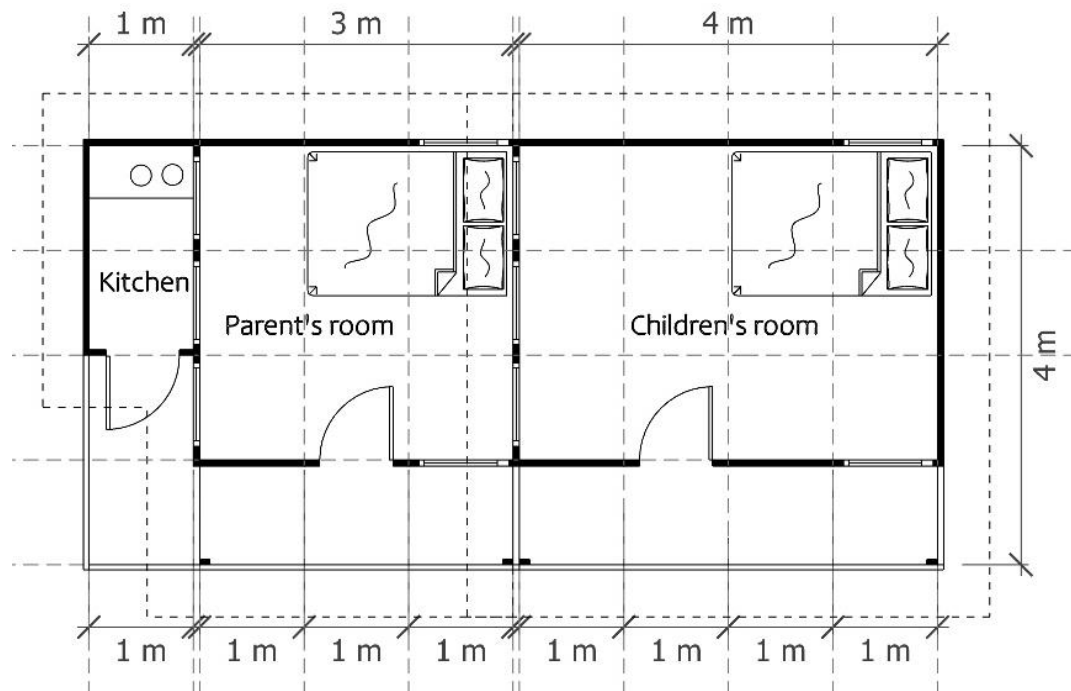
TYPE A3



ARCHITECTURAL APPLICATION



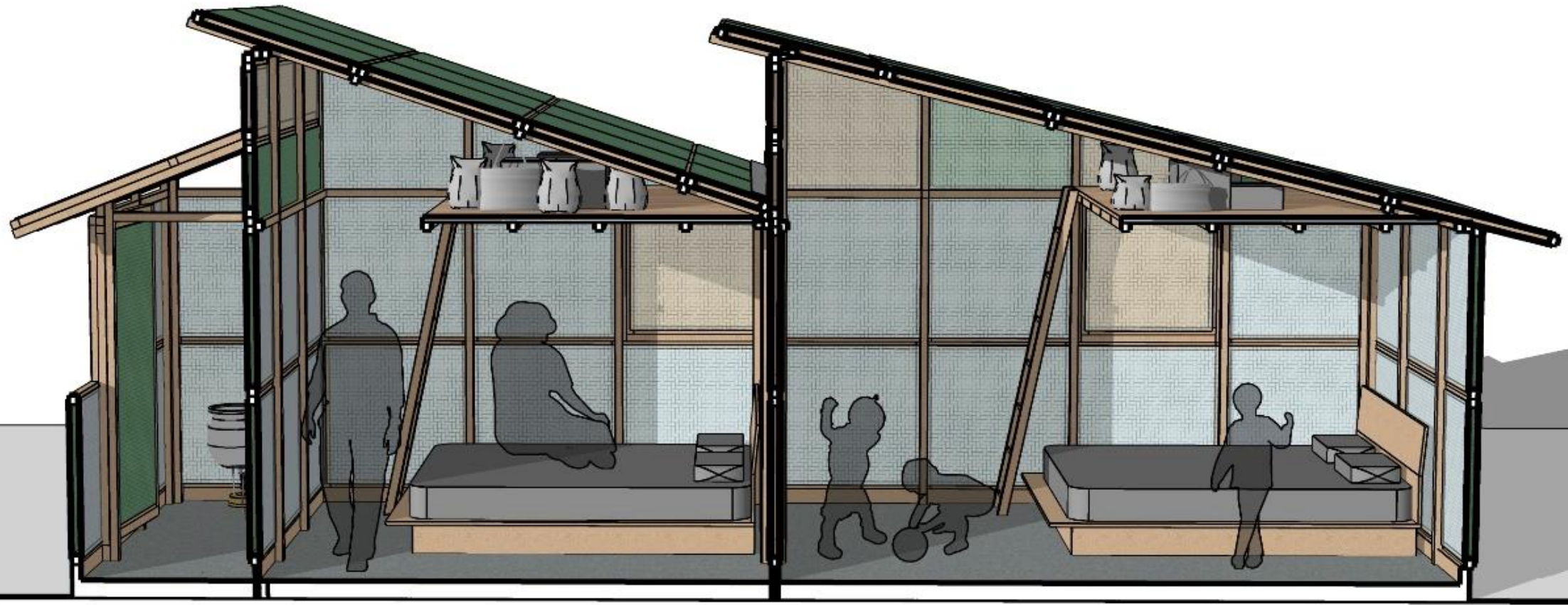
