A.4 Haiti - 2010 - Earthquake - Overview

Sheltering in Haiti: Looking forward while looking back

In August 2010, seven months after the devastating Magnitude 7.0 earthquake near Port-au-Prince, a think tank made the following key shelter-related recommendation[1]:

"*The Haitian government, together with the donor community, should accelerate removal of rubble. This is the single most important step toward reconstruction of housing and infrastructure that the Haitian government and donors can take.*"

The study went further:

"*For housing to be reconstructed, sites have to be cleared… Unless rubble is cleared expeditiously, hundreds of thousands of Haitians will still be in tent camps during the 2011 hurricane season.*"

That hundreds of thousands of Haitians still face the very real prospect of remaining in camps during the upcoming 2012 hurricane season, and perhaps beyond, speaks volumes about the challenges of delivering humanitarian shelter assistance and housing reconstruction in Haiti - and elsewhere.

The difficult, dangerous, and generally thankless task of clearing rubble is viewed largely as a means to the end of enabling the recovery of lives, communities, and societies in the wake of disasters. Clearing rubble, then, is a critical precursor to recovery; it can't be overlooked or sidestepped. Perhaps more so than any previous natural disaster since the adoption of the UN cluster system in 2005, the Haiti earthquake challenged that system significantly with the profound issue of ownership: which cluster would take the lead in addressing clearance of the enormous rubble pile generated by the earthquake? Which donors would fund the planning and clearance of rubble? Which organisations would actually do the clearance work? While the case studies that follow reflect extraordinary and laudable effort, they also at least suggest that the questions remain only partially answered, to the detriment of those living in - and out of - camps.

As central as the rubble issue has been to recovery, the more important issue, and underlying rubble both literally and figuratively, is the land that was the locale of the homes, shops, schools, neighbourhoods, and other features of a primarily densely populated urban area affected by the earthquake. The rubble and broken buildings littering settlements after the earthquake effectively decreased the size of those settlements, and thus the supply of land available for sheltering people and recovering economic, educational, governance, and other activities. The land and housing markets in those settlements, constrained by myriad tenure, infrastructure, service, and hazard risk issues prior to the earthquake, were exacerbated significantly by its impacts, making it extremely challenging to respond to widespread shelter needs, while also affecting the longer-term process of recovery.

Shelter and land issues in urban areas pose particular challenges to humanitarian organisations, many of which have their genesis, institutional memories, protocols, and expertise in rural areas. Confronting rubble, land, and related issues in dense urban areas anywhere would thus be a challenge to even the most experienced humanitarian organisations. All the more so in Haiti, where extreme poverty, environmental degradation, and a host of hazards, coupled with the limited capacities of a complex network of regulatory, political, community, and market actors, combined to create the highly vulnerable settlements that sustained such overwhelming destruction, and making it all the more difficult to respond to needs generated by the earthquake.

[1] RAND Corporation. Building a More Resilient Haitian State, 2010. Available from http://www.rand.org

Dealing with the rubble has been a central issue to recovery. Photo: Joseph Ashmore

Many of the case studies that follow contended directly with land and related settlements issues, bringing both reaffirmation of and new meaning to the phrase "shelter and settlements" (S&S) sector that has been used increasingly by humanitarian actors in recent years to reflect a recognition that sector activities entail not just the four walls and roof of a shelter, but also its contextual setting. A focus on the settlements side of the sector will likely remain a feature of continuing efforts in Haiti, as well as future sector responses elsewhere, particularly those in urban areas. To do otherwise would only further increase the vulnerability of populations in hazard-prone settlements.

Perhaps the zenith of shelter and settlements sector programming in Haiti has been the "neighbourhood approach" adopted by several actors to plan and integrate multi-sector, area-based programming, often in collaboration with other humanitarian agencies, civil society organisations, the private sector, and local and national government offices. This settlements-based approach to shelter provision was identified early on after the earthquake as a means of both working in rubble-strewn areas to provide humanitarian assistance and establishing a platform for subsequent reconstruction. Although initial results of the neighbourhood approach are promising, there are still more earthquake-affected neighbourhoods than actors to work in them. Further, a macro-level, city-wide complement to the neighbourhood approach, which could link currently disparate and distant efforts, is still very much a work in progress in Haiti, despite the intensive and concerted efforts of UN-HABITAT and others. Finally, it must not be overlooked that the neighbourhood approach, if adopted and implemented early in the response effort, is an effective means of promoting inter-cluster coordination, lending critically important on-the-ground support to the cluster approach, which is, after all, the primary means of guiding humanitarian action.

One very large "lesson learned" of the Haiti earthquake is that both the neighbourhood approach and its macro-level complement, an emergency master plan, are fundamental to any effort to address shelter needs. No less important than these foundational elements of sector strategy is the communication of strategy, for even the best of strategies are less than effective if not understood widely, adopted by key actors, and implemented expeditiously. The strategic communications outputs of humanitarian actors in urban areas must be disseminated early and repeated often in order to inform and guide response activities. Messaging also needs to be creative, visible, and pervasive to compete with the multiple and voluminous messages received daily by those living in urban areas. Although this was and remains a challenge in Haiti, as it is anywhere, the rapid emergence of numerous forms of social media enabled not only delivery of strategic messages, and much needed feedback, but also actual implementation of shelter programmes, with "mobile money" initiatives to pay for rent and other necessities a good example.

Finally, the following case studies reflect considerable innovation and flexibility by humanitarian actors in response to numerous constraints, an awareness that risk reduction is paramount to "Building Back Better" and a recognition that "one-size-fits-all" approaches, if they ever were effective in rural settings, are most definitely inappropriate in urban settings. Moving ahead, a focus on the neighbourhood approach will likely remain a feature of continuing efforts in Haiti, as well as future Shelter and Settlement sector responses elsewhere, particularly in urban areas. In Haiti, the range of interventions will have to expand, as impoverished families in camps, limited land supplies, complex land tenure issues, and limited resources will likely conspire to produce not just more transitional shelters and more repairs of damaged housing, but also greater resort to hosting support, rental housing production, and rental subsidies. It is hoped that the effort going forward will feature the continuing quest for clarity on the seminal issues that confound and define the sector, perhaps the largest alluded to in the study quoted above: what is shelter, what is housing, and what is meant by "toward reconstruction"?

A humanitarian response to urban context: Two-story transitional shelters, part of a project to apply a "neighbourhood approach" in central Port-au-Prince. Photo: USAID/OFDA.

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A.4 Haiti - 2010 - Earthquake - Overview continued

Overview:

Summary

The earthquake of 12 January 2010 resulted in over 222,000 deaths and over 300,000 people injured. Over 180,000 homes could no longer be occupied, the majority in densely populated informal settlements, generating a large scale challenge in terms of debris and increased pressure on space. Spontaneous and planned camps were established throughout the affected area, accommodating at peak 1.5 million people.

The international response was large scale and well funded. It used a wide range of actors, with varying degrees of experience of humanitarian response, urban crises and coordination.

The shelter sector recovery strategies evolved from meeting emergency needs to addressing a range of shelter solutions including T-shelter and housing repairs. The Shelter, Camp Coordination Camp Management, and Early Recovery Clusters were mobilised to address these needs.

Background

Prior to the earthquake, Haiti was the least developed country in the region, ranking 145th of 169 countries in the United Nations Human Development Index. More than 70% of the population lived on less than 2 USD per day.

In the cities people lived in crowded neighbourhoods with poor infrastructure and without access to basic services. Living space in Port-au-Prince's permanent housing was reported at just 1.98m^2 per person before the earthquake.

The urban context, with high proportions of tenants, needs for urban planning and challenges of engagement with the government contributed to the complex operating environment.

After the earthquake, thousands of non-government organisations with varying levels of experience appeared in Haiti. At times this undermined an already weak government sector that had lost infrastructure and personnel. Recovery was further challenged by political uncertainty, annual risks due to rain and hurricanes and an outbreak of cholera at the end of 2010.

Emergency Response

During the first three months, many affected families moved from damaged neighbourhoods onto available spaces, establishing spontaneous camps. Some of these were subsequently formalised and serviced by various supporting agencies. In less damaged areas, many stayed with host families. For the first months, many people slept outside damaged houses afraid to go back in.

An estimated 500,000 people left the earthquake affected area in the first month but the majority returned by mid 2010.

The initial response provided emergency shelter support through provision of basic materials, tarpaulins, fixings and other non-food items to a maximum number of people. This was to supplement and weather proof the large number of self-made shelters built from salvaged materials.

In the first four months, 560,000 tarpaulins, 62,000 tents and 130,000 kits containing tools and fixings were distributed by 80 organisations.

As per the initial plans, distribution data showed that 100% of households received emergency shelter items by 1st May 2010.

T-Shelter and early recovery

Many donors and agencies developed projects to provide transitional shelters (also referred to as T-Shelters) to agreed standards. Given the need for large scale material imports, pressure for land and other challenges, it took two years to build over 100,000 planned shelters, missing the initial planning target of 18 months - the start of the hurricane season of 2011.

Repairs to damaged houses were slow to start but accelerated from the end of 2010 to almost 14,000 houses repaired by agencies by the end of 2011. This figure does not include the houses repaired by people themselves without support.

