Sustainable Housing Reconstruction Following Wenchuan Earthquake

Submitted by: China Architecture Design & Research Group (CADG)
Sustainable Housing Reconstruction Following Wenchuan Earthquake

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### Causes of housing damage

- Underestimation of earthquake hazard
- No consideration of earthquake requirement
- Earthquake induced serious geological disaster
- Vulnerable building system

<table>
<thead>
<tr>
<th>No</th>
<th>Location</th>
<th>Magnitude</th>
<th>Seismic basic intensity in Zoning Map</th>
<th>Event Peak Intensity</th>
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<td>1966 Xingtai 河北邢台</td>
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<td>1973 Luhuo 四川炉霍</td>
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</table>
Building with story collapse in Beichuan county (XI) (basic intensity VII)

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Middle school residential building in Xiaoyutou cun of Qingchuan county which was built in 1950s without considering earthquake requirements.

**Causes of housing damage**

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New town

Beichuan county town

Jingjiashan landslide

906 died!

Two large scale landslides which were slid 600 years ago. Newly slides strengthened in 1990 by anti-slide piles keep intact.

1600 died!

Wangjiayan landslide

Old town

Big slide with 30 million m³ of soil and stone occurred at Donghekou village in Qingchuan county buried 700 people and let the ground surface raised 100m.
Residential buildings of Seismology Bureau in Wenchuan county town damaged by a big stone fallen from maintain near by.

Causes of housing damage:
- Underestimation of earthquake hazard
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Damage of buildings with first soft floor

• Active participation and cooperation of governmental, non-governmental, and professional bodies, as well as victims
• Good reconstruction plan
• Efficient Implementation
Where rebuild?

1. Rebuild at original place should be put in the first priority.

2. Partially rebuild at the original place, partially move to close neighbouring place.

3. Renounce the original place and move to a new place is a more expensive and more difficult solution. It can be adopted on the following conditions:
   - It is very difficult to take measures to mitigate future disasters.
   - Inhabitants are willing to relocate.
   - Economically, environmentally and ecologically feasible.
How to deal with damaged housing?

Technology Capable + Economy Feasible + Planning allowed = Strengthening

Keep original configuration, lean no more than 5%-1.0%

Strengthening cost no more than 70%-75% of the reconstruction fees

Located in the area allowed in reconstruction planning

1. Satisfy emergency needs of the victims
2. Occupying large area of cultivated land
3. Victims are isolated with their original place
4. Price is close to local commercial housing
Resources for reconstruction

- State & local government
- Donations
- Collective institutions and individuals
- Partner Assistance program

21 economically advanced provinces gave supports to 23 seriously damaged counties in Sichuan and Gansu.

E.g.: Shandong ➔ Beichuan
Zhejiang ➔ Qingchuan

Tasks of support
- Providing temporary shelter to each household
- Providing basic livelihood goods to each household
- To assist rehabilitation and reconstruction, including houses and infrastructures
- To assist economy recovery

Sustainable reconstruction

- Highest resources efficiency
- Lowest environment impact
- Most benefit to man & bio-community
Thank you

谢谢
AMESEGNALEHU!

СПАСИБО

スキーグルバールサ デンケ オブリガダ

mahalo Khun Khun