TYPE B



ARCHITECTURAL APPLICATION



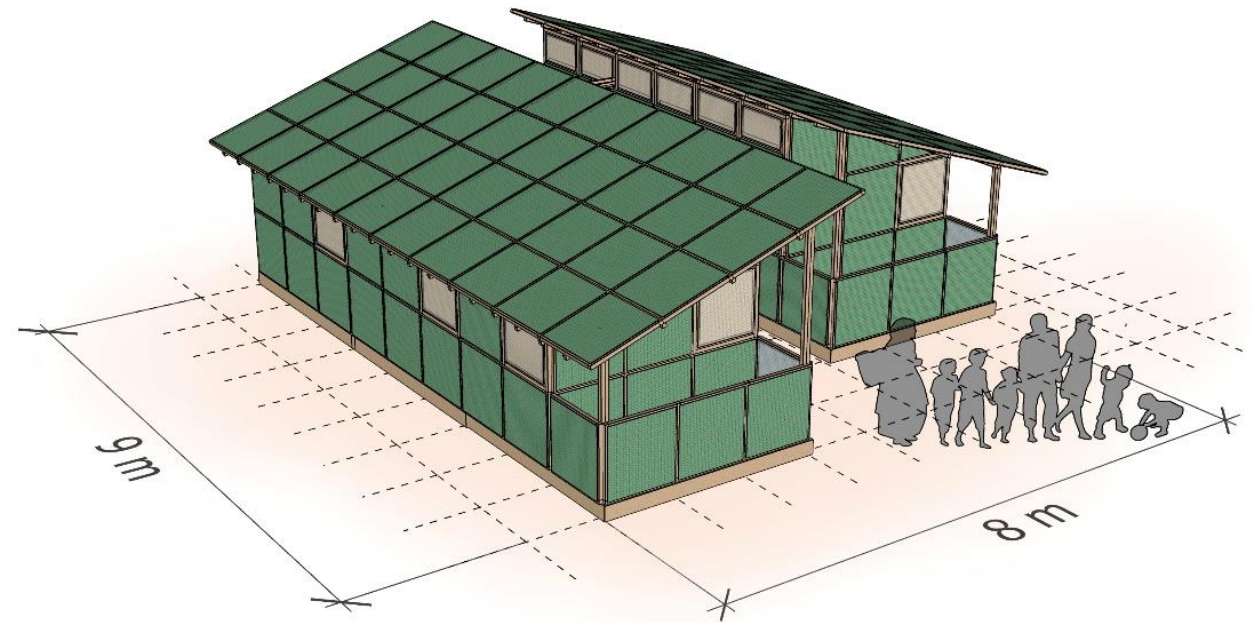
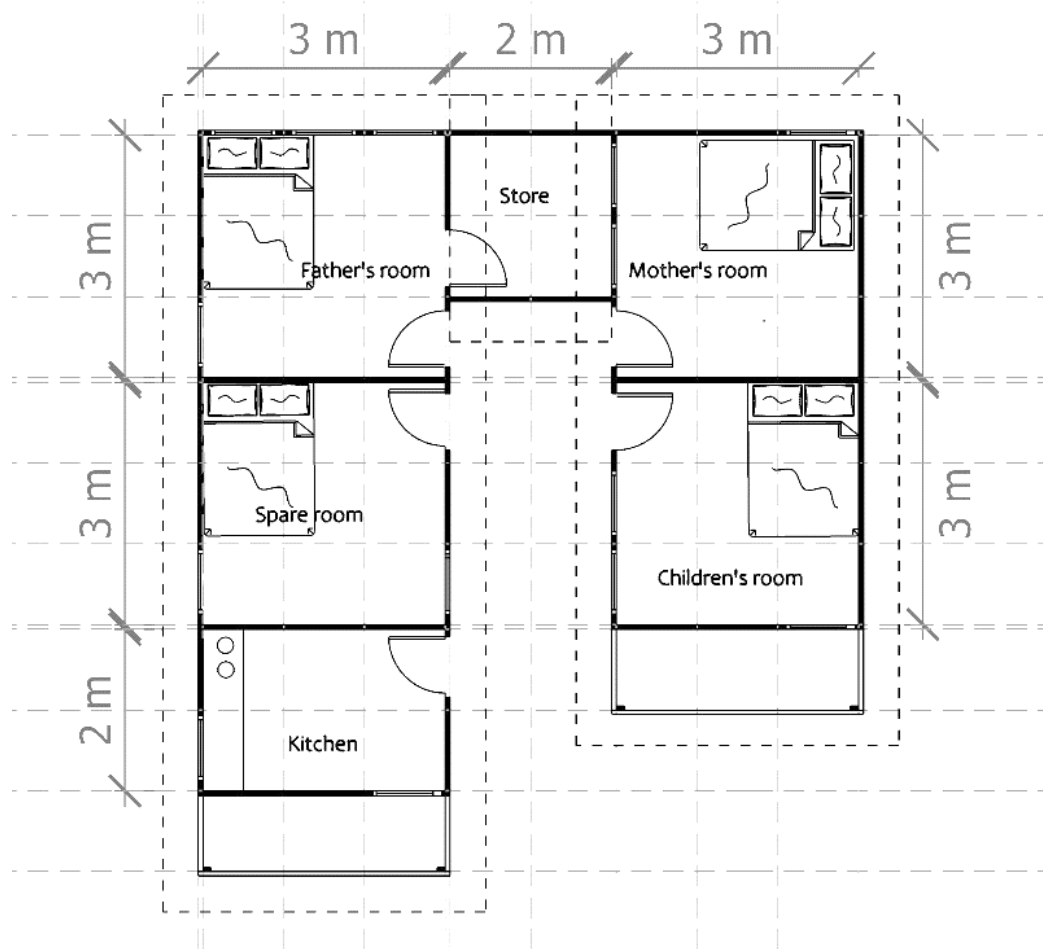
TYPE B



