CASE STUDY

SUDAN 2021-2023 / ETHIOPIAN TIGRAYAN CRISIS

CONTEXT / SETTLEMENT | SHELTER TYPE | SUPPORT METHODS

CRISIS	Ethiopian Tigrayan Crisis (refugees in Sudan)
PEOPLE DISPLACED	**69,790** refugees and asylum seekers from Ethiopia*
PROJECT LOCATION	Gedaref state, Sudan
PEOPLE SUPPORTED BY THE PROJECT	**10,587 individuals (3,290 households)** (incl. 5,971 males and 4,886 females)
PROJECT OUTPUTS	**3,690 transitional shelters (Tukuls)** built, with refugee and host-community labor contributions.
SHELTER SIZE	**19.6-23.75 m²** per shelter
SHELTER DENSITY	**3.9-4.75 m²** per person
DIRECT COST	**USD 2,000** per shelter (materials and labor)
PROJECT COST	**USD 2,500** per shelter (incl. supervision, logistics, site works, transport and overhead costs)

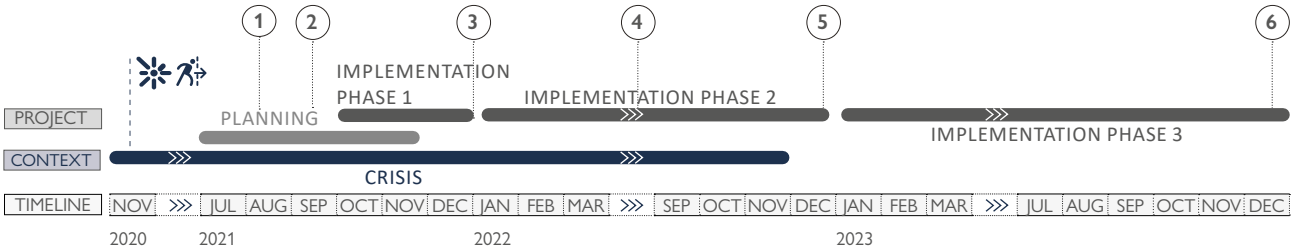
The project constructed transitional shelters and site infrastructure for refugees from Ethiopia.

PROJECT SUMMARY

The project supported Ethiopian refugees who sought protection in Sudan following conflict and violence in Ethiopia's Tigray region. In planned camps in Gedaref State, tukuls, round shelters with mud-brick walls and thatched roofs, were used as a transitional shelter solution that combined Sudanese construction techniques, local materials and elements familiar to many refugee households.

Beyond shelter construction, the intervention strengthened the wider settlement through plot planning, roads, drainage, culverts, pedestrian bridges, water infrastructure, sanitation facilities, service areas, distribution points and multipurpose communal facilities.

** UNHCR Operational Data Portal*



Nov 2020: Ethiopian Tigrayan Crisis start.

1. **Jul-Nov 2021:** Site assessments, beneficiary verification, technical designs, and procurement planning for tukul construction in Tunaydbah, Um Rakuba and Babikri refugee camps.
2. **Aug-Oct 2021:** Engagement of refugees and host communities regarding Tukul design, cultural preferences, and site layouts.
3. **Dec 2021:** Completion of 1,572 tukuls during the first phase. In 2021 and 2022, the organization conducted key training sessions for local labours, especially skilled labourers (refugees and host community) on sustainable Tukuls construction techniques.
4. **Mid 2022:** Completed site selection, planning, and community mapping for expansion into Babkri and Um Gargour camp.
5. **Dec 2022:** Completion of 1,972 tukuls, achieving approximately 96% of the planned shelter target across project locations.
6. **Dec 2023:** 146 Tukuls were constructed completing the total target of 3,690. Completion of 100% of planned tukul construction works in the targeted refugee camps in Gedaref State. Final inspections, beneficiary verification, handover of completed tukuls, and project closure completed.

Beyond the provision of tukuls as transitional shelters, the project adopted a settlement lens including the planning of roads, drainage, water and sanitation facilities.

