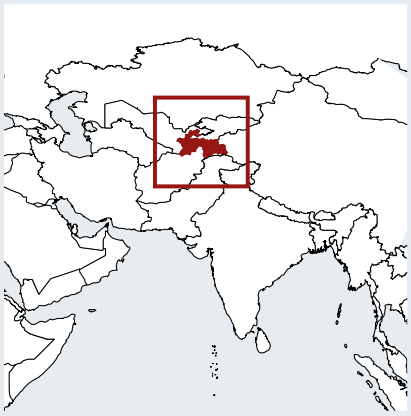
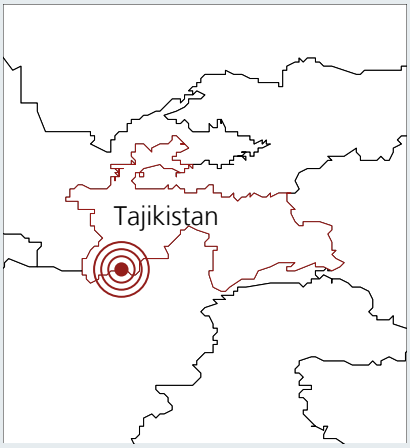
# A.29 Tajikistan - 2010 - Earthquake

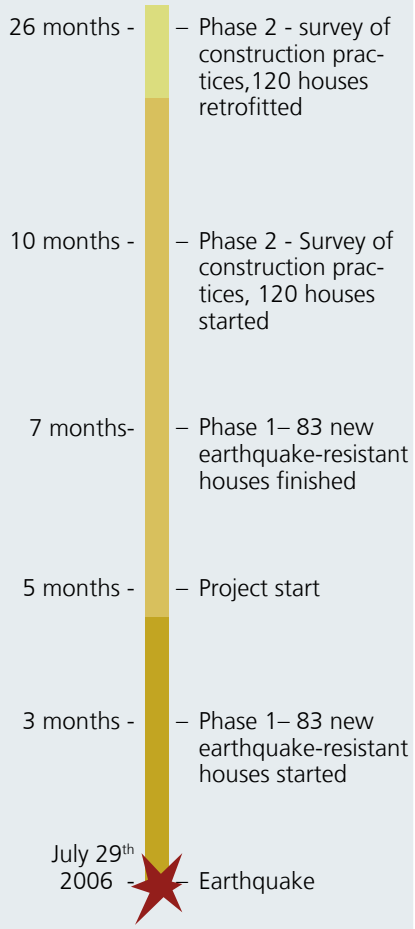
## Case study:

**Country:**
Tajikistan
**Disaster:**
Earthquake
**Disaster date:**
July 29th 2006
**No. of houses destroyed:**
1,000 destroyed
1,500 damaged
**No. of people affected:**
16,000 people lost their homes
**Project target population:**
83 new build houses
120 houses retrofitted
**Occupancy rate on handover**
100%
**Shelter size:**
New house - 45 $m^2$
Reinforcement of two rooms in the house – 32 $m^2$
**Materials Cost per house:**
New houses – USD 6,405
Reinforcement of two rooms – USD 895
Loans average 800 USD
**Project cost per house:**
New house – USD 7,945
Reinforcement of two rooms – USD 984






**Project timeline**




**Project description**
This project helped to rebuild communities affected by earthquakes in the Kumsangir district. It also aimed to help prepare remote rural communities against further earthquakes and mud slides. The project used alternative and affordable construction technologies and provided loans to help families to rebuild or repair their homes.