ARCHITECTURAL APPLICATION

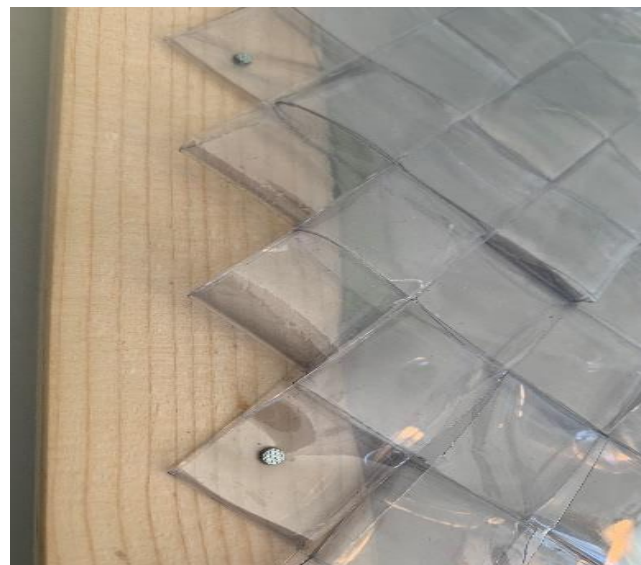
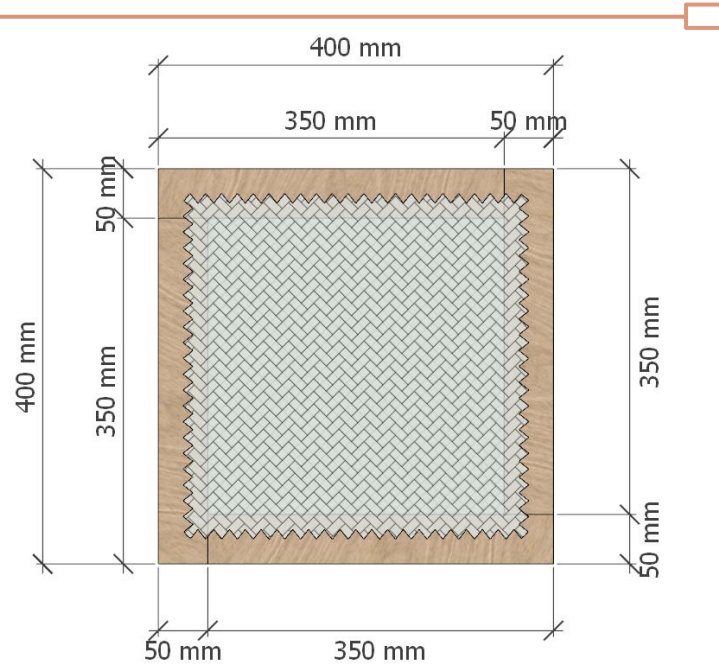


TYPE C

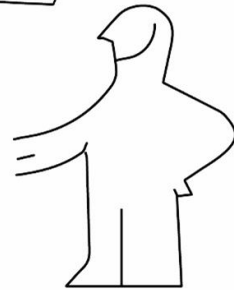
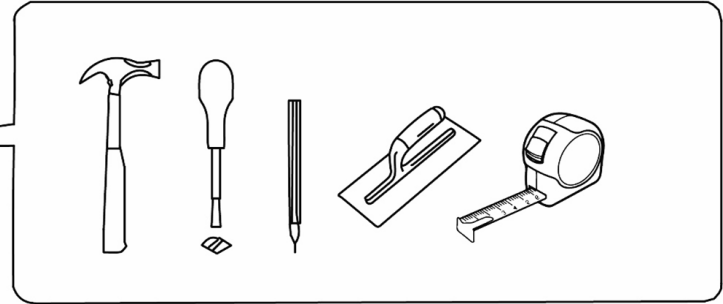
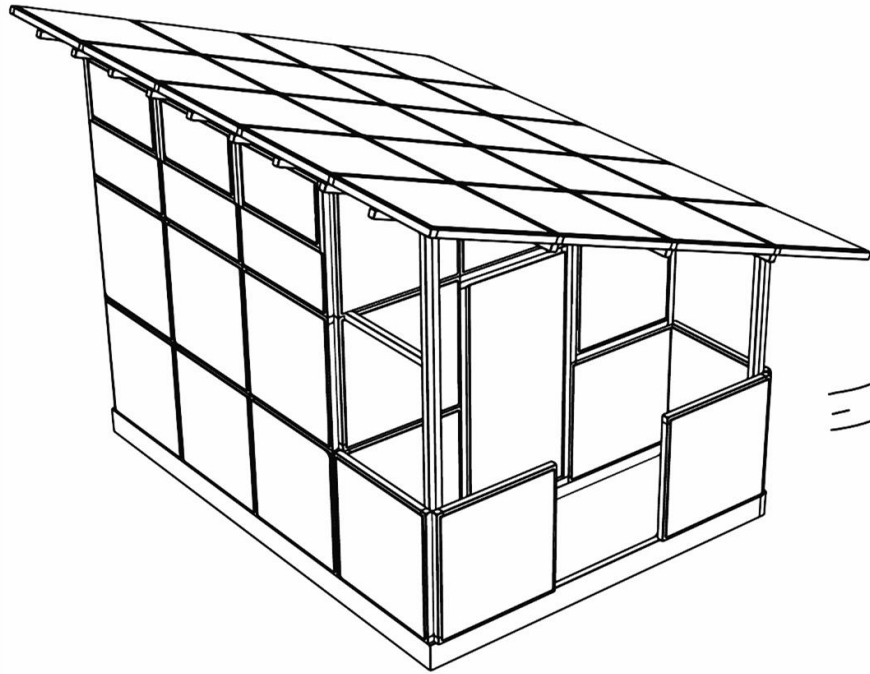




