Community-Led Shelter Modelling for a Changing Climate

SHELTER PREPAREDNESS IN ZIMBABWE

A project report and
humanitarian shelter design catalogue
for informing future responses

Acknowledgements

The lead authors of this document were Justus Kikuvi and James Morgan from CARE's Global Shelter Team. The contributing authors were Tinashe Kasirori (CARE Zimbabwe), Linda Dyirakumunda (CARE Zimbabwe) and Step Haiselden (CARE Global Shelter Team). Graphic design by Eszter Sarody.

CARE extends its gratitude to the Government of Zimbabwe Department of Civil Protection within the Ministry of Local Government and Public Works, as well as the Ministry of National Housing and Social Amenities, for their invaluable support in approving the implementation of this pilot project.

Furthermore, CARE would like to express its appreciation to the Mutare Provincial Civil Protection Unit, as well as the Mutare and Chipinge Rural District Councils, the Chipinge District Development Coordinator (DDC), and the Manicaland Shelter Cluster for their unwavering support throughout the project. Their involvement in engaging communities, monitoring project activities, certifying prototypes, and facilitating the evaluation process has been instrumental to the success of this initiative.

CARE also acknowledges the collaborative efforts of partner organisations such as Africa AHEAD and the International Organisation for Migration (IOM). Their shared experiences and knowledge have played a vital role in the implementation phase, enriching the project and contributing to its effectiveness.

The collective support and collaboration of these agencies and partners have been essential in driving the success of this pilot project, and CARE is grateful for their dedication and contributions towards achieving the project's objectives.

Foreword by Stakeholders

Together, through this project, we have done remarkable work in disaster preparedness, community engagement and capacity building. This community-led shelter preparedness initiative has been transformative, with local residents actively participating from design, construction, and monitoring to the final evaluation, showcasing the power of collaboration. As a councillor, I worked to bring the community and stakeholders together to ensure the project's success. Preparedness is a cornerstone of disaster response, and this project has equipped our district with ready plans and Bills of Quantities, empowering communities to activate shelter solutions swiftly during emergencies. This close cooperation between all the stakeholders but especially the community themselves has enabled us to strengthen disaster readiness in our vulnerable wards, particularly Wards 11 and 19.

Tadious Ngadziore,
Councillor for
Ward 19 in Chipinge Rural

Community Representative

The community-led shelter preparedness process in Chipinge District showcased the power of collaboration and community involvement in the design and implementation of this emergency shelter project. Acting as a 'midwife' between the community and CARE International, I facilitated seamless operations from design to evaluation. This vital preparedness exercise highlighted the need for streamlined procurement, district-level artisan training, and improved design tools. It has equipped the district with designs, bills of quantities, and actionable strategies to support vulnerable communities, ensuring timely activation of shelter solutions in emergencies.

Tinashe Nyasha
Department of Civil Protection and Zimbabwe Shelter Cluster

Government of Zimbabwe

The implementation of the community-led shelter preparedness project aligns with one of CARE's impact areas, which is Humanitarian Action. As part of CARE's 2030 goal to provide quality, gender-focused, and localised humanitarian assistance to 10% of those affected by major crises, reaching at least 50 million people by 2020, this project marked a significant step in that direction. By enhancing the capacity of at-risk communities through shelter preparedness initiatives, CARE aimed to contribute to building resilience and preparedness among vulnerable populations. Acknowledging the importance of collaboration with governments and partners in systems strengthening for the benefit of the communities served, CARE envisions expanding these preparedness initiatives to all affected areas, furthering its commitment to providing effective and sustainable humanitarian assistance.

Tinashe Kasirori,
Humanitarian Programs Coordinator,

CARE Zimbabwe

Contents

Executive Summary

The humanitarian shelter sector has historically faced significant gaps in preparedness and climate-smart shelter design. These challenges stem from a traditionally disaster-response-focused funding architecture and limited experience in integrating climate change adaptation into shelter design. Organisations often lack the bandwidth and resources to test and evaluate various materials and designs with communities, let alone address climate change adaptation through this process.

"Community-led Shelter Modelling for a Changing Climate" (CSMCC) represents a new attempt to address this gap by designing, prototyping, and evaluating climate-smart community-designed humanitarian shelters for populations vulnerable to climate shocks. The model emphasises scaling learning through partnerships with NGOs, INGOs, and governments. Uniquely, it integrates community-led design with insights from climate forecasting models, local climate knowledge, engineering and gender-inclusive methodologies, resulting in more resilient and inclusive shelter solutions.

The implementation of this model in Zimbabwe represents the first piloting of this approach whereby the community-led climate-smart process enabled communities to co-create shelters tailored to their evolving climate-related challenges. We believe this model not only strengthens preparedness for one of the core sectors of humanitarian response but also empowers affected communities with greater agency and equips them to design shelters better adapted to future climate hazards.

Introduction

Context

Zimbabwe has faced a series of humanitarian and climate-related disasters in recent years, significantly impacting large parts of its population. The devastating effects of Cyclone Idai in March 2019 marked one of the most severe natural hazard induced disasters in the country's history, causing widespread damage and destruction of homesteads, displacing thousands, destroying critical infrastructure, and leading to food insecurity and health risks. The Government and humanitarian stakeholders responded to this crisis with significant shelter support to affected communities, however upon a review of this and other historic humanitarian operations, gaps were identified by CARE, the Government of Zimbabwe, and other key stakeholders.

In July 2023 as an offshoot of a multi-year regional shelter preparedness strengthening program CARE hosted the Zimbabwe Shelter Capacity Exchange 2023 – an event that aimed to strengthen the national and interagency shelter response preparedness plan through collaborative efforts involving vulnerable communities, government entities such as the Civil Protection Department under the Ministry of Local Government and Public Works, as well as the Department of Housing and Spatial Planning. It was in this event, that participants identified a lack of harmonisation in historic shelter provision and a lack of understanding and research around traditional construction and homebuilding in relation to shelter design.

Examples of emergency shelters built by impacted communities after Cyclone Idai

Examples of transitional shelters built by humanitarian organisations after Cyclone Idai

This event covered a lot of ground including the reconstitution of the government-led national shelter cluster, the establishment of effective coordination mechanisms, and the exchange of knowledge on past responses by participating stakeholders. However, one particular outcome of the event was the **recommendation to invest more resources in the development of national guidance for humanitarian shelter designs** to address the gaps in this knowledge area, considering the ever-changing climate-related hazards, and support better harmonisation in future humanitarian shelter responses.

Thankfully, CARE Zimbabwe along with CARE UK and donor The Volant Charitable Trust were able to step in to address this and other recommendations and this led to the creation of **the Zimbabwe Strengthening Shelter Preparedness and Response 2024 project** of which this report is a part of – a collaboration between CARE Zimbabwe, the CARE Global Shelter Team (hosted by CARE UK) and the Government of Zimbabwe. The project had several outcomes including: system strengthening of the National Shelter Cluster, development of national policies and guidelines, and preparedness activities. However this report will focus on Outcome 2 of that project: Community-Led Emergency and Transitional Shelter Design Prototyping.

Objectives

This project focused on the design, construction and evaluation of physical prototypes in order to learn lessons and share the findings contributing to future national guidelines and standards for shelter design in future emergencies with an emphasis on platforming community perspectives to influence decision-makers and promoting shelter typologies that integrate climate-smart design principles. To that end, the following objectives were established early on in the project conception:

- Consult with communities and local builders to better understand the rural Zimbabwe context of the Eastern Region Manicaland.
- Develop a process of community-led shelter design and prototyping that may be iterated upon and hopefully adapted for use in other relevant contexts.
- Bring climate forecasting and local knowledge on the changing climate to bear on this process and integrate its considerations into the design and evaluation.
- Build emergency and transitional shelter prototypes.
- Facilitate the communities to evaluate these prototypes capturing feedback, scoring and analysis across social and technical categories.
- Compile and share recommendations for the benefit of all stakeholders who may be involved in future humanitarian responses.

Scope

This project represents a new approach for shelter preparedness integrating community-led and climate-smart principles in its design. Because of its nature as a pilot project, this created certain constraints that helped establish the project scope:

- **Budget and time frame.** Funding constraints resulted in a limited budget and six-month time frame. While this budget and time frame were sufficient to pilot this process for the first time, it also understandably set scoping limitations in several areas.
- **Number of prototypes.** Budget, timeframe, target area and logistics limited the number of prototypes we were able to build to seven. While we were still able to build a significant number of different designs more prototypes would have allowed for more rigorous testing and evaluation across a broader variety of contexts.
- **Geographical area of operation.** Testing became focused on the eastern region of Chipinge due to its relatively high levels of economic vulnerability, exposure to climate-related hazards and it having been directly affected by Cyclone Idai in 2019. While the process results have inherent value to this region, testing in other regions would have broadened the lessons and widened the applicable contexts given more resources.
- **Integration of climate change adaptation.** Consultation with climate change experts and resources resulted in the piloting of methods to bring climate science to the community level beginning the development of a more climate-smart shelter preparedness process. However, in future iterations, we intend to work more closely with climate change technical experts, bringing them more formally into the project structure and adapting models from their sector.

We hope to develop this model and expand its scope in subsequent iterations, addressing these areas with more resources, integration of learnings and the involvement of a broader set of stakeholders.

Methodology and Preparatory Work

Process Overview

Once project implementation started, it was important to define process steps based upon the project objectives that would then allow for the scheduling of activities and activation of resources.

The following process steps were followed. Development of these steps occurred in phase one (Preparatory Phase) and the publication of this report represents an output of phase six (Write-Up and Dissemination). These process steps have been summarised below.

1. **Initiation**
   Initial meetings between CARE's Global Shelter Team and CARE Zimbabwe to set objectives, select prototype sites and define the scope of activities. This phase included the hiring of staff to manage the project and the mapping of stakeholders.