Many earthquake affectees found themselves living in temporary settlements through the rains. Photo: Joseph Ashmore

Over 630,000 plastic tarpaulins were distributed, allowing people to protect themselves from the sun and rain. However there was a risk that many of the spontaneous settlements would become the slums of the future.
Photo: Joseph Ashmore

Initial strategies also made provision for host family support, but in general projects were not able to scale up to quickly meet these needs on any scale. Two years later over 6,000 households had received rental subsidies.

Housing and neighbourhoods

A strategy was developed during 2010 to promote support in the areas of origin to accelerate return from camps and reconstruction in rehabilitation. This was not adopted until the beginning of 2011 and formed the basis of the majority of neighbourhood based recovery programmes.

At the end of 2011 there were still over 500,000 people in camps. This included both people directly affected by the earthquake but also reflected a pre-existing housing deficit and urban poverty.

Official permanent reconstruction assistance shows limited progress with approximately 5,200 houses built within two years, and limited support for host families. However, the rate of self recovery and formation of spontaneous new settlements by Haitian families themselves is significantly higher. Support programmes including information and training have been limited, and much of the rubble has yet to be cleared.

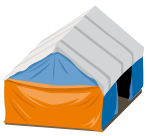
There were major shortages of land - in this settlement, families built in the central reservation of a major road.
Photo: Joseph Ashmore

Many families built their own temporary shelters using reclaimed materials.
Photo: Joseph Ashmore

SHELTER IN HAITI

188,383 DESTROYED OR SERIOUSLY DAMAGED HOUSES IN HAITI

1.5 MILLION PEOPLE NEED SHELTER ASSISTANCE



EMERGENCY SHELTER consists primarily of tarpaulins and fixings such as ropes, nails, a hammer etc. Tents can also be used for emergency shelter but, because they are less versatile than tarps, their use is limited. Emergency shelter can be distributed quickly but offers only limited protection against heavy rains.

TRANSITIONAL SHELTERS are simple timber or steel frame structures that provide better protection, more privacy and more space. Transitional shelters will often have a concrete foundation and can last years. Once people have found permanent homes, transitional shelters can be be put to other uses. They take longer to build but can be dismantled and moved if necessary.

THE ACHIEVEMENTS

AS OF 6/25/10

MEMBERS OF THE SHELTER AND NON-FOOD-ITEMS CLUSTER have delivered vital aid to the estimated 1.5 million people who were directly affected by the earthquake. Despite a destroyed port, a severely damaged airport and a lack of infrastructure, cluster members reached an average of 100,000 people per week in the first four months of the response operation. Each family received two tarpaulins or one tent.

TRANSITIONAL SHELTERS

Today, shelter cluster agencies are increasingly focusing on transitional shelters. These are simple structures that provide better protection than tents or tarps but take longer to build.

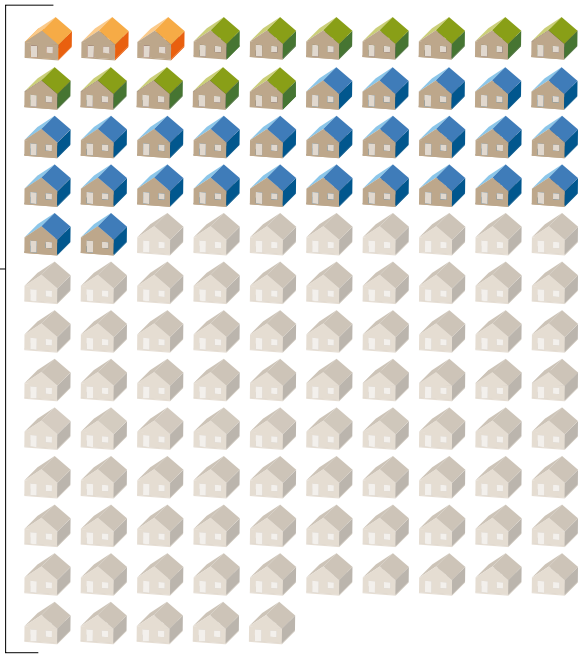
= 1,000 TRANSITIONAL SHELTERS

OF TOTAL **125,000** PLANNED

3,264 COMPLETED

12,175 IN COUNTRY

27,214 IN PIPELINE



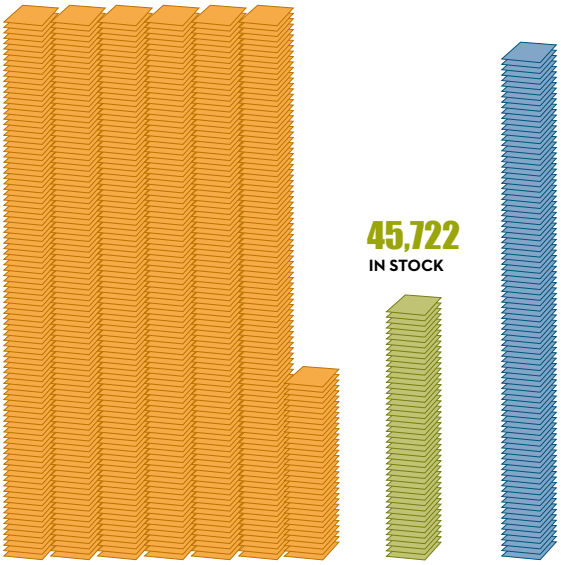
HEAVY DUTY TARPAULINS

633,052 DISTRIBUTED

= 1,000 TAUPAULINS

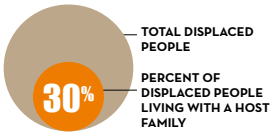
93,287 ON THE WAY

45,722 IN STOCK



HOST FAMILIES

500,000-600,000 PEOPLE LIVING WITH A HOST FAMILY

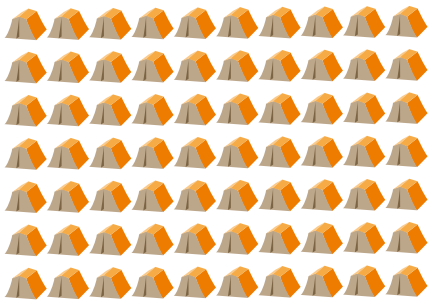


TENTS

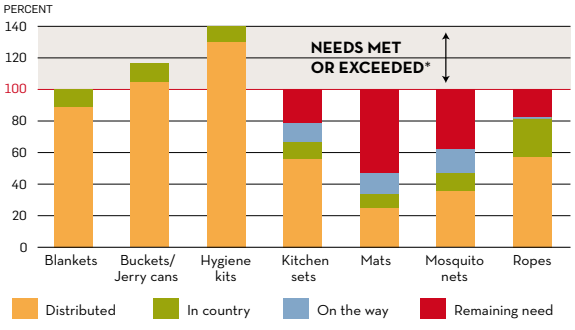
70,279 DISTRIBUTED

= 1,000 TENTS

Tents are less versatile, need more space and do not last as long as tarpaulins. For that reason fewer tents than tarps were distributed.



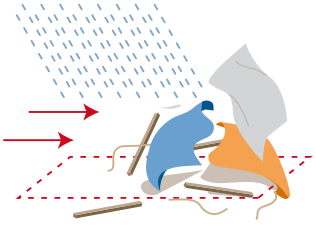
HOUSEHOLD NFI'S COVERAGE AND GAP



*Needs are often exceeded because items are lost or destroyed by weather or used up.

THE CHALLENGES

Because most people were renters or squatters and don't own land, all aspects of shelter are very complicated. All steps have to be agreed with the tenant and the land owner.



1 OWNERSHIP OF LAND IS OFTEN UNCLEAR BUT OWNERS HAVE TO GIVE PERMISSION BEFORE ANY WORK CAN BE DONE.

2 SITES ARE BLOCKED BY DEBRIS. EVEN WITH HEAVY EQUIPMENT IT WILL TAKE YEARS TO REMOVE IT.

3 MANY ROADS ARE TOO NARROW FOR HEAVY EQUIPMENT. MULTI-FAMILY BUILDINGS CANNOT BE EASILY REPLACED.

4 HURRICANE SEASON: EMERGENCY SHELTERS CAN BE DESTROYED BY HEAVY WIND AND RAIN.

THE WAY FORWARD

The provision of transitional shelters is gaining momentum, particularly in rural areas where more land is available. It is essential that the identification of additional, safe relocation sites, debris removal and the required planning processes are urgently addressed by the authorities to enable the large scale construction of transitional shelters and ultimately the provision of permanent housing solutions.

SOURCE: IASC HAITI SHELTER CLUSTER, 2010

CC BY-ND

GRAPHIC BY STANFORD KAY STUDIO.COM

A.5 Haiti - 2010 - Earthquake

Case study:

See A.4 "Haiti - 2010 - Earthquake - Overview", p12 for background.

Country:
Haiti
Disaster:
Earthquake
Disaster date:
January 12th 2010
No. of houses damaged or destroyed:
180,000
Project target population:
10,000 emergency shelter kits distributed
20,000 reinforcement kits distributed.
2,550 T-shelters installed
Materials Cost per shelter:
T-shelter: USD 1,700 per unit
Project cost per shelter:
T-shelter: USD 2,800 per unit (materials and project costs)

Project timeline

Project description
This project provided different forms of support for people with differing needs. In the emergency phase the organisation distributed 10,000 emergency shelter kits. It went on to provide 2,550 transitional shelter kits, 20,000 reinforcement kits for those did not have land to build upon, 500 rural repair kits and over 1,000 tool kits. These kits were accompanied by trainings and posters on staying safe during hurricanes. The organisation also actively supported inter-agency coordination and had a strong advocacy role.

