

Overview of Shelter Cluster Partner Recovery Interventions

(Shelter Recovery Strategy Types 2, 3, 4A, 4B, 5, 6)

Cyclone IDAI Response

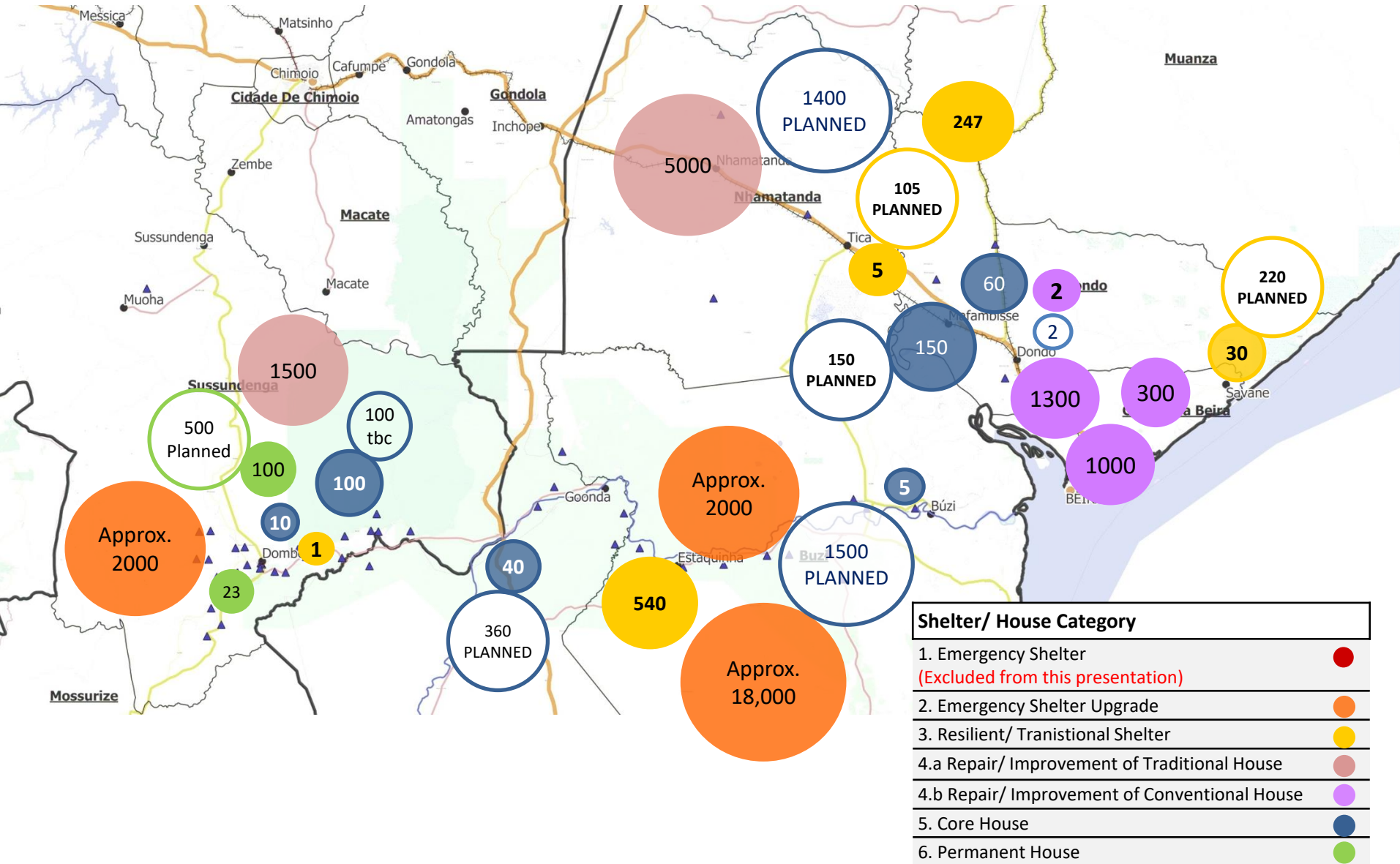
Central Region of Mozambique (Sofala, Manica)
March 2019- March 2020

31.3.20

Prepared by:
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Partner Projects Included:
Anteparo, Alliance 2015, Apoiar, CARE, Care for Life, Caritas, CRS, DORCAS, German Red Cross, IFRC, IOM, Save the Children, Soul Frater, Spanish Red Cross, Tzu Chi, UNDP, UN-Habitat

MAP OVERVIEW: Location of Projects + Shelter/House Category + No. of Units





Recovery Strategy category

1	2	3	4A	4B	5	6
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Area 18 m2 - max 5 people

Cost 100 USD

Roof Tarp

Walls Bamboo structure and tarps/ stick in-fill with adobe

Time 1 week per unit

Labour Built by beneficiaries themselves with guidance/ assistance from minimally trained community volunteers

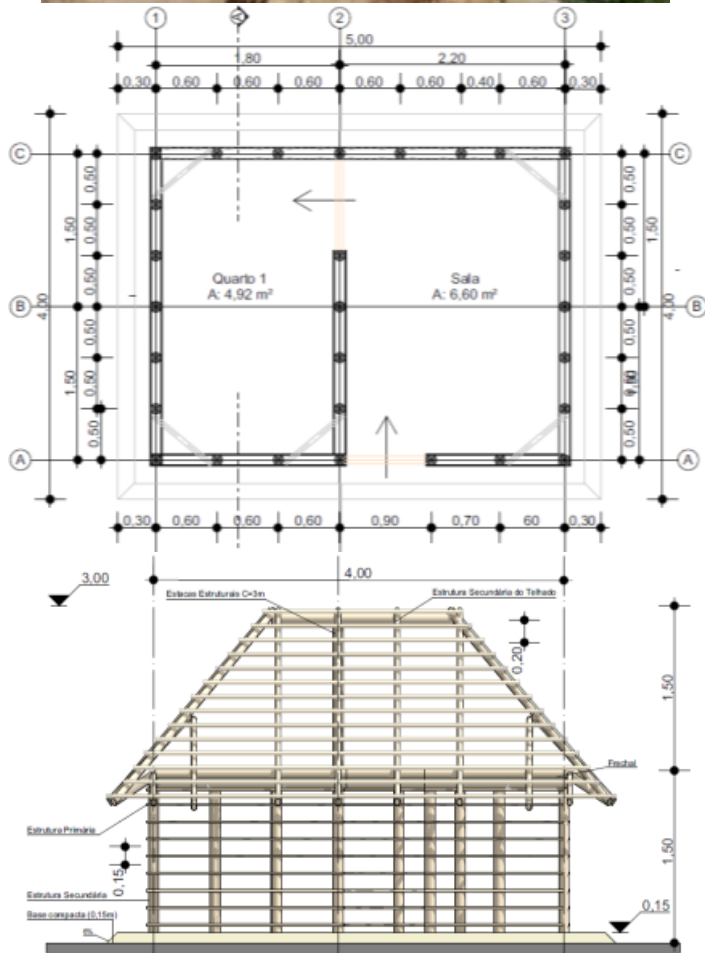
~4000+
UNITS



- Successful example of Emergency Shelter Upgrade
- Economic Typology
- Allows beneficiary freedom to decide design for themselves
- Different models possible depending on family needs (Fully enclosed, Partially enclosed etc.)
- Assembled quickly in one week with 2 low skilled people
- Does not de-incentivize self-recovery as materials are versatile and can be used to extend existing house also
- Area is as per sphere standards



- No treatment of the estacas/sticks when inserted into the ground (Missed opportunity to increase resilience)
- Some difficulty in supply of bamboo (Supply chain considerations)
- Base should be raised before building to increase resilience to flooding



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area

Prototype 1: 12 m² (2 rooms) = max 3 people
 Prototype 2: 18 m² (3 rooms) = max 5 people

Cost

Prototype 1: **600 USD**
 (materials 250 USD+ labour 350 USD)

Roof

Thatch in 4 slopes

Walls

Timber structure with stick in-fill with adobe

Time

3 weeks per unit

Labour

Locally trained artisans

30
UNITS



- Economic Typology / Adapted to the context of rural construction
- Assisted self-construction with owners contributing materials and unskilled labor
- Strengthening of walls and ceiling (respecting the traditionally built typologies)
- 4 pitches- resistant to strong winds (No sail effect)
- Easy to maintain and rehabilitate by owner
- Possession of land guaranteed by customary law and housing intervention integrated with basic infrastructure/services



