Landslides are one of the major hydro-geological hazards that affect large parts of India, especially the Himalayas, the Northeastern hill ranges, the Western Ghats, the Nilgiris, the Eastern Ghats and the Vindhyas.

To extend the scope of the Vulnerability Atlas of India published by BMTPC to include consideration of hazards due to landslides, alongside earthquakes, floods and cyclones, the Council jointly with the Centre for Disaster Mitigation and Management, Anna University, Chennai prepared the first Landslide Hazard Zonation Atlas of India as a tool for macro level assessment of landslide hazards and for prioritizing hazard mapping projects towards reduction of vulnerability.

The Atlas presents the first ever GIS based Landslide Inventory Map and Landslide Hazard Zonation Map of India, both produced at the scale of 1:6 million. The hazard map is the product of a state-of-the-art approach of integrating factor maps, centered around the landslide inventory map of India, called the Mother Map. The whole mapping approach is based on the simple logic that for the inferred hazards to be reliably depicted, they must stand the scrutiny of observed landslide hazards. The best fit between the observed and the inferred hazards was obtained by iterative integration of factor maps, taking recourse to fine tuning of weights and ranks.
Earthquake Tips: Mass awareness programme through vernacular languages

- EQ Tip 1: What Causes Earthquakes?
- EQ Tip 2: How the ground shakes?
- EQ Tip 3: What are Magnitude and Intensity?
- EQ Tip 4: Where are the Seismic Zones in India?
- EQ Tip 5: What are the main seismic effects on structures?
- EQ Tip 6: How architectural features affect buildings

During Earthquakes?

- EQ Tip 7: How buildings twist during earthquakes?
- EQ Tip 8: What is the seismic design philosophy for buildings?
- EQ Tip 9: How to make buildings ductile for good seismic performance?
- EQ Tip 10: How flexibility of buildings affects their earthquake response?
- EQ Tip 11: What are the Indian seismic codes?
- EQ Tip 12: How do brick masonry behave during earthquakes?
- EQ Tip 13: Why should masonry buildings have simple structural configuration?
- EQ Tip 14: Why are horizontal bands necessary in masonry buildings?
- EQ Tip 15: Why is vertical reinforcement required in masonry buildings?
- EQ Tip 16: How to make stone masonry buildings earthquake resistant?
- EQ Tip 17: How do earthquakes affect reinforced concrete buildings?
- EQ Tip 18: How do beams in RC buildings resist earthquakes?
- EQ Tip 19: How do columns in RC buildings resist earthquakes?
- EQ Tip 20: How do beam-column joints in RC buildings resist earthquakes?
- EQ Tip 21: Why are open ground storey buildings vulnerable in earthquakes?
- EQ Tip 22: Why are short columns more damaged during earthquakes?
- EQ Tip 23: Why are buildings with shear walls preferred in seismic regions?
- EQ Tip 24: How to reduce earthquake affects on buildings?

The tips released on a monthly basis were also published and printed in various building and construction-related journals and magazines which have a combined reach of several thousands of users. These tips are written in an easy-to-understand simple language and are supported by figures and diagrams to create awareness and provide knowledge about earthquakes and safety measures. The Council has received appreciation both from professionals and common people about the usefulness of the tips. The Council is also contemplating to publish the following 8 more earthquake tips:

- EQ Tip 25: Why are load paths important in earthquake-resistant structures?
- EQ Tip 26: What are the problems in load paths of buildings?
- EQ Tip 27: How can non-structural elements be made safe during earthquakes?
- EQ Tip 28: Why is confined masonry better for housing in earthquake areas?
- EQ Tip 29: What are the essential features of confined masonry?
- EQ Tip 30: What are the concerns in earthquake-resistant foundations?
- EQ Tip 31: Why buildings tilt and sink into the ground during earthquakes?
- EQ Tip 32: Why is quality control important in earthquake-resistant buildings?

A project was launched by BMTPC in collaboration with IIT Kanpur for preparation and dissemination of 24 "Earthquake Tips". These tips are targeted for awareness creation and guidance to professionals and common man. The following tips have been published both on print and internet:

Capacity Building Programme in Gujarat

After January 2001 earthquake, BMTPC partnered with Gujarat State Disaster Management Authority (GSDMA) and undertook a Capacity Building Programme for:

- Awareness creation and strengthening disaster preparedness at community level
- Dissemination of disaster resistant construction technologies using innovative and cost effective building materials

Under this Capacity Building Programme, 5500 masons were trained in use of disaster resistant construction technologies and 50 engineers were also trained. Under the programme construction of one model house alongside with water tanks in each 477 villages and retrofitting of 442 Public Buildings, spread over 5 districts of Kachchh, Rajkot, Jamnagar, Surendranagar and Patan was undertaken.

