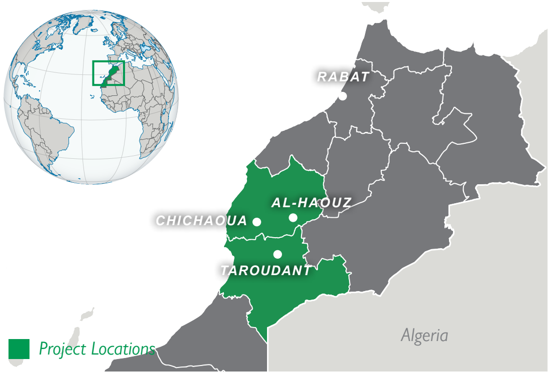
CASE STUDY

MOROCCO 2023-2024 / EARTHQUAKE

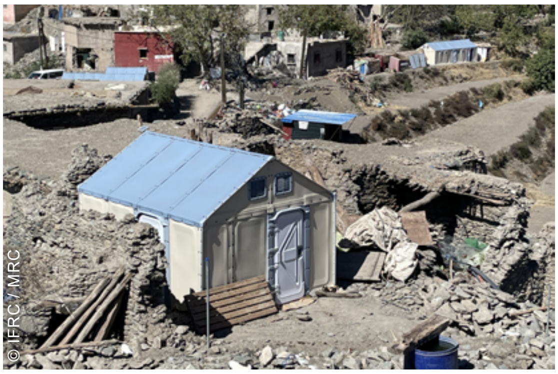
CONTEXT / SETTLEMENT | SHELTER TYPE | SUPPORT METHODS

CRISIS	2023 earthquake
TOTAL HOMES DAMAGED	**60,000 houses** damaged or destroyed
PEOPLE WITH SHELTER NEEDS	**240,000 ind.** in need of immediate shelter
PROJECT LOCATION	Al-Haouz, Chichaoua and Taroudant provinces
PEOPLE SUPPORTED BY THE PROJECT	**6,656 direct beneficiaries** (as of Dec 2024) **27,943 indirect beneficiaries**, including 1,464 individuals (394 HH) from affected communities 5,112 individuals through educational activities Future uses included for the Ministry of Health and for the civil protection.
PROJECT OUTPUTS	**785 Transitional Shelter Units** installed (including 396 as temporary accommodation; and 389 for educational purposes). **221 fire extinguishers** and emergency response kits distributed. **25 community toolkits** provided. **7 Technical trainings** delivered to volunteers on TSU installation and maintenance.
SHELTER SIZE	**17.5 m²** for the Transitional Shelter Units.
SHELTER DENSITY	**3.5 m²** per person or more (based on HH size, with one unit for families of up to 5 members and extensions added for larger households).
DIRECT COST	**USD 1,765** per shelter (incl. materials cost and transport to Morocco) **USD 2,859** per shelter (incl. labour & add-ons)
PROJECT COST	**USD 3,564** per shelter on average



PROJECT SUMMARY

The project provided Transitional Shelter Units (TSUs) as temporary shelter solutions and community facilities for earthquake affected communities in Morocco, complementing the governmental reconstruction program and supporting access to safer and more dignified living conditions during recovery. In parallel, a Repair and Reconstruction Support (RRS) program was mobilized to help eligible households complete priority works or carry out technically feasible, para seismic repairs of vernacular homes. Together, these interventions reduced prolonged reliance on emergency tents and helped families remain close to their original villages, livelihoods, and social networks while permanent housing recovery progressed.



The project supported earthquake affected families in remote areas.

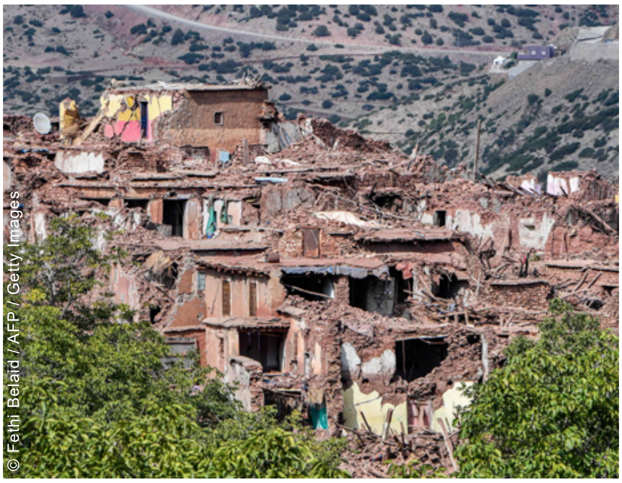
PROJECT: 1 2 PLANNING; 3 4 5 IMPLEMENTATION PHASE 1 (TSU); IMPLEMENTATION PHASE 2 (RECONSTRUCTION AND REPAIR)

