A.10 Jordan – 2013 – Syria conflict

Case study

Keywords: Emergency shelter; Transitional shelter / T-shelter; Site planning.

Emergency: Syria crisis, refugees in Jordan.

Date: Conflict begins: March 2011 (ongoing). Refugee numbers increase: December 2011 onwards.

People affected: Over 3.1 million refugees from Syria. Around 620,000 in Jordan (October 2014).

Project location: Azraq camp, Az Zarqa Governorate.

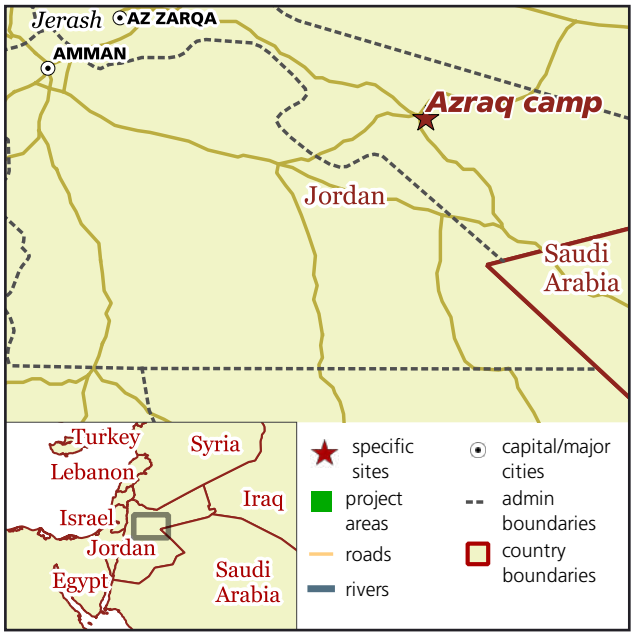
Beneficiaries: Up to 67,000.

Outputs: 13,500 T-Shelter units. Over 7,000 completed as of September 2014.

Camp occupancy rate: Capacity: 67,000 people. Population September 2014: approx. 13,000.

Shelter size: 24m²

Cost: Materials per shelter: 900-1,000 Jordanian dinars (US$ 1,270-1,410). Total cost per shelter (including contractor and indirect costs): 1,650 Jordanian dinars (US$ 2,330).



Project description:

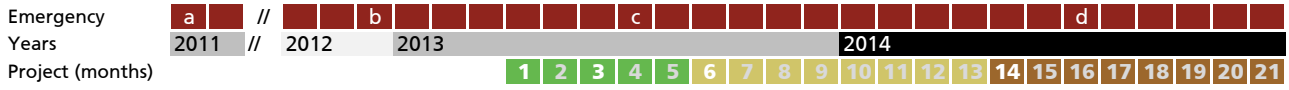
Azraq camp was constructed with 13,500 T-shelter units to accommodate 67,000 refugees in response to protracted displacement. T-shelters are interlocking steel structures, designed to maximise privacy and protect against severe weather conditions. They can be disassembled, transported and reassembled.

Emergency timeline:

[a] March 2011: Civil war in Syria. **[b]** December 2012: Refugees reach 100,000 in Jordan. **[c]** July 2013: 500,000 refugees. **[d]** July 2014: 600,000 refugees.

Project timeline (number of months):

[1] April 2013: Surveying of camp site begins.
[3] Multi-agency T-shelter prototype construction and evaluation.
[6-10] Implementation trial phase (1,000 units).
[14] Camp officially opened with 4,200 units completed.
[24] Planned handing over of 13,500 completed T- shelter Units by February 2015.



Strengths

- ✓ The production, manufacture and assembly of the T-shelters is less technically complicated than previous prefab solutions, meaning more contractors are able to produce the units faster and cheaper.
- ✓ T-shelters can be dismantled and re-used, making re-siting possible and can potentially be part of a return package.
- ✓ Kits can be stored as contingency stock.
- ✓ Positive impact on local labour market, with contractors employing more than 400 labourers.
- ✓ Though government policy originally opposed semi-permanent solutions, close collaboration on the design and contractor tendering process meant that the T-shelter solution was accepted.

Weaknesses

- × Despite relatively fast production time, tents are still potentially necessary for response to population spikes until production meets demand.
- × Inverted Box Rib (IBR) corrugated sheet, one of few roofing materials available, was hard to seal off against dust, wind and rain and had to be painted white to reduce heat gain.
- × Due to time and cost reasons, the construction of a porch had to be cancelled, which caused beneficiaries to complain, particularly in relation to reduced privacy.