PHYSICAL PROTOTYPE



PLASTIC BACHA



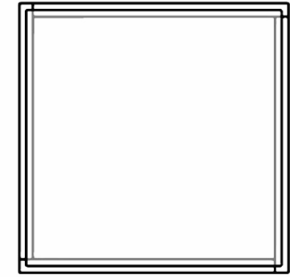
x8



x>100



x>100

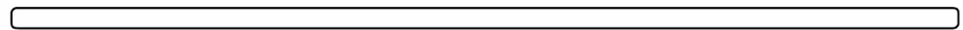


x50

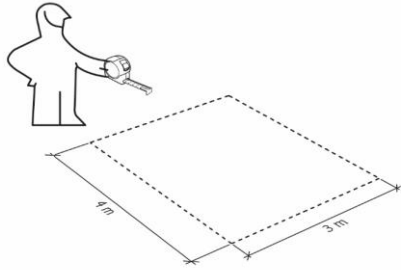
x>4



x>40

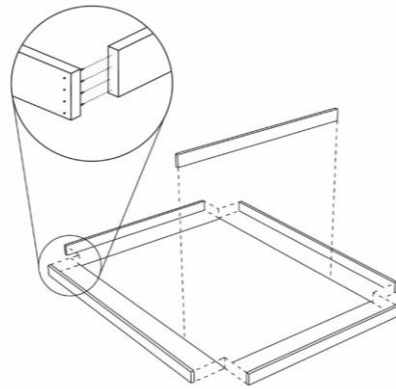


1



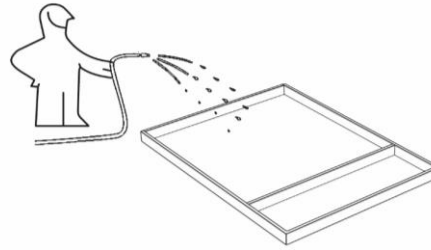
Set out the dimension of the bacha

2



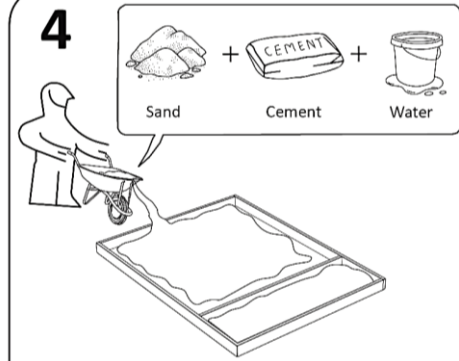
Attach the base panels to get the concrete formwork

3



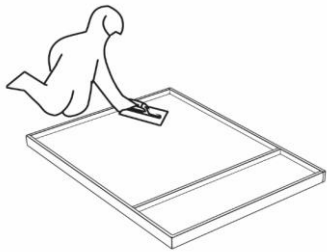
Water the ground to allow the soil to expand

4



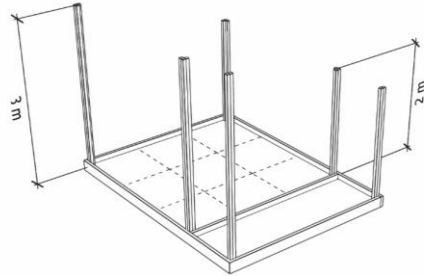
Mix appropriate amount of cement, lime, sand and water according to the instructions on the bag until smooth. Pour the mortar inside the formwork

5



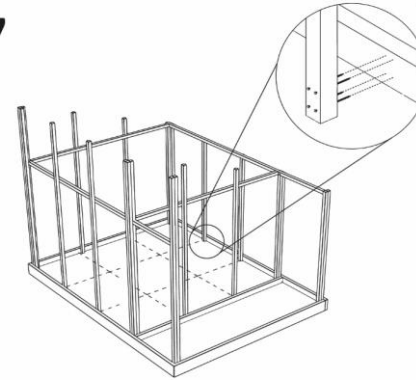
Level the concrete with a trowel and allow to dry

6



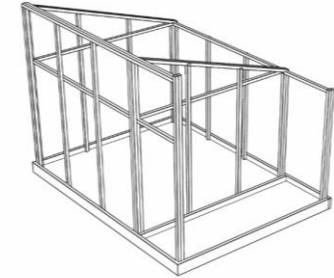
Place the columns at the base of the dry concrete and attach to the wooden plank

7



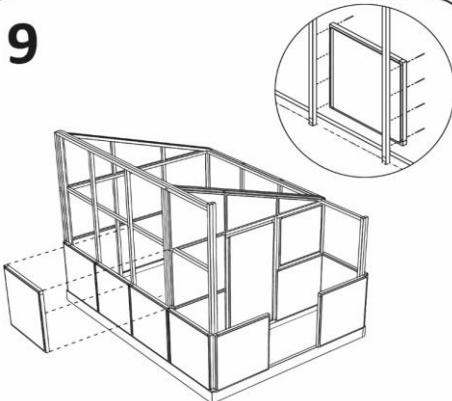
Attach the rest of the columns and connect them with horizontal beams

8



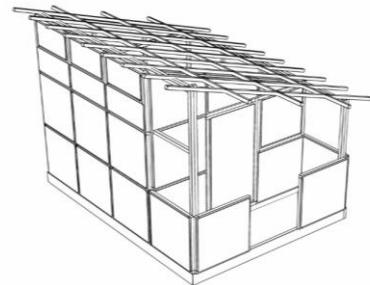
Attach the sloping beams to complete the frame

9



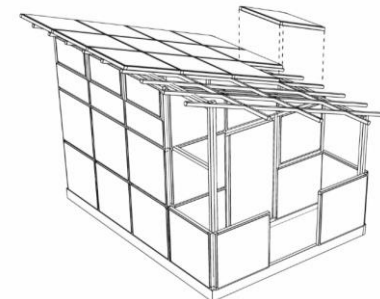
Attach the panels to the columns using screws

10



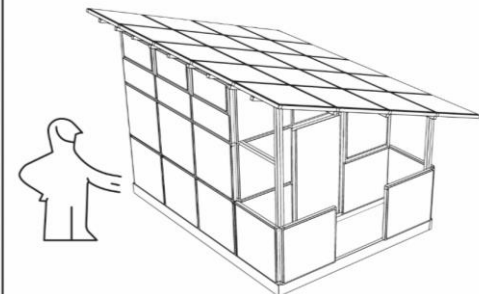
Place the roof beams spaced at 1m to accommodate the panels

