# Disaster Mitigation

## HUDCO'S Techno-Financial Assistance for Rehabilitation/ Reconstruction Programme for Areas Affected by Natural Disasters and Calamities

India is a country vulnerable to various natural calamities like earthquake and landslides in the hilly terrains of Northern and North-Eastern States and the Kutch region of Gujarat, Latur in Maharashtra; cyclone, sea erosion and flooding in the coastal States and flooding in many States. After each of these natural calamity, substantial humanitarian, social and economic loss by way of damage to property and life takes place, rendering large number of families homeless and communities without basic social and utility infrastructure. As a part of the rehabilitation for the affected people and reconstruction, repair and retrofitting programmes and other requirements taken up by various State Governments, HUDCO has extended its special financial and technical assistance for rehabilitation housing and other programme. HUDCO's assistance has helped in the rehabilitation of 41.44 lakhs (4.1 million) families affected by natural calamities.

HUDCO has been instrumental in rehabilitation and reconstruction programs in times of crises due to natural calamities like earthquakes, landslides, cyclone, flooding, sea erosion and tsunami etc in various parts of the country. Consequent to these natural calamities, substantial damage to property and assets takes place, rendering large number of families homeless. HUDCO has contributed technically as well through its financial support for the disaster management, rehabilitation and resettlement of the affected families.

HUDCO has so far extended its support in various forms in the following calamity hit areas:

1. Bhopal gas tragedy
2. Earthquake at Uttarkashi, Latur, Jabalpur, Chamoli, Gujarat, Jammu & Kashmir and Sikkim
3. Super cyclone in Orissa and cyclone rehabilitation in Andhra Pradesh
4. Tsunami in Tamil Nadu
5. Recent cloudburst at Leh, Ladakh

| **Natural Calamities** | **HUDCO Loan Amount - Rs. in Crore** | **No. of Houses Supported** |
|---|---|---|
| Earthquake and Landslide | 197.45 | 1,31,067 |
| Cyclone | 1054.17 | 4,37,934 |
| Flooding and Sea Erosion | 957.74 | 35,75,734 |
| **Total** | **2209.36** | **41,44,735** |

HUDCO has rendered financial assistance of Rs 2209.36 crore and played a significant role in identifying the appropriate materials and technologies suitable for sustainable and resilient construction for housing options in areas vulnerable to earthquake, cyclone and flooding. HUDCO's technical recommendations for design and construction are based on the suitable standards like Bureau of Indian Standards (BIS), National Building Code, Special design and construction Code for

Earthquake and Wind Resistant Construction and findings of Research, Development and Technological Institutions like CBRI, SERC, RRL's and Technological Universities. These are further converted into user friendly pictorial guidelines and manuals with DO's and Don'ts for disaster resistant construction using various technologies/local building components. The Rehabilitation Projects undertaken by HUDCO are-

1. Leh Rehabilitation Project for Victims of Cloud Burst of 5 - 6 August 2010 by HUDCO as a Corporate Social Responsibility Initiative.
2. HUDCO's Assistance for Rehabilitation of Earthquake Affected Regions of Gujarat 2001.
3. HUDCO's Assistance for Earthquake (Chamoli 1999) rehabilitation in the Hill Districts of Uttar Pradesh.
4. HUDCO's Assistance for Rehabilitation of the Super-cyclone affected in Orissa 1999.
5. HUDCO's Assistance for Earthquake rehabilitation in Jabalpur 1997.
6. HUDCO's Assistance for Earthquake rehabilitation in Latur and Osmanabad 1993.
7. HUDCO's Assistance for Housing for Gas Tragedy victims, Bhopal 1984.

**Model Houses for Earthquake victims of Gujarat**

Further, special efforts for technology transfer and training of local artisans on construction of cost-effective houses using appropriate technologies have been made for establishing special Building Centres in the natural calamities affected areas. These Building Centres have contributed significantly in housing delivery system through training of local artisans, production of building material components, extending construction assistance, and filling the gap for providing housing guidance, information, and counselling to the local people for repairs, renewal and retrofitting of damaged housing and buildings stock.

Further, HUDCO has also directly contributed in the construction and exhibition of demonstration houses using disaster resistant features incorporating stakeholder participation and based on the beneficiary requirements. HUDCO also adopted villages and urban bastis under the Model Villages and Model Basti development schemes for rebuilding villages/urban bastis that were completely destroyed

HUDCO's Research and Training Wing namely the Human Settlements Management Institute (HSMI) has played a major role in imparting training and capacity building programmes and the awareness on various facets of disaster mitigation to the Government officers of state departments, urban local bodies, urban planning and development institutions, Executives of various housing agencies as well as urban professionals working in the housing sector.

**Leh Rehabilitation Project for Victims of Cloud Burst of 5 - 6 August 2010 by HUDCO as a Corporate Social Responsibility Initiative**.