CONTEXT: CRISIS

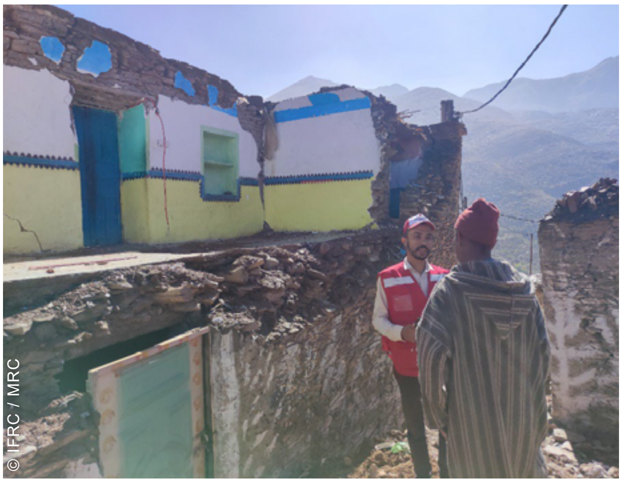
TIMELINE: SEP OCT NOV DEC (2023) JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC (2024)

Sep 2023: Earthquake struck the High Atlas Mountains and emergency shelter response began.

1. **Dec 2023:** Launch of the project. TSUs were identified as a more durable temporary shelter solution to support households affected by prolonged displacement and delays in permanent reconstruction.
2. **2024:** Staff and volunteers received technical training on TSU assembly, installation procedures and site preparation.
3. **2024:** Introduction of technical adaptations to the standard unit, following field observations, community feedback, and climatic challenges in mountainous areas.
4. **2024-ongoing:** Expansion of the use of the units for community-level functions beyond shelter
5. **2024-ongoing:** Preparations for the launch of the Repair and Reconstruction Support (RRS) across three provinces.



The 2023 earthquake affected many villages located in the High Atlas Mountains near Marrakesh, damaging or destroying approx. 60,000 homes.



In hard-to-reach areas, humanitarian actors complemented the government reconstruction efforts. This project targeted families who needed a transitional solution before the reconstruction could be completed.

BACKGROUND

On 8 September 2023, a magnitude-6.8 earthquake struck the High Atlas Mountains near Marrakesh, followed by a magnitude-4.9 aftershock. It affected Al Haouz, Taroudant, Chichaoua, Azilal, and surrounding mountainous areas, causing widespread damage in remote rural communities. Around 3,000 people died, nearly 6,000 were injured, and approximately 60,000 homes were damaged or destroyed. Schools, health centres, water systems, and other essential infrastructure were also affected, compounding response challenges in isolated villages with difficult access.

SITUATION BEFORE THE EARTHQUAKE

Before the earthquake, many High Atlas communities lived in isolated rural areas connected by narrow roads over difficult terrain. Housing was predominantly vernacular and non-engineered, using adobe, rammed earth, stone masonry, timber, and mud mortar, with limited seismic-resistant features. Livelihoods depended largely on agriculture, livestock, seasonal labour, and remittances, while harsh winter conditions made housing essential for protection from the cold.

SITUATION AFTER THE EARTHQUAKE

Immediately after the earthquake, many families sheltered in tents and makeshift structures distributed through national authorities and humanitarian partners or self built from salvaged materials. Exposure to strong winds, cold temperatures, snowfall at higher elevations, and seasonal rains affected privacy, safety, and habitability, while damaged infrastructure disrupted access to services and isolated many small villages. Communities also needed temporary spaces to keep services functioning, including classrooms, accommodation for teachers, kitchens, and communal spaces for social and recreational activities.

