SUSTAINABLE SHELTERS for post earthquake reconstruction

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MISSION

To *educate* the community in the village of Bana, Pakistan, about improved building practices to assist in the transition towards livelihood restoration and self-sufficiency in the reconstruction process.
CURRENT SITUATION

- In October 2005, an earthquake of 7.6 scale devastated areas of northern Pakistan.

- **Bana**, in the remote valley of Azad Jammu & Kashmir (AJK) is one of the affected villages.
  
  - Affected population: 2,800
  - Damaged Homes: 500

Courtesy of USGS.
CURRENT SITUATION

60% of the affected population still lives in make-shift shelters, which:
- are not seismically sound
- have poor indoor comfort conditions

- **Homes** built by NGOs and the Pakistani Government:
  - require expensive manufactured components
  - are not customized to local
• The need of the hour is to use traditional technologies which will also provide much needed employment to the people of the area, rather than highly skilled techniques, which will marginalize them.

Faultlines in Earthquake reconstruction policies

Yasmeen Lairi
THE NEED

- Housing needs to be safer and more sustainable:
  - To reduce community’s vulnerability to future disasters
  - To improve living conditions that had existed prior to the earthquake

- Education and dissemination of improved construction practices is required:
  - for the residents of Bana to make informed decisions in the reconstruction process.
Based on previous field research, our developed solution consists of

1) constructing a demonstration home

2) training members of the community in the construction and teaching processes, and

3) disseminating educational materials about construction practices that are more:

- efficient  - affordable
- adaptable  - resourceful

OUR SOLUTION
OUR SOLUTION

- Construct physical model of small-scale building improvements
  - Constructed by:
    - local mason, 3 construction workers
    - Staff from partner organizations (Packages Ltd. and Kashmir Education Foundation)

- Educate about the need for improved building methods and how to teach those methods
  - Training staff: community partners & IDEAS team
  - Participants: 30 local residents (men/ women, skilled/unskilled)

- Illustrate essential ideas about:
  - Improved seismic resistance
  - Improved thermal efficiency
  - Rainwater harvesting
  - Ventilation & day-lighting
SUSTAINABLE SHELTERS
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Key features:
- Improved seismic resistance
- Improved insulation
- Rain water harvesting
- Improved Ventilation

Construction
- Use of local materials
- 2 week staged construction
- Skills to encourage entrepreneurial activities

Priorities for Improvements:
- Efficiency
- Resourcefulness
- Affordability
- Adaptability
- Ease of construction

Image removed due to copyright restrictions.

Traditional House

Improved design

C.G.I Shelter

### Stakeholder Participation
- **Design & planning:** Information sharing, Consultation, Collaboration, Empowerment
- **Construction:** Owner driven, Participatory, Subsidized
- **Maintenance:** Local community has skills, Technical support not needed from organization, Local entrepreneurs control material supply chain

### Materials
- **Raw:** Most materials available locally, Procured from region in environmentally friendly, Salvaged from debris
- **Manufactured:** Subsidized by organization, Obtained through material hub, Standardized sizes, Reduced packaging, Can be recycled / reused

### Properties
- Light weight roofing material, Fire resistant interior, Water resistant foundation & exterior, Resistant to vectors, Non-toxic

### Attributes
- Flexibility- varied use of space
- Livability- accessible & secure spaces
- Sense of community
- Adaptability- easily upgraded

### Space Allocation
- **Cooking**
- **Sleeping & entertaining**
- **Cleaning/ washing**
- **Domestic activities for women**
- **Livestock shelter**
- **Storage**

### Improved seismic resistance
- **Wall**
- **Roof**

### Insulation
- **Floor**
- **Wall**
- **Roof**

### Indoor comfort conditions
- Temperature
- Ventilation
- Day-lighting

### General Conveniences
- Stove with smoke extraction
- Latrine
- Water source: rain water harvesting
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WHO’S INVOLVED

phase I
(June -August 2007)

1) Recruited during initial consultation
2) Learn low cost innovations during demo home construction
3) Stipend available for assisting during training session

Local masons

phase II
(August 2007 - )

1) Assist members in the community to construct homes (for pay)
2) Assist to train other members to locally manufacture innovations for low-cost improvements (stipend provided)
3) Distribute pamphlets in training locations

1) Construct own homes
2) Hired as skilled labor by contractors
3) Involved with entrepreneurial activities (producing insulation panels, reinforcing masonry walls, constructing trusswork for roof, contracting market materials)

residents of bana (un-skilled)

1) Involved in initial consultation for housing design
2) Observe improvements articulated in demo home & learn about the sustainability of the design
3) Attend morning training session

1) Apply insulation/plaster/ rainwater harvesting system to existing shelter (subsidized materials available)
2) Engage in entrepreneurial activities (insulation panels, water collector for rainwater harvesting, plastering etc)
3) Participate in community meetings

women

1) Observe improvements articulated in demo home & learn about the sustainability of the design
2) Obtain assistance from local community & training staff to upgrade existing shelter

persons from nearby village

Local community

1) Involved in initial consultation for housing design
2) Observe improvements articulated in demo home & learn about the sustainability of the design
3) Attend training session (1 bag of flour distributed per attendee)
WHO’S INVOLVED

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**PHASE 1**
June- Aug 2007

**Construction Manager**

  - Arrange meetings, organize procurement & storage of materials, sequence construction with community partners

**Dissemination Personnel**

- **Jean Li** (MIT '10) Architecture
  - Design & produce construction manuals, pamphlets and catalogue in collaboration with community partners

**Design Engineer**

- **Zehra Ali** (MIT '07) Building Technology
  - Conduct initial consultation and surveying, assist in construction of demonstration home, plan and oversee training session with community partners

**Community Partners**

- **Packages Ltd.**
  - A Pakistani paper-packaging company that has participated in the relief effort in the Rawalkot region, has pledged to fund and manage the reconstruction efforts in Bana

- **Kashmir Education Foundation**
  - A non-profit NGO, that has established English medium schools and teacher training institutes in rural areas of Rawalkot in the past and is now involved with the reconstruction of shelters in the region.

**PHASE 2**
Aug 2007-

**Packages Ltd.**

1) Place orders for materials in demand
2) Catalogue entrepreneurial activities
3) Apply for grants and organize the introduction of local welding and sawing center to assist entrepreneurial activities

**Dissemination Personnel**

1) Discuss improved dissemination of ideas with other interested organizations
2) Improve design of pamphlets based on community suggestions
3) Pitch project to other NGOs and ERRA through website

**Design Engineer**

1) Evaluate the popularity and prioritization of construction improvements by local community
2) Collaborate with other organizations on design for increased adaptability
3) Make design suggestions available online
4) Meet with other organizations

**Community Partners**

1) Support entrepreneurial activities
2) Subsidize construction materials
3) Oversee reconstruction of village

1) Dissemination of design through improved educational programs
2) Training community members & raising awareness
THE PROJECTED IMPACT

The success of this pilot program will lead to the adoption of our innovative dissemination and reconstruction program by community partner, Packages.
From the knowledge gained through this project:

- **residents** will be able to build and maintain individual homes for families

- **local entrepreneurs**, with our initial assistance, may create construction businesses and small industries specializing in local materials

- **women** will be empowered to earn a living using skills in areas of work typically not open to them

- an **awareness** of basic engineering concepts and long-term sustainability will be created

- **additional communities and organizations** will incorporate the dissemination solution into the rebuilding of other areas
QUESTIONS?
EC.715 D-Lab: Disseminating Innovations for the Common Good
Spring 2007

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