11



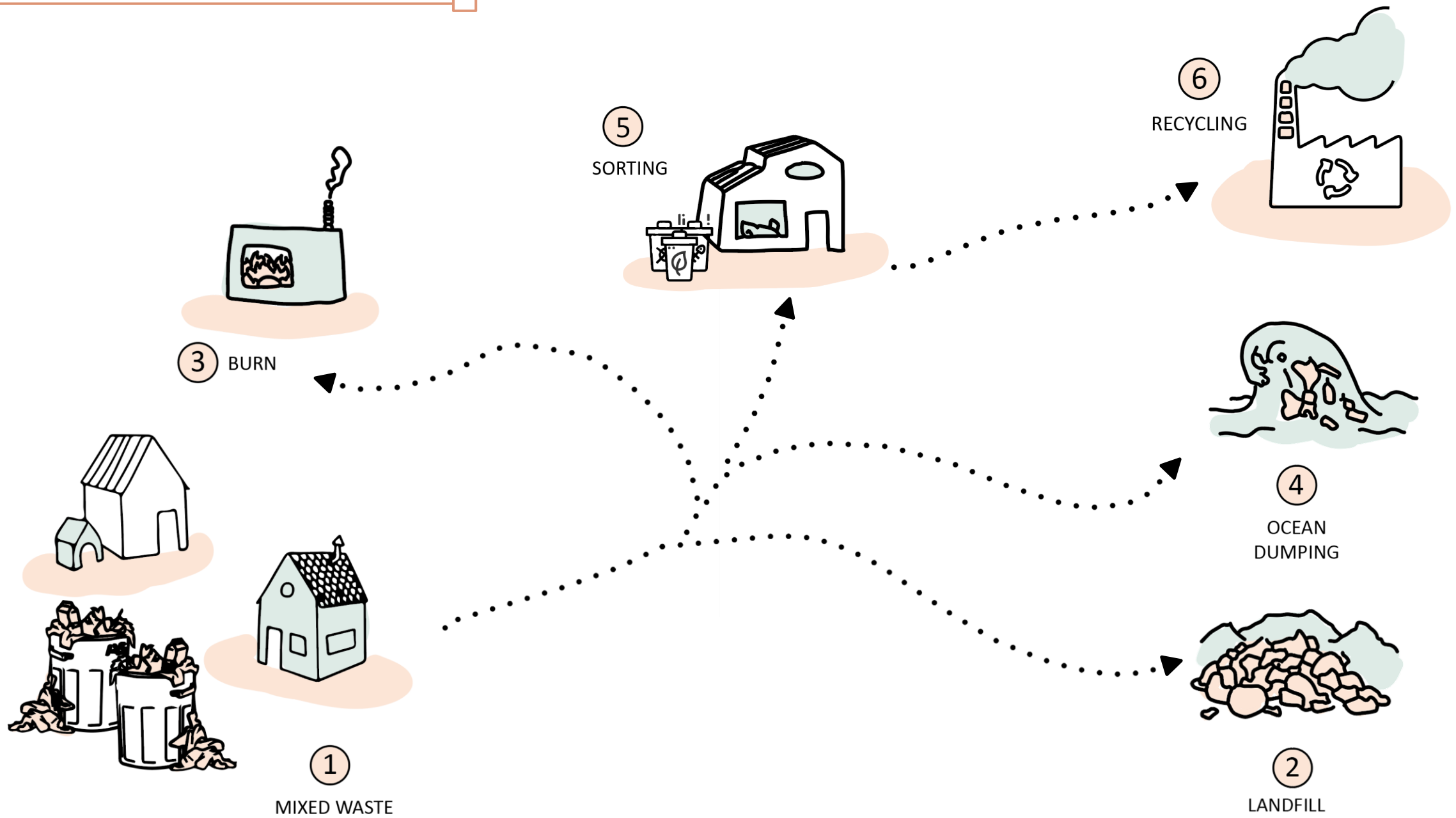
Place the roof panels

12

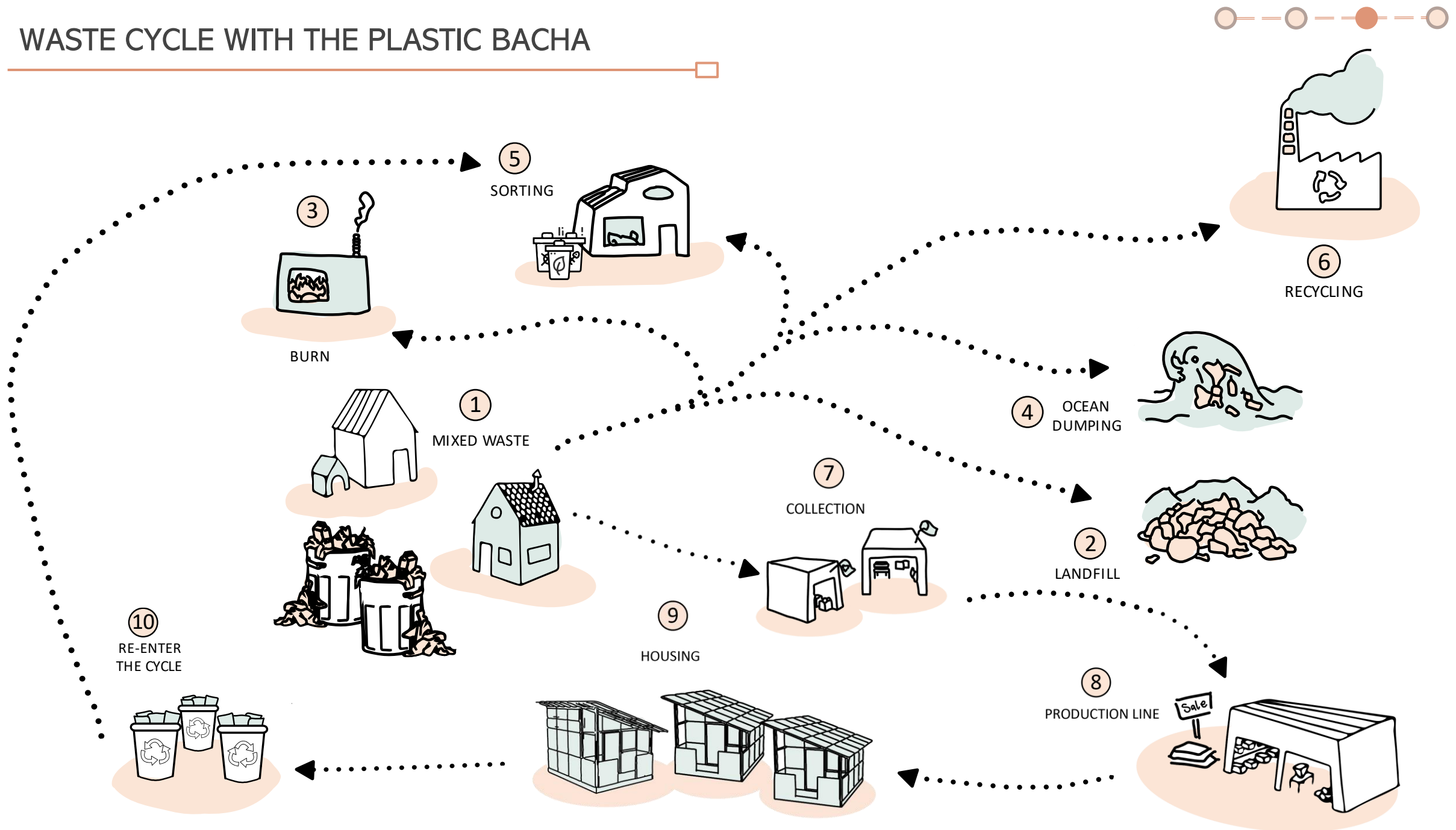


The complete bacha

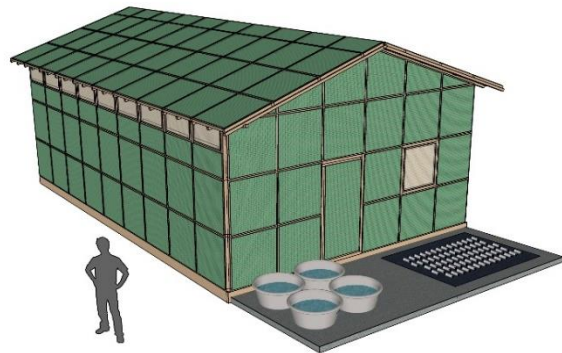