**Strengths and weaknesses**

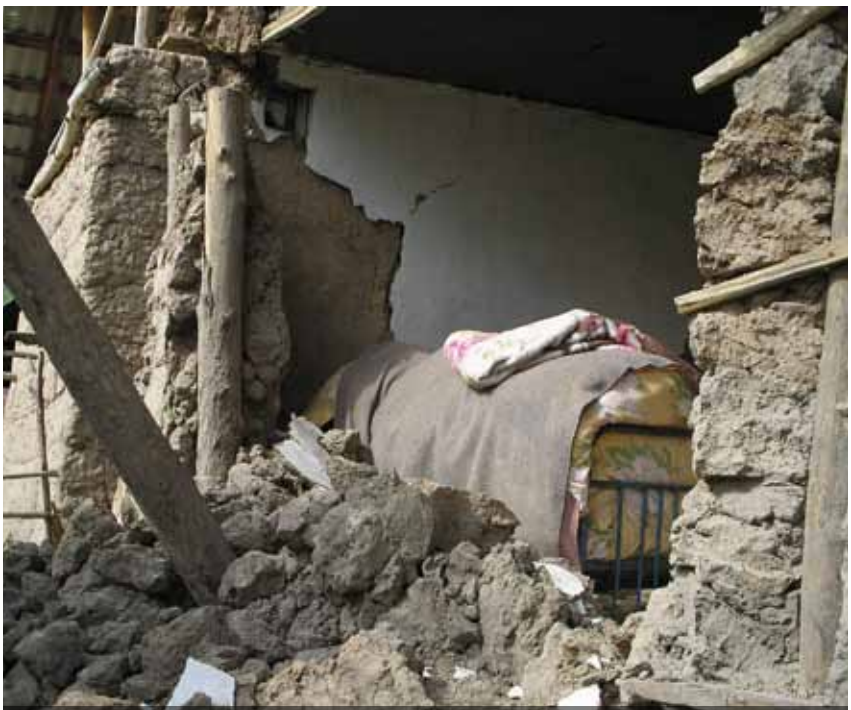
✓ The project used local materials to reduce costs and avoid delays in transportation.
✓ The low technology reinforcement and construction technology was simple and was 30 percent cheaper than the standard reinforcement techniques.
✓ The project promoted owner-driven home reconstruction and involved the whole community in the procurement and construction process.
✓ Families were offered loans that they could repay into a revolving fund. This was used to finance later projects.
× The project met the housing needs of 10% of the affected population. However, there was limited response by other organisations.
× Affected villages were located far from each other leading to logistical challenges.
× The technology was viewed positively by the local population. However, many families who were not affected by earthquakes soon forgot or dismissed the risks, as they had other priorities and limited resources.
× Structural elements were more easily applied in new construction than in retrofitting after the disaster. Reinforcement involved the destruction of wall finishes.
× Loans require that families have sufficient income to be able to repay them. The poorest people may therefore be excluded.
- This project involved a number of partners.

## Before the earthquake

Tajikistan lies in a mountainous region. Annually, it experiences over 5,000 tremors and earthquakes. In total, from 1980 to 2010, more than 6 million people in Tajikistan suffered from the effects of natural disasters.

The main causes of destruction during earthquakes are poorly constructed homes which lack any earthquake resistant, seismic technology. This is also coupled with lack of knowledge, and limited financial resources to reinforce or even maintain homes.

Around 75% of the population in Tajikistan lives in remote rural areas in the mountains. These are the families that are most vulnerable to disasters. In addition to that, almost half of the population lives on less than 2 dollars a day.



The project rebuilt about 10% of the damaged and destroyed houses using food for work, loans and materials distribution. Photo: Habitat for Humanity Tajikistan

## After the earthquake

On 29 July 2006, two earthquakes in separate locations hit Tajikistan. They fully damaged 1,000 houses and partially damaged 1,500 houses. There were concerns for the winter ahead.

## 1st Phase: 83 new houses

In the initial phase, the organisation, in partnership with international non-government organisations, the government of Tajikistan and the affected communities, supported 83 families to build new earthquake-resistant houses.

Beneficiary families were involved in the whole process of planning and building. They were trained in construction skills, earthquake resistant construction and house maintenance. The families provided all necessary unskilled labour.

## 2nd Phase: 120 houses reinforced

In the second phase of the project, the organisation worked with the UN to support the retrofitting of 120 homes in earthquake affected districts.

This phase of the project was implemented in three stages:

- research and technology development,
- training,
- construction / retrofitting.

Starting from May 2007 construction team members and an expert at the national seismic institute conducted a joint survey of newly constructed houses in three target communities of Kumsangir.

Based on the results of the survey, the design, technical intervention and the scale of the project were identified. The institute initiated technical research on the effectiveness of using local materials to reinforce mud walls.