BACKGROUND

Sudan was one of the largest refugee-hosting countries in Africa in 2020, already hosting close to one million refugees and asylum seekers alongside significant internal displacement. In November, conflict in Ethiopia's Tigray region triggered a new influx into eastern Sudan, increasing shelter needs in Gedaref State and placing further pressure on camps and host communities. High temperatures, recurrent flooding, economic pressures and a June to October rainy season regularly damaged shelters and infrastructure, making drainage, access and flood-resistant foundations central design considerations.

SITUATION DURING THE CRISIS

Following conflict and violence in Ethiopia, refugees from the Tigray region entered eastern Sudan through border points in Kassala and Gedaref states. Many walked for several days and were first received in transit or reception centres before moving to camps. Initial shelter support relied on family tents, emergency shelter kits and locally built rakoubas, but these had limited durability under successive rainy seasons and frequent high winds.

PROJECT DESIGN/STRATEGY

The response concentrated on four main refugee camps in Gedaref. The Government of Sudan, through the Commissioner for Refugees (COR), identified and managed camp land, while an international agency and partners supported site planning, basic infrastructure and shelter delivery. The tukul model was selected as part of a wider settlement approach, linking shelter construction with plot planning, roads, drainage, culverts, pedestrian bridges, sanitation, water infrastructure, service areas, distribution points, multipurpose centres and pre-positioned machinery for rapid works before and during the rains.

Tukuls use largely local materials, perform better in heat and wind, and can be adapted to flood-prone camp locations through elevated stone or burnt-brick foundations and internal and external backfilling. COR managed HLP arrangements, assigning plots through the camp management framework. Following initial shelter support, plots were demarcated and allocated to households for temporary occupancy rather than ownership or rental tenure.

Typical tukuls had an internal diameter of about 5–5.5 metres, 30 cm mud-brick walls and an overall area of about 19.6–23.75 m^2. Because routine maintenance was required, especially replastering and roof upkeep before the rainy season, skills transfer and household guidance were built into the design.

Beyond the 2021-2023 implementation, the international agency continued implementing this type of project across different locations.

The project adopted locally accepted construction typologies, the tukuls, built with local materials and adapted to the climate.

PROJECT IMPLEMENTATION

New sites were assessed through inter-agency processes before layout design, plot demarcation, emergency shelter support and the transition to tukuls. Implementation was labour-intensive, drawing on both refugee and host-community labour. More than 50 masons, 30 roofing workers and five carpenters were engaged, while beneficiaries and local labourers sourced and prepared red soil, danblab grass for mud reinforcement and roofing grass. This generated short-term income, supported social cohesion and strengthened construction skills.

Implementation modalities varied by camp and phase. In Tunaydbah, delivery included contractor-led implementation and a direct modality in which materials were contracted while refugee labour was engaged through Cash-for-Work. Different partners and contractors worked in different camps or sections. Civil engineers and technical staff supervised quality, materials and progress, resolving issues through structured follow-up. Plots were planned with WASH and settlement services, linking durable shelter delivery to sanitation, water access and wider camp infrastructure.

TARGETING

Beneficiary households were selected through vulnerability-based prioritization. Community leaders and representatives supported initial identification, which project staff verified. As needs exceeded available resources, priority was given to persons with disabilities, women-headed households, households facing socio-economic or protection risks, elderly-headed households and survivors of gender-based violence. (GBV)

To ensure physical accessibility and inclusion, site layouts and shelter positioning were adapted to accommodate individual with mobility limitations, additionally shelter designed features such as low-threshold entrances , wide door openings, and proximity to WASH infrastructures and service points were incorporated to reduce protection risks and easy access to vulnerable groups. Labour-based modalities and community support helped households unable to undertake physically demanding works.

COMMUNITY ENGAGEMENT

To faster peaceful coexistence between host and displaced, the project integrated host community engagement through the project lifecycle. Construction modalities deliberality paired refugee labor with local Sudanese mesons, carpenters, and suppliers. By generating income opportunities and purchasing material directly from local markets, the project provided tangible economic benefits to the host populations.

The collaborative construction process strengthened social cohesion, reduced friction around the camp establishment, and supported building trust between displaced population and neighboring host communities.

The project team conducted consultations with women, adolescent girls, people with disabilities, and elderly, which informed details regarding the privacy, safe door locks, and well-lit main pathways and communal facilities to mitigate GBV risk Refugee households contributed to selected tasks, while skilled workers carried out technical elements. Post-construction monitoring recorded that 97 per cent of respondents participated, supporting ownership, skills development and understanding of maintenance needs.

