LESSONS FROM THE GREAT NORTHERN PAKISTAN EARTHQUAKE

Najib AHMAD

KEY WORDS

Earthquake, Mitigation, Intensity, Damage, Construction, Masonry

ABSTRACT

The great Northern Pakistan Earthquake which struck Pakistan on 8th October, 2005 was the most devastating earthquake in the history of Pakistan. It had a magnitude of 7.6 on Richter scale and an intensity of X to X1on MM scale.

The catastrophe has not only prompted Government of Pakistan to set up new institutions/establishment to study disaster areas, the causes and effects, of lapses in various aspects, and find ways and means to mitigate effects of such natural hazards on life and properly, but also the provide, well meaning private sector has not been left behind and DRI was established by Preston. Ultimately for the same purpose, of finding various reasons of mass scale destruction and failure of houses, properly planned buildings and infrastructure. This study would then lead to find and establish a mitigation, methodology and process.

THE EARTHQUAKE

The Great Northern Pakistan earthquake which struck Pakistan in the early hours of 8th October, 2005 precisely at 8:50:40 AM local time, was the most devastating and powerful earthquake that hit the northern regions, in the history of Pakistan. It had a magnitude of 7.6 on Richter scale and intensity of X on M.M.I. (Modified Mercalli Intensity) scale with a tendency in some areas towards XI, where semi-engineered buildings collapsed en masse and some well engineered structures were also greatly damaged.

As we know the magnitude of an earthquake is a measure of its size in terms of energy released and radiated in the form of seismic waves, while “Intensity” is used to describe earthquake destructiveness at a particular location. As mentioned above on MMI scale in some areas the intensity is seen to reach XI, on MMI scale while the minimum on the scale is XII. This indicates the extent of destructiveness of the earthquake.

Figure-1 shows the general area of the earthquake. The axis of the rupture region runs through Muzaffarabad and Balakot as shown in Figure 2.