- Prototype 1 is below the minimum area in Sphere standards(18m²)
- Environmental impact should be considered (High timber use)
- Materials are seasonal so this can affect project planning
- Preference in the community is for metal sheet roof due to high maintenance, inevitable leaking as well as fire risk of thatch roof
- Floor raised only by 15cm (PALPOC states 30cm minimum)
- PALPOC defines this solution as a Temporary Shelter Solution

DESIGN REVIEW ONGOING FOR ANOTHER 220 UNITS



Recovery Strategy category

1	2	3	4A	4B	5	6
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5
UNITS

Area 22 m2 (3 rooms) = max 6 people

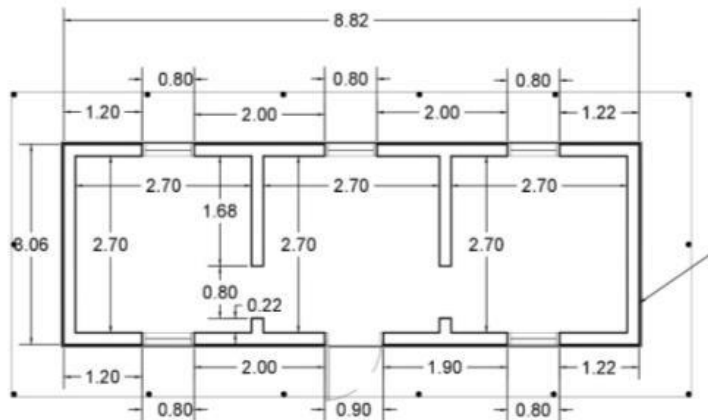
Cost **1300 USD*** (material + labour)

Roof 4 pitch roof -0,7 x 3.60 mts (0,4 mm thick sheets)

Walls Adobe Blocks (40 x 13 x 15 cm)

Time frame 1 month per unit (+ Block Preparation)

Labour Locally trained artisans

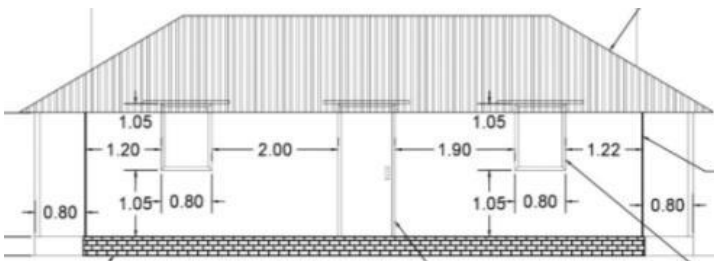


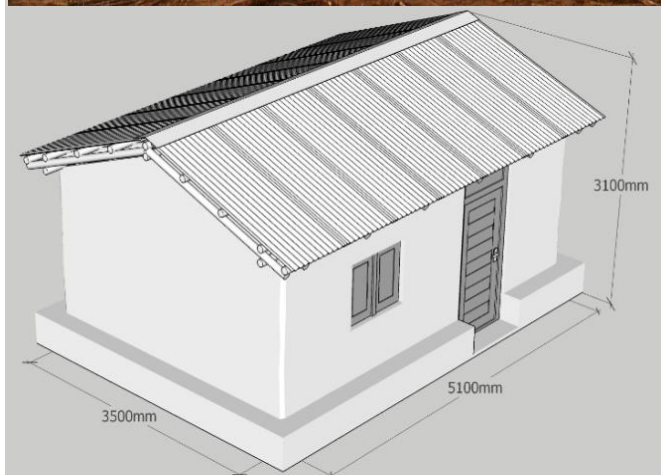
- Built according to the PALPOC indication to promote typologies in mixed materials
- It is built in assisted self-construction, with the owners contributing with the block-making and non-specialized labor
- Good quality IBR sheet (90cm x 3m) @ 0.4mm Thickness
- Good conventional foundations and base (*Increasing cost compared with other transitional houses*)- Permanent Base + Transitional structure
- Internal partitions included
- Protection: Doors (90 x 200cm) and windows (80 x105) included
- Area above sphere standards



- The use of sticks (to reduce cost/locally available) instead of sawn timber for the roof and overhang support structure introduces weakness, irregularity and fixing difficulty in the overall roof structure
- Walls may be at risk of damage in driving rain
- Difficulties encountered in the preparation of the blocks as well as the construction of the house during rainy season
- Design of roof with overhang at all sides could create sail/ lift effect in high winds/ cyclone
- With some additional cost, (5% min) cement could have been added to increase resilience of the blocks
- PALPOC defines this solution as a Temporary Shelter Solution

DESIGN REVIEW ONGOING FOR ANOTHER 105 UNITS





Recovery Strategy category

1	2	3	4A	4B	5	6
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Area 18 m² (1 room) = Max. 5 people

Cost 470 USD (Materials and Labour)

Roof 2 pitch roof - 0,7 x 2.20m CGI (0,4 mm)

Walls Timber structure with stick in-fill with adobe

Timeframe 1.5 weeks per unit

Labour Locally trained artisans

540
UNITS



- Economic Type 3 Typology / Adapted to the context of rural construction
- Follows PALPOC recommendation of mixed material typologies
- Area is as per sphere standards
- Uses assisted self-construction, with the owners contributing the wall infill and mud walling (maticado), and non-specialized labor
- Good quality short CGI sheets @ 0.4mm thickness
- Good size posts used for primary structure
- Treatment of the posts where inserted into the ground (Increased resilience to moisture)



- A partition could have been included for protection and privacy
- Floor should be raised by 30cm
- Protection: Doors and windows by beneficiary
- PALPOC defines this solution as a Temporary Shelter Solution



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area

17m²

Max 4 people (Sphere standards)

Walls

Earth sacks

Roof

CGI roof / 2 pitch

Cost

500 USD

Timeframe

3 Month (As was a prototype trial)

Labor

Local tradespeople
Population



- Experimental project with the community were involved in the construction process
- Good quality CGI (0,4 mm)
- Located in resettlement sites which are not at risk of flooding
- Low environmental Impact
- Low cost construction
- Higher labour cost (Labour intensive construction)



- Below 18m² Sphere standards minimum area
- Elevation from the ground is below 30cm
- More consideration for hole created from digging out the soil needed
- Beneficiary Selection should be carefully considered when developing one-off prototypes, without plans for more later.
- PALPOC defines this solution as a Temporary Shelter Solution

The hybrid rectangular solution (earth bags and CGI sheets) compromised the effectiveness of the earth sack construction method. Originally it was planned as being circular in plan (for which this construction method is more suitable-See image) but the plan was changed to rectangular to use CGI sheets. This created issued at corners. A circular plan would have been more contextually appropriate also.

247
UNITS



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area 18 m2 (1 room) = Max. 5 people

Cost 450 USD (Materials and Labour)

Roof 1 pitch roof - CGI (0,4 mm)

Walls Timber structure with stick in-fill with adobe

Timeframe 1.5 weeks per unit

Labour Locally trained artisans



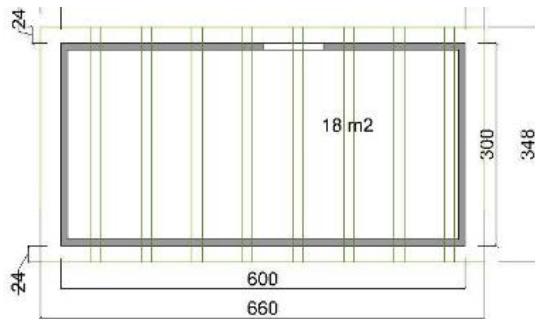
- Follows PALPOC recommendation of mixed material typologies
- Area is in as per sphere standards
- Uses assisted self-construction, with the owners contributing the wall infill and mud walling (maticado), and non-specialized labor
- Good quality CGI sheet 0.4mm thickness
- Single pitch allows ease of future extension
- Good size posts used for primary structure
- Protection: Partition included for protection and privacy
- Treatment of the posts where inserted into the ground (Increased moisture resilience)



- Floor should be raised by 30cm
- Protection: Doors and windows by beneficiary
- PALPOC defines this solution as a Temporary Shelter Solution



Example of roofing materials distribution used on traditional house, built by beneficiary



Training at distribution point- Fixing of CGI to pole roof structure

Recovery Strategy category

Recovery Material Kit distribution ONLY

1	2	3	4A	4B	5	6
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Area

18m2 Required to be Categorized as 4A/4B

- 1: +18m2 (RURAL)
- 2: +18m2 (RURAL + RS)
- 3: 11m2* (RURAL + RS)
- 4: +18m2 (URBAN)

KIT CONTENTS

CGI Thickness should be 0.4mm (PALPOC)