Ladakh was struck by a cloudburst on 5th and 6th August 2010 that wiped out the lives of more than 150 people, left more than 500 missing and washed away houses across Ladakh region.

**Situational analysis**

It was observed that the after the cloudburst the floodwaters damaged houses that were located in the watershed areas that served as channels facilitating flow of floodwaters. Since housing sites were washed away, the District Administration allotted them plots of 30 x 60 ft size in the Solar Colony near Leh. Traditionally houses have 2-3 rooms and were constructed either with mud blocks or dressed stone to withstand the extremely cold climatic conditions.

**Challenges**

After the emergency rescue and relief the victims were lodged in tents and other temporary shelters which are not suitable for stay in the harsh winter.

The 634 damaged houses were located in over 62 villages spread across 86,000 sq.km. in Ladakh and the connectivity to many of the villages was poor.

The critical factor in this situation was that the winter was just two months away wherein temperatures drop to as low as minus 25 degrees Celsius, and the victims had to be rehabilitated in weather proof shelters before the onset of winters. During winters most of the mountain passes connecting Ladakh are closed down on account of snow. Moreover, working with traditional items like mud blocks is not possible as temperatures do not allow setting process required for traditional materials i.e. mud blocks and mortar to solidify during winters.

**The solution**

Keeping in view the challenges, it was decided that a starter unit consisting of one room with adequate thermal comfort should be provided as immediate relief. The beneficiaries could then expand the housing unit with the monetary assistance of Rs. 3 lakh given to them by the Central and State Governments, after the winter season. The material chosen for housing was PUF (polyurethane fibre) injected panels sandwiched between pre-painted galvanized iron sheets on either side. The design and technology was finalised only after a detailed dialogue and consultation with the community and the CSR team of HUDCO. The options and constraints were discussed and before finalisation, community representatives were taken to the army camps in Leh where houses for army personnel have been constructed using this material.

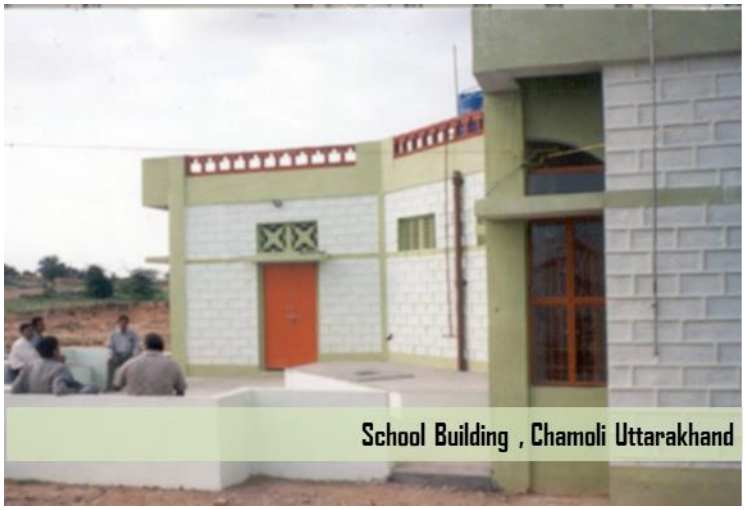
**Project Details**

HUDCO decided to sanction Rs.5 Crores from the Corporate Social Responsibility Fund for construction of 133 houses in Solar Colony, Leh. The material was transported in trucks to Leh in lots of 4 units.

Plinth consisting of 9 nos. concrete column stumps were commissioned at the site with the help of local contractors and labour in ahead of arrival of PUF panels. In a record time of 45 days all the houses have been commissioned. On the advice of the local Lama, beneficiaries have moved into the houses on 19th November 2010. A rapid assessment survey to gauge the beneficiary satisfaction was conducted wherein it was reported that the PUF panelled rooms are warmer compared to traditional houses constructed with mud blocks.

**HUDCO's Assistance for Earthquake rehabilitation in the Hill Districts of Uttarakhand**

Two major earthquakes have occurred at Uttar Kashi (1991) and Chamoli/Rudra Prayag/Tehri-Pouri Garhwal (1999) in the hill districts of Uttarakhand State (earlier Uttar Pradesh State). The earthquake in the Chamoli area measured 6.8 on the Richter scale. HUDCO has offered its financial assistance for housing 20,000 families and also in establishing special Building Centres for imparting appropriate technology transfer. HUDCO also adopted the villages of Kansili in Rudra Prayag and Gingrana in Gopeshwar, and also the Harijan Basti improvement in Chamoli. In addition, 21 demonstration units were also put up in various locations to demonstrate the appropriate use of disaster resistant technologies. HUDCO established 11 Building Centres for technology dissemination in the disaster affected districts. HUDCO also provided training to 175 engineers and hundreds of artisans in cost effective disaster resistant building technology features for the region. In addition, Do's and Don'ts technology manuals for earthquake resistant housing construction for hilly regions were also prepared and extensively distributed/disseminated by HUDCO. HUDCO was also actively associated with the Task Force for the rehabilitation of housing stock in the earthquake affected areas of Chamoli and Rudra Prayag regions and CMD, HUDCO, was the Chairman of the Task Force and a comprehensive action plan with immediate term, short term, medium term and long term measures have been identified including the `disaster management plan' for Uttarakhand region which is affected by frequent tremors.