Strengths and weaknesses

✓ Multiple approaches were taken to shelter provision, allowing projects to match the evolving context.

✓ The organisation was able to deploy several experienced shelter team members, who were able to influence national strategy and programmes beyond the organisation.

✓ The organisation carried out extensive advocacy on land rights and access to land.

× Procurement and logistics caused significant delays to the transitional shelter projects. Recognising that logistics capacity within the organisation was weak, attempts were made to establish partnerships for supply with other organisations. These were not all successful, and three months were lost trying to establish a working partnership.

× The quality of non-food items and tents procured and imported by the organisation was variable.

- Immediately after the earthquake, there was an apparent "equality of vulnerability" as everyone has lost their home. However, it quickly became apparent that who, prior to the disaster, had the power, identity, connections and resources – in particular housing, land and property assets – were able to reassert these networks and recover more quickly;

- A given neighbourhood was likely to need an array of services and it was not always clear whether it is more efficient for a single, non-specialist agency to deliver all services or for specialist agencies to provide a single, specialist service across several neighbourhoods or indeed the whole city.

Hillside showing transitional shelters built on small plots of land.
Photo: Mildred Beliard, CARE

Before the earthquake

(See A.4 "Haiti - 2010 - Earthquake - Overview", p12.)

Before the earthquake the organisation in Haiti had concentrated in poor rural areas and on smaller scale projects. The organisation was not focused on shelter or construction.

Many of the organisation's experienced staff were directly affected by the earthquake. The country office had very few staff, no partners and little experience in areas directly affected by the earthquake. Scaling up the capacity of the country office was also difficult because many non-government organisations arrived – all trying to recruit locally.

Emergency shelter kits

The organisation initially responded by distributing emergency shelter kits. These contained plastic sheeting, mattresses, hygiene sets and kitchen sets. These materials were delivered to affected people within the first three months after the earthquake and before the major rains arrived.

It was difficult for any agency to identify the neediest geographic areas in terms of the highest number of the most vulnerable people, highest levels of damage, and zones most likely to be neglected by responding agencies in the first 3-6 months. The organisation decided to deliver emergency shelter kits to:

- Spontaneous camps in highly damaged zones close to the epicentre of the earthquake (Leogane).
- Dense spontaneous settlements along roads to Leogane, that were likely to be neglected by other agencies (Carrefour).
- Spontaneous settlements close to the office and warehouse (Port-au-Prince).

Neighbourhoods

Following the emergency distributions, the organisation shifted target to neighbourhoods rather than camps. The main reason for this was to push to more durable shelter solutions than could be found in camps.

Although massive shelter needs remained, the organisation decided not to continue providing shelter assistance in spontaneous settlements in Port-au-Prince. This was due to the large number of other actors working there, and also to allow them to focus activities.

All families with destroyed housing in the most vulnerable neighbourhoods were targeted.

Transitional Shelter Kits

Kits were developed to protect people from the imminent rains and hurricanes. 2,550 transitional shelter kits (6 million USD of materials), 20,000 reinforcement kits (3 million USD of materials) and 500 repair kits for timber-frame houses were distributed. Half of these transitional shelters were built in partnership with another organisation.

Transitional shelter kits required that people had access to a space to build a shelter. These were not necessarily the most vulnerable families.

Reinforcement kits targeted families who were unlikely to receive a transitional shelter kit and who would remain in self-built shelter during the hurricane season. Training sessions were held on how to use the kits and printed fliers were distributed. Trained carpenters also supported families to reinforce their makeshift emergency shelters.

Toolkits were given to agencies that were training technicians, but who had limited resources.

Land tenure

The organisation's approach to tenure was to:

- Record reported tenure status during registration.
- Develop a Memorandum of Understanding (MoU) with beneficiaries in coordination with other agencies. This highlighted that beneficiaries will own the shelter but that tenants must take responsibility for seeking the consent of their landlord to erect a transitional shelter for 3 years.
- Engage the municipality in a similar agreement which outlines the approach and puts the onus on municipalities to resolve disputes.

Shelter Design

The following are the seven key stages in the transitional shelter programme:

- Assessment and beneficiary selection: visit dwelling and complete assessment form.
- 1st verification: visit destroyed house, and plot. Check with neighbours. Fill in verification form.
- 2nd verification: visit proposed plot to check that it is ready.
- Explanation and 1st MoU signature: explain and sign the MoU to clarify that the beneficiary has consent to use the plot and that the roles and responsibilities are understood.
- Delivery and 2nd MoU signature: sign MoU to confirm that the shelter has been received.
- Installation: teams install the shelter (2 carpenters, 5 helpers from the beneficiary's side, supervised by a technician).
- Final handover and 3rd MoU signature: sign the MoU to confirm that the shelter has been installed.

Kits and the accompanying information campaign were developed in partnership with other agencies using a commonly agreed transitional shelter brief. Shelter designs were checked by qualified structural engineers from partner organisations both in Haiti and Europe, who offered their services to check the designs.

Daily labour on construction sites was supervised by technicians who had been trained by engineers.

The organisation itself directly monitored implementation of the project and quality.

Logistics and supply

Haitian companies were not necessarily registered, paying tax, publishing accounts or accountable to identifiable shareholders. This made it difficult for the organisation to monitor problems with labour rights, health and safety, environmental regulation or check that materials – particularly imported timber – were from sustainable sources.

Emergency staff were unable to build sufficient capacity for efficient procurement. As a result the project used multiple approaches for procurement. These were:

- A partner organisation and local private contractors purchased the timber and all other components and delivered them to site.
- The organisation itself purchased and delivered plastic sheeting, hurricane strapping and cement. It also provided truck rental for later deliveries.
- The beneficiaries themselves provided gravel and sand.
- Local private sector manufacturers assembled roof trusses and frames. This allowed quality to be controlled before kits arrived on-site.

Different approaches were used to procurement - some items were prefabricated off site.
Photo: Mildred Beliard, CARE

Extension built by a family to upgrade a transitional shelter.
Photo: Mildred Beliard, CARE

20,000 Reinforcement kits

Item	Quantity
Plastic sheet (4m X 5m)	1
Timber 2" x 4" (50x100mm)	24m
Hurricane strap	6m
Roofing nails	1Kg
Nails - 1inch (25mm)	2Kg
Nails - 4 inch (100mm)	1Kg
Metal corner spikes 50cm	6
8 mm nylon rope	25m
Bag for ironmongery	1
Plastic box	1

500 Rural Repair kits

Item	Quantity
Timber 2" x 4" (50x100mm)	48m
Hurricane strap	10m
Nails - 1" and 4" (25, 100mm)	4Kg
Plastic sheet 4m x 5m	2
Corrugated iron	2m2
Roofing nails	1Kg
Cement 42.5kg	2 bags

1,126 Tool kits

Item	Quantity
Bucket - 20l with cover	1
Rope - polypropylene 10mm	15m
Iron wire gauge 12 or 14	15m
Hammer carpenters 0.5kg	1
Mallet - 1.3kg	1
Crowbar 45cm	1
Cold chisel 20cm	1
Wire cutters 20cm	1
Dust masks	2
Gloves	1
hacksaw 30cm	1
Hacksaw blades 30cm	4
Roofing nails 25mm	50
Wood saw 50cm	1
Chisel 3cm	1
Nails - 1 inch (25mm)	2Kg

A.6 Haiti - 2010 - Earthquake

Case study:

See "A.4 Haiti - 2010 - Earthquake - Overview", p.12 for background.

Country:
Haiti

Disaster:
Earthquake

Disaster date:
January 12th 2010

No. of houses damaged or destroyed:
180,000

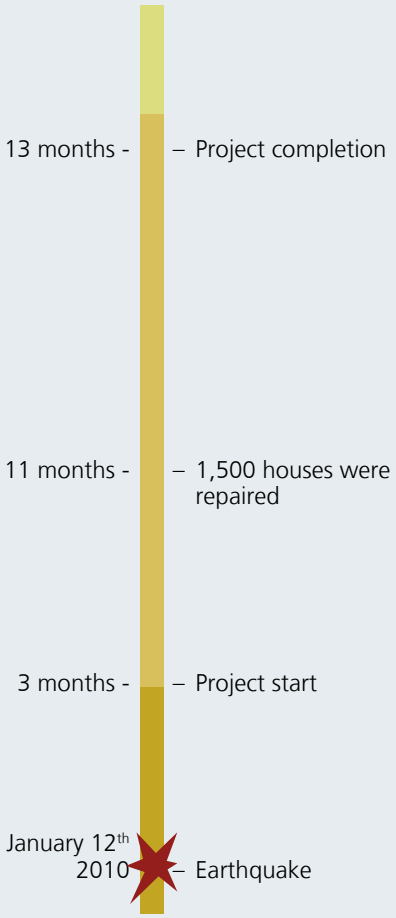
Project target population:
Repair - 14,000 households
Structural assessment - 400,000 structures

Occupancy rate on handover:
Once a building had received a green-tag, occupancy jumped from 50% to 80%

Shelter size:
1-floor earthquake damaged structure (1 – 3 rooms): average of 15 - 35 m²

Materials Cost per house:
Repairs: average 2,000 USD per structure

Project timeline



Project description
The programme provided safe and improved housing which helped people to leave the camps and allowed them to restart the recovery process. The programme included: 1) damage assessment, 2) house repairs 3) public communication and training manuals 4) training.