Observations

- Prefab caravan units have been used in other camps, but have been found to be expensive solutions due to high transport and production costs.

Contractors produced and erected the shelters according to specifications developed by the main organisation. Photo: Werner Schellenberg/UNHCR

Situation before the crisis

The majority of Syrian refugees lived in urban settings in Syria, particularly in areas such as Daraa and Homs, with a range of different income levels and housing standards.

Situation after the crisis began

Flows of refugees from Syria to other countries began to increase in late 2011. Azraq was chosen as the site for a new camp as it was owned by the state and had previously been developed as a camp for Iraqi refugees in the 1990s (though it was never inhabited). The site was already linked by road to the towns of Azraq and Zara and had previously undergone some drainage work.

Shelter strategy

The Shelter Working Group (SWG) was set-up in October 2012 and co-chaired by a UN agency and an INGO. By December regular meetings were taking place and a shelter strategy began to be developed.

The finalised shelter strategic guidelines were endorsed in September 2013 (updated a year later). A brief summary of the two main strategic objectives is as follows:

- Settlement: Enable refugee communities to access settlements which provide access to services, transportation and economic opportunities.
- Shelter: Increase the availability of adequate shelter solutions.

With the majority of refugees (80%) finding shelter in urban settings, mostly by renting, there has been considerable strain on the affordable housing market, affecting housing costs for both refugees and for vulnerable Jordanians.

This has led the government to pursue a policy of developing camps, particularly to provide shelter for those who are priced out of the rental market.

The Ministry of Public Works and Housing (MoPWH) was involved in the planning of shelter solutions for Azraq camp. Despite an original reluctance on the part of the government to permit semi-permanent shelters, the agency advocated for the use of T-shelters in place of tents, emphasizing the kit-nature and the easy disassembling of the structures.

Project implementation

The development of the Azraq camp site was officially approved at the end of March 2013 and opened in April 2014.

The site plan paid careful attention to storm-water flows, and divided the space into "villages" of between 10-15,000 people. At the lowest level, family plots of 12 shelters share four WASH units.

The project was executed by the main organisation along with two implementing partner organisations: an INGO and the MoPWH.

The T-shelter design phase involved multiple stakeholders, including refugee representatives, who gave feedback on proposed designs from different organisations. The winning T-shelter design was endorsed by the SWG and MoPWH.

Once the design had been selected, the partner INGO and MoPWH were then responsible for the tendering process and awarding contracts to contractors, who produced the T-shelter kits to a technical specification provided by the main organisation. The involvement of a government ministry in the process helped.

Contractors produced the kits, which were made up of steel structural pieces manufactured in a factory off-site, aluminum coated foam insulation, IBR metal sheet cladding, steel windows and doors, ventilation pieces, plastic sheeting for roof ceiling works, and steel wires and turnbuckles for temporary room partitioning.

Multiple contractors worked on-site at the same time, constructing the shelters. A team of four people could complete a T-shelter in 12 to 16 hours. With 20 to 50 teams operating at any one time, an average of 60 T-Shelters could be completed in two working days, including the excavation and levelling of foundation trenches.

The T-shelter construction was monitored by two civil engineers on a daily basis.

Beneficiary selection

The camp has a total capacity for 67,000 people and is expected to reach full capacity by February 2015. Space has been identified to potentially increase the total population to 130,000 people.

All families arriving in Azraq are allocated a T-Shelter, with families of more than six members receiving two units. Vulnerable families (female-headed households and households with disabled family members) are sited nearest to camp services.

At time of writing, half the camp population of nearly 13,000 is from

Left: A family converted the outside wall of their shelter into a kitchen. Space between shelters is often covered with plastic to provide a shaded sitting area, a laundry area or for storage. Right: Plastic sheeting is used as a ceiling inside the shelter to reduce heat gain. Photo left: Ru'a Al-Abweh/UNHCR. Photo right: Werner Schellenberg/UNHCR.

Daraa and Aleppo, with 50% of the population being children and female-headed households accounting for 40% of families.

Coordination

The design was developed within the Shelter Sector Working Group in Jordan, in coordination with other sectors. Design features included:

- Steel wires to allow for partitioning, helping to meet protection/gender privacy concerns.
- The entrance and door were designed in collaboration with disability experts.
- T-shelters can be adapted in the future to include WaSH facilities, with water and waste pipes.