NATIONAL SHELTER RESPONSE

The Moroccan government launched a reconstruction and recovery program with financial grants for affected households, structured by damage category and disbursed in tranches linked to construction milestones. Standard layouts followed Moroccan seismic standards, with commune technical agents overseeing compliance before tranche release. Reconstruction was slowed by damaged roads, limited skilled labour, large contractor caseloads, scams affecting some households, and market inflation linked to simultaneous demand for materials and labour. Humanitarian shelter efforts complemented the national program in hard-to-reach mountain communities where recovery lagged.

COORDINATION

While the formal cluster system was not activated, authorities coordinated the response at national, provincial, and local levels. Humanitarian actors aligned their support to defined geographic Areas of Responsibility to avoid duplication and strengthen coverage. Within selected communes in Al Haouz, Taroudant, and Chichaoua, humanitarian actors focused on households that still lacked adequate temporary shelter while awaiting reconstruction progress.

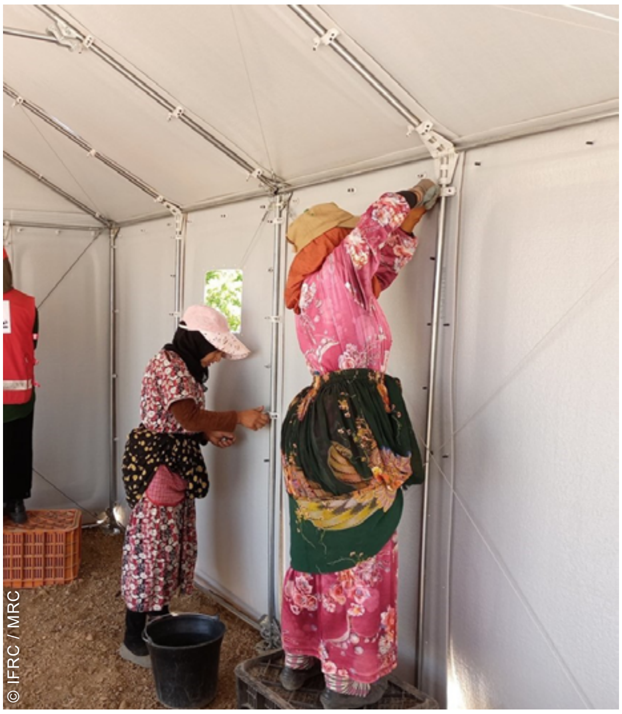
TARGETING

Targeting prioritized households whose homes had collapsed or were severely damaged and who were living in tents or improvised shelters since the grants were not enough for a full reconstruction, so a transitional solution was needed in-between. Vulnerability criteria considered household composition, age, disability, income, and socio-economic conditions within designated geographic areas. Local authorities and community structures helped validate information, confirm residency and family ties, and reduce opportunistic and un-eligible claims.

PROJECT DESIGN

The programme, which was implemented by a local organization with the support of an international one, combined two complementary strands:

- **Transitional Shelter Units (TSUs):** selected to reduce exposure to harsh weather during a longer-than-anticipated transitional period and to keep households close to homes, livelihoods, agricultural land, social networks, and services. A market assessment found that local shelter options were insufficient in quantity and quality, supporting international procurement of a modular flatpack model already approved for import. As mentioned, the units supported households unable to return home and temporary community-service functions. A small pilot confirmed suitability, after which a larger batch was ordered and later adaptations were refined through field observation and community feedback.
- **Repair and Reconstruction Support (RRS):** designed to be implemented through two tailored pathways. Reconstruction focused support, to be provided in staged grants to households already rebuilding but unable to complete priority works to reach habitability; and repair focused support, to target technically repairable vernacular homes through household specific Bills of Quantities and closer technical follow up. Both pathways were set according to the same process flow (authority data, verification, assessment, MoU, staged assistance, QA/QC, completion checks), with the type of support determined by housing conditions and recovery stage. This component was planned towards the end of 2024 and piloting and implementation only commenced in 2025.



Staff and volunteers received training on TSU installation, and over time could install two or three units daily, compared to one unit per day at the start.