Capacity building programme was envisaged to make the earthquake rehabilitation programme a people's programme wherein the people undertake the reconstruction, repair and retrofitting based on the awareness created through the programme with the help of the government engineer and local building artisans. This ambitious programme also attempted to take to people's doorstep the disaster resisting building technologies that are based on the local materials, local technologies and local available resources for constructing new houses that are suitable to people's lifestyle and local conditions and retrofitting of existing houses.

The model houses constructed under the project are serving as a disaster preparedness centres.

Recent past earthquakes (Uttarkashi, 1991, Latur, 1993, Jabalpur, 1997, Chamoli, 1999, Bhuj, 2001 & Kashmir 2005) have clearly demonstrated the vulnerability of our building stocks, which has caused wide spread damages resulting into loss of lives and property. This is mainly due to faulty construction practices which do not follow earthquake resistant features complying with Codal practices.

To address this gigantic problem, the Ministry of Home Affairs constituted a Committee of Experts to develop Model Building Bye-Laws and City, Town & Country Planning Act and the Zoning Regulations. After detailed deliberations, the final recommendations were brought on the following:

- Proposed Amendment in existing Town and County planning Legislations
- Regulations for Land Use Zoning
- Additional Provisions in Development Control Regulations for safety against natural hazards, and
- Additional Provisions in Building Regulations/Byelaws for Structural Safety in Natural Hazard Zones of India

In order to assist State Governments in modifying their building byelaws for safety against natural hazards, the Council is also organising technical workshops in various States. So far more than twenty workshops have been organised in different States.

Strengthening Techno-Legal Regime for Safety against Natural Hazards
Seismic retrofitting of existing vulnerable buildings is one of the most challenging tasks before the architects & structural engineering fraternity. A large number of existing buildings in earthquake prone areas over the world need seismic retrofitting due to various reasons & motivations, including code modifications, deterioration of structures with age or change in use or modification of structure. Earthquake damaged buildings may also need retrofitting along with repair of damaged portion for reuse. Seismic retrofitting of existing stock is one of the most effective methods towards seismic risk reduction in future & to have safe & better habitat.

In its efforts to demonstrate the retrofitting techniques for seismic strengthening, the Council has initiated to showcase the technologies through retrofitting of public buildings. Keeping this in mind, BMTPC carried out the retrofitting of few MCD school buildings, preferably one each in Municipal wards of Delhi, so that the awareness could be generated among the people as well as various government agencies about the need and techniques of retrofitting.

To start with, retrofitting of MCD School buildings have been undertaken for their seismic strengthening at • Vasant Vihar (South Zone), • Rano Pratap Bagh (Civil Lines Zone), • Nareli Nagar (East) (West Zone), • Aruna Thakur Das Girls (Arora Bagh Zone), • Ram Nagar (Sadar Paharganj Zone), • Lajpat Nagar, and • Vivek Vihar.

In the course of retrofitting, an awareness programme for around 250 MCD engineers was conducted on the subject with a view to train them in seismic strengthening techniques.

Apart from above, a 100 year old stone masonry school building was retrofitted in Dehradun and masons were sensitised during the course of retrofitting.

The experience on these buildings would help people at large and the policy makers in working towards reducing the vulnerability of lakhs of existing buildings through retrofitting of public and private buildings, thus protecting the most number of people in case of future earthquakes.
In its pursuit towards main streaming disaster risk reduction in housing sector, BMTPC has made significant contributions towards disaster mitigation and management, since its inception in 1990.

Looking at the overall importance of seismic hazard in Indian context and associated risks involved, the National Disaster Management Authority, Government of India entrusted BMTPC the task of preparing updated earthquake hazard maps up to district level incorporating latest data as available from Survey of India, Census and Geological Survey of India, India Meteorological Department etc. An Memorandum of Understanding (MOU) was signed with NDMA in this regard on 22nd November, 2011.

The Council is at present preparing the earthquake hazard maps for India, 35 States/UTs covering all Districts. Besides country Atlas, BMTPC is also preparing State wise Atlases as regards earthquake hazards. The work is currently under progress and Maps have been generated for 24 States as per Survey of India updated data. It is further envisaged to incorporate latest digitised administrative boundary data from Census of India.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Area (sq km)</th>
<th>Number of Districts</th>
<th>Percentage</th>
<th>Number of Maps Generated</th>
</tr>
</thead>
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<td>India</td>
<td>35 States</td>
<td>649</td>
<td>100%</td>
<td>24</td>
</tr>
</tbody>
</table>


So far seven batches of Training of Trainers (TOT) programme have been organized successfully. The resource persons are from IIT Roorkee, IIT Mumbai, NIT Patna, BMTPC including other experts in the field. At the end of training of each batch, evaluation of trainees has also been conducted through examination.
The Council has brought out a number of publications in the area of disaster mitigation and management. These have been widely disseminated for creating awareness and spreading technical information amongst professionals, decision makers and public at large. Some of them are:

Guidelines on Earthquake, Flood and Cyclone resistance of Housing

BMTPC has published three guidelines namely Guidelines for Earthquake Resistance of Housing, Guidelines on Improving Wind/Cyclone Resistance of Housing and Guidelines on Improving Flood Resistance of Housing. The Guidelines would serve as an explanatory handbook on the various clauses of Indian Standards which are important from the point of view of designing new buildings or improving resistance of existing building stock.