Strengths and weaknesses

✓ The project used a community based approach and maintained open channels of communications with the relevant government ministries and the population at large.

✓ A repair and rehabilitation project was developed. This considered the types of housing, differing neighbourhoods, government guidelines and the local community.

✓ Local builders learned cost efficient but safe techniques for rebuilding.

✓ Public awareness campaigns assisted displaced community members to return to homes which were structurally safe.

× A shortage of local companies, combined with presidential elections and security issues lead to a delay in the start of the public information campaign.

× The public information campaign suffered from poor messages and overlapped with other organisations who were conducting repairs. This caused some confusion.

- Initially, owners were suspicious of the engineers. As the project became better known, owners began asking the engineers to assess their homes.

- The repaired houses are stronger than they were when the earthquake struck, but they look virtually identical to how they looked before the earthquake.

- The assessment showed that nearly every neighbourhood of Port au Prince contained a mixture of levels of damage.

- An analysis of the damage showed that residential buildings, schools, and churches were the hardest hit while commercial buildings fared best.

- Although all the houses repaired were more resistant to earthquakes than they had been before, it is not possible to guarantee that the repaired houses would be able to withstand another major earthquake.

Many buildings that were tagged yellow could be repaired at a lower cost than building a new transitional shelter.
Photos: Chiara Jasna Vaccaro

Before the earthquake

(See "A.4 Haiti - 2010 - Earthquake - Overview", p.12.)

Prior to the earthquake, there were no enforceable building codes and no inspections. As a result homeowners could build as cheaply and therefore insecurely, as they chose. The same was true for urban planning and zoning. Houses were regularly built into existing roads, on steep, unstable slopes, or in ravines prone to flash floods.

Most structures were built in stages as and when money was available. Additional floors and rooms were often added without checking the original foundations or structures. Entire neighbourhoods were built and developed without planning.

The main problem with construction in Haiti is that the structures are too brittle. Almost all the structures are built out of masonry blocks with reinforced concrete columns and beams.

After the earthquake

An international seismic engineering company was brought to Haiti a week after the earthquake to help the organisation with the early response. Initially the focus was on the main government buildings as well as the main hotels and factories.

Many people were sleeping under tarpaulins not because their house was unsafe, but because they were afraid that it was. Large numbers of people would leave camps and tents and return to their homes if they could be sure that their houses were safe.

Implementation

The programme was divided in four separate components.

1) Damage assessments

Damage assessments were implemented working closely with the Ministry of Public Works (known by its french acronym MTPTC). The survey was conducted by teams of engineers. Each team had between one and fifteen engineers. During the project there were up to 18 teams at any one time; a total of 270 Haitian engineers.

The assessment tagged buildings according to the damage using the following "traffic light" system:

- green - safe for use,
- yellow - damaged, but stable (needing minor repairs to be made useable),
- red - unstable, either major repairs or demolition and rebuilding required.

Haitian engineers were trained to conduct the evaluation. They were then sent in groups to assess the structures in a neighbourhood. The engineer would use a PDA to photograph each building and take its GPS coordinates.

They then inspected every room of the building, and completed a short questionnaire on the PDA. At the end of the inspection, each building was spray-painted with a highly visible red amber or green tag. Each engineer was able to inspect an average of 10 structures a day. At the end of each day, the data was downloaded directly into the central database and used to create a map.

To standardise assessments, the ATC20 form was modified for use in Haiti. The ATC20 is the standard form used in California to rapidly assess earthquake damage.

During the assessment, over 400,000 structures were tagged; this was nearly every building in the Port-au-Prince metropolitan area that was impacted by the earthquake.

Buildings were sprayed with green, yellow or red markings according to the level of damage sustained.
Photos: Joseph Ashmore

The assessment highlighted how widespread the damage was. Rather than having a core area of red tagged houses surrounded by rings of yellow tagged and then green tagged houses, nearly every neighbourhood is a mixture of green, yellow, and red tagged buildings.

2) House repairs

Once a house had been assessed, the next challenge was to repair it. The cost of rebuilding yellow tagged buildings was relatively inexpensive compared to the cost of new construction or comparable transitional shelters. However, it was also clear that the reason that most buildings had collapsed was that they were poorly built.

Based on the information gained during the damage assessment, twelve different types of repairs were identified.

The most common repair was of an X-shaped crack in masonry wall. The specific steps to repair each type of damage were detailed in a separate guideline accompanied by clear illustrations.

To ensure that builders continued to use the better techniques, the organisation, working with an international contractor, conducted inspections of the work on site.

3) Public communication & training manuals

Four areas were chosen, for a public communications project. In each area, a community based organisation was contacted.

The involvement of the community facilitated the setting up of meetings with the inhabitants, and municipal authorities. It has also facilitated the design of a public awareness and information campaign.

Workshops with local populations and existing community projects helped to identify the key people to meet and to accompany and support the teams on the ground.

To build back safer, three key changes were made to the way that the masons built walls:

- High quality materials: rather than allowing the masons to make their own blocks using river sand, stronger blocks were made in factories. They were made with clean materials and were vibrated after casting. Masons were required to use clean sand for the mortar.
- A thinner layer of stronger mortar: the masons used a 3:1 sand : cement ratio rather than the traditional 6:1 ratio. The masons were instructed to use only a thin layer of this mortar. This helps to compensate for the higher cost of the mortar.
- Steel reinforcement bars in the wall: the masons were instructed to add two steel bars between every four courses of blocks and vertically every three blocks. The horizontal steel bars are tied into the vertical columns and the vertical bars are tied into the ring beam.

The repair process

1. The damage assessment database was used to identify the number of houses that can be repaired.
2. Project engineers visit the neighbourhood to verify that the houses are not in high risk areas, nor in rights of way.
3. Community animators meet with local leaders to identify the house owners. The owners sign a repair agreement.
4. Local engineers assess each house. The engineer fills in a form on the PDA and writes the details of the repair required on the house.
5. A contractor is assigned to repair a group of houses.
6. As each repair is completed, the supervision engineer certifies that the repairs are complete and the contractor is paid.

- Contractors work on groups of three to six houses at a time.
- Only masons and contractors who had successfully completed the training on the improved construction techniques were allowed to work on the repairs.

Team of engineers assessing buildings. Photo: Chiara Jasna Vaccaro

Different repair specifications were developed for walls with and without windows, cracked ring beams, walls that had separated from the roof, and for minor cracking in walls and columns.

The specific steps to repair each type of damage were detailed in a separate illustrated guideline.

4) Training

The following people were trained:

- engineers (who had been vetted by the government) - to conduct damage assessments, to use PDAs and to how complete the required forms,
- masons - on repair techniques,
- contractors - on repair techniques,
- international NGOs and their technicians.

The focus was on how to build more safely. Since the changes were minor, the masons and contractors could be trained in just three days.

Trained on conducting Damage evaluations
270 engineers for Damage evaluations:
105 during the 1st Phase
165 during the 2nd Phase
Trained on conducting Repair evaluations:
32 engineers
Trained on conducting repairs:
11 sub-contractors
Trained to support subcontractors on conducting repairs:
30 engineers
210 masons

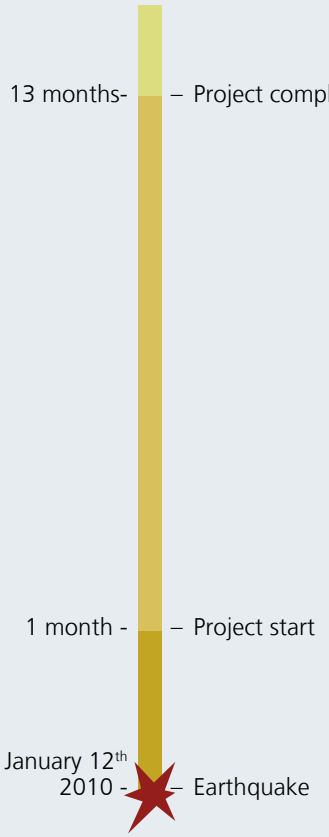
A.7 Haiti - 2010 - Earthquake

Case study:

See "A.4 Haiti - 2010 - Earthquake - Overview", p.12 for background.

Country:
Haiti
Disaster:
Earthquake
Disaster date:
January 12th 2010
No. of houses damaged or destroyed:
180,000
Project target population:
5,690 households or 34,140 individuals
Shelter size:
18 m^2
Materials Cost per shelter:
Wood framed shelter 878 USD
Steel framed shelter 1,800 USD
Host family grant 800 USD
Project Cost per shelter:
Wood framed shelter 1,060 USD
Steel framed shelter 2,500 USD

Project timeline



Project description
This organisation ran several projects focused on supporting economic, social, and political recovery. Shelter assistance was delivered through a variety of "shelter solutions", including traditional wooden framed transitional shelter construction, steel framed transitional shelter construction, supporting host families through a livelihoods-based incentive system, and the removal of rubble. The projects targeted those who decided to stay in or around their homes of origin.