PROJECT IMPLEMENTATION

TSUs were procured internationally and shipped from Poland (production factory) to Morocco, then moved to target areas via multi stage logistics. Final delivery to dispersed mountain villages used trucks, smaller vehicles, and, where access demanded, donkeys for the last mile.

Implementation relied on staff, volunteers, and local workers trained in TSU assembly, with technical support from the organization specialists. As the operation scaled, installation efficiency improved markedly: a team of four trained volunteers moved from nearly one full working day for a single unit at the outset to approximately two or three installations per day once proficiency increased. Staff, volunteers, and local workers also gained practical experience in assembly, maintenance, and technical upgrades. Community participation was essential for site preparation and final installation, facilitating faster deployment in dispersed and hard to reach settlements. WASH facilities (toilets and hammams with showers) were implemented by dedicated teams in parallel to TSUs.

TECHNICAL ADAPTATIONS

The standard unit required adaptation to mountain conditions. Field observation and community feedback led to some adjustments on the original model, such as: wooden flooring, secondary doors, supplementary rockwool insulation protected by tarpaulin, and reinforced anchoring through concrete pockets, slabs or double anchoring where required. Please refer to the table on the next two pages for more details on the adaptations. A temperature comparison test recorded an internal difference of about 12°C between insulated (rockwool protected by tarpaulin) and non-insulated units under comparable conditions.

COMMUNITY ENGAGEMENT

Dedicated engagement teams and volunteers worked alongside shelter technicians, holding community sessions, focus groups, and regular meetings in affected villages to explain the approach, eligibility, installation steps, household responsibilities, and expected timelines. Local structures and associations aided outreach and helped validate household information. Continuous consultations, a feedback line, and field level feedback channels enabled households to raise installation, adaptation, or usability concerns, which informed contextual improvements and supported transparent communication.

EXIT/HANDOVER

As households progressed in rebuilding or repairing their homes, TSUs enabled safer living conditions and continuity of essential services during the interim period. After households returned to their homes, many kept the TSU rather than dismantling it, repurposing units for storage, as guest annexes, or for poultry, an outcome noted during field follow up.

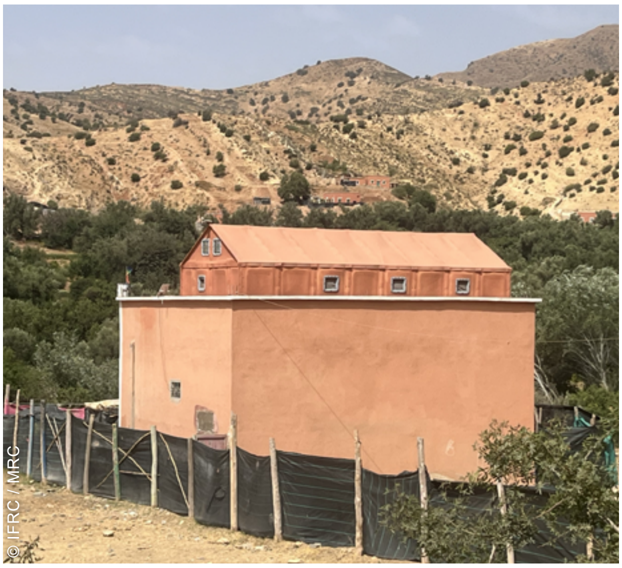
MAIN CHALLENGES

- **Difficult terrain, seasonal conditions, and dispersed settlements:** remote mountain locations, uneven ground, damaged or difficult access routes, and seasonal weather increased transport time and complicated TSU installation, monitoring, and coordination.
- **Reconstruction delays:** national reconstruction was slowed by capacity constraints (contractors, skilled labor) and market pressures (simultaneous demand, inflation), with some households facing scams or unfinished works.
- **Planning and standardization:** some technical adaptations were introduced progressively rather than built into the initial design and installation SOPs; future responses would benefit from standardized assessment of site, foundations, anchoring, and thermal measures before scale up.
- **Restricted TSU options and procurement timelines:** import restrictions and limited availability of suitable local products reduced procurement options and influenced delivery pacing under access constraints.

