PDNA AT A GLANCE

Republic of Bhutan

Earthquake, September 2009

Disaster Risk Profile of Bhutan

Bhutan is a small landlocked country in South Asia, located at the eastern end of the Himalayas and bordered to the south, east and west by the Republic of India and to the north by the People's Republic of China. It has a land area of nearly 38,816 km² and a population of about 700, 000. The majority of people follow Budhism, which is the state relgion, and is reflected in many religious heritage buildings. About 36% of her people live in urban areas, mainly in the capital Thmbhu. Bhutan's unique topography of glaciated mountain peaks on the north and Himalayan alpine valley in the south results in polar-like climate in the north to subtropical climate in the south. Located on the active meeting point of Indian plate and Eurasian plate, large earthquakes are frequent in Bhutan. A moderate earthquake had struck Bhutan on 24 February 2006. It had a 5.8 magnitude and caused some damage to property near the epicenter, not far from the epicenter of the 2009 earthquake. Between 1937 and 1998 a total of 30 earthquakes have been recorded in Bhutan of which an earthquake in 1941 with the magnitude 6.75 on the Richter scale was the most powerful according to the department of geology and mines.

The Disaster

An earthquake struck the eastern region of Bhutan on September 21, 2009. It was the most damaging disaster that Bhutan has experienced in recent times. According to the US Geological Survey, the earthquake registered a magnitude of 6.3 (later revised to 6.1), with the epicenter in Mongar Dzongkhag (district), 180 kilometers east of the capital, Thimphu. The earthquake had a shallow depth of 14 kilometers, lasted for 95 seconds and was followed by aftershocks.

According to updated reports of the Royal Government of Bhutan (RGOB), 12 people died and 47 were injured. A total of 4,614 households were affected in 12 dzongkhags, representing approximately ten percent of all households in some areas. An estimated 7,290 people were left without adequate shelter. Aftershocks caused further damage and created fear among affected communities, with many people preferring to stay outside their houses. The earthquake caused destruction of infrastructure and institutions including 91 schools, 25 health centers and hospitals, 50 government offices, 281 monasteries, and 485 stupas (chortens) and 7 Dzongs (district administration centers).

Figure 1: The 2009 earthquake resulted in widespread destruction including many heritage buildings

Immediate Response – Joint Rapid Assessment

Following a request by the RGOB to the UN Resident Coordinator, planning was initiated for carrying out a rapid assessment of damages and losses. A Joint Assessment Team was formed, comprising of national and international experts from the UN system (OCHA, UNDP/BCPR, UNICEF), the World Bank and the RGOB. In addition, support was provided by the Bank's Global Facility for Disaster Reduction and Recovery (GFDRR). The primary objective of the assessment was to conduct a rapid analysis of damages and losses to ascertain an order of magnitude for the cost of early recovery and reconstruction, clarify priority sectors, and delineate an implementation strategy.

The Joint Rapid Assessment mission conducted its work from September 30th to October 14th 2009, including three days of visits to affected villages in eastern Bhutan, and in-depth consultations with the RGOB at the central, dzongkhag and geog levels. Two sub-groups visited selected locations, which, according to the RGoB, were representative of damages and losses throughout the affected region.

Methodology Used for Rapid Assessment

To assess the overall impact of the disaster, the team drew upon the established DaLA by UN Economic Commission for Latin America and the Caribbean (UNECLAC). However, the assessment has utilized only certain elements of the methodology and not followed it in great detail. The assessment provided estimate of the value of destroyed assets. It also identified the overall financial needs for post-disaster recovery and reconstruction, as well as long-term disaster risk management. It has quantified damages and losses at the sectoral level. An aggregation of sectoral effects has enabled the quantification of total damage and losses for the entire affected area of the country. Since the major impacts were on physical structures, the damages and losses were added together. This was used to develop short-term recovery and long-term reconstruction activities. Disaster risk management activities and implementation support actions were also developed.

Assessed Damages and Losses

The structural damage in all sectors was categorized into: (1) beyond repair; (2) major repair; (3) partial repair, and (4) minor repair. In case of categories 1 and 2 (i.e. beyond repair and major repair), losses were calculated on the basis of 100 percent of the unit cost given that they will have to be reconstructed entirely. For categories 3 and 4 (i.e. partial repair and minor repair), 25 percent and 10 percent of the unit cost, respectively, was applied for calculating approximate asset losses in the absence of detailed information about each structure.