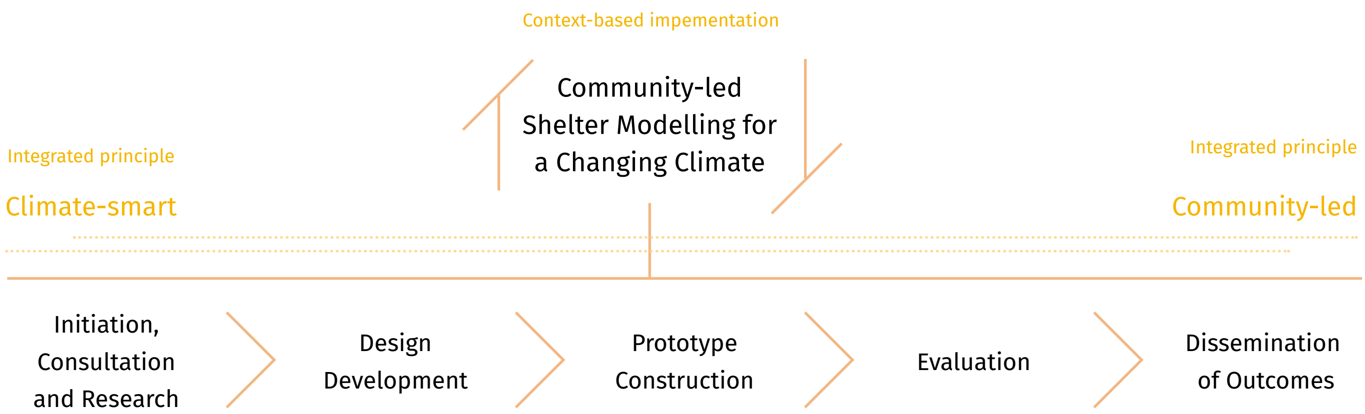
2. **Consultation and Research**
   This phase involved community sensitisation, market and supplier assessments, initiation of stakeholder engagement, and a review of climate data. It finalised design constraints based on local materials and conditions.

3. **Community-led Design Development**
   Communities engaged in climate reflection and design workshops, including inclusive focus groups. Discussion around climate change adaptation was facilitated, and community recommendations were produced to shape the emergency and transitional shelter designs, complete with detailed drawings and cost estimates.

4. **Prototype Construction**
   The materials were procured, and community labour was hired. The prototypes were built by community-skilled and non-skilled builders and accompanied by engineers who also documented the process.

5. **Evaluation**
   The community evaluated prototypes using pre-defined criteria through workshops, on-site visits, and discussions. The process captured social, cultural, technical, and climate resilience feedback.

6. **Write-Up and Dissemination**
   A report summarising findings and recommendations is to be compiled, reviewed, and approved at the national level. The final designs are published and shared across relevant platforms for future deployment.



Project Principles

Initial meetings between the leading parties allowed for the development of a plan of phases (consultation, construction, evaluation phases of prototypes etc.) but also established the common ground of principles that would guide the project through the design of its every activity:

- **Community-led**

  Any future shelters for the community should be designed, constructed and evaluated by the community. Maximise community ownership, agency and decision making across all phases of the prototype design project.

- **Climate-Smart**

  Any future shelter Designs should Integrate climate change adaptation throughout their design construction and evaluation. Importantly this should combine actionable information from meteorological offices on climate forecasting with local knowledge, experience and adaptation to the changing climate.

- **Stakeholder inclusive**

  The project should seek to engage all relevant stakeholders including community individuals, groups and leaders first and foremost, but equally civil society, the NGO/INGO community and any relevant departments of the local and national government.

- **Technical and Social Focus**

  Housing and shelter should seek to address social needs just as much if not more so than technical needs. The project should balance its design and evaluation objectives equally between technical and social aspects. This includes the inclusion of technical as well as non-technical community participants as well as design objectives and evaluation criteria reflective of these two areas.,

- **Develop Tools and Guidance for the Future**

  The output of this process should be practical and actionable in future shelter projects in Zimbabwe but furthermore the process of community-led shelter design should be shared on the iterated upon for other relevant contexts.

Stakeholder Engagement

In alignment with the objectives and principles of this project, it was important to build a consortium of stakeholders and engage them throughout the process steps. The following represent these key stakeholders and their roles in the project:

Stakeholder engagement with District Government at the Chipinge Rural District Council

- **CARE Zimbabwe**

  The CARE country office led and managed this project based on its long history in Zimbabwe and a strong presence across all regions of the country, particularly Chipinge and Manicaland during significant disaster responses such as Cyclone Idai in 2019. Their leading role drew from their strong relationship with local authorities and communities as well as extensive experience in facilitating community-led approaches.

- **CARE Global Shelter Team**

  This external CARE team based across UK, Kenya and Colombia led on the concept and process development of this project with technical advisors providing ongoing remote support throughout the duration and undertaking three separate deployments to accompany critical moments in the project phases. This team also led on documentation of the process and it outputs.

- **Government of Zimbabwe** (The Ministry of Local Government and Public Works & The Ministry of National Housing and Social Amenities)

  The Department of Civil Protection in Zimbabwe, which is under the Ministry of Local Government and Public Works, plays a pivotal role in disaster management by overseeing disaster preparedness, early warning systems, response coordination, search and rescue operations, disaster risk reduction initiatives, capacity building, collaboration with stakeholders, public awareness campaigns, and post-disaster recovery efforts. Both Ministries played a critical role in supporting the monitoring of field works that was done, deploying technical staff to support the project, and in community engagement.

- **Zimbabwe Shelter Cluster**

  The Shelter Cluster played a crucial role in coordinating the relevant government departments and the community. This coordination mechanism brought together the relevant partners to ensure a unified and effective approach to implementing the shelter preparedness project.

- **Participating Communities**

  From the start the local participating community were the most important stakeholders in this project, actively engaging in defining their unique context and hazards, which in turn informed the project's direction while also considering their gender and cultural dynamics. Their invaluable leading role was instrumental in determining designs, constructing those designs as prototypes and evaluating the suitability and effectiveness of the various prototypes in different scenarios. Moreover, the community's active involvement in the evaluation process for the prototypes ensured that the solutions proposed were not only feasible but also resonated with their specific needs and circumstances, fostering a sense of ownership and sustainability within the community. solutions proposed were not only feasible but also resonated with their specific needs and circumstances, fostering a sense of ownership and sustainability within the community.

Establishment of Design Criteria

During the preparatory phase it was important to establish the design criteria or constraints that would be used to guide the development of the prototypes. Two categories of shelter were chosen to reflect the different stages of emergency response based on global and humanitarian norms as well as lived experience from past responses in Zimbabwe:

Development of the initial Shelter Design Criteria between CARE and Government Engineers at CARE Offices in Mutare

Emergency Shelter

Temporary structures provided directly after a disaster to offer immediate protection and safety. They're quick to assemble and often made from lightweight materials such as tarpaulins and lightweight framing elements or alternatively can take the form of readymade tents. Designs often focus on minimising costs to maximise scale of delivery so that the broader needs in a large-scale disaster can be better met.

- **Target material cost: $500-$1000** (The lower cost the better)
- **Intended for construction within first days / weeks**
- **Longevity (lifespan) – minimum 6 months**
- **Minimum covered floor area for 5 people families – 17.5 m^2 [1]**
- Minimum 2 rooms with separate external access doors for male/female separation
- Materials should be locally available and fast to procure
- Shelter should take no longer than 1 days to construct (Target construction time once materials and labourers on site)
- No more than 3 community members necessary to construct – 1 skilled, 2 unskilled (Skilled means has experience in constructing rural homesteads)

1 Based on Sphere Project Humanitarian Standards – 3.5m^2 covered habitable area per person

Transitional Shelter

Structures provided to bridge the gap between emergency shelters and permanent housing. They're more durable and can be upgraded or adapted over time. This enhanced durability over emergency shelter means there is a higher construction cost.

- **Target material cost: $1000-2500** (The lower cost the better)
- **Intended for construction within first 3–6 months**
- **Longevity (lifespan) – minimum 2 years**
- **Minimum covered floor area for 5 people families: 17.5 m^2**
- Minimum 2 rooms with separate external access doors for male/female separation
- Materials should be locally available and fast to procure
- Shelter should take no longer than 1 week to construct
- No more than 4 community members necessary to construct – 1 skilled, 3 unskilled (Skilled means has experience in constructing rural homesteads)
- Design should be:
  - Reflective of local traditional design
  - Well lit (Windows)
  - Secure (Locks on doors windows)
  - Well ventilated (Ventilation grilles or openings)
  - Raised on a plinth to reduce flood risk to structure

Choice of Location

Communities were chosen in two locations to participate in this project – Ward 11 and Ward 19 in Chipinge constituency, Manicaland Province. This highland constituency has a subtropical climate, with higher altitudes providing cooler temperatures compared to the rest of Zimbabwe and fertile soils making small-scale farming and subsistence agriculture common. However, this area of Zimbabwe is also very remote consisting of dispersed rural communities many of whom experience economic vulnerability in addition to their increased exposure to climate related hazards such as they experienced in 2019 when Cyclone Idai brought heavy rains, high winds and flooding.

This is also an area of the country that CARE has historically worked in having responded to Cyclone Idai. Because of this and other projects in the province CARE has good relations with communities and local government which were regarded as critical factors in fostering an environment conducive to project success.

Community-Led Design and Construction

Community-Led Design Workshops

Following the principle of a community-led approach the project intentionally began the shelter design process at the community level by facilitating those communities to reflect on their vulnerabilities, capacities and risks so that they would be empowered to put forward the shelter typologies they saw as most relevant to their context and most appropriate to their culture.

The process began with a general discussion on risks and hazards the communities have faced with a specific discussion on Climate Change considerations as outlined in the section below. Discussions then moved on, facilitated around a set of pre-designed topics and leading questions covering the following topics:

- Disaster Risk Management
- Community Organisation
- Shelter and the home, materials and design
- Gender, protection and inclusion

This led to a drawing exercise on shelter designs deemed to demonstrate resilience and climate-smart design. This activity was consolidated in the prioritisation of shelters to be trialled through the construction of their prototypes. This ensured the community choose the typologies, materials, configurations and layouts most relevant to them for testing and evaluation.

Consultations were developed to be inclusive by featuring separate focus groups for women, the elderly, and people with disabilities, each facilitated appropriately in line with the principles of inclusive participation. For example, using women facilitators to facilitate women's groups, arranging support for those with difficulties to attend, and providing structured feedback to the larger community to ensure all voices were heard.

Ultimately these initial consultations led to the communities putting forward a selection of ten relevant prototype designs, which were then passed on to engineers for further development.