- 1: 10 no. 0.3mm Thick; 3600x660mm CGI + toolkit
- 2: 9 no. 0.4mm Thick; 3600x900mm CGI + toolkit
- 3: 6 no. 0.4mm Thick; 2400 x 700mm (Short) CGI + toolkit
- 4.1: 8 no. 0.35mm Thick; 3600 x 700mm CGI + 10 wooden poles(5-7cm dia.),3 bags cement + toolkit
- 4.2: 6 no. 0.35mm Thick; 3600 x 700mm CGI + 5(5x10cm)+ 5(5x5cm) timbers + toolkit

Cost

1: 200\$; 2: 200\$; 3: 150\$; 4.1: 210\$; 4.2: 210\$

Timeframe

Material distributions Only

Labor

Beneficiaries



- Self-driven recovery can act as a catalyst for repairs of the rest of the house
- Increases resilience of existing building stock
- Inclusion of timbers is recommended especially where there is low availability locally
- In-kind material distribution addresses access + transportation difficulties in rural areas



- *Project 3 was categorized as 2. *Emergency shelter upgrade*, due to the area covered by the kit (<11m2, which is less than Sphere Standards)
- Some Perceived Risk with material distribution, of beneficiaries selling materials if other needs have to be prioritized by beneficiaries (Coordination possible with Food Security Cluster to compliment FFA programs, if area has very high food insecurity)
- CGI sheets, if not fixed down properly, can introduce danger to life in high winds/cyclone

Clear technical guidance, BBS messaging, trainings, assistance to vulnerable and follow-up on the use of the materials is needed for successful implementation of material distribution project.

Material distribution alone does not guarantee improvement in shelter/ housing situation of beneficiaries without such considerations and also, if other humanitarian needs are not met first (especially food).

Partner 1:
5,000
UNITS

Partner 2:
1,500
UNITS

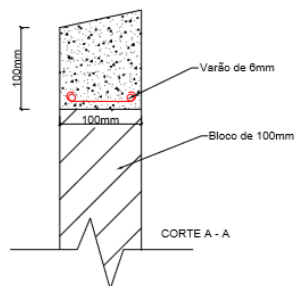
Partner 3:
18,000
UNITS*

Partner 4:
Project 1-1300
UNITS

Partner 4:
Project 2-1000
UNITS



Ahghbngngn



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area

18m2

Max 5 people (Sphere standards)

Walls

- Upper beams added: reinforced concrete 10x10 cm
- Walls reinforcement: Cement plaster + chicken net

Roof

CGI roof / 1 pitch

Cost

350 USD

Timeframe

1 week

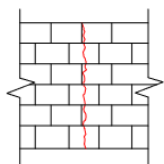
Labor

Local tradespeople
Beneficiaries

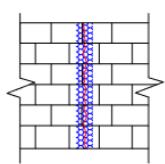
- Good quality CGI (0,4 mm)
- ‘Matafogos’- Rim to hold down metal sheeting promoted and included
- Upper ring beam all around all house (Awareness of ring beams for rest of community)
- Good quality plaster
- Equality across all beneficiaries with all beneficiaries receiving same materials
- Beneficiary choice of which 18m2 of the house to rehabilitate
- The community were involved in the construction process and benefited from training
- Development of straps to ensure increased resilience in the roof design
- Simple, replicable methods for repairing wall cracks (chicken wire)
- Catalyst for repairs of the rest of the house
- PALPOC defines this solution as a Permanent Shelter Solution



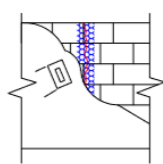
- Beneficiary selection: Conventional house owners not usually most vulnerable
- Roof straps not available locally (Simpler, more replicable options available, such as wrapping of reinforcement bars- See Resilience Measures at end of presentation)
- Improved fixing of connection of roof secondary structure to primary structure needed



1) Limpar a fissura e preencher com argamassa rica em cimento;



2) Cobrir a fissura com 200mm de largura com rede de galinha;



3) Rebocar com argamassa sobre a rede de galinha;

300
UNITS



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area ~30m² (Existing Building)

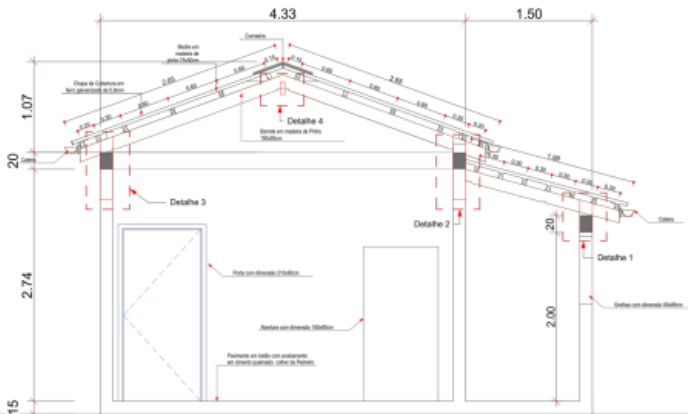
Walls Cement Blocks

Roof IBR roof / 1 pitch (0.4mm)

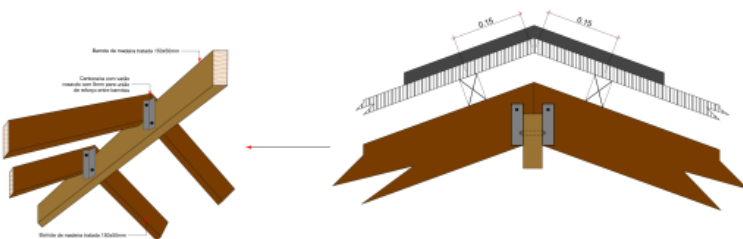
Cost ~2000 USD

Timeframe 15- 20 days

Labor Local tradespeople



- Rehabilitation Project
- Good quality IBR (0,4 mm)
- Protection: Doors and windows included
- Electrics and new painting included
- Resilience Measures- Timbers added to either side of existing central structural wall with threaded rod connecting through. Use of 'cantoneiras' (Metal L-plates) connecting these additional timbers to the roof structure
- Roof timber has been treated
- Municipality was the counterpart who arranged the DUAT taxes
- PALPOC defines this solution as a Permanent Shelter Solution



- Beneficiary selection: Conventional house owners not usually the most vulnerable
- Cost is high in comparison with other 4B Type interventions

1
PILOT



Damaged House

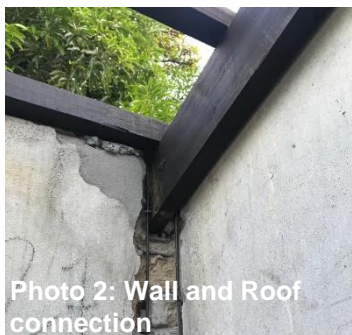
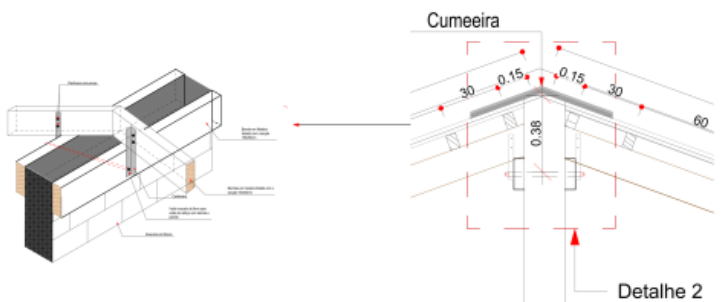
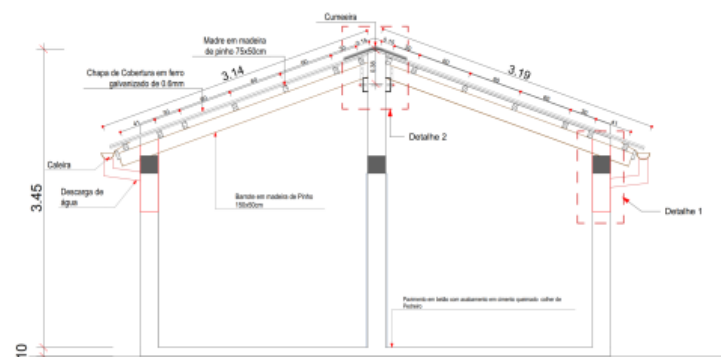


Photo 2: Wall and Roof connection



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area ~30m² (Existing Building)

Walls Cement Blocks

Roof IBR roof / 1 pitch (0.4mm)

Cost Not disclosed

Timeframe 15- 20 days

Labor Local tradespeople



- Retrofitting Project
- Good quality IBR (0,4 mm)
- Protection: Doors and windows included
- Electrics and new painting included
- 6mm Reinforcement bar used to connect wall to roof structure (Photo 2)
- Resilience Measures- Detail 2: Timbers added to either side of existing central structural wall with threaded rod connecting through. Use of 'cantoneiras' (Metal L-plates) connecting these additional timbers to the roof structure
- Timber has been treated
- Municipality was the counterpart who arranged the DUAT taxes
- PALPOC defines this solution as a Permanent Shelter Solution