Guidelines for Multi-Hazard Resistant Construction of EWS Housing Projects

The Guidelines for Multi-Hazard Resistant Construction of EWS Housing Projects published by BMTPC, empowers the professionals through series of checklists, tables and forms, to look for hazard resistant features given in Indian Standards and use them while designing and preparing the project reports.

Guidelines on “Aapda Pratirodhi Bhawan Nirman: Sampurn Bharat ke liye Margdarshika”

At the behest of UNDP BMTPC brought out Hindi translation of UNDP - Ministry of Home Affairs, English Manual on Disaster Resistant Construction: Safety of housing being constructed without the help of engineers. The guidelines will also help in creating awareness amongst common people as regards disaster resistant techniques.

Manual for Restoration and Retrofitting of Buildings in Uttarakhand and Himachal Pradesh

This manual is prepared for the restoration and vulnerability reduction through retrofitting of the existing buildings in Uttarakhand and Himachal Pradesh situated in the Western Himalayan belt of India. It covers the traditional building systems other than the reinforced concrete frame, being used by the people of the region.
The Building Materials & Technology Promotion Council (BMTPC) was setup in 1990 under the Ministry of Housing & Urban Poverty Alleviation to bridge the gap between laboratory research and field level application.

Vision

BMTPC to be world class knowledge and demonstration hub for providing solutions to all with special focus on common man in the area of sustainable building materials, appropriate construction technologies & systems including disaster resistant construction.

Mission

To work towards a comprehensive and integrated approach for promotion and transfer of potential, cost-effective, environment-friendly, disaster resistant building materials and technologies including locally available materials from lab to land for sustainable development of housing.

PUBLICATIONS AND VIDEO FILMS RELATED TO DISASTER PREPAREDNESS & MITIGATION

1. Manual on Basics of Ductile Detailing
2. Vulnerability Atlas of India (First Revision - 2006): Earthquake, Windstorm and Flood Hazard Maps and Damage Risk to Housing with CD
5. Manual for Restoration and Retrofitting of Buildings in Uttarakhand and Himachal Pradesh
6. Guidelines for Improving Earthquake Resistance of Housing
7. Guidelines for Improving Flood Resistance of Housing
8. Guidelines for Improving Wind/Cyclone Resistance of Housing
10. Guidelines for Damage Assessment and Post-Earthquake Action for Chambal and Jabalpur
11. Retrofitting of Kupwara Sub-Divisional Hospital
12. Building a New Techno-Legal Regime for Safer India
13. Simple Ways to Earthquake Safety for J&K
15. Seismic Retrofitting of MCD School Buildings in New Delhi
16. Design & Construction of Earthquake Resistant Structures: A Practical Treatise for Engineers & Architects

Video Films

1. Makan ho to Aisa
2. Abhivardhan
3. Lessons from Latur
4. Seismic Retrofitting
5. Build A Safer Tomorrow
6. Rekindling Hope

Other Initiatives

- Evolving methodology for retrofitting of OPD building of Bara Hindu Rao Hospital, New Delhi
- Provided technical support to Asian Disaster Preparedness Centre under ADB Funded Project on Strengthening Disaster Mitigation and Management in Uttaranchal.
- Provided technical support to National Task Force constituted by MHA for Special Study of Lakshadweep Islands to assess vulnerability to various hazards and suggest mitigation/prevention measures.
- Prepared Guidelines for Improving Earthquake, Wind/Cyclone, Flood and Landslide resistance of housing and also prepared Manuals, Do's and Don'ts, Posters, Pamphlets, etc. in local languages.
- A number of Video Films and publications have been brought out on disaster resistant technologies.
- Organising Training Programmes on Disaster Resistant Technologies jointly with IITs & other institutions. Also involved in providing training to 300 engineers in J&K after the recent earthquake.
- Building capacities of ULBs in the area of disaster mitigation and management through JNNURM projects.
- Established strong linkages with the National Disaster Management Authority (NDMA) and National Institute of Disaster Management (NIDM), Ministry of Home Affairs, etc.

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