Community determined shelter designs produced by different community focus groups in Chipinge

Integration of Climate Change Adaptation

Climate Change Adaptation was a project principle woven throughout the community-led processes. This began within the community-led design phase by facilitating conversation around the changing climate, manifested in the shelter prototype design decisions, and was specifically evaluated during the community-led design process. It was important throughout this that we brought together the two knowledge areas of this topic in a dignified exchange:

1. **Local Knowledge and Experience of Climate Change**
   Facilitating communities to share their perspectives on the topic allowing them to reflect on their own experiences of the changing climate and how they have made changes to their behaviour and construction practices to adapt.

2. **Risk Communication of Climate Science**
   Relevant climate forecasts, projections and actionable information first had to be researched. Relevant information profiling the Zimbabwe climate outlook[2] was then adapted into straightforward key messages. These messages were then read to the community to validate their experience of the changing climate and contribute climate projections that informed their understanding of the evolving risks.

2 https://www.climatecentre.org/wp-content/uploads/Climate-Profiles-of-Countries-in-Southern-Africa-Zimbabwe.pdf

A rural Chipinge household and their self-built shelter integrating local knowledge on the changing climate

Workshop Findings

The community workshop was thoroughly documented, and a detailed report of these specific events was produced which can be found in the Appendix of this document. However, for the purposes of this narrative section we can share the most relevant findings and recommendations. Please remember that these findings relate to this specific Zimbabwe context should not be generalised to other contexts:

Disaster Risk Management

- The majority of individuals or families did not evacuate but rather moved to safer places within the community. During Cyclone Idai, people sought shelter with relatives and friends, as well as in schools and hospitals.
- After the rains stopped, communities returned to their homesteads and the largest number built emergency shelters using poles and dagga (local mud rendering technique) while some others used plastics, roofing sheets, and tents.
- During the first 72 hours, limited response efforts were at the community level, with humanitarian organisations, the government, and other well-wishers bringing in tents after one week. However, no permanent shelter construction took place outside the tents. A German organisation assisted after 3 months, which helped communities obtain materials to construct shelters.
- To this day, some people are still living in emergency shelters self-constructed using poles and dagga. Although communities are aware of disaster risk management plans, the plans do not include a shelter preparedness component. As a result, no disaster risk management actions have been taken until now, and the people have always responded to disasters at the household level.
- It was also expressed that the community had experienced climate change first hand with notably drier, less green landscapes than could be remembered from previous decades. Homes were noted to be more exposed to heavy rains and flash floods.

Community orientation on the community-led design workshop in Chipinge

Community Organisation

- The majority indicated that they felt a lack of community cohesion and collective decision making around shelter preparedness, with these decisions instead happening at the individual or household level. In some rare cases, help was said to come through the church.
- Women have formed groups such as Village Savings and Loan Associations (VSLAs) to raise funds and build shelters as a coping mechanism, although the funds are insufficient to build permanent structures.
- Generally, due to economic hardships, there is no existing coping mechanism since the majority will be saving funds towards household needs such as food, school fees, and medication for the elderly.
- The community expressed a preference for shelters to be constructed at community centres, hospitals, and clinics for security reasons.
- In general community members are willing to contribute their services free of charge for shelter construction in times of emergency.

Shelter and the Home, Materials and Design

- There was a preference toward traditional housing materials such as poles and dagga or brick houses with zinc roofs however the latter was the preferred option for those with the means to construct that way.
- Communities were interested to make homes more resilient to climate change by using existing techniques on traditional typologies rather than importing new building systems. This included mention of plinth building, parapet walls to hold down the edges zinc roofs and concrete render to protect brick walls and their mortar.
- To ensure privacy, security, and adhere to cultural norms, the shelters should have separate rooms for girls and boys, as well as a private room for parents.
- Security should be ensured through the use of durable materials, doors, windows and robust locks to all openings.
- A habitable shelter should include amenities such as an ablution facility, water, a kitchen. The location of the shelter should be close to health facilities, educational institutions, amenities, and a GBV (Gender-Based Violence) rescue unit.
- The construction of shelters should be prioritised in locations near clinics, schools, and households for security reasons and long-term sustainability, as it was for those affected by Cyclone Idai who were left homeless.

Gender and Protection and Inclusion

- The communities emphasised that shelters should be inclusive of marginalised or disadvantaged groups such as women, children, the elderly, and people with disabilities.
- For those with disabilities shelters should be designed to be accessible through the provision of ramps and rails. The ablution facilities should also be disability friendly as well as consider the needs of women and girls during their menstrual cycles.
- Decisions regarding shelter development within each household are made collectively, with the father typically guiding the process and making the final decision. Women and children also participate in decision-making to establish a sense of ownership.
- However, in some households, decision-making is dominated by men, which can lead to gender-based violence, particularly if the shelter is constructed in the absence of women.

The final selection of prototypes for testing were chosen based on the recommendations put forth by the community during the community-led design workshop including a set of prioritised designs they wanted to build and evaluate (Including configuration, materials and construction techniques)

This list was then reviewed by engineers and weighed against the practical considerations of material availability and transport. Based on this review and other resource considerations, a final selection of 3 emergency and 4 transitional shelter prototypes were chosen for construction.

Detailed Design and BoQs

Detailed designs and BoQs were developed based on the community prioritised designs and worked on during several technical sessions held between CARE and district / provincial engineers. These final designs went through several iterations as the technical teams sought to value engineer the designs to achieve the maximum potential for scaling while balancing that with the inclusion of climate-smart resilient features. Discussions focused on material costs, local markets, supply chains, and construction feasibility, ensuring the final designs remained aligned with the community's original vision and intentions.

Site Selection

The process of selecting construction sites was made at the community level, with a focus on targeting the most vulnerable individuals as suggested by district stakeholders. It was important to prioritise community leadership in this process to ensure that from the outset that they had agency over project outcomes and were able to use their social capital to identify those most in need who might benefit from participating in the project.

Construction Management and On-Site Monitoring

Following the community-led principle, but also to ensure efficient material use and follow appropriate labour practices, a mix of skilled and non-skilled community members were chosen by the community leaders from within the localities to build the shelter prototypes. Community leaders also played an active role in monitoring the construction, strengthening their involvement in the project and fostering a sense of community ownership.

The process of material procurement was jointly overseen by CARE (Project Manager and Engineer) and the Government (Supervising engineer) in coordination with local communities for reception and storage. However, all construction activities at site level were led by the community builders once materials had been received.

To support construction, the supervising engineer was provided with a guidance document that covered pre-construction and post-construction responsibilities around quality control, accompaniment, and monitoring. The engineer worked closely with the local builders to explore the detailed design on site as it was constructed, and documented lessons learned and real-time adjustments to the design.

The community builder teams selected were also involved in the evaluation process after the shelters were complete so that they might share their insight during the construction process.

Prototype shelters under construction

Evaluation

Overview

The evaluation focused on a review and comparative analysis of the constructed prototypes capturing feedback from the different stakeholders. Community members participated in a social evaluation, sharing their perspectives on the designs' suitability and comfort. Community builders conducted a technical evaluation to assess construction process and material effectiveness. Additionally, government officials contributed their views on both the prototypes and the construction process, adding valuable insights from a regulatory and technical oversight perspective.

Methodology

The evaluation involved 2 main groups of people:

1) 25 regular non-construction skilled community members and government representatives
2) 4 community builders involved in the construction.

Groups were convened to reflect all parts of society not just community leaders or people of high social status. Where possible women's participation was encouraged with Group 1 having over 50% women as well as representative members from the youth, elderly, persons with disabilities and single female headed households. Group 2 prioritised people with technical/construction knowledge.

A two-part process was carried out to deliver complementary evaluation outputs - qualitative feedback and quantitative scoring:

- **Field Visits**
  A facilitated walkabout to the sites of each community prototype aimed to familiarise all participants with the shelter prototypes, ensuring a shared understanding so that they could provide informed and objective feedback during the workshop.
- **Structured Workshop**
  Discussions were guided along the social and technical evaluation criteria categories. Verbal contributions were recorded as qualitative feedback and the quantitative scoring was accomplished by organising participants into groups, introducing to the scoring system and allowing the groups to assess and assigned scores.

Evaluation Criteria

The evaluation criteria were based on a combination of social and technical considerations designed to balance the human considerations against the functional:

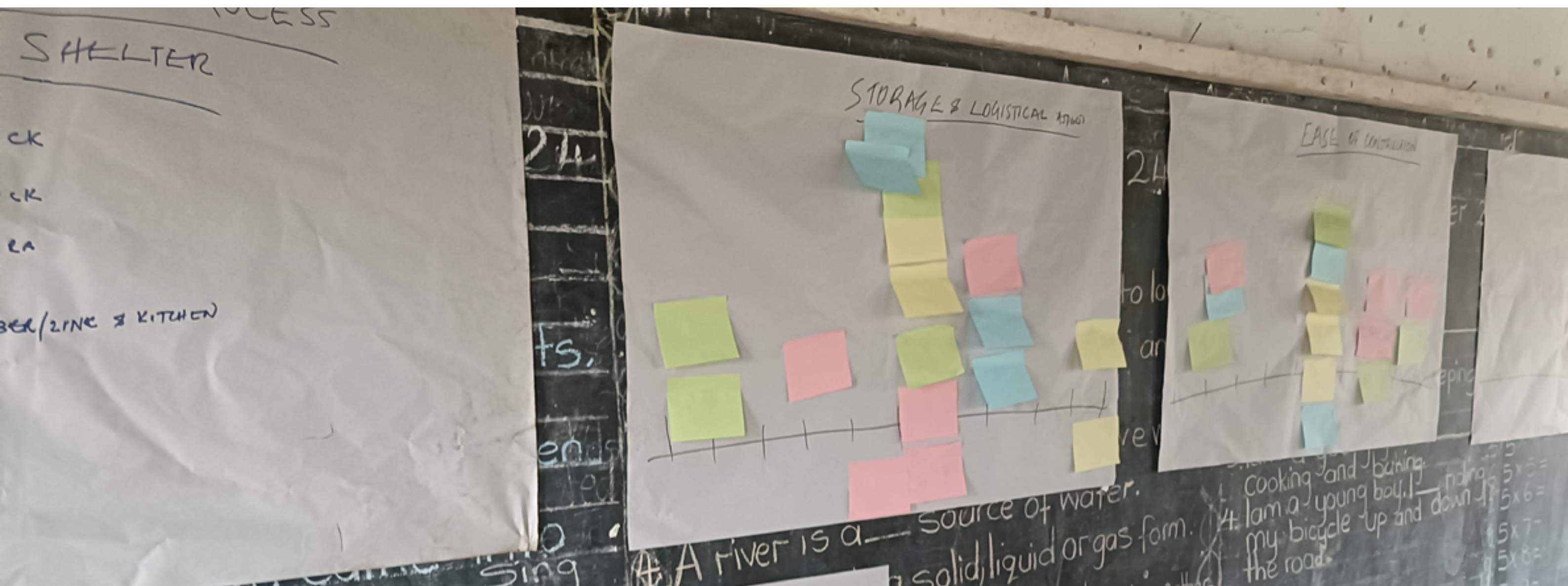
Social Criteria:

1. **Cultural and spiritual acceptability:** How the shelter aligns with the cultural and spiritual values of the community, ensuring respect for local customs and beliefs.
2. **Comfort and ease of living:** The level of comfort and adaptability afforded by the design toward fulfilling the daily needs and lifestyle of the community members.
3. **Protection against hazards and risks:** To what extent the shelter protects against hazards and risks identified in the community design workshop including climate related hazards influenced by climate change.
4. **Gender and protection aspects:** How well are gender considerations integrated toward ensuring a gender-sensitive design as well as elements that ensure safety, inclusivity, and protection for vulnerable groups.