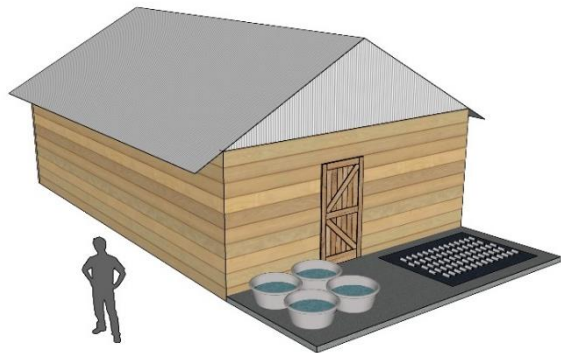
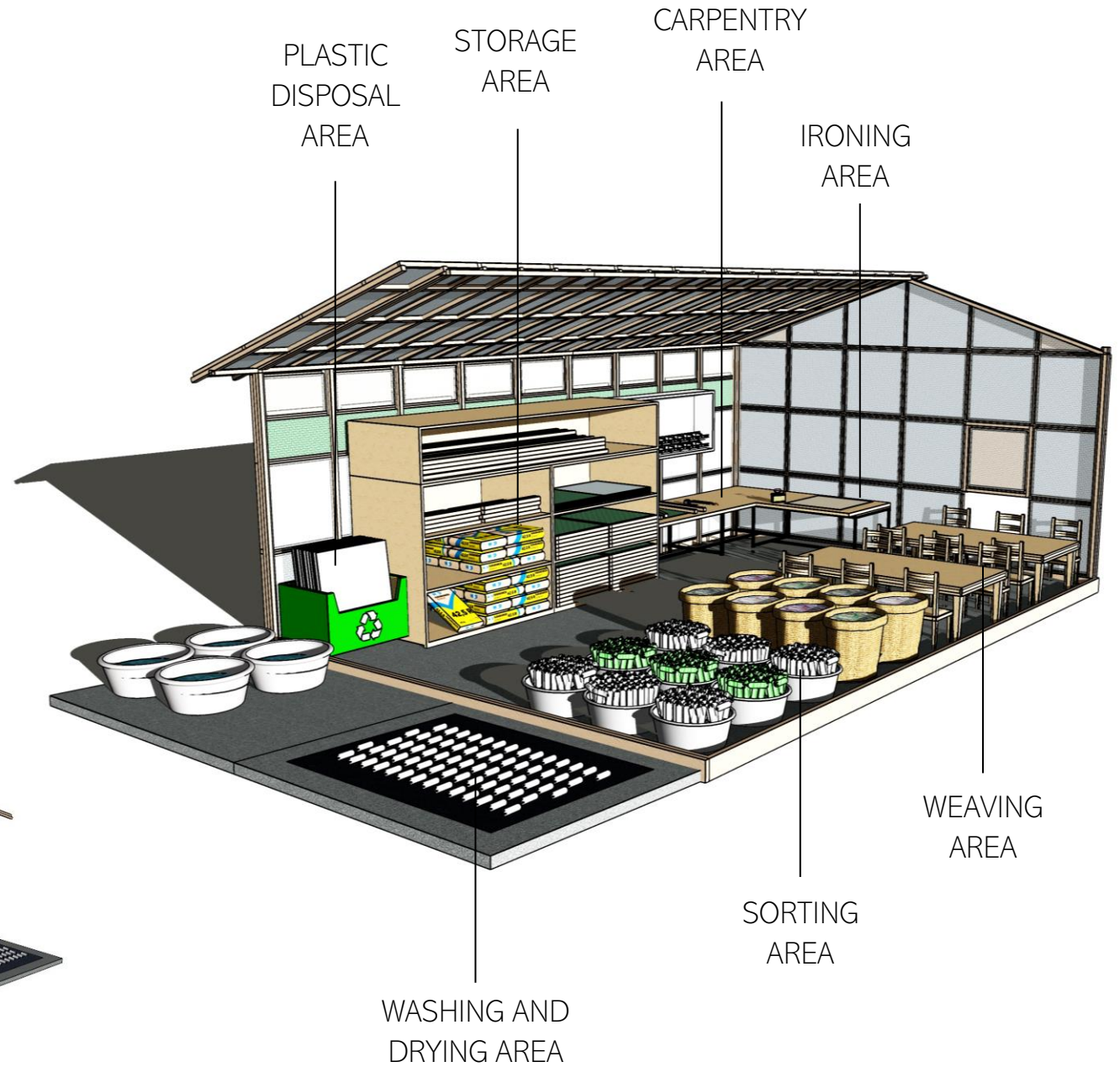
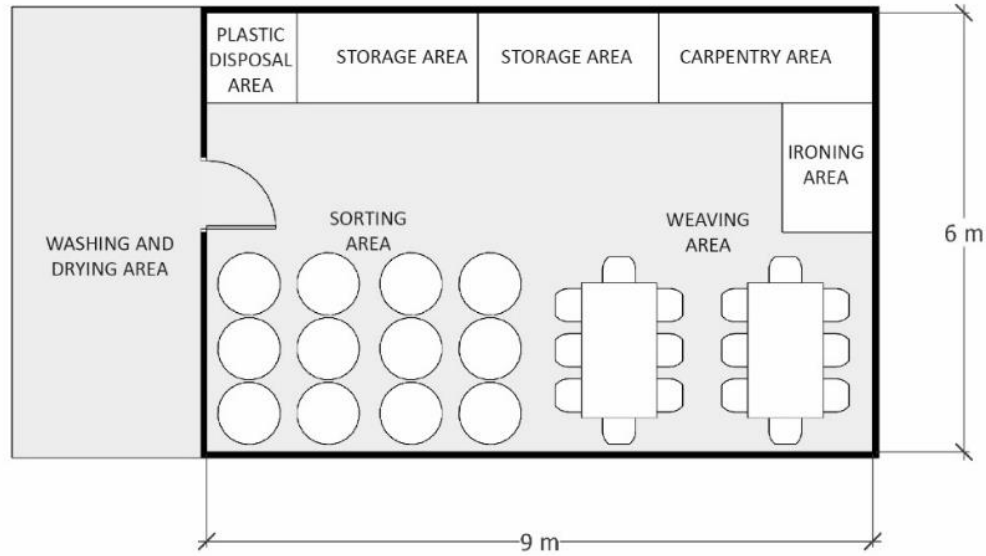
NIGERIAN WASTE CYCLE