Strengths and weaknesses

✓ The projects provided an economic benefit to both shelter recipients and through supporting activities such as paid labour for rubble removal. In total, the projects injected 750,000 USD into the local economy in paid wages.
✓ The projects trained and / or employed nearly 400 local masons and builders. Many of whom went on to secure formal employment for the first time.
✓ The projects successfully prevented over 5,000 households from going to settlements.
✓ Many households converted parts of their new homes into shops, salons or cafes, leading to a more rapid recovery.
× The projects were delayed. This was primarily due to unavoidable circumstances such as domestic shortages of key construction materials, severe weather conditions, disease outbreaks (cholera), and post-election tensions.
× Steel framed shelter components were delayed in shipment and customs.
× Effective sanitation for shelters was delayed.
× Relatively low capacity of local builders required extensive capacity building and oversight.
× Complications with land tenure and land verification processes slowed shelter provision and created an unexpected staffing and administrative burden.
× Procurement of some shelter components was delayed, leaving some incomplete shelters.
- Challenges with coordination often resulted in duplication and a wide variation in shelter assistance.
- Removal of debris was a key factor in the ability to construct transitional shelters.
- Limited local leadership from the local or national governments, which varied from location to location.
- Assembly lines and serial production were largely newly introduced concepts and required a lot of advocacy, training, and oversight.

Before the earthquake

(See "A.4 Haiti - 2010 - Earthquake - Overview", p.12.).

Target groups

The projects aimed to encourage affected families to stay in their communities of origin to depressurise formal or informal camps. To achieve this aim, mobilisation teams worked with settlement leaders to identify households who wished to settle near to their properties.

In most cases, the organisation worked with 'spontaneous settlements' that were no more than a cluster of households squatting on private land or in the streets or public spaces next to their property.

Selection of beneficiaries

Beneficiary criteria were developed with community leadership structures in neighbourhoods and informal settlements, and through local authorities.

The starting point for the beneficiary selection process was the Mayor's office in any given location. Identification of informal settlements in this way was highly dependent on the support and activity level provided by each Mayor.

To triangulate vulnerability assessments, project staff also consulted with other local organisations and community leadership. Shelter assistance was prioritised for single female-led households, the elderly, and households with more than four family members.

Previous homeowners rather than renters were targeted as a result of the added complexity of determining viable rental agreements and entitlements.

Plot identification

Individual shelter plots were identified through written statements by community members and local leadership.

Upon finalising the location of the plot, shelter construction teams coordinated with cash for work teams to assure that all rubble and dangerous material was removed from the construction site, and from access paths.

Engineers worked closely with shelter construction teams to assure that placement of the shelter would provide the safest possible space for the beneficiary household.

Wooden shelter

The transitional wooden shelter had an area of 18m^2 and was intended for a family of five. The structure was composed of almost 50 pieces of timber, ten corrugated galvanized iron sheets of 12 feet (4m) and a concrete floor.

The structure was strengthened with hurricane straps. The main bearing wooden columns were anchored to the soil using cast-in-place concrete piers. The walls were clad with plastic tarpaulin. The life expectancy of this structure was 24 to 36 months.

Once materials were delivered to site, a team of one skilled carpenter and two unskilled labourers built two shelters a day. On average, the project completed 15 wooden shelters per day.

The organisation hired approximately 120 carpenters in five communes of Port-au-Prince and installed wooden shelters in various areas of the capital.

Steel shelter

The organisation built 2000 light gauge steel shelters in areas outside of Port au Prince, Leogane and Petit-Goave. These were more resistant to hurricanes and heavy rain, being designed to resist winds up to 120-140 miles an hour. These 18m^2 shelters were anchored into concrete floor slabs.

The shelter components were shipped pre-cut from USA, from an American design firm in 40 containers of 50 shelters per container.

Different teams off-loaded the containers, assembled the parts, loaded and off-loaded prefabricated structures and installed the shelters on site.

Approximately 200 male and female workers were trained to use drills in the assembly of metal parts. Additionally, 8-10 other drivers and loader crews were used to deliver the assemblies to the construction sites.

Once the assembly mechanism was fully operational, each facility prefabricated about 45 steel shelters each day and installed or "completed" approximately 17 shelters per day on individual plots.

Only a short training time of 4-5 days for each assembly team was required to start producing roofs, sides and front walls.

Once the shelters were built, an additional 6-8 three man crews of masons installed the cement floors.

Owner contribution

The beneficiaries made a floor fill from broken rubble so that the concrete floor would use minimum

A steel framed shelter converted into a shop.
Photo: CHF International

Family in a timber framed shelter.
Photo: CHF International

Projects were implemented with the common goal of encouraging affected families to stay in their communities of origin to depressurise formal or informal camps.
Photo: CHF International

cement. The families were also expected to help clear rubble in preparation for the arrival of the shelter.

Since the project was only funded to provide a metal sheet roof and a tarpaulin as side covering, it was left to the families to build more durable walls. This lead to some issues between the organisation and the beneficiaries.

Host family

Rather than distinguish between the displaced and the host families, the project viewed the combined households as one household unit so that the economic assistance would be tailored to the needs of both families and agreed upon by both the displaced and hosting heads of household.

Each household unit was offered a choice of vouchers that could be spent on a variety of needs, including: tuition, household supplies and groceries, medicines, and small business re-stocking.

Project staff worked with each household to select the vouchers needed to support the joint family unit. Both families signed tri-partite agreements with the organisation and a local government representative to document their cooperation, agreement, and intent to mitigate any arguments with local officials.

Each household unit received 800 USD to support the host family arrangement for a minimum of four months. In most cases, the arrangement lasted long past the distribution and expenditure of household livelihoods grants.

Logistics

Existing relationships with brokers and familiarity with customs systems built over the previous years helped more rapid procurement of materials required for the wooden shelter. Local vendors sourced timber in bulk from the USA and the Dominican Republic, and delivered directly to warehouses.

Shelter managers submitted order forms for each project site for remaining materials such as nails, cement, and iron sheeting.

Shelter mobilisers and team leaders organised the delivery of specific material quantities to construction sites on a daily or weekly basis, to reduce the possibility of graft and wastage.

Customs delays resulted in some interruptions in the supply chain, and other materials such as sand and plastic sheeting were also delayed due to high demand among non-government organisations and slow-moving customs processing.

Wood framed shelters under construction.
Photo: CHF International

Local teams were responsible for managing and tracking shelter components from the assembly facilities. In many cases, steel frame shelter components were transported to individual building sites by groups of labourers.

Materials list

For 1500 Wooden Shelters	
Timbers 2"x4"x12' yellow pine (50 x 100mm x 3.7m)	9,000
Timbers 2"x4"x14' yellow pine (50 x 100mm x 4.3m)	11,500
Timbers 2"x2"x12 yellow pine (50 x 50mm x 3.7m)	10,500
Corrugated iron roof sheeting, 28 gauge. 12' lengths (3.7m).	5,000
Portland cement (42,5 Kg)	2,500 bags
Hinges 4" (100mm)	3,000 pairs
Sliding lock	1,500
Nails 3" (75mm)	900 kg
Nails 4"(100mm)	900 kg
Roofing nails (Umbrella Type)	900 kg
Doors and windows	1,500
Staples (boxes of 1000 staples)	1,000 boxes
Mosquito nets metalic type	50 Rolls

Host Family Livelihoods Grant Options	
Small business grants	Through a selection process with a committee with beneficiaries submitting business plans
Household supplies	Buckets, cleaning supplies, cooking supplies
Fees for tuition	Direct payment to schools through vouchers
School supplies	school books, pens, paper, etc.
Work tools	hammers, drills, nails, paint, brushes, etc.

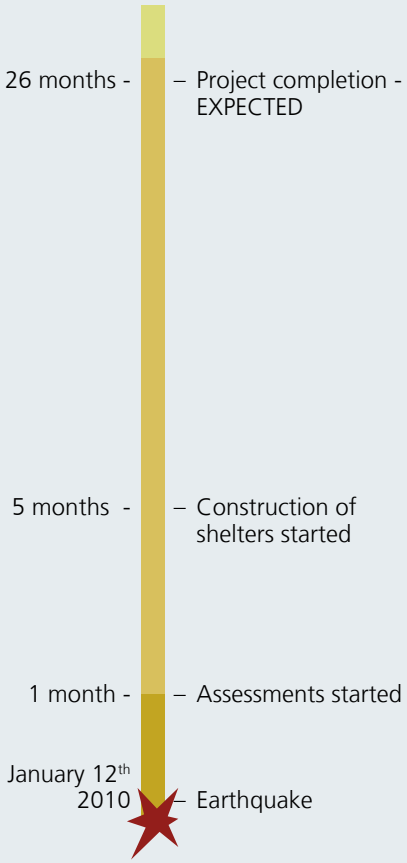
A.8 Haiti - 2010 - Earthquake

Case study:

See "A.4 Haiti - 2010 - Earthquake - Overview", p.12 for background.

Country:
Haiti
Disaster:
Earthquake
Disaster date:
January 12th 2010
No. of houses damaged or destroyed:
180,000
Project target population:
3,960 households
Occupancy rate on handover:
One year after the beginning of the project, the occupancy rate was 89%
Some households did not occupy shelters still covered with tarpaulin for fear of theft
Shelter size:
1-5 people 18m²
6-10 people 36m²
11-15 people 54m²
Materials Cost per shelter:
2,400 USD (18m² module)
Project cost per shelter:
4,700 USD (18m² module)

Project timeline



Project description
This project built progressive shelter in two phases: a first emergency response (structure covered with tarpaulin) and a second durable solution (permanent housing with cement cladding). The project included safer construction awareness activities and safer construction trainings. The shelter project was the beginning of an integrated programme that also included water and sanitation, hygiene promotion, health, disaster preparedness and livelihoods projects.