Technical Criteria:

1. **Storage and logistical aspects:** How well the designs and material choices facilitate efficient storage, accessibility, and transportation logistics.
2. **Ease of construction:** How straightforward the construction process is, enabling quick and safe assembly with minimal specialised skills or equipment.
3. **Material quality:** The quality of the materials including aspects of durability, local availability, and suitability based on the environmental context.
4. **Maintenance:** How manageable the long-term maintenance of the shelters is, with considerations to easy repair and replacement of parts based on local resources and capacities.

These criteria were more thoroughly elaborated in a handout document for facilitators that broke the 8 criteria down into 15 subheadings made up of 24 leading questions. This aided facilitators and participants, if necessary, to better understand the meaning of the categories and support discussions if conversations faltered or needed additional clarification.



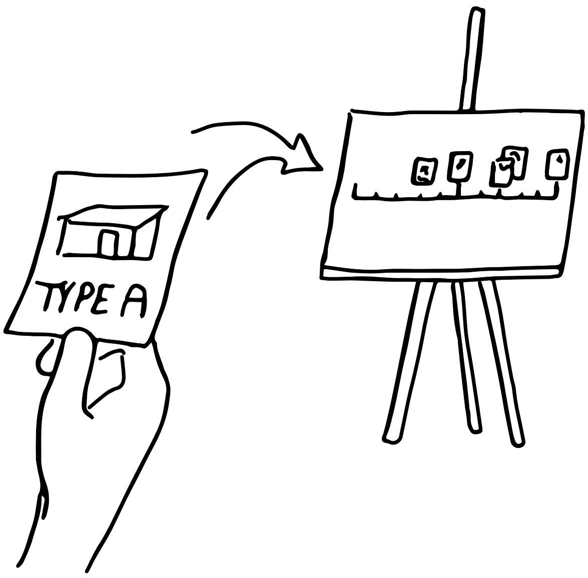
Scoring System

A scoring system was developed to maximise discussion and inclusion around the evaluation criteria and support the groups to perform a comparative analysis.

On a wall, hand-drawn scales 0-10 were produced for each evaluation criteria and explained for any non-literate members of the audience. The objective was to place each shelter on each scale as a way of rating their performance in each criterion. This also allowed participants to consider how shelter performed against each other and score comparatively.

Participants were organised into groups of 5 to keep group dynamics small and encourage the contributions of all members. The review criteria were then brought up one by one with pre-prepared leading questions helping stimulate discussion. The groups were asked to discuss each in turn and then agree and then place each shelter post-it note token on the hand-drawn scale before being recorded for this report.

Early concept sketch of the scoring system and the community-led evaluation that put this system into practice



Evaluated Shelter Profiles

Profiles Overview

The following shelter profiles represent the results of the community-led evaluation of the constructed prototypes. Each profile covers the basic practical information (for example cost and dimensions), technical description, the technical and social qualitative feedback and quantitative scoring.

The intention of these profiles is to equip humanitarian stakeholders responding to future crises with practical information, knowledge and insights that might aid them in decision making and rapid implementation of future shelter programs. Furthermore, these profiles aim to elevate and advocate the technical and social perspectives of affected communities – those whose voices humanitarian stakeholders should be paying closest attention to.

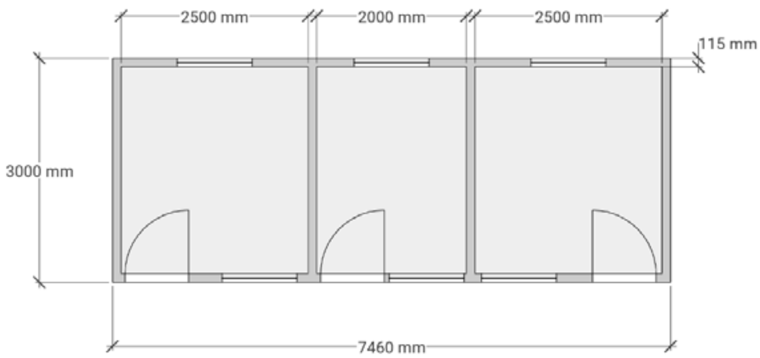
		Social Criteria					Technical Criteria				
		Cultural acceptability	Comfort	Protection against hazards	Gender and Protection	**Average Social Score**	Storage and Logistical Aspects	Ease of Construction	Material Quality	Maintenance	**Average Technical Score**
Transitional shelters	Three roomed mudbrick shelter with zinc roof	10	8.5	9	10	**9.4**	7.5	8.75	9.75	8.75	**8.7**
Transitional shelters	Two roomed mudbrick shelter with zinc roof	7	9.5	7.5	7.5	**7.9**	6.5	4.25	8.75	6	**6.4**
Transitional shelters	Two roomed concrete Dura panel shelter with zinc roof	6	3.5	4.25	6.75	**5.1**	3	3.75	8.5	3.5	**4.7**
Transitional shelters	Timber panel shelter with zinc roof	3.5	5	3	5	**4.1**	5.75	5.75	5.75	9	**6.6**
Emergency shelters	Poles and plastic walling with zinc roof	10	3.25	8	7	**7.1**	10	10	10	5	**8.8**
Emergency shelters	Plastic tarpaulin and poles (both walls and roof)	10	4.25	8	5	**6.8**	7.5	8	8	7.5	**7.8**
Emergency shelters	Pole and Dagga with zinc roof	5	8.25	8.5	9	**7.7**	5.25	8	8	8.75	**7.5**

Transitional Shelter Prototype 1:

Three roomed mudbrick shelter with parapet enclosed zinc roof

SCORING
9.0/10

MATERIAL COST:	$ 1858.68
TIME TO BUILD:	6 Days
PEOPLE TO BUILD:	2 Skilled, 3 Unskilled
SHELTER TYPE:	Transitional
ESTIMATED LONGEVITY:	Minimum 5 Years
DIMENSIONS:	7.46m × 3.03m
COVERED FLOOR AREA :	19.6m²



Description

A three-room shelter was designed with mudbrick walls and a 3-sided parapet-enclosed zinc roof to accommodate larger families, ensuring sufficient space and privacy for all members. The inclusion of three separate rooms addresses both cultural and practical needs for personal space within the household, particularly through the provision of separate lockable entrances to accommodate and protect individuals of different genders.

The structure sits on a plinth to protect it from floodwaters. A strip foundation was excavated down to stable ground and constructed slightly above ground level to form a 200mm plinth, which was then plastered to enhance flood resistance. A bituminous felt damp-proof course was laid on the strip foundation wall to prevent ground moisture from seeping into the walls.

The walls are made of burnt bricks joined with cement-sand mortar. To improve resilience against heavy rain, which often dissolves the brick mortar in exposed walls, the exterior walls were rendered in plaster using a mixture of sand and cement. Additionally, a parapet wall was added to secure the roofing, as the area is prone to strong winds. Metal-framed lockable doors and windows were also installed.

Physical observation | Scoring

Social criteria

Cultural Acceptability — 10/10

The shelter was highly rated because it aligned with local living practices by including three rooms, a common layout in the community. The use of locally sourced materials further enhanced its acceptability, respecting traditional customs while ensuring sustainability and cost-effectiveness. The prototype received widespread praise from beneficiaries, community members, stakeholders, and builders, who appreciated its design, functionality, and alignment with cultural norms.

Comfort — 8.5/10

While the shelter's design was generally well-received, the team noted that the room sizes were acceptable but relatively small and recommended increasing their dimensions to enhance liveability. The technical team also suggested that a verandah could be added to provide shade, reduce direct sunlight exposure to doors, and moderate indoor temperatures. Despite these recommended adjustments, the structure was still rated as comfortable.

Protection Against Hazards — 9/10

The shelter demonstrated strong resistance to hazards due to the durability of its brick walls protected by external rendering and zinc roofing further protected by its parapet brick enclosure. The plinth further protects the base from flood waters though could have been angled to prevent standing water. Both structural assessments and community feedback highlighted its robustness, instilling confidence in its ability to withstand adverse conditions.

Gender and Protection — 10/10

The inclusion of strong doors and windows was commended by the community for responding to their concerns around gender and the sense of security and protection it creates. Additionally, making the doors lockable with padlocks further enhanced the sense of security, ensuring that the occupants could better safeguard their personal spaces and belongings . The separate rooms and external doors recommended by the community during design stage were again praised for allowing all occupants but particularly women and children a safe and protected space of their own.

Technical criteria

Storage and Logistical Aspects — 7.5/10

While most materials, such as mud and bricks, were locally sourced, timber and zinc had to be delivered by vendors from outside the region, adding complexity and cost to the process. During the discussion, it was recommended that timber and zinc be sourced from local vendors as long as the zinc in particular could be found to a good thickness. This challenge slightly affected the overall rating. Addressing these logistical issues could further streamline future projects.

Ease of Construction — 8.75/10

The construction process was straightforward and familiar to the community, as it relied on traditional building techniques commonly practiced in the area. Apart from minor issues caused by poor brick quality, builders faced no significant challenges during construction, reinforcing the practicality of this design.