- Beneficiary selection: Conventional house owners not usually the most vulnerable
- Cost is high in comparison with other 4B Type interventions



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area 22 m² (2 rooms) = max 6 people

Cost **1500 USD** (material + labour)

Roof 2 pitch roof CGI 0,7 x 3.60 mts (0,4 mm)

Walls CSEB Blocks

Time frame 1 month per unit

Labour Beneficiary and contractor

100
UNITS



- Good quality CGI (0,4 mm)
- Lower beam all around the house
- The beneficiaries were involved in the process of opening and filling the foundations, collect water and materials, help removing soil for the production of blocks
- PROTECTION: door and windows are included in the construction
- Elevation from the ground min. 30 cm
- The houses are located in the resettlement site that is not susceptible to floods
- CSEB blocks are a good option to reduce the impact on the environment
- CSEB making provided an income for the local population



- Additional reinforcement at corners needed
- Time consuming process of making the bricks
- Extra effort needed to ensure maintenance of the block-making machines

PLANS FOR ANOTHER 100 UNITS



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area

16m²

Max 4 people (Sphere standards)

Walls

Cement Blocks

Roof

CGI roof / 1 pitch

Cost

1600 USD

Timeframe

2 Month (Water + Funding Restraints*)

Labor

Local tradespeople
Population

5
UNITS



- Good quality CGI (0,4 – 0,5 mm)
- Use of 'Matafogos*' technique
**blockwork row (rim) to hold down metal sheeting around perimeter*
- Upper ring beam all around the house
- Good quality plaster and painting to protect
- The community were involved in the construction and block making processes
- Protection: Door and windows are included in the construction
- The houses are located in resettlement sites which are not at risk of flooding



- Cement blocks do not have as low environmental impact as CSEB, for example
- Below 18m² Sphere standards minimum area for standard family of 5
- Overhang of the roof on the veranda with the roof is almost horizontal
- Pitch of roof is below recommended
- Elevation from the ground is below 30cm
- 1-man organization- Did not have the benefit of economy of scale in cost+time*
- No lower ring beam



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area

22m2

Max 5 people (Sphere standards)

Walls

Cement Blocks

Roof

CGI roof / 1 pitch

Cost

1600 USD

Timeframe

2 weeks

Labor

Local tradespeople
Population

10
UNITS



- Good quality CGI (0,4 mm)
- The community were involved in the construction process
- Door and windows are included in the construction
- The houses are located in resettlement sites which are not at risk of flooding
- Simple efficient design
- Painting Included
- Single pitch makes extension easy later



- Cement blocks do not have as low environmental impact as CSEB, for example
- Elevation from the ground is below 30cm
- Pitch angle is below PALPOC recommendation
- No use of 'Matafogos*' technique
- *blockwork row (rim) to hold down metal sheeting around perimeter*



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area

18- 25m²

Max 5 people (Sphere standards)

Walls

Cement Blocks

Roof

CGI roof / 1 pitch

Cost

1760 USD (Materials and Labour)

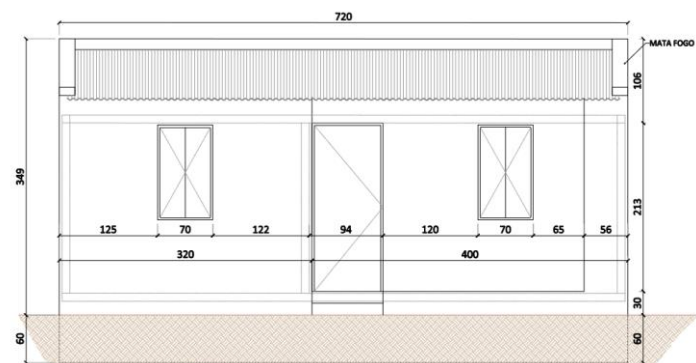
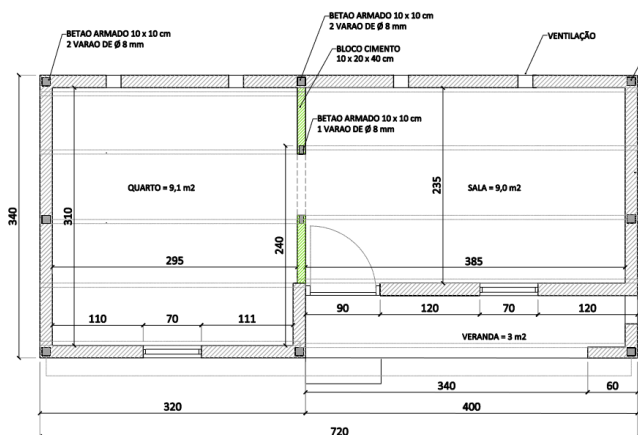
Timeframe

3 weeks

Labor

Local tradespeople
Population

150
UNITS



- Good quality CGI (0,4 mm)
- The community were involved in the construction process
- Protection: Door and windows are included in the construction
- Use of 'Matafogos*' technique
**blockwork row (rim) to hold down metal sheeting around perimeter*
- Simple efficient plan
- Elevation form the ground is 30cm (In line with PALPOC)
- Single pitch makes extension easy later



- Cement blocks do not have as low environmental impact as CSEB, for example
- Weak corner reinforcement
- Pitch angle is below PALPOC recommendation

PLANS FOR ANOTHER 150 UNITS



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area

13.5m2
Max 4 people (Sphere standards)

Walls

CSEB blocks, plaster

Roof

CGI roof / 1 pitch

Cost

4'000 USD

Timeframe

1 month to complete the construction

Labor

Local Contractor
Beneficiaries

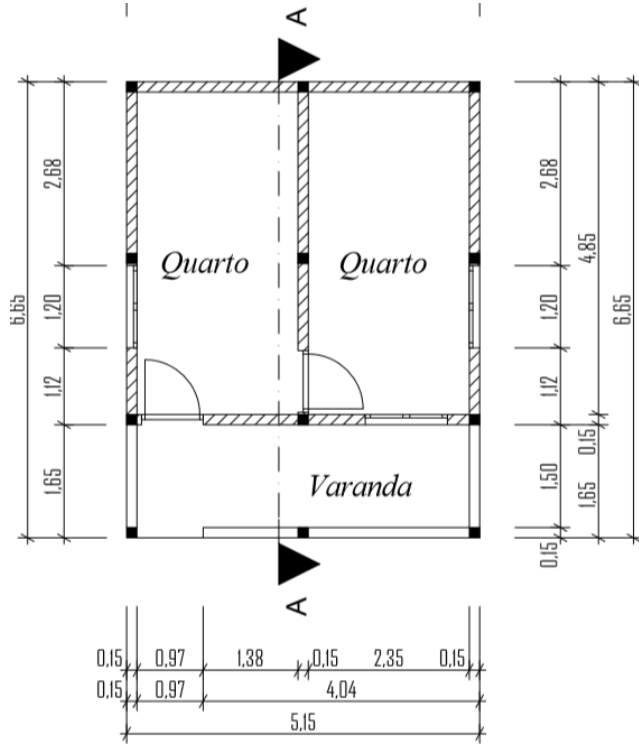


- Good quality CGI (0,4 mm) and good connections to the roof structure, built with welded metal profiles.
- Lower beam all around the house, with 4 rebar \varnothing 8 mm
- Good quality plaster
- Good elevation from the ground of the veranda
- The beneficiaries were involved in the process
- PROTECTION: door and windows are included in the construction
- The houses are located in the highest zone that are not susceptible to floods. *It is one of the main criteria to choose the location of the house and the elevation varies according to the soil conditions*
- CSEB blocks are a good option to reduce the impact on the environment.
- Very little timber used in the construction (door s+ windows only)



- Dimensions below minimum standard (13,5 m2 net area).
- The cost of the house (4'000 USD) is average cost of similar types in other locations, due to use of contractor
- CSEB machine made by contractor- Ensure machine compression is checked
- No upper beam
- Large roof overhang over the veranda (Risks lifting in high wind)
- Pitch angle is below PALPOC recommendation and almost flat (not recommended)

60
UNITS



Recovery Strategy category

1	2	3	4A	4B	5	6
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Area

22m²

Max 5 people (Sphere standards)