Strengths and weaknesses

✓ Support was provided irrespective of land tenure.
✓ Modular design allowed for living space to be varied according to family size.
✓ All construction materials, except the steel frames and a part of the roofs, were purchased locally, promoting the local economy.
✓ The project included safer construction awareness activities for all families and safer construction trainings for construction workers.
✓ As a part of the integrated programme, the access to water and sanitation was improved.
× Beneficiary participation in the construction is low as rapid construction was prioritised.
× Power tools were needed to assemble the shelters and as a result generators were required. This had logistical and financial implications.
× Due to lack of understanding of the market, some construction materials were purchased locally. However the local market could not provide these materials easily. This resulted in construction delays.
× The project was still ongoing two years after the disaster, and water and sanitation solutions were not complete.
× Few resources are being allocated to follow up and monitoring of incidents (occupation, evictions, etc.).
- Some of the land where the beneficiaries were living was very close to a river. All the shelters have a raised floor to prevent flood damage. In areas with higher flood risk, a deeper foundation would be built as an additional measure.
- The traditional Haitian house has several exterior doors. Many beneficiaries added doors to their shelter.

Before the earthquake

See "A.4 Haiti - 2010 - Earthquake - Overview", p.12.

After the earthquake

The town of Leogane's population was estimated at more than 134,000 people. The earthquake is estimated to have destroyed 32,000 buildings (around 80% of Leogane's buildings). After the disaster there were around 300 camps in the area, with more than 60,000 people living in them.

The construction of shelter was the beginning of a programme that provided support to affected households. The support also included water and sanitation, hygiene promotion, health, disaster preparedness and livelihoods projects.

Land issues

The shelters were allocated on land where the beneficiaries lived before the earthquake, promoting the return of displaced people to their places of origin.

Land ownership was difficult to verify. Many beneficiaries did not have personal identification documents, and there were many difficulties in obtaining legal and official land property records. There were many owners or heirs that did not have documents to prove that the land belonged to them. Rental agreements with the land owners were made verbally in most cases.

To meet shelter needs of all the people living in the communities, solutions for all households who fulfilled the selection criteria were developed, whatever their tenure situation. Intensive community mobilisation was undertaken, and local authorities were involved.

In the case of owners or heirs without official identification or land ownership documentation, validation meetings were organised where the community certifies their identity and their land ownership. A document was signed by the beneficiary, a neighbour, community representatives and local authorities.

In the case of tenants who lived in houses that were destroyed during the earthquake, it was initially unclear whether the shelter would be the property of the beneficiaries who fulfilled the selection criteria, or whether the shelter would be the property of the house owners.

Shelters had a steel frame and were modular. They could be personalised to meed household needs. Photo: Beti Egea

It was decided that shelters would always be the property of the beneficiaries. A document was signed between the beneficiary and the owners, where the owners authorise the beneficiaries to build their shelters on their land. This document was valid for five years. If the owner did not respect this agreement the beneficiary could move the shelter.

If families were landless, the community networks were encouraged to help them to find some land. There were also negotiations with local authorities to find a solution for beneficiaries who had lived in squatter settlements. Finally authorities let these shelters be constructed.

Implementation

After the validation and signing of the documentation, construction materials were distributed.

The construction team had 4 shelter specialists, 4 local coordinators and 15 local engineers. Each engineer led a team of workers from the communities, and each team built 6 shelters per week.

Up to ninety shelters were built per week, but delays with material supply slowed production.

Beneficiary participation in construction was low. Rapid construction was prioritised, leaving little time to mobilise, train and incorporate beneficiaries into the work.

The shelters were adapted according to the number of people in the family. The basic module is 18m². Families with up to 5 members received one module, families over 5 members received two modules and families with over 10 members received three modules.

The construction of the progressive shelter is implemented in two phases: a first emergency response shelter (structure covered with tarpaulin) and a second durable solution (permanent housing with cement cladding). Different cladding materials were tested for the permanent housing.

A prototype was erected to compare the practicality of installation and the acceptance by the target population. The beneficiaries chose cement cladding as they found it more durable, safer and very similar to the construction technique they traditionally used.

The project included safer construction awareness activities for all the families and safer construction trainings for construction workers.

Shelter made from two modules and later upgraded by family.
Photo: Betisa Egea

Two-module shelter with a door added by the family (standard two-module shelter has two doors, one on the front and one at the back).
Photo: Sandra Tapia

Shelter construction was part of an integrated programme to support affected households and communities, access to water and sanitation was later improved. There were plans to drill bore holes, to provide 70 litres of water per person per day.

Selection of beneficiaries

Coordinated project assessments started one month after the disaster intervention in areas agreed through coordinating with other organisations. 3,960 families living in rural and semi-urban areas of Leogane were targeted.

All of the families of the intervention areas were surveyed. Since this was an integrated programme, shelter support was not only provided to families directly affected by the earthquake, but also to families whose houses did not achieve a certain minimum habitability criteria. The aim was to avoid creating inequalities within the communities.

Selection criteria

The following selection criteria were used:

- Families whose main residence became uninhabitable because of the earthquake.
- Families whose house does not achieve a certain minimal condition of habitability, even if it has not been affected directly by the earthquake. These included:
  - lack of space in relation to the number of people who live there,
  - no water and sanitation.
- Vulnerability criteria:
  - number of dependants, elderly, or handicapped people or children,
  - single-parent families,
  - no monthly income.

Technical solutions

The shelter had a galvanised steel frame with a mono-pitch roof and a raised floor. The shelter was 3 x 6m on plan and had 6 columns spaced on a 3m grid, fixed to rectangular reinforced concrete foundations using a base plate and four ordinary bolts per base. The shelter could be demounted and foundation bolts cut to reuse the frame.

The main structure was made from three primary frames spanning in the transverse direction with rectangular hollow section columns. The roof cladding was corrugated steel sheeting nailed to steel secondary roof members spanning between the three primary frames.

Timber studs are screwed to the steel members and the tarpaulin (emergency response) or the perforated metal sheet of the cement cladding (durable solution) attached to them. Additional timber subframing is used to form windows and doors.

The intention was that the structure could be used in a modular manner, putting two side by side to form a double pitched roof structure of 36m^2.

Logistics and supply

Steel frames were procured internationally and shipped to Haiti. Other materials were sourced locally and transported by trucks to site.

Due to lack of understanding of the local construction materials market it was decided to locally purchase some materials that the local market could not provide easily. This resulted in construction delays.

Materials list

Materials	Quantity
Cement (42.5kg bags)	3 bags
Sand	0.38 m^3
Gravel (20mm aggregate)	0.38 m^3
Iron bars 12 mm	36 m
Column base plate (300mm x300mm x6mm plate)	6 pieces
Steel 2mm (80mm x80mm)	27.65m
Floor beams 2mm (40mm x 40mm)	100.9m
Window and door framing (32.5mmx100mm)	9.9m
Plywood door (1.94m x 0.7m)	1 piece
Plywood flooring (21.8thk)	18 m^2
Steel sheeting (0.75m x 1.83m)	18 pieces
Plastic sheeting (6m x 4m)	4 pieces
Mosquito net	8 m^2
Bolts, nuts + washers (20, 10, 6.25 d.)	200 pieces
Brackets (35wide, 70+20legs, 2thk)	70 pieces
Hurricane straps – angles (75x75)	36 pieces
Self tapping screws	75 pieces
Nails (10, 8, 4 d.)	22.7 kg
Hinges	3 pieces
Door latch + padlock	1 piece
Cement cladding:	
Perforated metal sheet	27 pieces
Cement (42.5kg bags)	16 bags
Sand	1.25 m^3
Natural fibre	0.34 m^3

A.9 Haiti - 2010 - Earthquake

Case study:

See "A.4 Haiti - 2010 - Earthquake - Overview" p.12 for background.

Country:
Haiti
Disaster:
Earthquake
Disaster Date:
January 12th 2010
No. of houses damaged or destroyed:
180,000
No. of people displaced:
Approximately 1.5 million
Project target population:
1,356 families
Occupancy rate on handover:
105%
Site density:
30m² / person
Materials Cost per shelter:
Tent 300 USD (excluding transport)
Transitional Shelter 1,600 USD
Project cost per shelter:
Unknown

Project timeline

Project description
Families were relocated from a spontaneous settlement in the Haitian capital to a new planned camp in an area called Corail 20km away. The initial establishment of the camp was according to a carefully considered plan and relocation took place within a month. As with many sites in Haiti, two years after the earthquake, the future for the camp based population remained unclear.

Strengths and weaknesses

✓ Key actors worked together to prepare the site within an extremely limited timeframe.

✓ Strong coordination greatly assisted with the logistics of the relocation through information campaigns and consultation with the affected population.

× The urgency of the relocation initially left little opportunity for activities beyond the provision of shelter, water, sanitation, food, education and health services.

× Greater emphasis on ensuring access to existing or developing livelihood activities would have been beneficial had time allowed and the site was far from existing livelihoods.

× There was a significant delay in the follow up construction of transitional shelters, meaning people had to stay in tents in an area with little natural shade from the sun and wind.

× The site does not represent a durable solution for the relocating families and remains one of 802 occupied camps for displaced families in Haiti.

× Rapid site preparation required significant investment at a time when financial resources for the provision of basic services were limited.

- The impact of having a camp in any location has to be carefully considered since it might end up as a permanent settlement.