Material Quality — 9.75/10

While the local bricks were ready-made, their initial quality was suboptimal, necessitating plastering to enhance the overall wall integrity. Other materials, however, were of good quality. Despite the poor-quality bricks, the builders rated the materials highly. Discussions with builders and community members emphasised that soil selection is critical for producing high-quality bricks. With the right soil, the need for replastering could be eliminated, ensuring better structural integrity from the outset

Maintenance — 8.75/10

The community regarded the maintenance of the brick structure as simple and manageable, given their familiarity with the materials and techniques involved. As the design uses traditionally recognised methods and locally available resources, the community expressed confidence in their ability to maintain the shelters over time

Summary

The shelter prototype received a high score and positive feedback from team members. It was culturally accepted, provided effective protection against hazards, and addressed gender considerations. Additionally, it offered the required comfort due to the use of bricks, which are excellent insulators. The design also did not require specialised skills to construct, making it highly practical for the intended setting. While the prototype performed above average in all areas of evaluation, there were some recommendations for improvement. These included increasing the size of the rooms to enhance functionality and reorienting the structure to minimise direct exposure to sunlight at the front. If these adjustments are implemented, the prototype has the potential to become one of the preferred shelter designs.

9.0/10

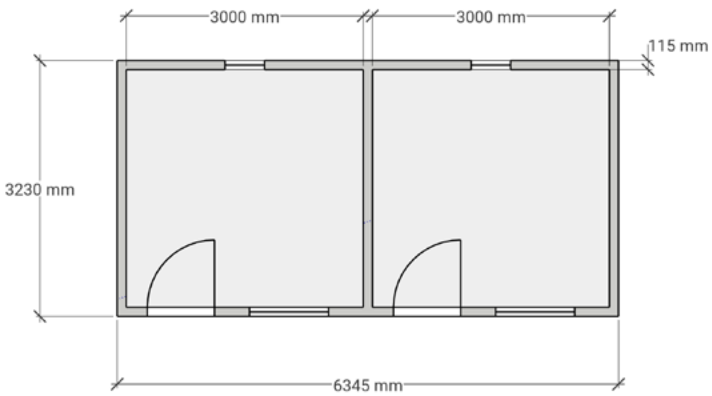
[3 roomed brick shelter prototype desig.pdf]

Transitional Shelter Prototype 2:

Two-roomed mudbrick shelter with zinc roof

SCORING
7.1/10

MATERIAL COST:	$ 1609
TIME TO BUILD:	5 Days
PEOPLE TO BUILD:	2 Skilled, 3 Unskilled
SHELTER TYPE:	Transitional
ESTIMATED LONGEVITY:	Minimum 5 years
DIMENSIONS:	6.345m × 3.23m
COVERED FLOOR AREA :	18m²



Description

The shelter features a two-room design with mudbrick walls and a zinc roof . It is constructed on a strip foundation, excavated to stable ground and raised slightly above ground level to form a plinth. The plinth is then plastered to protect against flooding, and a bituminous felt damp-proof course is laid to the foundation walls to prevent ground moisture from seeping into the structure.

The walls are built using burnt bricks bonded with a cement-sand mortar. To enhance durability, the exterior walls are plastered with a sand-cement mixture, providing protection from heavy rains that could otherwise weaken the brick wall. The shelter has doors that open inward into the room, serving as a barrier since the space also functions as a bedroom. When open, the doors help maintain privacy by preventing a clear view of the entire room.

Physical observation — Scoring

Social criteria

Cultural Acceptability — 7/10

The two-roomed brick shelter design was generally well-received by the community. However, it scored lower in comparison to the three-roomed design due to the limited number of rooms. According to the local community, their cultural norms dictate the need for a dedicated room for older children or visitors. While the two-roomed structure was culturally acceptable, its inability to accommodate this requirement resulted in a lower score.

Comfort — 9.5/10

Community members praised the spacious room sizes, which were noted to provide comfort and ease of movement. Additionally, the shelter's orientation was highly appreciated for promoting a naturally cooler indoor environment, a feature well-suited to the local climate. Despite the limited number of rooms, the structure received high scores for comfort due to its thoughtful room dimensions and orientation

Protection Against Hazards — 7.5/10

The shelter showcased strong resilience against hazards due to the durable construction of its brick walls, complemented by external rendering and zinc roofing, and further reinforced with a parapet brick enclosure. Both structural evaluations and community feedback emphasised the shelter's robustness, inspiring confidence in its capacity to endure adverse conditions while ensuring the safety of its occupants

Gender and Protection — 7.5/10

The community appreciated the inclusion of sturdy doors and windows, recognising their alignment with gender-sensitive and protection-compliant standards. These features were acknowledged as crucial for promoting the safety and security of all residents, especially women and children. However, the design was rated lower than the three-roomed alternative due to the limited number of rooms. Community members agreed on the need for additional rooms, particularly for larger families, to foster privacy and maintain dignity.

Technical criteria

Storage and Logistical Aspects — 6.5/10

While most materials, such as mud and bricks, were sourced locally, timber and zinc had to be procured from external vendors, which added complexity and increased costs. During discussions, it was suggested that sourcing timber and zinc from local suppliers could help reduce logistical challenges. These issues slightly impacted the overall rating, but addressing them could improve efficiency in future projects.

Ease of Construction — 4.25/10

The construction process was simple and familiar to the community, as it utilised traditional building techniques widely practiced in the region. Aside from minor challenges related to poor brick quality, builders encountered no major difficulties, underscoring the design's practicality and ease of implementation.

Material Quality — 8.75/10

Although the bricks were ready-made, their initial quality was inadequate, requiring plastering to improve their durability. Other materials, however, were deemed to be of good quality. Builders and community members highlighted that proper soil selection is essential for producing high-quality bricks. By using suitable soil, the need for replastering could be avoided, ensuring stronger structures from the beginning.

Maintenance — 6/10

The community found the maintenance of the brick structures to be straightforward and manageable, given their familiarity with the materials and traditional construction methods. Since the design incorporates locally recognised techniques and resources, the community expressed confidence in their ability to sustain the shelters over time.

Summary — 7.1/10

The two-roomed brick shelter design was generally well-received for its comfort, ease of construction, and resilience against hazards, although it was rated lower than the three-roomed alternative due to the limited number of rooms, which conflicted with cultural norms requiring additional space for older children or visitors. The spacious rooms and orientation provided comfort, while sturdy materials, including brick walls, zinc roofing, and parapets, ensured strong protection against hazards. Gender-sensitive features, such as secure doors and windows, were praised but highlighted the need for more rooms to enhance privacy for larger families. Although locally sourced materials simplified construction and maintenance, reliance on externally sourced timber and zinc increased logistical complexity. Addressing these sourcing challenges and improving brick quality through better soil selection could enhance the design›s efficiency and durability in future projects.

2 roomed brick shelter prototype design.pdf

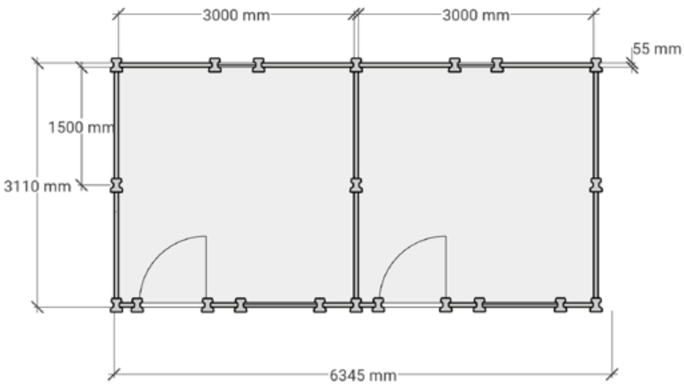
Transitional Shelter Prototype 3:

Two-roomed concrete Dura panel shelter with zinc roof

SCORING

4.9/10

MATERIAL COST:	$ 2077
TIME TO BUILD:	5 Days
PEOPLE TO BUILD:	1 Skilled, 3 Unskilled
SHELTER TYPE:	Transitional
ESTIMATED LONGEVITY:	Minimum 5 years
DIMENSIONS:	6.165m × 3.1m
COVERED FLOOR AREA :	18m^2



Description

Dura panels are primarily designed for fencing but have also been used in some areas for constructing houses. This prototype was proposed by the community after observing similar structures in their area built with dura panels. Their main objective was to explore the feasibility of using this material by assessing the construction process, associated costs, required skills, and its viability compared to other existing options.

These panels are made of reinforced concrete and are supported by dura poles, which provide additional strength and durability to the structure. The structure is built on a foundation that is excavated, filled with coarse aggregate, and levelled with a sand-cement mortar.

Structurally, the dura poles act as vertical cantilevers emerging from the strip foundation. There is no ring beam at eaves level; instead, horizontal concrete panels interlock with the poles, creating a system where the panels essentially tie the frame together, contributing to the overall stability of the structure. However, one limitation is the length of the dura poles, which restricts the available headroom inside the structure.

Physical observation | Scoring

Social criteria

Cultural Acceptability — 6/10

The community expressed reservations about the structure due to its technical complexity, the limited availability of required materials, and the need for specialised tools during construction. These factors contributed to a perception that the design did not align with their cultural expectations. According to community members, dura panels are traditionally associated with fencing rather than housing, further diminishing its acceptability. Additionally, the lack of familiarity with the materials and techniques created a sense of disconnect, as the design deviated from locally recognised building practices. Addressing these concerns by incorporating more culturally familiar materials and construction methods could improve acceptance in the future.

Comfort — 3.5/10

The structure featured spacious rooms and good ventilation, which the community praised for providing a high level of comfort. However, concerns were raised about the headroom, which community members identified as a potential issue. They noted that the low headroom could pose challenges, particularly in adapting to their climatic conditions, such as heat retention and air circulation. Addressing this issue by increasing the headroom could enhance the structure's suitability for the local climate and improve overall comfort.

Protection Against Hazards — 4.25/10

The design of the structure, which featured small gaps between the dura panels, raised concerns among community members about its ability to provide adequate protection. These spaces were perceived as vulnerabilities, making the structure less secure against external threats such as harsh weather, insects, and intruders. The community expressed a strong preference for fully enclosed structures where windows and doors would serve as the only openings for light and ventilation. The presence of gaps in the dura panels led to a sense of insecurity among occupants, rendering the structure unsuitable for providing reliable protection.