Walls

Cement Blocks

Roof

CGI roof / 1 pitch

Cost

3000 USD (Materials, Labour, transport)

Timeframe

1 Month

Labor

Local tradespeople
Population

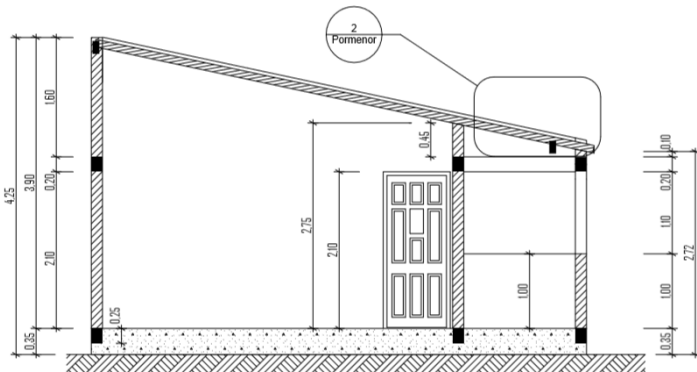
40
UNITS



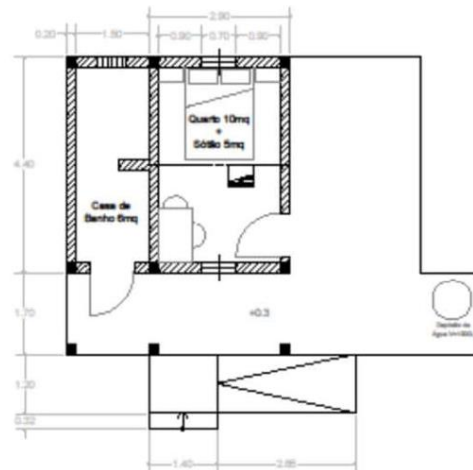
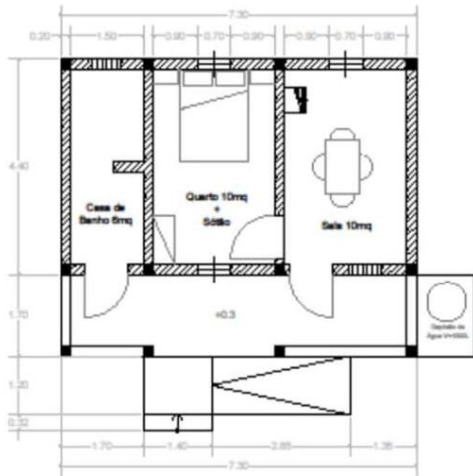
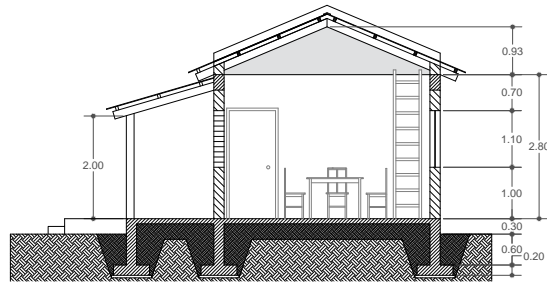
- Good quality CGI (0.4 mm)
- Protection: Door and windows are included in the construction
- The houses are located in resettlement sites which are not at risk of flooding
- Simple efficient design- Simple plan cross ventilation
- Pitch in line with PALPOC recommendations
- Good elevation from ground (35cm)
- Ground and upper beam designed in
- Use of 'Matafogos*' technique
- *blockwork row (rim) to hold down metal sheeting around perimeter
- 15cm Blocks used in line with PALPOC recommendations]



- Cement blocks do not have as low environmental impact as CSEB, for example
- Cost is high compared to similar models by other organizations
- Information on foundations not known



PLANS FOR ANOTHER 360 UNITS



Recovery Strategy category



Area

Type 1: 10m² + 6m² (bathroom)

Extendable Core 1 (1 room)

Type 2: 20m² + 6m² (bathroom)

Extendable Core 2 (2 rooms)

Walls

Cement Blocks (20cm)

Roof

IBR roof / 2 pitch

Cost

Core 2: \$4500

Timeframe

1 Month

Labor

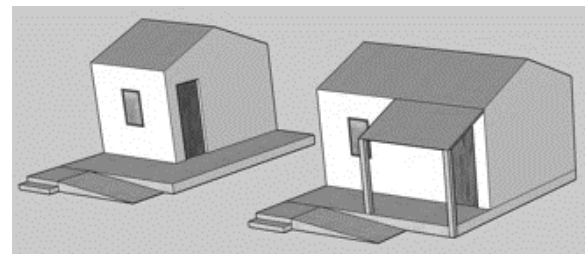
Locally trained Artisans with beneficiary involvement



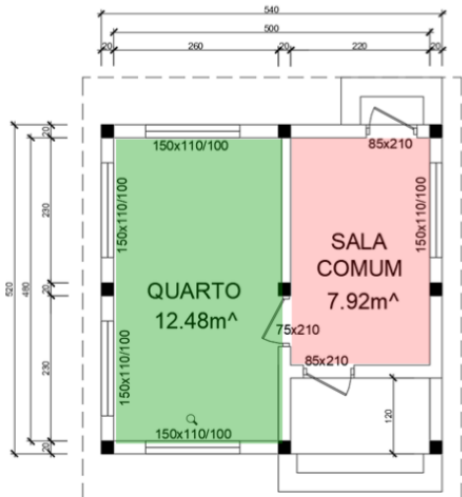
- Good quality IBR (0.4 mm)
- Protection: Door and windows are included in the construction
- Electrical Installation included
- Simple efficient design- Simple plan cross ventilation
- Good elevation from ground (30cm)
- Ground and upper beam, and 80cm foundations designed in
- Accessibility: Ramped entrance included
- Bathroom space and water storage area included as part of model
- Veranda roof is detached from the main roof to avoid lifting in cyclone/high wind



- Cement blocks do not have as low environmental impact as CSEB, for example
- Expensive relative to other models of the same size (Platform base, water storage area, ramped entrance, Bathroom + electrical installation included)



PLANNED



5.4 x 5.2 = 28.08 m²



8.2 x 5.2 = 42.64 m²



Recovery Strategy category



Area

Type 1: 28m²

Max 5 people (Sphere standards)

Type 2: 43m²

Max 12 people (Sphere standards)

Walls

Cement Blocks

Roof

CGI roof / 2 pitch

Cost

Not disclosed (Materials, Labour, transport)

Timeframe

TBC

Labor

TBC (Expected to be by contractor)



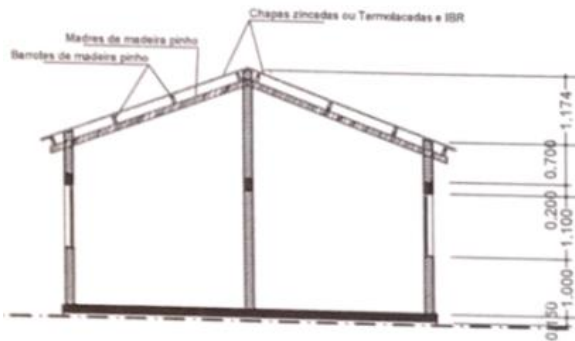
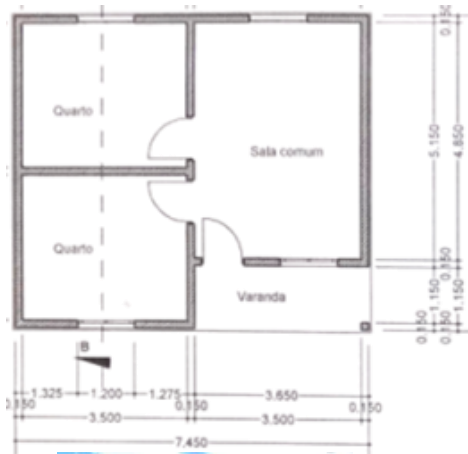
- Good quality CGI (0.4 mm)
- Protection: Door and windows are included in the construction
- The houses are located in resettlement sites which are not at risk of flooding
- Simple efficient design- Simple plan cross ventilation
- Pitch in line with PALPOC recommendations
- Good elevation from ground (30cm)
- Ground and upper beam designed in
- 15cm Blocks used in line with PALPOC recommendations]
- Ventilation of roof space indicated



- Cement blocks do not have as low environmental impact as CSEB, for example
- Information on foundations not known
- No use of 'Matafogos*' technique
- *blockwork row (rim) to hold down metal sheeting around perimeter(recommended)

~2899
UNITS

PLANNED



Recovery Strategy category

1 2 3 4A 4B 5 6

Area **35m2**
(PALPOC standard)

Walls Cement Blocks

Roof IBR sheet roof / 2 pitch

Cost **3500 USD (Materials and Labour)**

Timeframe 2 Months

Labor Local tradespeople
Population

100
UNITS



- Simple plan and relatively small veranda(Good)
- Good quality IBR (0,4 mm)- painted
- The community were involved in the construction process
- Protection: Doors (90 x210) and windows (1 x 1.2m) are included in the project
- The houses are located in resettlement sites which are not at risk of flooding
- The houses are based on the Obras Publicas Model- T2
- Good separation of spaces for privacy
- COST:** Low due to use of local labour