WASTE CYCLE WITH THE PLASTIC BACHA



PRODUCTION LINE





LONG TERM DEVELOPMENT



AMOUNT OF MATERIALS REQUIRED

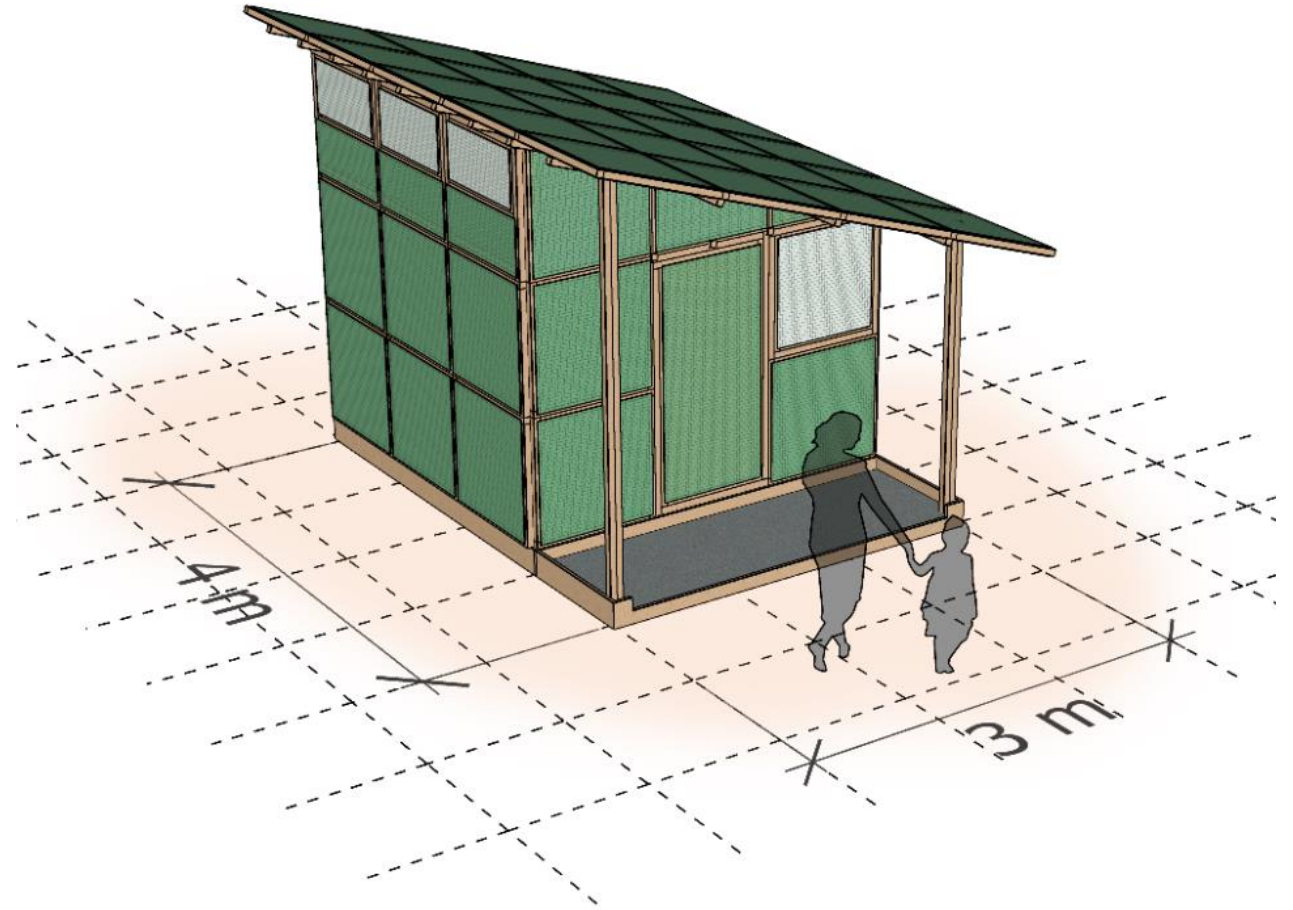
SMALL BACHA (A1)