School Building , Chamoli Uttarakhand

**HUDCO's Assistance for Earthquake rehabilitation in Latur**

A major earthquake rocked the Latur and Osmanabad areas in 1993 which had the magnitude of 6.4 in the Richter scale having its epicentre near Killari village in Latur and left an unprecedented destruction behind, with the human casualty of over 10,000 people. HUDCO had adopted four villages namely Tapse, Utka, Tungi and Tembhi and constructed 1319 houses for the people affected, with a

financial assistance of Rs.20 crores as a joint collaborative programme with the Government of FRG and KfW Germany.

HUDCO had also established 10 Building Centres in Latur and Osmanabad districts which has played a major role in imparting training to the local population on earthquake resistant construction and also in the production of the walling, roofing and other components required for the massive reconstruction programme taken up by the various agencies in the two districts. HUDCO has also brought out Special brochures with guidelines of Do's and Don'ts in Hindi for reconstruction, repairs and renewal of houses.

HUDCO's Contribution for Latur reconstruction programme had received a special citation for rehabilitation of earthquake victims in Latur district and Thembey village in the World Habitat Award 1996 by the Building and Social Housing Foundation of UK. It also received the JK Cement's `Architect of the Year Award 1997' for the rehabilitation project for earthquake victims of Latur under the category of `Rehabilitation Project'. HUDCO had also been awarded a Shield of appreciation for the rehabilitation of earthquake affected regions of Maharashtra.

**HUDCO's Assistance for Earthquake rehabilitation in Jabalpur**

An earthquake measuring 6.1 on the Richter scale had hit Jabalpur in 1997 with its epicentre near Kosamghat village causing widespread damage to properties.

HUDCO had extended assistance of Rs.58 crores (Rs.580 million) for the construction of 7424 houses and repair and retrofitting of 12733 housing units. HUDCO had assisted in the establishment of 5 Building Centres in the affected areas. HUDCO had also adopted two villages of Kosamgarh and Guna for redevelopment as model villages with its technical and financial help. Special brochures have been brought out for reconstruction, repairs and renewal in Hindi and circulated both in the urban areas of Jabalpur and also separate brochures have been circulated in the village areas for Reinforcement Cement Concrete (RCC) construction and wall masonry using mud.

**HUDCO's Assistance for Rehabilitation of the Super-cyclone affected in Orissa**

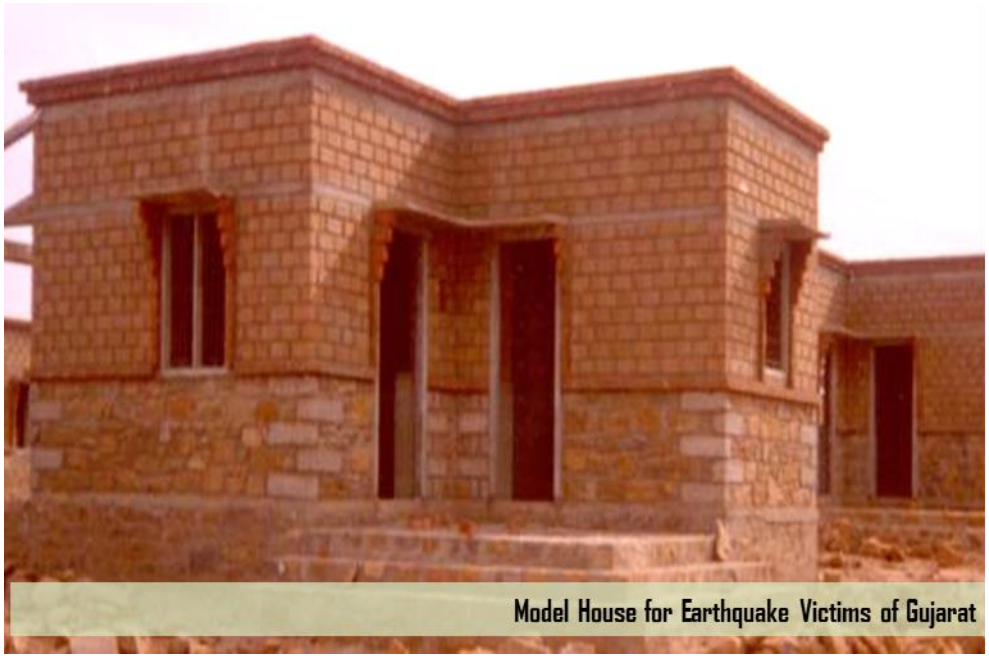
A super cyclone with a wind speed of over 250 kms per hour had hit the coast of Orissa in October, 1999 which very severely affected 14 districts of the State. In addition to the damage to the housing, over 14800 primary school and other public institutional buildings were also damaged. HUDCO had extended a total financial assistance of Rs.1287.5 crore for construction of 3.25 lakh houses and an additional Rs.3.9 crore for promoting Building Centres and Model Villages. HUDCO has supported setting up of 20 special Building Centres in the cyclone affected regions. Four villages were adopted as Model Villages. In addition, Do's and Don'ts in Oriya language were also prepared indicating the appropriate technologies and construction methods which are cyclone resistant in nature. HUDCO's