Training workshops on house reinforcement using locally available materials were conducted in target communities. During the workshop participants learned about the methods and practiced by reinforcing and retrofitting one house.

Both women and youths were actively involved in the production and mounting of grids made from mulberry branches to reinforce the houses. A permanent project team, made up of engineers and supervisors assisted the families by giving them training and assistance.

An external organisation provided support by providing "food for work" to the project beneficiaries. Families received the food based on the amount of working days they invested in the construction of their houses (wheat flour 2 kg/person/working day, vegetable oil 75g/person/working day, salt 25g/person/working day, pulses 200g/person/working day.)

The families were selected by the Committee of Emergency Situation of Tajikistan, a United Nations agency and the organisation itself.

The criteria for family selection were based on three pillars:

- housing need,
- ability to repay,
- willingness to partner and contribute hours of labour.

The organisation aimed to ensure that it serves the most vulnerable first. However, as the organisation encouraged self-driven reconstruction and ownership of homes, families were required to have a minimal stable income and be willing to work on the construction or reconstruction of their own house and, if needed, neighbouring homes.

**"Now my house is solid and I am not in fear of earthquakes as I was in the past. It has reinforcement frames made of wood and mulberry branches and I am sure that it can protect my family from earthquakes in the future"**

**Shamsov Sharofidin, 58-year-old head of the family**

**Houses were retrofitted with a mesh of mulberry branches to increase seismic resistance developed by the Tajikistan institute for seismology. Photo: Habitat for Humanity Tajikistan**

## Technical solutions

A mesh of mulberry branches was used to make rural homes more seismically resistant. This was a new technology to the area. The aim of this was to reduce the risk to life due to building collapse as well as to reduce the chances of reinforced houses being damaged in small or middle magnitude tremors.

The external and internal damaged walls were channelled out to take the structural timber frame, to where the floor and walls joined and the walls and ceiling joined. Filling this, mulberry twigs woven into grids, were attached to the timber framing, and then plastered with an adobe render/plaster, which was fortified with straw and wool.

Mulberry branches were tested for sufficient strength as required by Tajik national building codes and norms. According to the data from the Institute of Seismology in Tajikistan, if the walls are properly plastered, mulberry branches could serve a minimum of 25 years without losing their strength and without getting brittle.

The approach was cheap to build as mulberry branches are free to people living in rural Tajikistan and the total reinforcement process costs 33 percent less than the steel reinforcement bar (rebar) alternative.

To make the grid, branches are bound to each other with steel wire. The wire is also used to fasten the mesh element to the walls and to the wooden structure of the wall.

This approach of adding a grid of branches could also be built into the construction of new homes or retrofitted into existing homes, specifically those already suffering from some earthquake damage.

## Loans

The organisation offered loans averaging 800 USD. These were designed to cover the construction and reinforcing costs. Homeowners could repay their loans with 18 USD monthly instalments over a period of 3 years. These repayments went into a revolving fund. Later, this fund was used to offer more loans to families for retrofitting houses in the disaster prone areas. Families paid monthly instalments at the nearest bank in their respective community.

One year after the project completion, the organisation returned to support 206 families with non-profit loans to retrofit their houses to improve their resistance to earthquakes.

## Achievements

Perhaps the most important achievement of the project was that at the end of it, families and organised community groups developed vital skills of safer house construction. These skills could be then applied without additional assistance, as well as transferred to other communities.

**A wall being retrofitted. Photo: Habitat for Humanity Tajikistan**

## Materials list

| Materials | Quantity |
|---|---|
| Timber (150mm x 100mm x 2.7m) | 16 |
| Timber (50mm x 100mm x 3.2m) | 8 |
| Timber (50mm x 100mm x 5.2m) | 4 |
| Mulberry mesh 150mm x 150mm | 96m$^2$ |
| Timber (50mm x 150mm x 3.2m) | 4 |
| Timber (50mm x 150mm x 5.2m) | 4 |
| Timber (for doors/windows) (100mm x 50mm x 3.2m) | 16 |
| Timber (for doors/windows) (100mm x 50mm x4.1m) | 4 |
| Binding wire | 4kg |
| Tightening wire | 3kg |
| Wire | 10kg |

Total timber 1.5m$^3$