- Elevation from the ground is below 30cm
- No use of 'Matafogos' technique (Cement Block Rim to hold down metal sheeting)
- Large size of house is not proportionate to average house in the area (Tensions?)
- Perceived increased risk of sale of house (To be considered and measures put in place to avoid)

DESIGN REVIEW ONGOING FOR ANOTHER 500 UNITS



Recovery Strategy category

1	2	3	4A	4B	5	6
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23
UNITS

Area 35m2
(PALPOC standard)

Walls Cement Blocks

Roof IBR sheet roof / 2 pitch

Cost 5800 USD (Materials and Labour)

Timeframe 1 Month

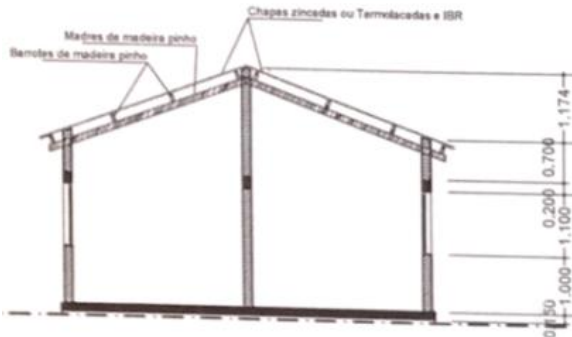
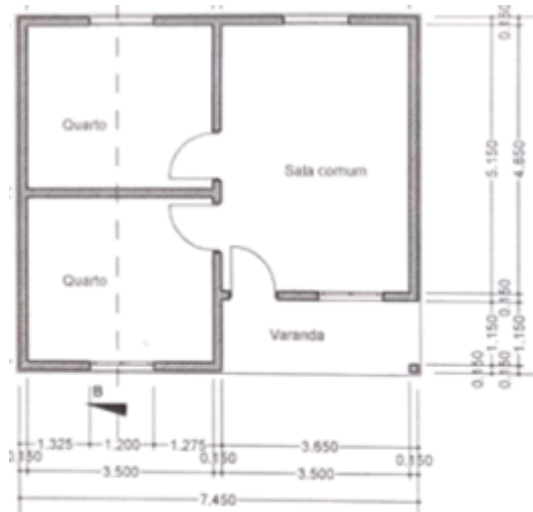
Labor Contractor



- Simple plan and relatively small veranda(Good)
- Good quality IBR (0,4 mm) - painted
- The community were involved in the construction process
- Protection: Doors (90 x210) and windows (1 x 1.2m) are included in the project
- The houses are located in resettlement sites which are not at risk of flooding
- The houses are based on the Obras Publicas Model- T2
- Good separation of spaces for privacy



- Elevation from the ground is below 30cm
- No use of 'Matafogos' technique at gables (Cement Block Rim to hold down metal sheeting)
- Large size of house is not proportionate to average house in the area (Tensions?)
- Perceived increased risk of sale of house (To be considered and measures put in place to avoid)
- COST:** SAME MODEL HOUSE AS PREVIOUS SLIDE-COST IS HIGHER DUE TO USE OF CONTRACTOR



SCRSC #	SHELTER CLUSTER RECOVERY STRATEGY CATEGORY (SCRSC) DEFINITIONS STRATEGY FURTHER INFO	APPROX. COST	TIMEFRAME	RESULT: (PALPOC DEFINITION)
2	EMERGENCY SHELTER UPGRADE (18m2)	<\$150 USD	4-7 days <i>(Beneficiary Themselves with guidance)</i>	TEMPORARY SHELTER 1 year 3 Years 3Years
3	TRANSITIONAL HOUSE (18m2)	Between \$400- \$700 USD	10 Days	
4A	REPAIRS/ IMPROVEMENTS TO TRADITIONAL HOUSES (Self-Recovery Support)	<\$300 USD (Roof Materials + Tools Only)	1 day (Distribution) <i>(Full involvement in works not recommended)</i>	
4B	REPAIRS/ IMPROVEMENTS TO CONVENTIONAL HOUSES	<\$350(Minor) >\$700 (Major) USD	10 Days or 1 day (Distribution)	TOWARDS > PERMANENT HOME 9 years 9 Years 9 Years
5	CORE HOUSE (18m2)	\$1200- \$2000 USD	3 weeks	
6	PERMANENT HOUSE (35m2- PALPOC)	\$3000 -\$4500 USD	1-2 Months	

SITE CONSIDERATIONS: SAFE SITE, NO FLOOD RISK, DUAT

SERVICES: INCLUDE LATRINE/ COORDINATE WITH PARTNER TO PROVIDE; CONNECTION TO EXISTING SERVICES

COMMUNICATION: FAIR + CLEARLY COMMUNICATED BENEFICIARY SELECTION, NO COMMUNITY TENSION CREATED

WIDER COMMUNITY BENEFIT: KNOWLEDGE, EMPLOYMENT, SUPPORT SELF-RECOVERY

ACCEPTANCE: DESIGN BUY-IN, INVOLVEMENT IN CONSTRUCTION, RESPECT FOR LOCAL TECHNIQUES + ASPIRATIONS

DESIGN: SIMPLE LAYOUT (18m2 Min.)—SMALL VERANDA ONLY—SOLID FOUNDATION/BASE—CORE HOUSES RECOMMENDED

HEALTH: COMFORTABLE/ HEALTHY SPACE, CROSS VENTILATION, AVOID OVERHEATING (IF CGI ROOF)

PROTECTION: INCLUSION OF DOORS, WINDOWS + INTERNAL PARTITION

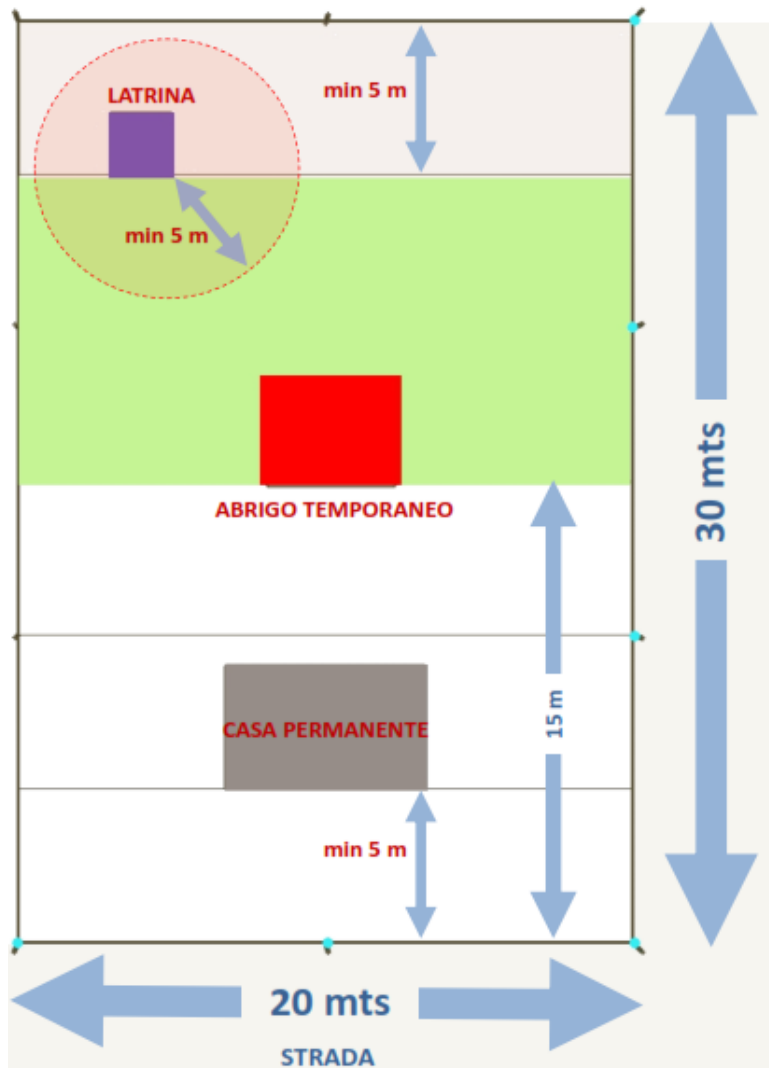
WELL CONSIDERED MATERIAL SELECTION + PROCUREMENT/PRODUCTION- BALANCE OF COST, QUALITY, AVAILABILITY, DURABILITY, MAINTENANCE, REPLICABILITY LOCALLY, EXISTING LOCAL TECHNICAL KNOWLEDGE + ASPIRATIONS