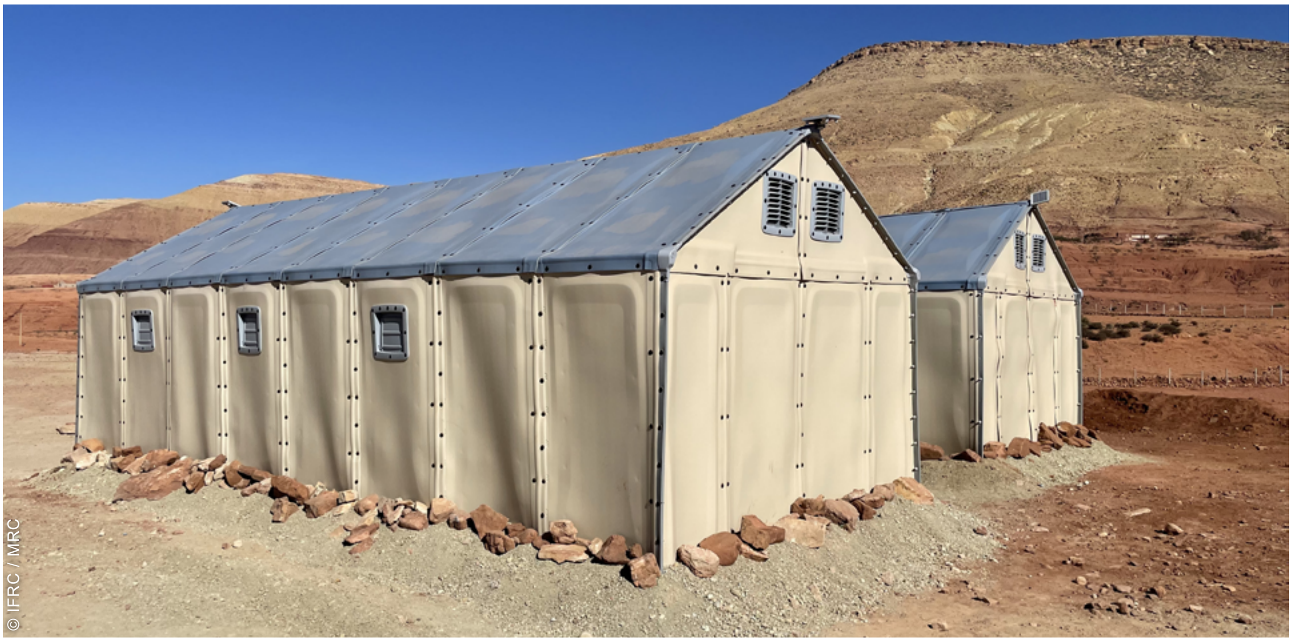
Regular meetings were conducted in the affected villages to explain the project approach, timeline, eligibility criteria and implementation steps.

OUTCOMES AND WIDER IMPACTS

- **Reduced exposure and improved habitability:** TSUs reduced reliance on tents and makeshift shelters exposed to wind, snow, cold, and moisture. Thermal and stability adaptations, coupled with timber flooring, improved indoor comfort and safety.
- **Continuity of basic services:** adapted TSUs helped maintain education, health, Civil Protection, kitchen, communal, and recreational functions during recovery.
- **Local capacity:** staff, volunteers, and local workers gained practical experience in TSU assembly, maintenance, technical upgrades, tool handling, teamwork, quality control, and adaptation techniques. These skills supported installation quality and can also inform future shelter repair and maintenance tasks.

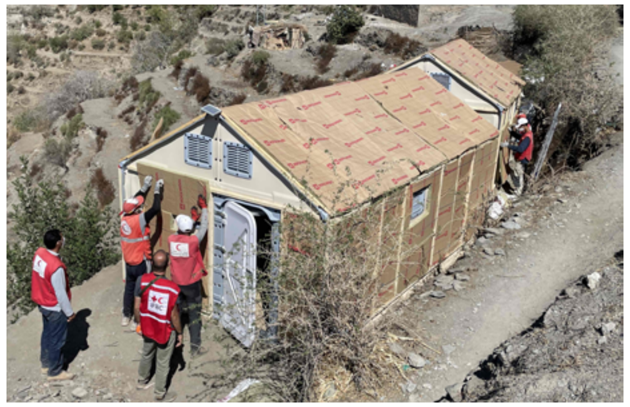


After repairing their houses, many people repurposed the TSUs, including as house extensions, or for storage.