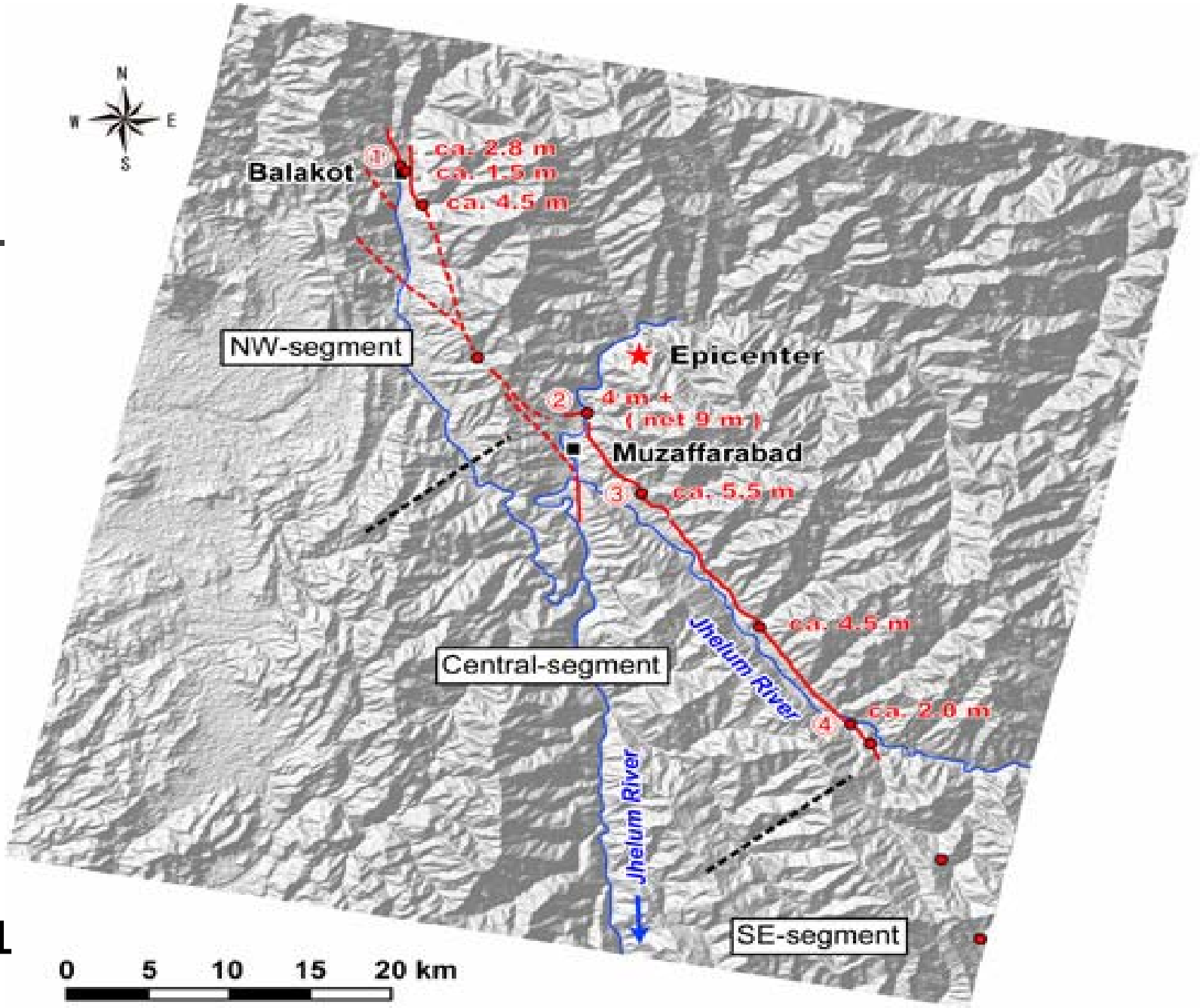

N
W
E
S
Balakot
ca. 2.8 m
ca. 1.5 m
ca. 4.5 m
NW-segment
Epicenter
4 m+
(net 9 m)
Muzaffarabad
ca. 5.5 m
ca. 4.5 m
Central-segment
Jhelum River
ca. 2.0 m
Jhelum River
SE-segment
0 5 10 15 20 km