LOW ENVIRONMENTAL IMPACT: LOW TIMBER USE, MANAGED SOIL USE, MINIMIZE TRANSPORTATION

WIND/CYCLONE RESILIENCE: MEASURES DESIGNED INTO PROJECT FOR WELL FIXED ROOF, RESILIENT WALLS

FLOOD RESILIENCE: Min. 30cm ELEVATION FROM GROUND

5- Ensure Latrine Provision



2- Temporary and Permanent House Location
Layout of Individual Plot (Sofala)

SITE CONSIDERATIONS

Safe Site: Site is not in a flood risk area or close to large tree, too close to river or other body of water

Permanent House Location prioritized: Positioning of temporary shelters on beneficiaries plot should not be in the same location as the future permanent house and should not require removal during construction of permanent house. *(Particularly relevant in resettlement sites)*

[See MOPHRH Guidelines- Housing Projects](#)

Reasonable House size in relation to average size in the community

DUAT – or Customary DUAT/ Provisional DUAT in place

SERVICES

Integrated with basic infrastructure/services ideally

Ensure latrine provision: Include Latrine in project or coordinate with WASH partner

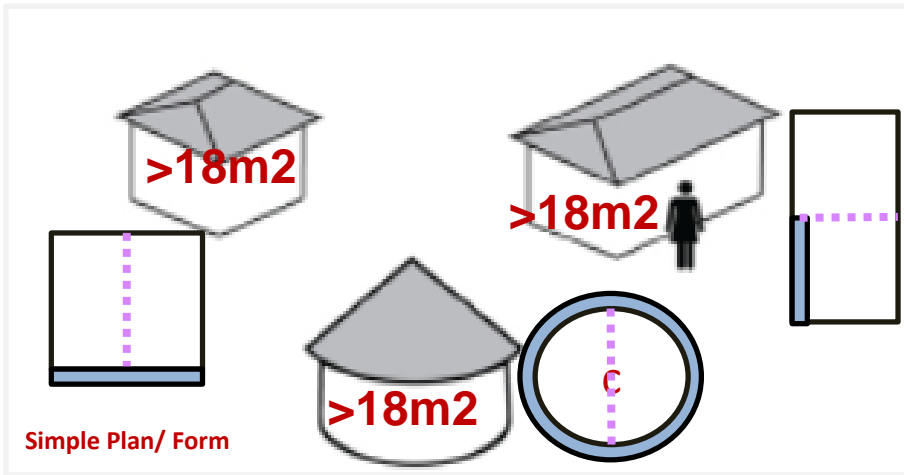
COMMUNICATION

Clear communication on beneficiary selection- *Should not create expectation or de-incentivize self-recovery within wider community*

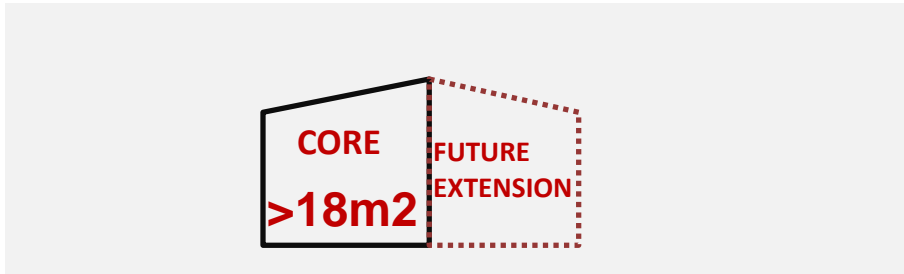
Include Community and beneficiary in all aspects of the project from initial planning stages



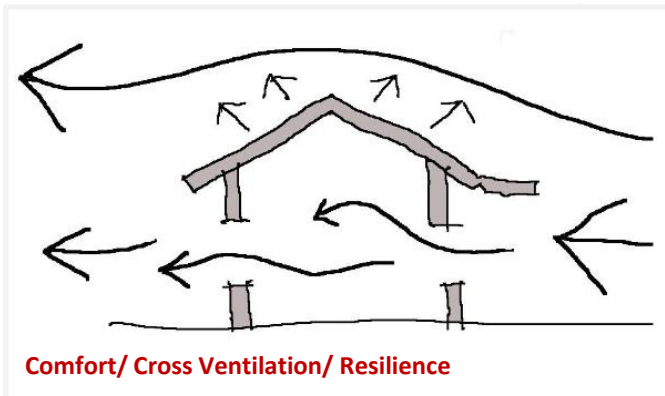
1- Safe Site



Simple Plan/ Form



Core House Recommended



Comfort/ Cross Ventilation/ Resilience



Protection: Door (Outward Opening) + Windows

DESIGN

Simple plan and layout (Minimum 18m²)

Core (Extendable) Houses recommended

Minimize roof overhangs: Reduce risk of lifting in wind/cyclone

One internal partition minimum within the house

Protection: Include 900mm wide front door (Outward opening for wind) and windows, as part of the project

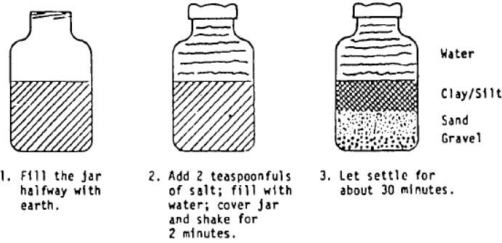
Small veranda only, or as required to protect walls externally
Beneficiaries can create their own shaded areas and verandas separate to main core house, without needing solid base

HEALTH

Comfort/ Health: Ensure cross ventilation (One opening per room)

\$ Where there are cost restraints, **prioritize housing design and resilient construction detailing over dimensions of the house.**

[Further Reading and Information HERE](#)



Adobe Blocks- Under construction (! rainy season)



Factory Made Block Maker



Local/ Contractor Made Block Maker

MATERIAL SELECTION

ENVIRONMENTAL IMPACT

Adobe [Further Information on Adobe HERE](#)

Highly recommended to add minimum 5% cement to make blocks more resilient to humidity

-Low Environmental Impact

-Local soil Suitability Needs to be assessed and tested.

A clay, good mixture of soil used in adobe blocks consists of sand, content and silt. A specific range of either sand, clay, or silt depends on the local soil.

-Mold can be easily made locally

-Quality Control: Supervision/ training in the production of the blocks

-Rainy Season Constraints: Project planning implications

-Easy to maintain and rehabilitate by owner

-Care to reduce erosion during to earth retrieval

CSEB- Compressed Stabilized Earth Blocks (Recommended) [Further Information on CSEB HERE](#)

-Low Environmental Impact

-Stabilized with minimum 5% cement (10% recommended)

-Machine Required- Maintenance of the machine is also required

-If machine made by contractor/ locally- Checks on compression needed

-Machine and use of compression means blocks are more regular in form

-Must be used with cement mortar

-Care to reduce erosion during to earth retrieval

MATERIAL SELECTION

ENVIRONMENTAL IMPACT

-Fired bricks:

-Based on adobe blocks (using the same mixture as adobe blocks) cooked in traditional oven(kiln)

-Most environmental impact compared with other earth based materials, due to burning timber during firing process

-Opportunity to build on and enhance extensive local knowledge + interest, especially in some parts of country

-High durability and low maintenance

-Molds made easily in community

-Quality Control: In mixture, oven cooking and regularity of dimensions

-Should be used with cement based mortar

-Care to reduce erosion during to earth retrieval

-Timber burnt to cook bricks should be controlled/ monitored and permitted by government

-Requires reinforced concrete lower and top ring beams and corner reinforcement for good resilience



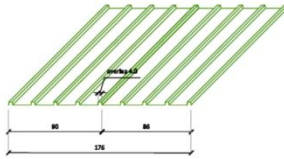
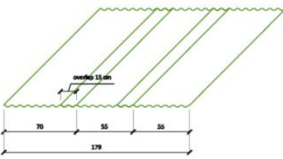
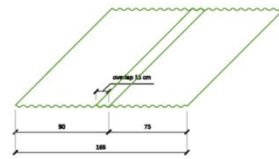
Fired Brick Oven(Kiln) - Manica Province