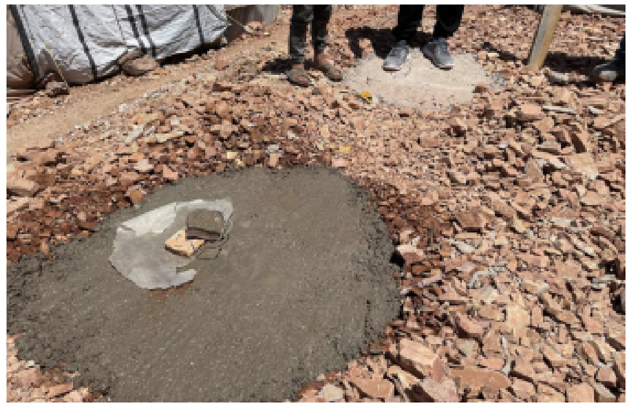


The imported shelter units, which costed around USD 1,765 including transport to Morocco, had to be adapted to the mountainous conditions, with add-ons and adjustments that costed on average an extra USD 1,000 per unit. One of the adaptations had to do with safe anchoring of the foundations against the wind.

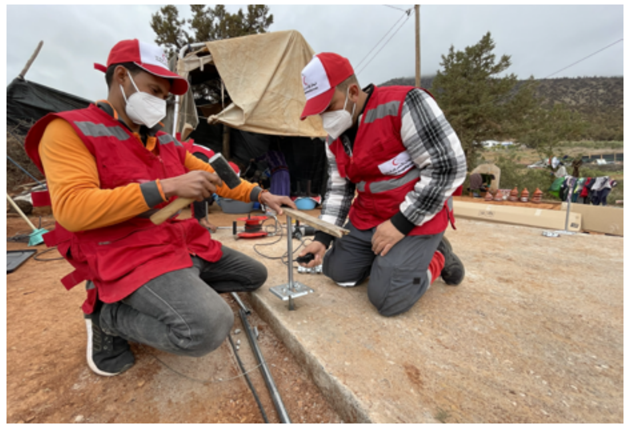
	TECHNICAL CHALLENGES	ADAPTATIONS & DRR	PROJECT IMPLICATIONS
A	Extreme temperatures inside standard TSUs, particularly during winter nights and summer days in the High Atlas Mountains	**Additional insulation using rockwool covered with tarpaulin and protective layers** Temperature testing demonstrated an internal improvement of 12–12.5°C compared to non-insulated TSUs, enhancing habitability during prolonged occupancy	• Additional procurement of insulation materials. • Increased transportation volume. • Additional labour required for installation. • Additional volunteer training required. • Increased unit cost per shelter.
B	Variations in soil conditions and rocky terrain complicated installation of TSUs in some communities	**Concrete foundation pockets/slabs** Improved load distribution, long-term stability, and shelter integrity under challenging terrain conditions	• Additional concrete works required. • Additional labour and technical supervision. • Increased material and transportation costs.
C	Strong winds and exposure to severe weather conditions in mountain locations threatened shelter stability, requiring a stronger anchoring system	**Reinforced anchoring systems combined with concrete pockets/slabs. Double anchoring techniques in selected locations** Improved structural stability and resistance to strong wind loads	• Additional materials required. • Increased labour requirements and installation time. • Additional technical supervision required. • Increased shelter cost.
D	Uneven terrain, moisture accumulation, cold ground conditions, and insect exposure affecting living conditions	**Installation of OSB wooden flooring platforms** Improved thermal comfort, reduced moisture, provided protection against insects, and improved overall habitability	• Additional procurement and transport requirements. • Increased installation time. • Additional labour required. • Increased shelter cost.