technical assistance was extended for construction of school buildings in all the affected districts in Orissa.

School for Cyclone Victims, Odisha

**HUDCO's Assistance for Rehabilitation of Earthquake Affected Regions of Gujarat**

A major earthquake measuring 6.9 on the Richter scale had hit various towns and villages of Gujarat in 2001 with its epicentre 20 Km from Bhuj. The damage assessment of losses in life and houses was immense that over 30,000 people have lost their life and nearly 175,000 houses were fully damaged. These had to be reconstructed and over half a million houses which were partially damaged were required to be repaired and renewed.



Model House for Earthquake Victims of Gujarat

HUDCO provided techno-financial assistance for a massive rehabilitation and reconstruction programme for the earthquake ravaged areas of Gujarat under a comprehensive Action Plan entailing rapid assessment of the extent of damages to houses and buildings, financial assistance, dissemination

of appropriate technology, establishment of building and community centres to demonstrate the use of disaster resistant housing including earthquake resistant technologies, adoption of villages and bastis for comprehensive development .

As part of the Action Plan, HUDCO and BMTPC in collaboration with the State Governments carried out a rapid assessment of the extent of damages both qualitatively and quantitatively for reconstruction of fully damaged houses, repairs and renewal of partially damaged houses and retrofitting of existing vulnerable stock.

Based on the overall assessment, the programme for reconstruction of houses for various income categories in rural, semi-urban and urban areas as well as for redevelopment of infrastructure such as damaged roads and water supply, toilets and other civic amenities, was proposed by the State Government and financial assistance was provided by HUDCO.

The financial assistance from HUDCO was backed up with an appropriate technology package needed for re-building earthquake resistant houses, using local building materials like mud, stone, bricks, concrete etc. and this was widely disseminated through use of instructive guidelines in the form of simple and user friendly Do's and Don'ts.

Further, with a view to propagate earthquake resistant technologies in the cities and towns and villages, HUDCO and BMTPC extended support for the establishment of 30 Building Centres, construction of demonstration houses and community buildings in all the disaster affected districts for technology transfer, training of local artisans, production of building materials and components, construction assistance and for guidance and information of the people. Various school buildings and Community halls were constructed at various locations in different villages with MPLAD funds. Work sheds were also constructed at Bhujodi village for the artisans.

**Work sheds for Earthquake victims of Gujarat**

HUDCO adopted a few model villages and bastis for comprehensive development of fully damaged villages and bastis. In addition, HUDCO had set up its Field Project Management offices in Bhuj, the worst affected area. HUDCO also gave assistance for the construction of temporary shelters.

**HUDCO's Assistance for Housing for Gas Tragedy victims, Bhopal**

The demonstration project at Bhopal was meant to rehabilitate the shelter less victims of the Union Carbide gas leak of December 1984. The idea was to set up a mini neighbourhood of a population of over 5,000 with all the necessary community facilities, including schools, a health centre, a community hall, a welfare centre, and shopping. The entire design strategy is based on the use of these clusters within a low-rise high-density approach, taking into consideration the future growth requirements of individual families. This is the first major experiment in the cluster planning approach to provide a basic unit for community development.

The basic cluster has 10 to 20 units grouped around a group of open spaces of size not exceeding 12x12 m. The dwelling design is based on ground + one-storeyed development. Houses are organized cluster condominiums with a single entry point. The dwellings are planned to suit the Indian way of life with traditional features such as otlas, verandahs courtyards, and terraces. The houses are designed to receive plenty of natural light and generous cross-ventilation

Total of 3,000 houses were constructed in five phases. One cluster design is not repeated for all the houses. There are four different designs for four different phases. Design of dwelling clusters show a gradual development of the cluster concepts giving a more matured interpretation with each

**Housing Cluster Layout Plan**

**Housing Cluster View**