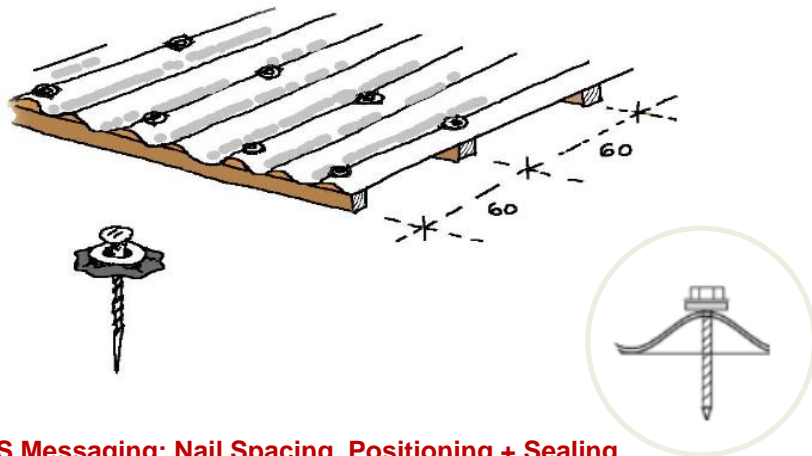
Mozambique Government MOPHRH Construction Guidelines:

[See MOPHRH Guidelines- Block Quality](#)

[See MOPHRH Guidelines- Construction Manual](#)

[See MOPHRH Guidelines- Construction Norms](#)

 <p>IBR SHEETS 90 X 360 cms Overlap 4 cms Usable length 86 cms</p>	 <p>CGI SHEETS 70 X 360 cms Overlap 15 cms Usable length 55 cms</p>	 <p>CGI SHEETS 90 X 360 cms Overlap 15 cms Usable length 75 cms</p>
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BBS Messaging: Nail Spacing, Positioning + Sealing

MATERIAL SELECTION

ENVIRONMENTAL IMPACT

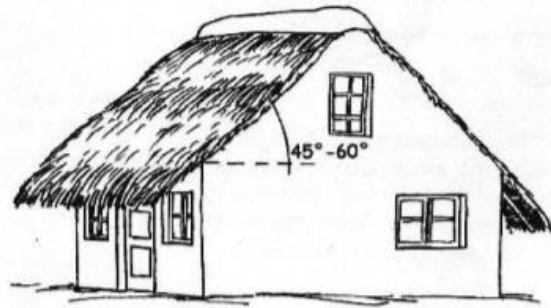
-Cement blocks:

- Production has a high environmental Impact
- Quality Control is important (Ratio 1:9 cement to sand)
- 15cm blocks minimum recommended
- Foundations (70cm deep min.)
- Low maintenance

-CGI/ IBR Sheets:

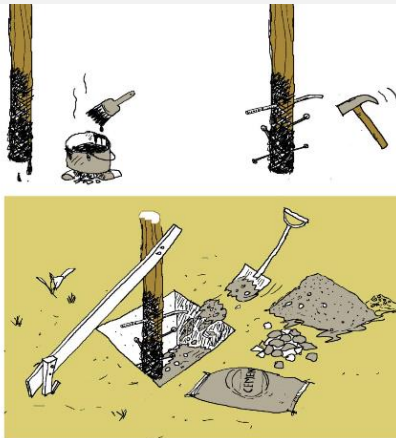
[See IFRC CGI Guidelines](#)

- Production has a high environmental Impact
- Minimum 0.4mm thick (PALPOC)
- Calculation of overlap to be considered when estimating number of sheets required (CGI requires more overlap than IBR)
- CGI is more widely available rurally for replacement purposes (but usually @ less than .4mm thick)
- Painted finish to increase durability recommended
- Ideally should be fixed to sawn/regular timber or metal roof structure as it is not well compatible with circular/ irregular structure(sticks)
- Nails:
 - >Ensure enough nails to fix sheeting well are distributed/ Used
 - >Grooved Nails with a ringed head + rubber gasket to seal penetration



MOPHRH Recommended pitch

[Image Source](#)



[REFERENCE: BBS Messaging Sheet](#)

Treatment of timber posts in contact with ground



Elevar o Pavimento da Casa com terra compactada

Compacted raised floor

MATERIAL SELECTION

ENVIRONMENTAL IMPACT

Capim/ Thatch:

- Pitch 45-60 degrees (MOPHR Guidelines)
- Good quality capim can be difficult to source (Quality Control)
- Seasonal Material
- Very good in cyclone/ high winds as it allows wind to pass through
- Difficult to ensure no leaks- *which can result in owner improvisation with use of plastic sheets and CGIs, creating weakness against strong winds*
- Requires maintenance every 1-2 years
- Fire Hazard especially when open fire cooking takes place close by

-Pau-a-pique:

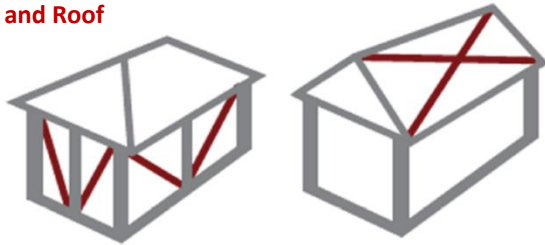
- Low resilience if built in traditional way: Additional Resilience measures needed, such as more structure, enhanced fixings and bracing, treatment of posts in contact with ground (burnt oil/ creosote/ cement and nails)
- Ensure controlled cutting of stakes and, reforestation where possible
- Easy to maintain and rehabilitate by owner

-Bamboo:

[Further Bamboo Guidelines HERE](#)

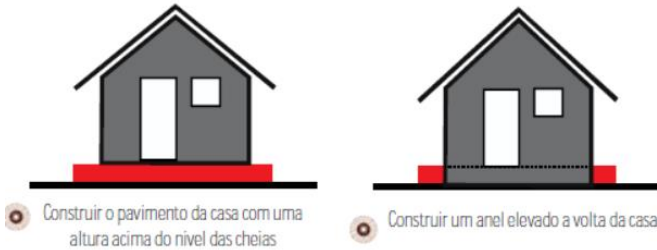
- Low environmental Impact
- Flexible, familiar material for communities due to similarity with local laca-laca (sticks) and pau-a-pique

Bracing- Walls and Roof

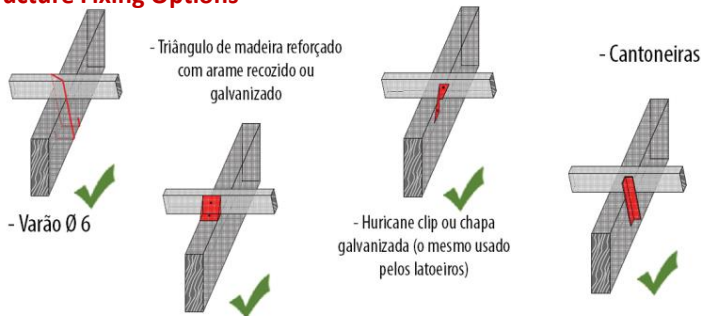


[For further Information- See BBS Messaging Sheet](#)

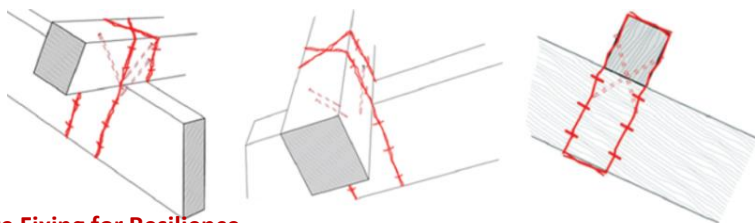
Raised Floor/ Base/ Platform: Minimum 30cm (PALPOC)



Roof Structure Fixing Options



[UN-HABITAT Resilience Presentation- October 2019](#)



Tie Wire Fixing for Resilience

FLOOD/ HEAVY RAIN RESILIENCE

WIND/CYCLONE RESILIENCE

Resilience Measures:

-Considerations for resilience to:

Flooding, heavy rain, driving rain, high winds, cyclones, extreme heat

HEAVY RAIN MEASURES:

-Conventional roof Pitch 30-45 Degrees (MOPHRH Recommendations)

-Overhang of

FLOODING MEASURES:

-Conventional Foundations recommended- (Minimum 70cm deep)

-Floor should be raised by minimum 30cm

-OVERHEATING MEASURES:

-Consideration should be taken for ventilation of the roof space, by use of light ceiling (Capulana/ tarp/ other light material) hung from roof internally, and ensuring air flow at high level via penetrations in walls

-Alternatively placement of something(thatch/grass) on top of CGI sheets can be considered to reduce the radiant heat causing overheating internally

-CYCLONE/ HIGH WIND MEASURES:

-Cross bracing of walls and roof structure recommended

-Consider inclusion of 'matafogos' (Rim at gables on top of roof)

-Fixing of Roof structure Options:

-Ø6 Reinforcement bar wrapped

-Triangular wedge of wood fixed at junction, reinforced with

burnt/ galvanized wire

-Hurricane Clips

-L Plates 'Cantonieras'

[Further Links to Relevant Documents HERE](#)