Fig.1

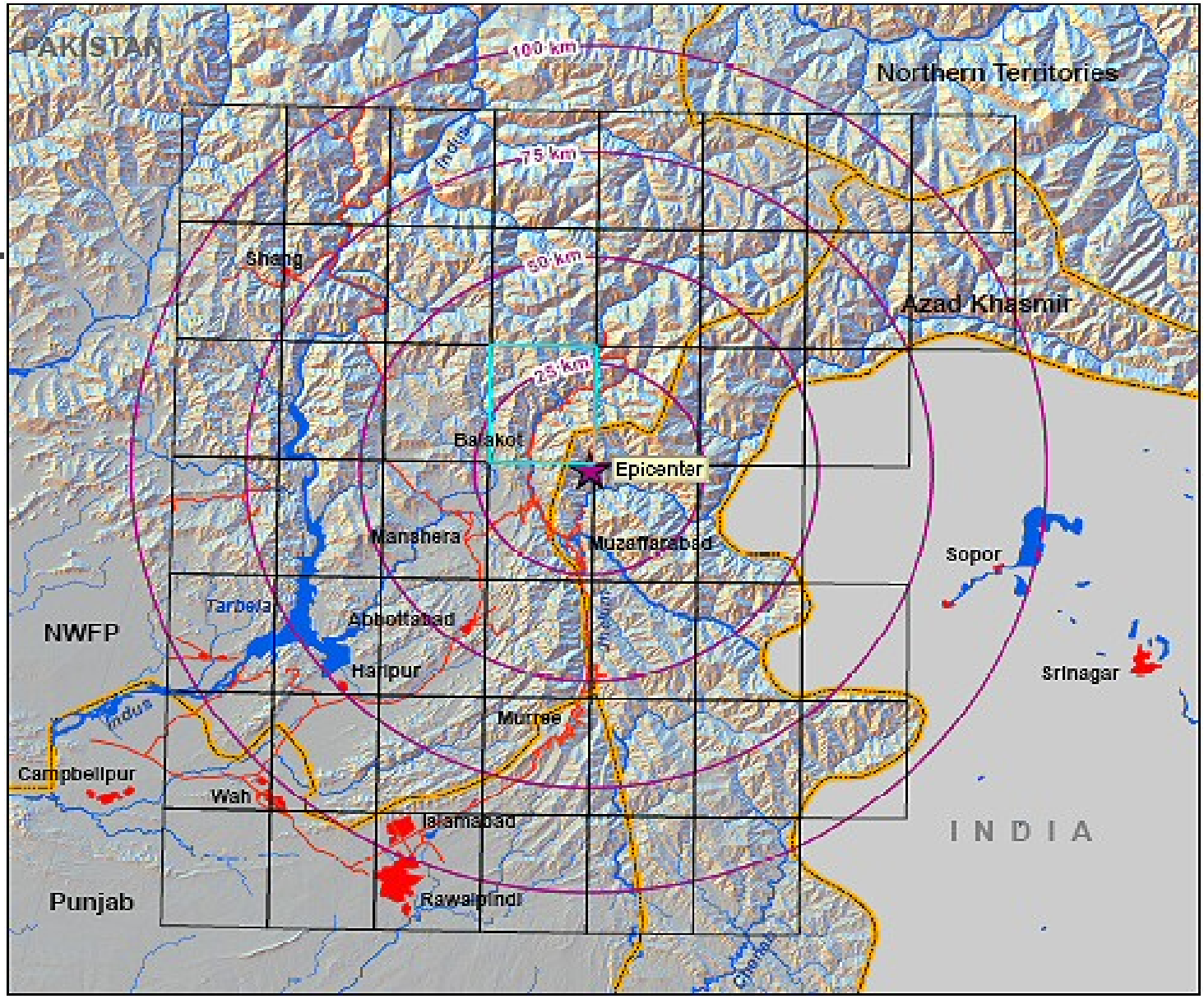

PAKISTAN
Northern Territories
100 km
75 km
50 km
25 km
Indus
Shang
Azad Khasmir
Balakot
Epicenter
Mansehra
Muzaffarabad
Sopor
Tarbela
Abbottabad
NWFP
Haripur
Srinagar
Murree
Indus
Campbellpur
Wah
Islamabad
INDIA
Punjab
Rawalpindi
Jhelum

Fig. 2

- **The earthquake killed over 73,000 people and affected more than 3 million others, completely destroying hundred of villages and large sections of towns in “Kashmir and NWFP (North Western Frontiers Province of Pakistan). The effected area was nearly 30000 square kilometers, and the shocks destroyed and damaged an estimated 450,000 homes, 6000 schools and hundreds of hospitals/clinics and other infrastructural facilities. The earthquake left in its wake millions of survivors to face devastation in form of destruction of their homes and means of livelihood. Some of the damage is visible in following photographs. (Figure-3).**

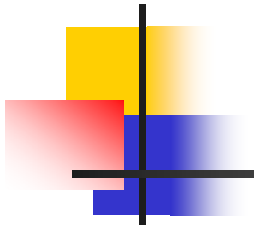
Pakka House

Katcha House

Figure -3

Need for Assessment Parameters & Codes

Considering the above mentioned scenario, it is suggested that extensive studies be carried out in fields of seismology and earthquake engineering to develop specifications and engineering parameters for the design and construction of various types of structures, i.e. residential houses, utility buildings and infrastructure like roads, bridges water and power supply lines. Building and operational codes may be prepared and upgraded for various regions.



THE LESSONS LEARNT

Disaster Mitigation

The earthquake not only brought destruction, it also raised many questions on aspects here to never visualized in Pakistan. This has prompted the Government of Pakistan to start thinking on the lines of Earthquakes Disaster Mitigation and Preventation. They have established on 8th October, 2006, the Disaster Management Authority (DMA) Similarly ERRA (Earthquake Rehabilitation and Reconstruction Authority) was established earlier in 2005 to handle such calamities.

Thinking on the similar lines, PRESTON University, established a Disaster Research Institute (DRI), as an independent unit of the University to meet the need for conducting research into several dimensions of natural calamities which have particular significance for Pakistan. One of the objects of DRI, as mentioned in its charter is “Research on recommending standards for Residential and Commercial Buildings for earthquake prone areas”. The research would cover all the facets as envisaged by the research teams

PRESTON UNIVERSITY

Disaster Research Institute

A unique institue conducting research on Disaster Management

The Causes

- Some of the main causes of the earthquake destruction can be established as:
- Type of building construction (Brick, stone masonry, RCC frame, wooden frame etc.).
- Quality of construction.
- Non-conformance to the existing design codes.
- Non-existence of state of the art codes.
- Nearest in enforcement of building codes.