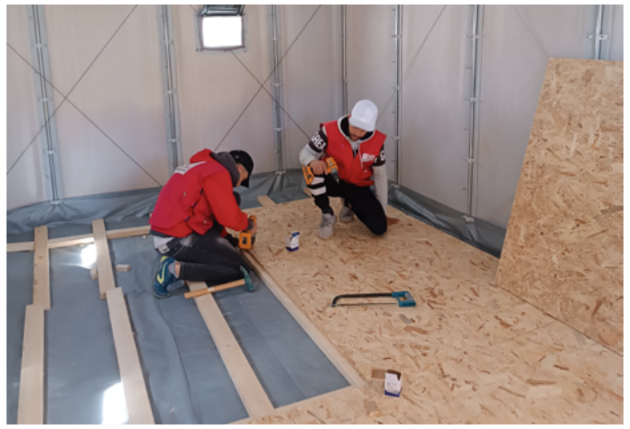
A - Insulation using rockwool covered with tarpaulin and protective layers



B - Concrete foundation pockets/slabs

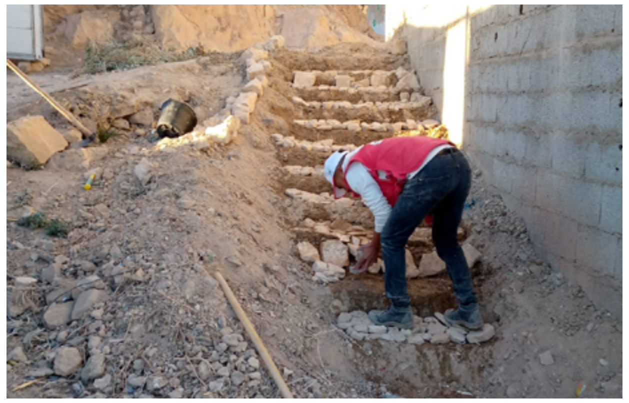


C - Reinforced anchoring systems combined with concrete pockets/slabs.

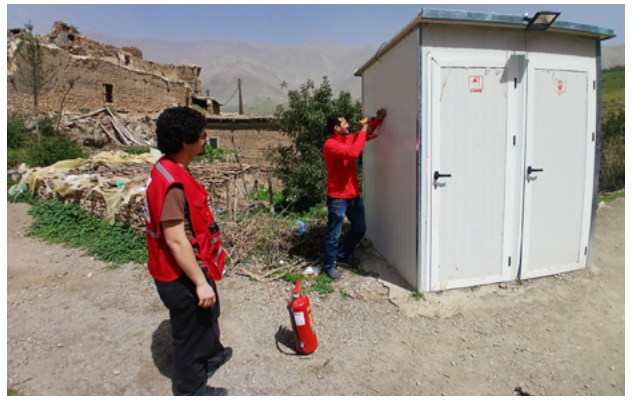


D - Installation of OSB wooden flooring platforms

	TECHNICAL CHALLENGES	ADAPTATIONS & DRR	PROJECT IMPLICATIONS
E	Accessibility challenges for elderly persons and persons with disabilities	**Construction of ramps and adapted site layouts** Enhanced safety, accessibility, and inclusion of vulnerable groups and individuals	• Additional site preparation works. • Additional materials required. • Increased labour requirements.
F	Fire risk between adjacent TSUs and other constructions	**Improved shelter spacing, distribution of fire extinguishers and emergency response kits, and provision of community maintenance toolkits** Reduced fire risk and improved community preparedness and emergency response capacity	• Additional planning requirements. • Procurement of fire safety equipment. • Community training and awareness sessions required.
G	Household sizes exceeded the capacity of a standard TSU in some cases	**Extension of TSUs by approximately one-third for larger families, or for other functions like classrooms** Improved dignity, privacy, and compliance with standards for m² per person	• Additional materials required. • Increased installation time. • Increased shelter cost per household.
H	Standard TSU design provided a single entrance and exit point	**Addition of a second door** Improved evacuation, ventilation, and usability of the shelter. Adopted in selected TSUs to improve accessibility and functionality. It also supported privacy and dignity, especially for larger HHs or specific gender considerations.	• Additional materials required. • Additional installation works. • Additional technical supervision required. • Increased shelter cost.