Gender and Protection — 6.75/10

The gaps between the dura panels also raised significant concerns regarding gender protection. Community members emphasised that these spaces compromised privacy, particularly for women and children, which they regarded as unacceptable. The lack of full enclosure heightened fears of potential breaches in safety and dignity. As a result, the structure was deemed unsuitable for meeting gender-sensitive protection requirements. To address these concerns, the community recommended the use of fully enclosed walls to enhance privacy and ensure occupants' safety.

Technical criteria

Storage and Logistical Aspects — 3/10

Dura materials are not readily available within the community, as they are centrally produced by a limited number of vendors and require specialised tools for manufacturing. Transporting these materials from production sites to construction locations poses significant challenges due to their bulkiness, which results in high transportation costs. Additionally, the dura panels are fragile, with several breaking during transit. The same fragility extends to storage, as the panels require careful handling and packing to avoid further damage.

Ease of Construction — 3.75/10

Constructing dura shelters presents significant challenges due to the need for specialised technical skills and tools. Cutting the dura panels requires an electric disc cutter, a tool that is not commonly available within the community. This limitation made it difficult for local community members to actively participate in or replicate the construction process. Moreover, fitting the panels together requires expertise in dura fixing, a skill that is scarce in the locality. Builders voiced strong concerns about these challenges, with many expressing dissatisfaction with the design and its impracticality for local conditions.

Material Quality — 8.5/10

Dura panels were found to be fragile and prone to breakage during transportation, with several arriving damaged at the construction site, complicating the building process. The panels also lacked sufficient reinforcement, prompting builders to seek additional ways to enhance the structure's stability and safety. Furthermore, the dura poles, primarily designed for fencing, were too short to provide adequate headroom, resulting in cramped interior spaces. These material shortcomings significantly reduced the community's acceptance of dura materials for shelter construction.

Maintenance — 3.5/10

Maintenance of dura shelters, much like their construction, requires specialised skills and dura panels, which are not locally available. The community lacks the expertise needed to carry out repairs or upkeep, further diminishing the suitability and acceptance of this design. Without accessible materials or training, the community viewed the dura shelters as impractical for long-term use.

Summary — 4.9/10

The dura panel shelter design faced significant cultural, technical, and practical challenges, resulting in low community acceptance. Although the structure featured spacious rooms and good ventilation, its low headroom and the gaps between dura panels raised concerns about comfort, safety, and privacy, particularly for women and children. These design flaws undermined security and failed to meet cultural expectations for fully enclosed housing. The reliance on specialised tools, technical expertise, and the limited local availability of dura materials further impeded construction, maintenance, and community participation. Additionally, the fragility of the panels, coupled with high transportation costs and frequent material breakages, further diminished their practicality and suitability for the community.

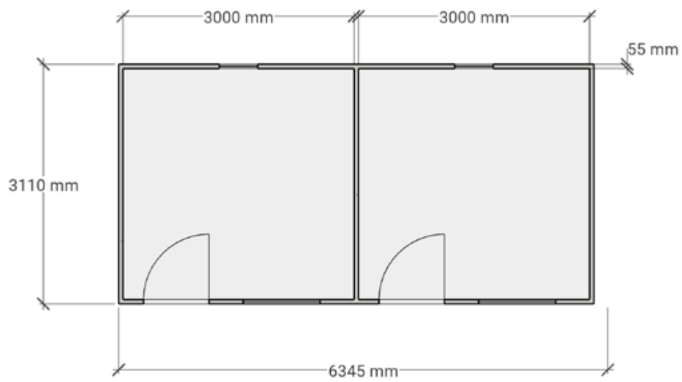
2 roomed dura shelter prototype design.pdf

Transitional Shelter Prototype 4:

Timber panel shelter with zinc roof

SCORING
5.3/10

MATERIAL COST:	$ 1536,95
TIME TO BUILD:	8 Days
PEOPLE TO BUILD:	2 Skilled, 6 Unskilled
SHELTER TYPE:	Transitional
ESTIMATED LONGEVITY:	Minimum 5 years
DIMENSIONS:	6.165m × 3.1m
COVERED FLOOR AREA :	18m²



Description

The timber structure was proposed by the community as a quick and practical solution for emergencies, especially in areas where timber is readily available or in forested regions. The design consists of a two-room structure with a timber frame, panel walling, and a zinc roof supported by a timber frame.

The foundation is excavated down to stable ground, then filled with coarse aggregate and compacted. It is raised slightly above ground level and sides plastered to protect the structure from rainwater and potential flooding. The floor is first filled with coarse aggregate and compacted. Sand is then added to fill larger voids and create a smooth surface. This is followed by a layer of waterproof sheeting, and finally, a 100mm concrete slab is poured on top. Additionally, a 40mm thick cement-sand screed is applied as the final floor finish. The treated timber frame is then installed on the rendered floor to support the timber panels, which are nailed to the frame.

Once the walling is completed, a timber frame is built for the roof, which is then covered with zinc sheets. For fire safety, the kitchen is constructed as a separate structure outside the main building. It is made of brick half wall and a zinc-sheet roof, helping to minimise fire hazards while ensuring the functionality and convenience of the household.

Physical observation

Scoring

Social criteria

Cultural Acceptability — 3.5/10

The use of timber as a building material was positively received by the community, especially in areas with readily available timber. Community members appreciated the design, particularly the inclusion of an external kitchen, which they regarded as an important cultural feature. However, there was debate within the community about whether the structure should be classified as emergency or transitional. The general consensus was that the structure was more temporary than transitional, as they felt it did not fully align with their cultural expectations for longer-term housing solutions.

Comfort — 5/10

The structure was commended for its spaciousness and excellent ventilation, with community members highlighting that because of small gaps between the timber panels it offered a comfortable and well-aerated living environment. These features were particularly appreciated in hot and humid conditions, where proper airflow significantly enhanced the overall quality of life for the occupants.

Protection Against Hazards — 3/10

The structure's design, featuring small gaps between the timber panels, raised concerns among community members about its ability to provide adequate protection. These gaps were perceived as weak points, reducing the structure's effectiveness against external threats such as harsh weather, insects, and intruders. This sense of vulnerability was further compounded by the community's general belief that timber is not a strong material for walling, which heightened their feelings of insecurity. As a result, the structure was deemed inadequate for ensuring reliable and durable protection. Fire risk was deemed a lesser-issue due to the cultural practice of cooking outdoors.

Gender and Protection — 5/10

The gaps between the timber panels raised serious concerns about gender protection. Community members stressed that these openings compromised privacy, especially for women and children, which they considered unacceptable. The absence of full enclosure amplified fears of potential threats to safety and dignity. Consequently, the structure was deemed inadequate for addressing gender-sensitive protection needs.

Technical criteria

Storage and Logistical Aspects — 5.75/10

This type of construction is feasible primarily in forested regions or areas with sufficient access to timber. In locations lacking a local supply of timber, significant logistical challenges could arise in sourcing and transporting the necessary materials to the construction site. These challenges may include increased costs, delays in delivery, and environmental concerns associated with transporting timber over long distances. Additionally, reliance on timber from non-local sources could affect the sustainability and practicality of the construction approach in such areas.

Ease of Construction — 5.75/10

Technically, the builders faced few challenges during construction, as the materials and techniques used were familiar and accessible. The construction process was notably quicker compared to other prototypes, demonstrating that it was both practical and efficient to build.

Material Quality — 5.75/10

The timber panels were noted to be strong and of good quality, providing durability and structural stability. However, the design resulted in gaps between the panels, which raised concerns among community members. These openings, while not compromising the overall strength of the structure, were viewed as potential vulnerabilities in terms of privacy, safety, and protection from external elements such as weather and pests. Addressing these gaps would enhance the functionality and acceptability of the structure without detracting from the quality of the timber panels themselves

Maintenance — 9/10

The maintenance of this structure was found to be the easiest compared to others and did not require specialised skills. The community expressed confidence in their ability to perform routine maintenance, minimising the need for external assistance. This ease of maintenance was highly valued, as it allowed residents to address repairs quickly and affordably, reducing long-term costs. Additionally, the use of locally available materials and straightforward construction techniques further enhanced the structure's practicality and sustainability, ensuring it remained a cost-effective option for the community

Summary

The timber shelter was well-received, particularly for its inclusion of an external kitchen, a culturally significant feature for the community. However, it sparked debates about whether it should be classified as transitional or emergency shelter, with many considering it too temporary for long-term use. The structure was praised for its spaciousness, excellent ventilation, and suitability for hot, humid climates. However, small gaps between the timber panels raised concerns about protection from weather, pests, and intruders, as well as privacy, especially for women and children, making these gaps a notable vulnerability despite the high-quality timber. Construction was quick and straightforward, and maintenance was easy and cost-effective due to the use of familiar materials and techniques. However, sourcing timber posed logistical challenges in non-forested areas, leading to increased costs and potential delays.

5.3/10

[2 roomed wooden cabin shelter prototype design.pdf]

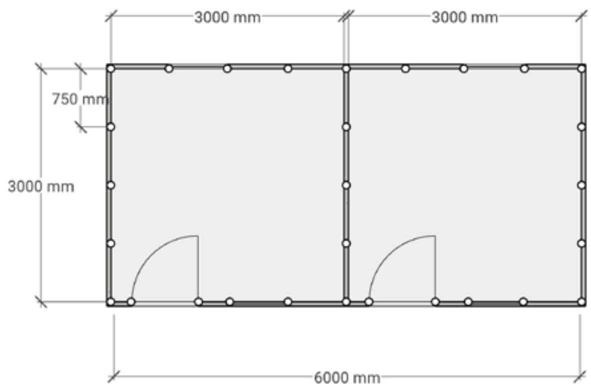
Emergency Shelter Prototype 1:

Poles and plastic walling with zinc roof

SCORING

7.9/10

MATERIAL COST:	**$ 751.65**
TIME TO BUILD:	**1 Day**
PEOPLE TO BUILD:	**2 Skilled, 2 Unskilled**
SHELTER TYPE:	**Emergency**
ESTIMATED LONGEVITY:	**Minimum 6 months**
DIMENSIONS:	**6.165m × 3.1m**
COVERED FLOOR AREA :	**18m²**



Description

The structure is built using 100mm treated poles, plastic tarpaulins for the walls, and a zinc roof. This design was proposed by the community as a practical and quick solution for emergencies, as most of the required materials are locally available. The design also allows for future upgrades, making it a flexible and sustainable option for temporary shelter needs.