The agency worked closely with the Government of Jordan, which had to approve the T-shelter design. The involvement of the MoPWH in tendering ensured a fast contract-awarding process.

Disaster Risk Reduction (DRR)

The T-shelters provide protection against the strong winds, dust, and extreme changes in climate.

The site itself has some steep slopes and is in a seismic risk area. The T-shelter mitigates against structural weakness by anchoring it to the ground with long re-bar bolts connected to each vertical frame pole.

Design, production and construction

The development of steel-frame T-shelters was in part a reaction to issues with the prefab 'caravans' used in Zataari camp. Problems with the caravans included:

- Sandwich-panel manufacture required specialist machinery, making caravans costly and limiting the number of producers.
- Slow production rates meant that it was difficult to scale-up.
- There were environmental issues surrounding disposal.
- Caravans were costly to transport, requiring a crane for loading/unloading, and placing heavy stress on roads from large trucks.
- The plywood floors were not durable, and there were water leakages in winter.

The T-shelter design, in contrast, was flexible and simple to produce using local materials. Features include:

- A gable roof, providing better ventilation than a flat roof.
- The kit format means that the shelter is easy to transport, store, and extend or modify.
- The ability to easily dismantle and re-erect means that it could be made part of a return package.
- Leg extenders facilitate the erection of shelters on slopes or uneven land (prefab caravans needed stilts or level foundations, in order to prevent sandwich-panels from twisting and failing).
- More spacious living area.

The first shelters included a porch (side entrance) to increase privacy, as the door does not then open directly onto the living space. This was in direct response to feedback from beneficiaries, who appreciated the modified design. However, the porch was dropped from the design for a number of different reasons, to the dissatisfaction of the refugees.

Some project team members also felt that this was a mistake as porch construction would not have made a significant difference to the construction timetable but would have made a considerable difference to beneficiaries' sense of privacy.

Competition amongst contractors means that production capacities and efficiencies have increased. Construction contractors developed their own scaffolding methods to increase the

Left : A private pathway between two T-shelters is created using plastic sheets and wooden beams.
Right: Some refugees also privatise the space between the last shelter on the plot and the latrines to increase privacy.
Photo: Ru'a Al-Abweh/UNHCR

rate of construction. There is now local, specialist knowledge in the production, construction and dismantling of the T-shelters.

Contractors have ten days after the awarding of the contract to produce the T-Shelter components and mobilize for commencement of work on-site.

Construction involves:

- Shelter positioning on-site with steel pegs and strings.
- Excavation and levelling of foundation trenches.
- Assembling the frame-kit components with interlocking self-drilling screws.
- Fixing windows, door and insulation.
- Covering the frame with external and internal metal cladding, and fixing the ventilation.
- Fixing plastic sheeting to the internal ceiling and adding partition wires.
- Compacting and adding the base course for the reinforced concrete floor.

Wider impacts

Alternative uses for the design are being looked at, and market stalls have been built in the camp based on the same inter-locking design of the T-shelter.

The design assumes ad-hoc extensions/adaptations will be made by beneficiaries and aims to facilitate these additions.

Items for a single unit	Quantity
Steel structure	
Steel tubes for walls, rafters, purlins (6cm diam., various lengths 1-3 m)	77 pcs
Rafter tie beam	8 pcs
Steel joints	132 pcs
Supporting steel angle at the gable	6 pcs
Foundation base plate	1 pcs
Welded steel tube leg (30 cm long)	14 pcs
Steel anchor pegs	28 pcs
Walls and roof	
Insulation (15 mm aluminum foam)	70m^2
Cladding (0.35 mm IBR sheeting)	131m^2
Steel flashing for gable, ridge etc.	15 pcs
Ceiling and partitioning	
Turnbuckles and angle holders for fixing steel wires	9 pcs
Galvanized wires for fixing plastic sheeting / partitioning	34m
Plastic sheeting (4m x 5m) for ceiling cladding	2 pcs
PVC ventilation pipes	4 pcs
Floor and other	
Cement for reinforced floor (covers 24m^2)	625 kg
Steel for reinforced floor	40 kg
Steel door	1 pcs
Steel window	1 pcs
Self-drilling screws: (6.3mm x 30mm)	600 pcs