COORDINATION

Coordination brought together authorities, the international agency, implementing partners, contractors, technical teams and communities. Regular technical follow-up and feedback meetings helped harmonize standards, address issues with materials or workmanship and maintain quality across multiple delivery modalities and sites.

Raised reinforced foundations and backfilling protected from flooding.

The adobe walls provided good thermal insulation and security.

The roofs used local wood, the frame was assembled on the ground and completed with thatch to waterproof and improve thermal comfort..

DISASTER RISK REDUCTION

The project integrated DRR at both shelter and settlement scales. Raised stone or burnt-brick foundations, 30 cm backfilling and reinforced lower wall sections reduced flood exposure and improved durability. At site level, access and drainage works reduced seasonal flooding, recognizing that shelter performance during the rains depended on surrounding settlement systems as much as on the shelter unit itself.

ENVIRONMENTAL IMPACT

The model leveraged local materials and low-transport inputs, including mud bricks, red soil, grass, bamboo and wooden poles, as well as practices such as using old tires as ropes for roof assembly and rehabilitating clay extraction areas. Cement was used where reinforced foundations were needed, creating a trade-off between durability, flood mitigation and carbon footprint.

MAIN CHALLENGES

Seasonality was a recurring constraint. During the June to October rainy season, access to camps could deteriorate, roofing grass became less available, and heavy rains delayed mudbrick drying, reduced brick quality and slowed construction. Monitoring in Tunaydbah also identified delays linked to relocation, procurement, technical specifications and seasonal access constraints. These issues highlighted the need to adapt plaster mixes, roofing materials and foundation details to the local context, and to communicate routine maintenance tasks clearly after handover.

CROSSCUTTING ISSUES

Security of tenure and land access were handled through formal camp arrangements. Households did not purchase land or pay rent; assigned plots conferred temporary occupancy rights within the camp. Protection and dignity were supported through numbered plots, closable shelters, household sanitation facilities, roads, service areas and communal facilities . Future use after potential returns would require agreement between local authorities and communities on whether shelters are reused, reassigned or dismantled under camp management arrangements.

LINKS WITH RECOVERY

The tukul model supported a shift from emergency shelters to a more durable, locally familiar solution that households could maintain and improve. It also contributed to early recovery through paid labour, skills development and practical opportunities linked to construction. Settlement planning organized access routes, services and communal facilities, although livelihood areas such as small shops, market spaces and public areas could have been planned more explicitly from the outset.

TECHNICAL SOLUTIONS

The shelter design combined traditional construction knowledge with camp-specific adaptations: circular mud-brick walls; layered grass roofing; raised foundations; backfilling; reinforced lower wall sections; and closable doors and windows. Skilled workers handled technical tasks, while households contributed to simpler works so the model would remain maintainable and transferable.

MATERIALS AND SUPPLY

Most materials were sourced from local markets and surrounding communities. Local sourcing supported maintenance, provided labour opportunities and reinforced supply chains in and around the camps, while keeping the model linked to available construction practices.

EXIT/HANDOVER

Upon completion, tukuls were handed over to beneficiary households through implementing actors and local authorities. Handover certificates included maintenance clauses, assigning households responsibility for roof and wall upkeep and recognizing scope for incremental improvements . Local authority involvement in camp management also anticipates possible future settlement handover if refugees return to Tigray, although earlier refugee influxes have remained and integrated locally.

OUTCOMES AND WIDER IMPACTS

The shelters improved privacy, safety and protection from heat, wind and rain for vulnerable Ethiopian refugee households. In Tunaydbah, post-construction monitoring showed strong beneficiary satisfaction. The settlement approach generated wider benefits by improving access, drainage, sanitation links, water distribution and service organization. The project demonstrated a scalable transitional shelter model for protracted displacement settings, provided that maintenance, settlement planning, livelihood space and seasonal constraints are addressed from the design stage.

The shelters were soon expanded and maintained, a sign of acceptance.

Despite the hazard mitigation measures introduced such as the raised improved foundations, issues like waterproofing of the plaster mixes and the need for improved roofing solutions emerged.