- The decision to relocate the people was based on an engineering assessment of the risk of flash floods (high volume, fast moving water) at several spontaneous IDP locations. The identified population faced life threatening risk in their current location. In addition, there was an urgent need to decongest the camp to allow the introduction of basic services.

Left: an aerial photo of a typical spontaneous settlement in Port au Prince.
Right: An aerial photo of Corail shortly after construction.
Photo: Shaun Scales / NRC

Background

See "A.4 Haiti - 2010 - Earthquake - Overview" p.12.

Identification of families

Given the large population in camps within Port au Prince, weeks after the disaster, assessment teams identified specific areas at risk from flash flooding. They also assessed which engineering works could mitigate identified threats to life.

The assessment was conducted in spontaneous settlements within Port-au-Prince. Amongst others, it identified the Delmas 48 site as being at risk from flash floods and landslides during the approaching seasonal rains. The site had over 25,000 people living in high densities on a steep hillside.

The engineering team developed a mitigation plan that included the diversion of surface water and land stabilisation works. To complete these works, an estimated 7,500 people would be required to move from their current high risk plots.

The area of the settlement that needed to be vacated was marked. The high density population left little room for internal relocation and re-organisation.

Selecting the site

State land is limited in Haiti and the power of the government to claim land for public emergency use is even more limited. Identifying alternative land close to neighbourhoods of origin was problematic as most potential sites were already occupied. The only immediately available land of sufficient size was 16km away. This did restrict opportunities for relocating families whilst maintaining access to livelihoods.

Planning the site

The new site was based on a firm plan. Site assessments identified four separate 'sectors' for development with 'Sector 4' selected as the first to be prepared and occupied by the relocating population from Delmas 48.

The outline of the site was determined by existing natural drainage. This was upgraded to protect plots from surface water from above the site and to allow the development of an internal drainage network.

The camp was planned for occupancy as a transitional site with defined individual family plots, internal road networks and space for education, health, recreation and distribution facilities. The plan was strictly followed so that future development with longer term infrastructure could be possible. Although the site was officially temporary, the site planners took account of the possibility that it might not close soon.

Pending the development of durable solutions for the significant displaced population within Haiti, the maintenance of essential services to all camps, including Corail, remains a prolonged and significant challenge.

Site construction

Land clearance and the development of a gravel road network were completed within two weeks. Construction progress was accelerated by foreign military forces, some who were due to depart imminently.

Land clearance allowed plots to be marked for shelter and infrastructure. Tents were then erected and temporary water and sanitation facilities provided. Fire breaks were built and a population density of 30m^2 per person was maintained.

Why tents?

Allowing relocating families to bring their existing shelter materials with them was not seen as a sensible approach as they were generally of too poor a quality to re-use and it was too logistically challenging.

It was recognised that the commonly adopted emergency shelter strategy focused on the provision of plastic sheeting, but given the circumstances tents were provided as they were the best emergency shelter solution.

Relocation

The Camp management agency with support from the Camp Coordination and Camp Management lead organisation initiated a settlement wide information campaign to identify families willing to relocate to a new planned camp.

The relocation of 1,356 families was completed in stages over a ten day period with transport provided by the United Nations mission. A plot identification system allowed each arriving family to be allocated an individual plot which was recorded as part of the registration process and assisted with the future delivery of services.

Transitional shelters and other structures

The delivery of transitional shelter was significantly delayed. However by mid 2011, each family plot had an 18m^2 transitional shelter on it.

Each shelter included a raised cement finished plinth and a small veranda area covered by an extended truss roof.

Education and health facilities were formalised with semi

permanent or permanent structures of wood and brick construction. The original temporary latrines were also replaced with blocks built of bricks.

Eighteen months after the occupation of the site, kitchen gardens and a market selling foodstuffs, household items and handicrafts had been established. Small businesses, including restaurants, carpentry workshops and an art gallery were also established, although the primary source of income comes from work off site.

The school was adopted as a government institution with ministry of education providing salaries for teachers.

Following the occupation of Sector 4, further development of adjacent sites continued to allow for further relocations including 178 families affected by Hurricane Tomas in November 2010.

The longer term

Almost two years after the earthquake, people in camps in Port au Prince continued to receive limited free services in water, education, health, and other assistance.

A typical street in Corail with transitional shelters.
Photo: Shaun Scales / NRC

However services were falling back as funds fell and organisations began to close projects. It was recognised that camp based services could contribute to the sustained presence in camps however an acute shortage of return solutions for the majority of the displared population of former tenants, remained the primary factor hindering camp closure. This may have contributed to the sustained presence of camps.

Two years after the earthquake, the future for camp based populations across Haiti remained unclear. The exit strategy for Corail was always the closure of the camp following delivery of durable solutions for the displaced population. However a lack of reconstruction continues to hinder this process, and Corail was not likely to close soon.

Corail was less densely populated than many spontaneous sites in Haiti. Transitional shelters were built, and this caused some confusion regarding the 'status' of the site. The future closure of Corail would require the same efforts as other emergency and transitional settlements. It also became surrounded by thousands of Haitians who had built their own shelters and houses.

Tents provided initial shelter at the site. This was later upgraded to transtional shelters.
Photo: Shaun Scales / NRC

A Market area in "Corail Sector 4".
Photo: Shaun Scales / NRC

Thousands of people spontaneously moved into the land surrounding the planned sites at Corail, many building durable houses. This spontaneous settlement was not planned.
Photo: Michelle Dupont

A.10 Haiti - 2010 - Earthquake

Case study:

See "Haiti - 2010 - Earthquake - Overview", p.12 for background.

Country:
Haiti
Disaster:
Earthquake
Disaster Date:
January 12th 2010
No. of houses damaged or destroyed:
180,000
Project target population:
Families with disabled persons
Shelter size:
12m², 18m² or 24m² with a 6m² porch dependent upon family size and land.

Project timeline

Project description
The project targeted displaced disabled people in rural locations in the south of Haiti. The project used a participatory approach to build durable shelters. The project re-engineered a well known traditional technique known as *clissade* making it more durable, suitable for mass assembly and later upgrade by beneficiaries.

Strengths and weaknesses

✓ The construction technique of *clissade* is well known by the local population as it has been traditionally used in rural Haiti. As a result it is easy and affordable to maintain and upgrade.

✓ The shelter was designed in panels. Each panel has the same width as a door, allowing beneficiaries to create new openings in their shelter.

✓ The project paid particular attention to beneficiaries with disabilities. Each individual shelter and its sanitation facility was adapted to the type of disability. It was accompanied by a rehabilitation program for people with disabilities, to increase their mobility and build capacities in the use and access to the latrine and the shelter.

✓ The project worked with students from a youth vocational training centre. It aimed to increase their capacity to join the labour market.

× Beneficiary selection depended on a referral system from other organisations. It proved very time and resource consuming to receive beneficiaries referred in this way. This increased the logistical challenges as beneficiaries were identified as the project progressed and were not identified from the start.

× If the beneficiaries do not upgrade their shelter by covering their panels, water could enter and it could be cold.

× Logistics were demanding and slow as rural locations meant that some families could not always be reached by vehicles.

× The project and the design was very labour intensive.

- The shelter was prefabricated in pieces in the central workshop and sent to the field for assembly by beneficiaries themselves. The concept was that shelters could later be moved if required.

Before the earthquake

See "Haiti - 2010 - Earthquake - Overview", p.12.

Before the earthquake, the majority of Haitian families who lived in rural areas lived in self-built houses. Many were built using *clissade*, a Haitian technique of weaving bars of palm wood to make walls. These walls were later covered by mud and cement. The roof was covered with corrugated zinc.

After the earthquake

In general, the *clissade* houses resisted the earthquake much better than the concrete houses. Where they were damaged in the earthquake, the injuries to the occupants were not as severe as those caused by collapsing concrete houses.

Pilot shelter

The project began with a participatory process that lasted 10 days. During this time, community groups were organised in a remote village. The focus was on understanding the daily activities of each member of the family, including working, cooking and sleeping. This process lead to a shelter design being developed that could be used for a pilot shelter.

A location for building the pilot shelter had to be negotiated with the local authority. It was intended that the pilot shelter would be useful for the community. In the end it became a treatment centre for disabled people.

Once a site was identified, it took another 10 days to organise teams and materials to build. The pilot shelter allowed different technical solutions to be tested. Different technical and design corrections were made to the pilot in order to improve it and to fit it in the budget. The shelter was assessed by structural engineers offered by another organisation. Specific changes including additional bracing and hurricane straps were required to ensure that it could withstand 100 mph (161 Km/h) peak wind speed.

The shelter was later adopted by the local authority and by several other non-governmental organisations. Once designed, the next three months were spent negotiating with donors, tendering, organising logistics and preparing workshops. The workshop was designed and organised with a chain of production producing around 30 shelters per week with almost 45 persons working inside.

The programme included a sanitation component providing with access to latrines or an adapted sanitation solution. Both the shelters and the sanitation component were adapted to the disability of the beneficiaries of the shelter.

To build the shelters, 60 USD was given to the beneficiaries to pay local workers. The organisation provided skilled workers to lead the construction.

Less than 40% of the families owned their land. For these families, a multi-party document was signed to keep the beneficiary on the land for free for at least for 3 years. This was signed by the beneficiary, the landowner, the community leader, the mayor and the organisation. After 3 years, the beneficiary will remain the owner of the shelter and the owner will keep the latrine.

At its peak, the project had a staff of over 150 people working in the workshop, on site, in logistics and as social mobilisers.