Treated poles are used as the main structural supports and are sunk 500mm into the ground, depending on the soil conditions, to provide stability. Plastic tarpaulins are nailed to the poles to form the walls. At ground level, the base of the tarpaulin is buried under soil to secure it in place, and a small drainage channel is created around the structure to divert rainwater away and prevent flooding. The roof is constructed using a timber frame, which is covered with zinc sheets.

Physical observation | Scoring

Social criteria

Cultural Acceptability — 10/10

The structure is culturally accepted as quick solution to responding to emergency. The use of sturdy poles and zinc was recommended as a measure to withstand storms within the locality which cause heavy damage. The community mentioned that use of poles will encourage the owners to upgrade the structure once the tarpaulin is worn out by mudding a technic which is commonly used within the community. The structure is widely regarded as a culturally appropriate and effective solution for addressing emergencies. Its design reflects the community's preferences and practices, ensuring quick implementation in times of crisis. The use of sturdy poles and zinc was particularly highlighted as a practical choice to withstand the region's frequent and destructive storms. These materials not only enhance durability but also align with local construction techniques.

Furthermore, community members noted that the use of poles provides an opportunity for future upgrades. Owners can enhance the structure by applying mud, a technique deeply rooted in local traditions, offering improved insulation. The incorporation of these culturally relevant elements ensures the solution is both functional and respectful of the community's heritage and environment.

Comfort — 3.25/10

The use of plastic tarpaulin for the structure resulted in excessive heat buildup inside, making the environment uncomfortable for occupants. Although windows were included in the design, the community expressed a preference for larger windows or alternative methods to improve ventilation and reduce heat. Suggestions included increasing the size and number of windows, adding roof vents to allow hot air to escape. These adjustments would not only enhance comfort but also align the structure better with the community's environmental and climatic conditions.

Protection Against Hazards — 8/10

The structure, constructed with plastic tarpaulin wall and designed for emergency situations, was considered effective in providing protection against immediate hazards. However, the community recommended enhancing its protective capabilities by replacing the plastic sheet doors and windows with more durable zinc sheets. They emphasised that the current plastic sheet doors, which are not lockable, not only fail to provide adequate protection but also leave the occupants feeling insecure. Additionally, the community suggested incorporating lockable features, such as padlocks or latch systems, to improve safety and privacy. Addressing these concerns would make the structure more robust, culturally acceptable, and better suited for long term use in emergency.

Gender and Protection — 7/10

As a temporary emergency structure designed to save lives, the structure was considered somewhat effective in addressing immediate needs. However, the community highlighted the need for additional features to enhance its functionality and safety. They emphasised the importance of incorporating secure door locking mechanisms in addition to providing lockable windows to provide occupants with a greater sense of safety and privacy. These improvements were seen as critical to fostering a more secure environment, especially for vulnerable groups such as women and children, who are at higher risk during emergencies.

Technical criteria

Storage and Logistical Aspects — 10/10

The structure's design leverages materials and skills readily available within the community, ensuring quick and straightforward assembly. The simplicity of the design allows even untrained individuals to participate in the construction process under basic guidance, further enhancing community involvement. This not only speeds up construction during emergencies but also fosters a sense of ownership and collaboration among community members.

Ease of Construction — 10/10

Technically, the builders faced few challenges during construction, as the materials and techniques used were familiar and accessible. The construction process was notably quicker compared to other prototypes, demonstrating that it was both practical and efficient to build.

Material Quality — 10/10

The materials used plastic tarpaulin, zinc sheets, and sturdy poles are of high quality within the context of emergency situations. These materials are durable enough to provide immediate protection from harsh weather conditions such as rain and wind, making them ideal for temporary shelters. The zinc sheets, in particular, add strength to the structure and help improve its longevity compared to alternative materials.

Maintenance — 5/10

While the structure is relatively easy to maintain, the availability of replacement plastic tarpaulin can be a challenge if damaged. This limitation underscores the community's preference for upgrading the structure over time into a more stable and permanent solution. Materials like zinc sheets and mud, often used in local construction, could replace or reinforce existing components, ensuring long-term durability and reduced maintenance needs.

Summary

The emergency shelter design was widely accepted as a quick and culturally appropriate shelter solution for crisis response, utilising locally familiar materials like poles and zinc to withstand storms. The design aligned with community practices, offering the potential for upgrades using traditional mudding techniques to improve insulation and durability. While effective for immediate protection, the plastic tarpaulin walls caused significant heat buildup, leading the community to recommend larger windows, roof vents for better ventilation, and durable zinc sheet doors to enhance safety, privacy, and comfort. Lockable doors and windows were seen as essential for gender-sensitive protection, particularly for women and children. The use of locally sourced materials ensured easy transport and storage, enabling rapid deployment in disaster-prone areas. Simple construction methods encouraged community involvement, fostering a sense of ownership.

8/10

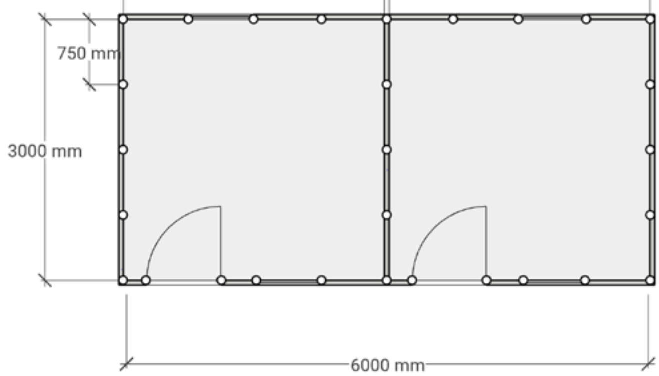
[2 roomed pole tarpaulin with zinc roof shelter prototype design.pdf]

Emergency Shelter Prototype 2:

Plastic tarpaulin and poles (both walls and roof)

SCORING
7.3/10

MATERIAL COST:	$ 817.37
TIME TO BUILD:	1 Days
PEOPLE TO BUILD:	2 Skilled, 3 Unskilled
SHELTER TYPE:	Emergency
ESTIMATED LONGEVITY:	Minimum 6 months
DIMENSIONS:	6.165m × 3.1m
COVERED FLOOR AREA :	18m²



Description

The structure consists of large poles for support, with plastic tarpaulin used for both the walls and roof. The design aimed to create a shelter that could be easily assembled and later upgraded as needed. This concept was proposed by the community, reflecting their preferences and practical considerations for a simple, flexible, and adaptable solution suitable for their needs.

Treated poles are used as the main structural supports and are sunk 500mm into the ground, depending on the soil conditions, to provide stability. Plastic tarpaulins are nailed to the poles to form the walls. At ground level, the base of the tarpaulin is buried under soil to secure it in place, and a small drainage channel is created around the structure to divert rainwater away and prevent flooding. The roof is constructed using a timber trusses, which is covered with plastic tarpaulins.

Physical observation | Scoring

Social criteria

Cultural Acceptability — 10/10

The structure aligns with the cultural norms and expectations for emergency shelters within the community. Despite its acceptance, the community has raised concerns about the plastic roofing's ability to withstand severe weather conditions, such as storms or heavy rains. This concern underscores a preference for more durable and robust roofing materials. Additionally, while the walling is regarded as relatively strong, upgrading the structure would necessitate a complete overhaul of both the walling and the roofing, presenting significant logistical and financial challenges for the community.

Comfort — 4.25/10

Plastic sheets are poor insulators and tend to trap heat, making the interior of the structure uncomfortably hot during the day. This compromises the living standards for the occupants, especially in warmer climates.

Protection Against Hazards — 8/10

The structure, supported by poles, is viewed as strong; however, the plastic sheeting used for both the walling and roof is considered inadequate for protection. The plastic sheet roof is particularly concerning due to its inability to withstand storms or heavy winds, raising safety issues for the occupants. The use of plastic sheeting for doors and windows offers minimal protection against external threats such as intruders, wildlife, or extreme weather.

Gender and Protection — 5/10

The lightweight and semi-transparent nature of plastic walls and roofs raises safety and privacy concerns, particularly for women and children who are more vulnerable to security threats. The structure does not provide a secure environment against potential gender-based violence, intrusion, or harassment. This significantly impacts the perceived safety and well-being of the occupant.

Technical criteria

Storage and Logistical Aspects — 7.5/10

The emergency structure is highly advantageous due to the availability and ease of transportation of its components. Locally sourced poles minimise logistical challenges, as they can be easily procured nearby. Likewise, plastic tarpaulins are lightweight and portable, making them ideal for transport to remote areas. Additionally, these materials are easy to store, enabling pre-positioning in disaster-prone regions for rapid deployment during emergencies.

Ease of Construction — 8/10

The design of the structure utilises materials and skills commonly available within the community, ensuring quick and efficient assembly. Its straightforward design allows even untrained individuals to participate in the building process with minimal guidance. This not only accelerates construction during emergencies but also promotes community engagement, fostering a sense of ownership and collaboration.

Material Quality — 8/10

The poles used in the structure provide sufficient structural strength, ensuring stability under normal conditions. However, the plastic sheets used for the roof lack the required durability and strength to withstand severe weather, such as storms or strong winds. This poses a significant concern regarding the long-term reliability and safety of the shelter.

Maintenance — 7.5/10

While the structure is relatively easy to maintain in the short term, replacing damaged plastic tarpaulin is a notable challenge. Limited availability of replacement materials in remote areas and their susceptibility to wear and tear increase the difficulty of maintaining the shelter over time. The community has expressed interest in upgrading the structure into a more permanent solution, but such an upgrade would require substantial effort and resources. Both the roof and walling would need to be replaced with more durable materials, such as zinc sheets for roofing and mud for walls, to ensure longevity and reduce maintenance demands.

Summary

The emergency shelter design aligns with cultural norms for temporary housing and is valued for its rapid deployment using locally available materials. However, concerns were raised about the plastic roofing's inability to withstand storm and the poor insulation provided by the plastic sheeting walls and roof, resulting in uncomfortably hot interiors in warmer climates. While the lightweight materials facilitate easy transportation, storage, and assembly enabling swift construction and encouraging community participation the durability of the plastic sheeting remains a significant drawback. Its susceptibility to wear and tear poses maintenance challenges. Upgrading the shelter to a more durable and long-term solution would require replacing the roof with zinc sheets and the walls with mud, but such improvements present substantial logistical and financial challenges for the community.