STRENGTHS, WEAKNESSES AND LESSONS LEARNED

STRENGTHS

√ **Tukuls constructed in flood prone areas were better able to withstand heavy rains** due to elevated foundations and backfilling, which reduced water ingress and improved internal habitability during the rainy season.

√ **Post construction monitoring showed very high satisfaction** with shelter materials and construction quality; respondents also reported feeling safer thanks to stronger walls and closable doors and windows.

√ **The project addressed settlement level risks** rather than treating shelters in isolation. Site layouts incorporated residential plots, numbered shelters, roads, service areas, drainage, latrines, showers, water distribution points and communal facilities. Flood risk was mitigated through roadside drainage, canals and access works, reducing risk around shelters and across the camp.

√ **The shelter model was widely accepted** because it built on construction techniques already known in Sudan and familiar to many refugee households, while still being adapted to the specific climatic and soil conditions of the camps.

√ **Coordination** between government counterparts, the lead agency, implementing partners, contractors and technical teams helped maintain implementation quality.

WEAKNESSES

x **In some locations, mud plaster did not withstand strong rains sufficiently;** households unable to afford cement based finishes sometimes resorted to plastic sheet protection, which is neither durable nor environmentally sustainable.

x **Roofing materials required frequent maintenance** in the Gedaref context. Locally available grass did not always last as long as roofing grass used in other parts of Sudan, so roofs could require annual maintenance, especially before the rainy season, reinforcing the need to test locally appropriate alternatives and provide clear guidance after handover.

x **Seasonal constraints caused significant construction delays.** Heavy rains slowed the drying of mud bricks, reduced brick quality, limited access to camps and reduced the availability of roofing grass, altogether slowing shelter delivery.

x **Roofing materials remained vulnerable to rodents and termites,** increasing maintenance requirements and reducing long term durability.

x Where foundations were not sufficiently reinforced for local soil and flood conditions, **shelters needed more frequent maintenance** and performed less well over time.

LESSONS LEARNED

- Monitoring and technical documentation confirm that tukuls, when properly designed and built, can provide adequate covered living space and strong protection from sun, rain and wind, making them a relevant transitional shelter option in protracted displacement settings.
- The rounded shelter form, locally appropriate materials and inclusion of raised foundations and backfilling in flood prone areas improved performance against climate related risks.
- Refugee participation in construction increased shelter ownership, transferred practical skills and could be expanded through phased cash for shelter or labor based approaches where feasible.
- Fire safety, settlement planning and livelihood space are essential to longer-term shelter performance: keeping 2–4 metres between shelters, integrating drainage and access works, and planning public or market areas can help reduce risks and support greater self-reliance where displacement becomes protracted.
- Further research and adaptation of plaster mixes, roof protection and foundation design are necessary to improve durability across different soils, rainfall patterns and pest conditions.
- Maintenance requirements should be planned from the outset, particularly where local roofing grass has a short lifespan or where households may need support to protect mud brick walls before the rainy season. Clear maintenance guidance and phased coverage can help households transition effectively and sustain shelter performance over time.

RECOMMENDATIONS MOVING FORWARD

Moving forward, the project would place stronger emphasis on maintenance planning from the outset, especially roof-grass replacement, external wall protection and testing of locally appropriate plaster or roofing alternatives before each rainy season, and provide more structured support on annual maintenance. It would also plan more explicitly for phased coverage so that households remaining in emergency shelters have a clearer pathway to transition into tukuls as resources allow. Future settlement planning should also include livelihood and public spaces, such as small shops or market areas, to support self-reliance in protracted displacement settings, and should clarify how tukuls would be managed or reused if households return or relocate.

FURTHER READING ON SHELTER PROJECTS

On local materials and vernacular techniques:
SP 2008 / B.1 AFHANISTAN / 2002; SP 15-16 / A.26 ETHIOPIA; SP 10TH ED. / A.01 MOZAMBIQUE and A.15 PAKISTAN.

On Ethiopian refugees in Sudan: SP 2008 / D.9 SUDAN / 1985

Beyond design features, the project learned that the need for maintenance should be incorporated from the outset in project considerations.

The round shelters were locally appropriate and improved significantly the thermal comfort of users in the harsh sudanese climate.