Figure 2: While some buildings could be easily repaired, many others have been completely destroyed

A total damage and loss of US$ 52.6 million was estimated by the assessment team. In the shelter sector, 446 houses were classified as beyond repair, while 1,012 houses require major repair. The number of houses which require partial and minor repair were 1,749 and 1,407, respectively. The total cost of damage in the shelter sector is estimated to be Nu 1,118.8m (approximately US$23.3 million). The earthquake damaged 91 educational institutions and 25 Basic Health Units (BHUs) as well as caused minor damage to three hospitals. A total of 50 local government offices were also damaged. Bhutan is rich in terms of cultural and religious heritage, with numerous monasteries, temples (*lhakhangs*), monuments (*chortens*), and ancient fortresses (*dzongs*) containing valuable artifacts and paintings, which have endured for centuries. Many of these monument were damaged.

Table 1: Summary of Damage and Losses

Sl	Sector	Approximate Loss (Nu, Mil)	Approximate Loss (USD, Mil)[12]
1	Shelter	1119	23.3
2	Education	594	12.3
3	Cultural Heritage	650	13.5
4	Health	124	2.6
5	Government and Public Offices	14	0.3
APPROXIMATE TOTAL LOSS		2501	52

Assessed Needs

The Joint Rapid Assessment team estimated the cost of early recovery, reconstruction, and disaster risk reduction at Nu 2,192 million (approximately US$ 45.6 million).

Table 2: Total estimated post-disaster needs

Sl	Head of Expenditure	Total Approximate Cost (Nu, Million)	Total Approximate Cost (USD, Million)
1	Early Recovery Activities	87	1.8
2	Reconstruction Activities	2005	41.7
3	Disaster Risk Reduction	50	1.04
4	Implementation Support	50	1.04
TOTAL COST		2192	45.6

Short-term Recovery Needs

The Joint Rapid Assessment team ascertained early recovery priorities on the basis of discussions with affected people and through visits to houses, schools, BHUs, monasteries and Gup's offices in the villages in two of the most affect dzongkhags of Mongar and Trashigang. The estimated cost of early recovery interventions is Nu 87.1 million (approximately US$1.8 million). Short-term interventions included providing semi-permanent and intermediate structures as well as livelihood assistance such as small grants for agricultural production, livestock maintenance and income generating activities. This also includes support for water and sanitation, livelihood assistance to women-headed households, and psychological assessment of affected people.

Long-term Recovery and Reconstruction Needs

The construction of permanent shelters was a matter of particular urgency. House designs were expected to include earthquake-resistant features and technologies and constitute a "build back better" approach. The reconstruction program is expected to be implemented following an owner-driven reconstruction approach, and avoiding relocation and resettlement to the extent possible. Schools, BHUs, and

government offices also require repair and reconstruction in a similar manner. An important feature of this category is the reconstruction and repair of religious and cultural heritage structures (e.g. temples, monuments). This will require specialized expertise, but should be viewed as a priority once shelter and other livelihood requirements are met, given the central role of religious and cultural structures in the life of rural Bhutanese. The assessment provided an overview of sector-wise reconstruction costs, estimated at Nu 2,005 million (approximately US$41.7 million).

Disaster Risk Reduction Program Needs

Bhutan is vulnerable to high impact disasters. The assessment provided a broad range of recommendations for improving disaster preparedness and risk reduction. These include in-depth identification and assessment of risks for the preparation of easily understandable, composite risk assessment reports. Risk reduction for earthquake risk in particular may include the development of a seismic hazard map of Bhutan and the establishment of a seismic monitoring network in the country with appropriate instrumentation.

Suggested preparedness measures include setting-up an inter-connected network of Emergency Operations Centers (EOCs) at the national, district and sub-district levels, developing a multi-hazard Early Warning System (EWS), and the strengthening of search and rescue teams and emergency medical response capacities. Bhutan may wish to consider the merits of establishing a national chapter of the International Federation of Red Cross/Red Crescent Societies.

A training and capacity-building program was proposed to strengthen the capacity within the Department of Disaster Management, as well as among sectoral disaster management focal points, and field-level staff.

Seismic-resistant building specifications were suggested for all public buildings, especially schools, BHUs and hospitals, which are enforced through appropriate legal and regulatory measures at the dzongkhag and/or geog levels. While a rural housing insurance program of the Royal Insurance Corporation of Bhutan has been in existence for a number of years, it could be improved by including risk mitigation incentives for policyholders.

Implementation Strategy

The assessment suggested the need for an implementation strategy that includes resources for the program, institutional arrangements, a disbursement mechanism, and technical assistance for earthquake-resistant construction. The RGOB's implementation strategy should be guided by principles of efficiency, transparency, and inclusiveness. National allocations of Nu 50m were proposed for each of the following cross-cutting areas: (i) disaster risk reduction and (ii) implementation overhead costs.

Figure 3: The implementation strategy will be geared towards disaster risk reduction