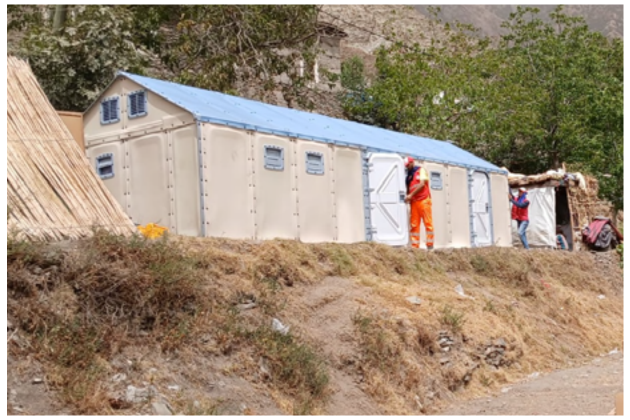


E - Construction of ramps and adapted site layouts



F - Improved shelter spacing, distribution of fire extinguishers and emergency response kits, and provision of community maintenance toolkits

G - Extension of TSUs for larger families, or for other functions like classrooms



H - Addition of a second door

STRENGTHS, WEAKNESSES AND LESSONS LEARNED

STRENGTHS

√ **More durable transitional shelter option.** TSUs provided a safer and more climate-appropriate alternative to emergency tents for households expected to remain displaced for an extended period, improving privacy, protection from weather, and overall living conditions.

√ **Continuity of community services.** The use of TSUs for public and communal activities helped maintain essential services and supported wider community recovery while permanent reconstruction progressed.

√ **Contextual adaptations improved habitability and safety.** Field observations, testing, and community feedback led to several adaptations to mountain conditions, improving safety, usability and comfort.

√ **Location choice supported uptake and use.** Installing TSUs near original villages, livelihoods, agricultural land, social networks, and local services improved acceptance and reduced the risk of vacant or underused shelters.

√ **Community engagement and feedback channels underpinned delivery quality.** Early and continuous engagement clarified eligibility, timelines, and responsibilities, especially site preparation, while creating feedback loops for installation, adaptation, and usability improvements.

√ **Flexible logistics and local participation enabled reach.** Combining multi stage transport with community site preparation, final installation support, and volunteer assembly teams made it possible to serve remote mountain communities despite access constraints.

WEAKNESSES

x **Design adaptations were not fully front loaded.** Some site-level, foundation/anchoring, and thermal measures were introduced progressively rather than integrated from the start, increasing follow up needs.

x **Site assessment detail varied.** More systematic pre installation assessments would have anticipated terrain related challenges and reduced later technical modifications.

x **Assembly training needed earlier standardization.** Without early, common procedures and refreshers, initial installation time was longer; standardized training packages can shorten learning curves at scale.

x **Maintenance support mechanisms were limited.** For households expected to remain in TSUs for extended periods, more structured maintenance guidance or support would have reduced wear and improved user experience.

x **Procurement choice carried timeline trade offs.** The decision to import units was considered a planning weakness because it influenced delivery pacing under access constraints.

FURTHER READING ON SHELTER PROJECTS

On projects in North Africa: SP 2009 / C.2 ALGERIA 1980; SP 11-12 / A.31 TUNISIA (CONFLICT IN LYBIA).

On earthquake response: SP 2008 / B.9-B.11 PAKISTAN 2005; SP 2008 / C.2 PERU; SP 2010 / A.4-A.11 HAITI; and A.29 TAJIKISTAN; SP 15-16 / A.3-A.7 NEPAL; SP 10TH ED. / A.12 AFGHANISTAN.

LESSONS LEARNED

- **Plan technical adaptations from the outset.** In mountainous contexts with wind, snow, and unstable soils, integrate reinforced anchoring/foundations, timber flooring, and insulation into the initial design, installation SOPs, and BoQs rather than adding them reactively.
- **Standardize assessment and training.** Adopt a common site assessment checklist (terrain, subsoil, exposure, spacing, fire breaks) and a standardized assembly curriculum for volunteers and partners to accelerate safe, consistent installation.
- **Keep shelters close to origin and services.** Proximity to original villages, livelihoods, agricultural land, social networks, and local services is critical for sustained use.
- **Build maintenance into the offer.** Where transitional shelter is likely to last multiple seasons, plan simple maintenance mechanisms (toolkits, guidance, community repair rosters) so households can keep units safe and habitable.
- **Clarify roles for exit and reusability.** Since many families retain TSUs as storage, guest rooms, or small annexes, define with authorities and communities, at the outset, what re use is appropriate and who is responsible for any relocation, re assignment, or recycling when permanent housing becomes available.