7.3/10

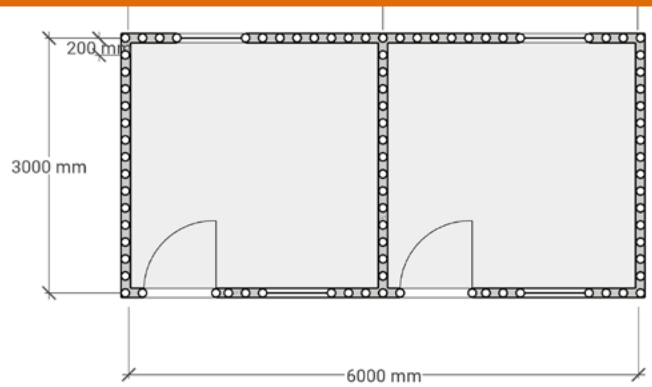
2 roomed pole tarpaulin walling with tarpaulin roof shelter prototype design.pdf

Emergency Shelter Prototype 3:

Pole and Dagga with zinc roof

SCORING
7.6/10

MATERIAL COST:	**$ 972.30**
TIME TO BUILD:	**4 Days**
PEOPLE TO BUILD:	**2 Skilled, 3 Unskilled**
SHELTER TYPE:	**Emergency**
ESTIMATED LONGEVITY: When rendering fixed)	**Minimum 5 years**
DIMENSIONS:	**6.165m × 3.1m**
COVERED FLOOR AREA :	**18m²**



Description

The original design of the structure featured spaced poles to allow for the application of mud, creating insulated walls with a zinc roof, a common and practical approach within the community. However, during construction, the community requested the addition of extra poles to enhance the structural strength. This modification unintentionally reduced the gaps between the poles, making it impractical to apply mud as initially planned.

The structure is constructed using poles sunk 500mm below ground level, with the depth varying depending on the soil conditions. The original design specified that the poles should be spaced apart, leaving sufficient gaps for mud infill, which would be supported by horizontal thin members placed at regular vertical intervals.

The design also includes timber-framed doors and windows, both covered with zinc sheets for durability and weather protection. The roof is constructed with a timber frame and covered with zinc sheets.

Physical observation

Scoring

Social criteria

Cultural Acceptability

5/10

The initial plan for the shelter, consisting of poles with mud walls and a zinc roof, was culturally acceptable because it aligned with traditional building practices. However, the modifications made by the community to add more poles for perceived structural strength inadvertently prevented mudding, an essential cultural aspect of construction. While the resulting structure was stronger, the absence of mud walls made it feel less like a traditional cultural structure. The community agreed that redesigning the shelter to allow mudding would make it culturally acceptable.

Comfort

8.25/10

The open spaces between the poles allowed for good ventilation, making the interior cooler, which was a positive aspect in the local climate. However, these spaces compromised privacy as occupants could easily be seen from the outside. This lack of privacy reduced the overall comfort of the shelter for the residents.

Protection Against Hazards

8.5/10

The additional poles enhanced the structure's robustness, making it capable of withstanding hazards such as wind and heavy rain. However, the open windows and gaps between the poles left it vulnerable, leading to potential insecurity and discomfort for the occupants. The absence of window shutters was identified as a significant security concern, and community members recommended addressing this issue to improve overall safety

Gender and Protection

9/10

The structure had a strong door, however, the open spaces between the poles and the uncovered window openings created significant privacy and safety issues, particularly for women and children. These gaps allowed outsiders to see inside easily, exposing the residents to potential risks and discomfort. Addressing these concerns is essential to ensure the safety, privacy, and dignity of all occupants, especially vulnerable groups.

Technical criteria

Storage and Logistical Aspects

5.25/10

The materials used for the construction of this shelter, including poles, are locally sourced, ensuring minimal logistical challenges. These materials can be stockpiled and readily accessed for future emergency responses, enhancing the preparedness of the community. Iron sheets are available at the nearby market, making their procurement quick and convenient during emergencies.

Ease of Construction

8/10

The construction process for this structure was straightforward and relied on skills readily available within the community, enabling rapid assembly. However, a significant challenge arose when additional poles were added, deviating from the original design. This change complicated the process, particularly by making mudding impractical, which impacted the structure's cultural suitability and functionality.

Material Quality

8/10

The poles used in the construction are of high quality and locally available, ensuring durability. Based on the initial design, the structure was considered a hybrid between transitional and emergency shelters due to its use of durable materials, including lockable doors, which enhanced security. However, the inability to mud the walls significantly reduced its effectiveness in providing adequate protection and comfort, especially in line with local cultural preferences.

Maintenance

8.75/10

The shelter is easy to maintain, as it does not require specialised skills for repairs or upkeep. The use of locally available materials ensures that any necessary replacements or adjustments can be managed by the community, promoting long-term sustainability.

Summary

The shelter design, originally consisting of poles with mud walls and a zinc roof, was culturally accepted for its alignment with traditional building practices. However, modifications to add extra poles for structural strength inadvertently prevented mudding, a key cultural feature. While the added poles enhanced the shelter's durability, the absence of mud walls made it feel less traditional. The open spaces between the poles provided good ventilation but compromised privacy and exposed occupants to security risks, particularly for women and children. While the shelter's simple construction and use of locally sourced materials ensured ease of assembly and maintenance, the design changes reduced its cultural suitability and diminished comfort, security, and privacy.

7.6/10

2 roomed pole dagga with zinc roof shelter prototype design.pdf

Lesson Learnt

Community-Led Shelter Design

Communities demonstrated a deep understanding of their own shelter needs. They explained that when external organisations introduce pre-designed shelters without involving them in the design process, they felt like passive participants in the process. They admitted that in these cases they usually accept externally designed shelters not out of preference but because they view them as a gift despite the fact that many of the shelters were seen as uncomfortable, inappropriate or short-term solutions. As a result, these shelters are often seen as ‘organisation shelters’ rather than community-driven solutions and people often quickly moved out of them or converted their use, for example to storage once they had built a replacement home

Through the community-led process, interesting tensions were also revealed when external engineers, curious to trial concrete dura panel shelters, proposed them to the community as a new (non-local material) solution. While the communities agreed to trial this design amongst the others, ultimately those same communities led the evaluation wherein they rejected this design, after close consideration, for many reasons including maintenance, repair, logistics and sustainability. The communities much preferred the brick systems they already knew well and saw greater value in adapting their features and elements to be more durable and climate-smart rather than import an unfamiliar building system.

To ensure long-term success, shelter interventions should prioritise participatory design approaches that integrate local knowledge, preferences, and cultural considerations from the outset. Actively engaging communities in the design process ensures that shelters are not only functional but also culturally appropriate and sustainable. In Zimbabwe, for instance, communities expressed a strong preference for brick structures for transitional shelters, as they are familiar, culturally accepted, and climate resilient. They also emphasised the need for specific features, such as multiple rooms, to accommodate larger families.

The community and other stakeholders gather for project consultations in Chipinge

Beneficiary Feedback and Evaluation Limitations

When engaging beneficiaries who had received prototype shelters, their feedback was largely positive. However, this response stemmed from comparing the provided structure to their previous inadequate shelters rather than an objective assessment of the design's effectiveness. This suggests that evaluation methods should incorporate comparative studies with traditional shelters and engage a broader cross-section of the community to obtain more balanced feedback.

A case in point is the dura shelter, which was widely criticised for non-compliance with cultural norms and security concerns. However, occupants initially reported high satisfaction, as they compared it favourably to their original shelters, which were in poorer condition. Once comparing them to the alternative transitional shelter designs, this feedback became more balanced and informative. This emphasises the need for evaluative approaches that mix carefully considered qualitative and quantitative methods and inclusively encourage comparative analysis. In addition, we must endeavour to go beyond direct beneficiaries to include a wider community perspective. For example, involving community leaders, local artisans, and non-beneficiaries in evaluations will provide a more holistic understanding of the shelter's strengths and weaknesses.

Climate-Smart Shelter Solutions

Through direct engagement, it became clear that communities have valuable knowledge of their local climatic conditions and indeed their own experiences of climate change. By creating the space to discuss these narratives around climate-related hazards and sharing climate science information to both validate those experiences as well as looking to the future, the community were able to constructively reflect on what the shelter designs needed for a changing climate and integrate these considerations into their suggestions.

For example, while plastic tarpaulin and pole shelters seemed like a quick and practical emergency solution, community members raised concerns about the plastic roof's vulnerability to storms. Instead, they preferred a well-secured zinc roof with plastic sheet walling for emergency use, with the intention of later reinforcing the walls with mud. For transitional shelters, they favoured mud-brick structures due to their durability against storms and superior heat absorption. The factors guiding these choices are particularly crucial in a region frequently experiencing extreme heat and storms.

To improve climate resilience in shelter solutions, it is essential to use locally available and sustainable materials, strengthen structural stability to endure extreme weather, and incorporate passive cooling designs to reduce heat stress. Organisations should work closely with communities to identify and implement climate-adaptive techniques, such as raised foundations to mitigate flood risks, reinforced roofing for storm protection, heat-absorbing wall materials, and strategic orientation with enhanced ventilation for better temperature regulation.

The community's ability to evaluate both their intrinsic climate knowledge and the extrinsic climate projections before selecting a shelter option highlights their expertise in identifying appropriate climate-resilient solutions. Instead of imposing pre-designed structures, organisations should prioritise offering technical guidance, climate science information and material support, empowering communities to lead the decision-making process.

Appendices

1. Community Consultation

1.1. Community consultations report.docx

2. Prototype Design Drawings

2.1. 3 roomed brick shelter prototype design.pdf

2.2. 2 roomed brick shelter prototype design.pdf

2.3. 2 roomed dura shelter prototype design.pdf

2.4. 2 roomed wooden cabin shelter prototype design.pdf

2.5. 2 roomed pole dagga with zinc roof shelter prototype design.pdf

2.6. 2 roomed pole tarpaulin walling with tarpaulin roof shelter prototype design.pdf

2.7. 2 roomed pole tarpaulin with zinc roof shelter prototype design.pdf

2.8. Outside kitchen design.pdf

3. Prototype Material Schedules

3.1. Emergency shelter Prototype Materials Schedule.ods

3.2. Transitional shelter protype materials schedule.ods

All appendices are hosted online and can be accessed by the above hyperlinks. Alternatively you can reach out to emergencyshelter@careinternational.org or info.zimbabwe@care.org to obtain copies of these files or wish to follow up on further inquiries.

care

THE

CHARITABLE TRUST