Day	Stage	Worker days
1	Ground preparation	2 x technical advisor, 6 x beneficiaries
2	Digging foundatrions	6 x beneficiaries
3	Bolting and fixing columns	1 x chief carpenter 1 x chief mason 6 x beneficiaries 6 x labourers
4	Embankments	6x workers
5	Installation of panels and carpentry	1 x chief carpenter 6 x beneficiaries 3 x workers
6	Paving and drainage	1 x chief mason 6 x beneficiaries 3 x workers
7	Fixing roof windows and doors	1 x chief carpenter 6 x beneficiaries 3 x workers

Selection of beneficiaries

The project targeted vulnerable families affected by the earthquake, including people with disabilities. A survey form was prepared to select the most vulnerable people amongst those who were referred to the organisation. A social officer worked in close collaboration with the organisations field office, with other non-governmental organisations referring families with disability cases and with local organisations and associations.

The shelters were built using a traditional technology known as clissade. Photo: David Sacca

A traditional shelter that survived the earthquake.
Photo: Joseph Ashmore

A completed shelter, based on vernacular styles.
Photo: David Sacca

Technical solutions

The T-shelter was made from pressure treated pine wood. Panels were prefabricated in the workshop and were then transported to the field. Once on site, the pieces were bolted together. All the nails and screws (the panels were fixed with nuts and bolts, not nails) were double hot dip galvanized.

For roofing, corrugated bituminous sheets were selected. They were selected due to their 15 year guarantee, their thermal properties and their strength.

The site for each shelter was prepared by a team who were tasked with taking into consideration possible risks, such as landslides, of each plot. The field teams were expected to conduct work to mitigate the risks.

Each shelter is raised by between 30 and 50 cm from the level of the ground preventing water entry in case of floods.

The shelter was designed and tested by structural engineers to be resistant to hurricane, earthquake and floods. It was also designed to ventilate naturally.

Logistics and materials

Once the shelters had been prefabricated in the workshop, it proved challenging to get the components to remote locations in the mountains of southern Haiti.

Many of the raw materials had to be imported to Haiti. For example the timber used was pressure treated pine that was not available in Haiti. Most were shipped in and then trucked into the workshop in Petit Goave. In the workshop, the whole shelter was pre-fabricated in panels and trusses. The pre-assembled components were then transported to the site, by truck or by hand in difficult to access areas.

Materials list

Materials	Quantity
Timber 2"x2"x14' (50x50mmx4.3m)	4 pieces
Pine 2"x4"x14 (50x100mmx4.3m)	89 pieces
Pine 1"x4"x14 (25x100mmx4.3m)	23 pieces
Pine 1"x6"x14 (25x150mmx4.3m)	3 pieces
Plywood 1/2" (13mm)	3 pieces
Plastic mosquito net 48" (1.2m)	20' (6m)
Wood Glue	0.5l
Corrugated fastener 1"x5"	unit
Corrugated roof sheets (Onduline)	19 pieces
Ridge (Onduline)	9 pieces
Twisted roofing nails for wood 2 1/2"x9" (60x230mm)	
Threaded rod 3/8" 80" (10mm)	23' (7m)
Nails: 1 ½"-5" (30mm-125mm)	
Coiled strap (Hurricane strap)	15 m
Hinge 4"x4" (100mmx100mm)	1
Hinge 3"x3" (75mmx75mm)	2
Bolt 4", 3"(100mm, 75mm)	2
Wood screw 3½"x10	
Cement	18 bags
Sand	6 m^3
Gravel 5/25	4 m^3
Cement blocks	70 pieces

Some areas were difficult to access and materials needed to be transported by hand.
Photo: Olivier Dorighel

A.11 Haiti - 2010 - Earthquake

Case study:

See "A.4 Haiti - 2010 - Earthquake - Overview", p. 12 for background.

Country:
Haiti
Disaster:
Earthquake
Disaster Date:
January 12th 2010
No. of houses severely damaged or destroyed:
185,000
Project target population:
8,450 households after 24 months
T-Shelter size:
Aim for 18m² minimum
Less considered when insufficient space
Materials Cost per household:
T shelter: 2,800 USD
500 USD livelihoods grant
Project cost per household:
T-shelter projects: 4,500 USD

Project timeline

Project description
The project supported people to leave overcrowded camps and encouraged them to lead their own recovery process. It provided transitional shelters for those with land, cash for those who needed to rent, and relocation grants for those who moved to different areas. It also subsidised health care and provided livelihoods grants which were used to help re-establish businesses, or to support children going to school. Camp decongestion required at least one year of monitoring and support after families had relocated.

Strengths and weaknesses

✓ The project took a broad approach to shelter, looking at the overall settlement issues.
✓ Households were involved in identifying a shelter solution with which they felt comfortable.
✓ Families were able to quickly pick up some threads of normality with the cash support to develop income generating activities.
✓ Physical security for people was improved once they were out of the camps.
✓ Cash gave people a greater degree of choice and permitted them to spend money according to their own priorities. This in turn helped to maintain people's dignity.
✓ Cash had potential benefits for local markets and trade.

× The process was very labour intensive and required constant monitoring and support.
× The process for cash transfers was cumbersome and needed to be shortened.
× Technical support for some construction aspects has been limited. In particular, viewing the land and identifying the work that was required before construction could begin.
× Camp committees were difficult to manage as they believed that they should be receiving a salary.
- Some people did not want to leave the camps as they believed that they would continue to receive goods if they remained there.
- Some households split across multiple sites to receive a greater total amount of assistance.

Background

See "A.4 Haiti - 2010 - Earthquake - Overview", p. 12.

After the earthquake

Up to eighty percent of the population in Port-au-Prince rented either the house or the land. In other urban centres such as Leogane, up to seventy percent of the population rented.

Reconstructing houses would restore the assets of the landlords, but would not ensure the availability of this accommodation to the former tenants who are currently shelter-affected.

Residential reconstruction activities therefore included measures to ensure that former tenants received benefits in kind through agreed rent-free tenancies for a defined timeframe, separate cash grants linked to rental accommodation, or shared usage rights.

Settlement approach

The organisation implemented projects using a 'settlement approach'. Communities and infrastructure were supported, integrating other sectors such as water and education. Many of the projects had strong economic and social 'livelihoods' components.

Shelter was seen as including support to all of the settlement options chosen by affected populations, including host families, rental accommodation and, where necessary, camps. In choosing between options, families and groups can make best use of their coping strategies.

Five months after the earthquake, the shelter team began registering people in four camps in an area of Port au Prince. A variety of solutions to support households were identified.

The interventions were based on assessments and discussions with families. Three areas of support were identified:

- an improved shelter solution,
- support for livelihoods,
- an option to help their children return to school.

The project also had a significant information component and the organisation actively promoted public health messaging. Photo: Julien Goldstein

Different options offered

Different options were provided depending upon the context that the family found itself in:

1) Own land

Some people had the option to move back to where their house was or to a piece of land to which they could show ownership. They received a T-shelter on their land and received a 150 USD grant.

8% of families received this form of assistance.

2) Access to land

Some people knew someone who had a plot of land who agreed that they would be able to reside on the plot for two years. They had to produce a signed document stating that they can live on the land for two years, and a copy of the ownership documents and their identification

They received a T shelter built on the land and a 150 USD grant.

3) Repairable houses

People who had houses classified as green (having minor damage) were offered cash or a voucher to access the needed materials, an unconditional business grant, and training on earthquake resistant construction.

In the first two years of the project, no families chose this support option.

4) Resettlement in Port au Prince

Families identified accommodation within Port-au-Prince that they could rent. If the accommodation was deemed to be secure, had water and sanitation facilities and was seen as a safe dwelling, the family received up to 500 US dollars to resettle. This sum covered a year´s rent.

Often, people moved towards the areas they lived in previously as they were familiar with the area.

72% of families in the project chose this option.

5) Resettlement in the provinces

19% families chose to return to their provinces of origin. These families received a resettlement grant.

Additional support

All Families additionally received:

- A livelihoods grant of 500 USD divided into two distributions of 250 USD. The first was one month after having left the camp and the second was after three months.
- A training was provided on managing finances and business opportunities of their choice.
- Families were supported with health insurance for one year. The health insurance was provided by a local organisation. The insurance was 1 USD monthly per person, and entitled them to free consultation at clinics run by the organisation. It also limited their payments for medicines to a maximum of 150 USD. They could also have low cost medical investigations.

The project included support for livelihoods , support getting children back to school and access to improved health care.
Photo: Julien Goldstein

The small minority of families who did not take up any of the support offered signed a document to show that they had refused the offered support and would remain in the camps. Once families moved out of the camps, sometimes other families might settle in space made. It was the responsibility of the Haitian authorities to deal with these cases.

Monitoring and evaluation

The organisation was asked to intervene in the camps that it is working in either by the government, local organisations that were involved there or by the communities themselves. In some cases camps under threat of eviction asked the organisation to help.

All families in the camps were eligible for one of the support options above. The focus was on people without a land title. After registration, people were responsible for organising their preferred accommodation.

Camp decongestion did not end with finding shelter solutions and moving families out of the camp. At least one year of monitoring with support in livelihoods and vocational training followed.

The organisation provided transitional shelters for those with land to build on. It provided cash grants to help people other rent or resettle elsewhere.
Photo: Julien Goldstein

All families were provided with cash grants and training to allow them to establish livelihoods.
Photo: Julien Goldstein