50 panels

10,300 Shopping bags

37,500 small plastic bottles/

18,750 large plastic bottles



PLASTIC QUANTITY ESTIMATION

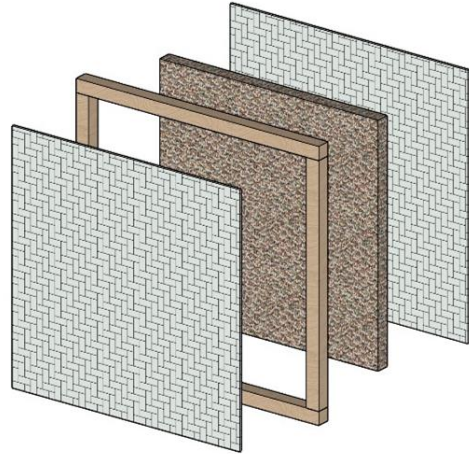


Defining the required amount of PET bottles, wood and LDPE/HDPE plastic bags	
Abuja Municipal area council	300,000
Amount of people (Kaura district)	50,000
People per household	5
Amount of houses	10000
Plastic bottles	4
Bags/ groceries	5
Frequency	3
PET incoming/ week	12
Plastic bag incoming/week	15
PET incoming/ week/neighbourhood	120000
Plastic bag incoming/week/ neighborhood	150,000
Number of bachas per week	3.2
Number of bachas per year	166.4

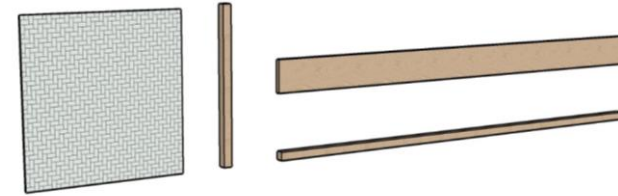
LONG TERM DEVELOPMENT



COSTS



	Amount	Cost (NGN)	Total
PET panel	2	25	50
Wood	4	50	200
HDPE bags	200	0.5	100
Total			350



Building part	Amount	Cost(NGN)	Total cost (NGN)
Wooden bars	42	250	10500
Bottom wood panels	4	500	2000
Composite panel			
PET	50	50	2500
Wood frame	50	250	12500
Shopping bag	50	50	2500
Total			30000

Building part	Amount	Cost(NGN)	Total cost (NGN)
Cost of panel and other parts			30000
Concrete	8	2400	19200
Total			49200

LONG TERM DEVELOPMENT

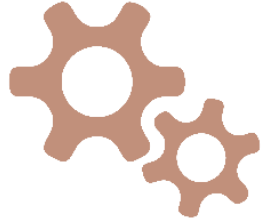


END OF LIFE

End of life	Amount	Weight	Cost	Total cost
One panel PET	2	11.25	50	562.50
HDPE	200	2.35	50	117.70
PET cut off	375	3.8	50	187.5
Total price for one panel	1			867.7
Total price for one bacha (50 panels)	50			43385

CONCLUSIONS

DESIGN BRIEF CHECK



PRODUCTION METHOD

- Low investment required
- Low tech methods are used



BUILDING METHOD

- Wood framework with cladding system
- Incremental building system
- Demountable due to use of screws and nails
- 85% Plastic and 15% wood



DURABILITY

- PET can last for 1.5 – 2 years exposed based on research but will experience 12-28% loss in tensile strength
- Watertightness needs to be tested
- Fire safety needs to be tested



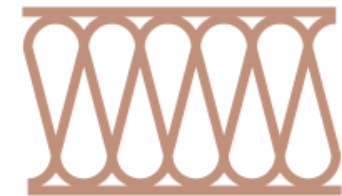
COST

- The bacha costs either NGN30,000- 49,200 (EUR59,65 - 97.83)
- End of life plastic is sold to generate income



SIZE

- It is 1 m x 1 m and weighs approximately 19kg.
- 1.8m doors and 0.8mx0.8m windows
- All the wooden pieces are 50mm thick, and all the panels are 950mm wide.



INSULATION

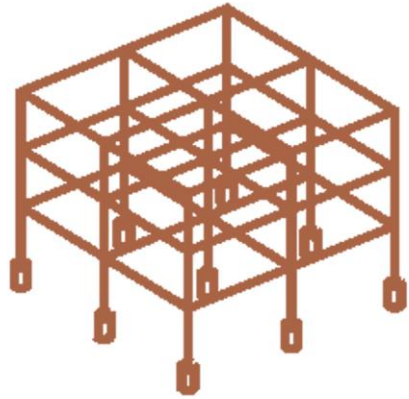
- Insulation value is 0.432 m²K.W, comparable to that of a brick wall 0.37 m²K/W at.

LIMITATIONS



- Due to insecurity only one camp is visited, Kuchingoro IDP camp located in the Kaura region of the Federal Capital Territory of Nigeria, Abuja.
- Plastic waste statistics are not highly accurate in the year this thesis is written (2020/2021); therefore, some assumptions are made.
- IDP camps consist of low-income earners, low running costs and investments are restrictions are considered in the final design.
- A complete design evaluation is outside the scope of this study, as the building component will have to be used for at least a year to see how durable and practical it is.
- The assumption is that simple methods are used to reprocess plastic. Thus, the material properties might be affected.
- This research was undertaken during the covid-19. As a result, most of the prototyping was carried out in a home setting.

RECOMMENDATIONS



STRUCTURAL DESIGN



ARCHITECTURAL DESIGN



MATERIAL DESIGN



BUSINESS PLAN

THANK YOU
FOR LISTENING!

An aerial, top-down view of a colorful, blocky city model. The buildings are represented as simple 3D rectangular blocks in various colors including green, yellow, red, blue, and grey. The blocks are arranged in a somewhat irregular, grid-like pattern. There are several green trees scattered throughout the city, and a few small, dark grey structures that look like utility boxes or trash cans. The ground is a light tan color. In the center of the image, there is a white rectangular box containing the text "ANY QUESTIONS?".

ANY
QUESTIONS?