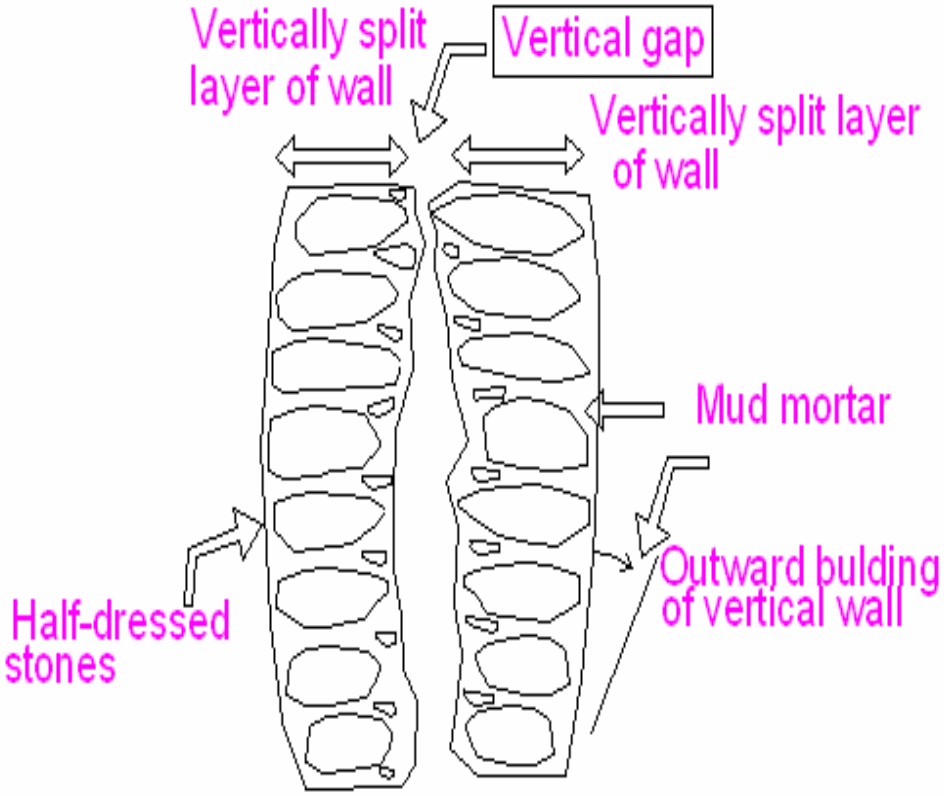


Figure 5 : Schematic of the wall section of a traditional stone house thick walls without stones that go across split into 2 vertical layers.

Establishment of Mitigation Process

- The development of a system for “Estimation and Management of Seismic Risks”.

- A study of the available historic earthquake data indicates that this earthquake can be considered as “moderate’ when viewed in the context of earthquake generation potential of the India-Tibet subduction region.

- As is being predicted by seismologists/geologists that there is probability of massive earthquakes up to magnitudes of 8 in the future. Therefore there is a need for detailed study of available data from previous earthquakes, to assess the pattern and magnitude of expected earthquakes, to ultimately mitigate the destructive effect of the earthquakes on the populance of the area and reduce human suffering in future as seen recently in AJ&K and NWFP, the Northern regions of Pakistan.

A study for reasons of massive destruction of public buildings especially schools and hospitals. In this context a research study by DRI supported by DESIGNMEN and GEOENGINEERS is being conducted, as assigned by, ACTIONAID International. This study hopes to pin-point/locate shortcoming and violation by public/Govt. agencies of the existing bye-laws before 8th October, 2005 earthquake, in schools/hospitals, to improve implementation of the codes etc

Study of building bye-laws and their upgrading in light of the new ground realities (available data and location of fault etc).

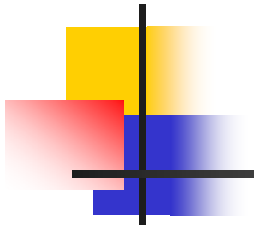
- Provision of equipment is required for disaster management, where as no such facility existed earlier. This also resulted in deaths due to people being trapped in debris, when they had survived the earthquake itself. The setting up of expertise and agencies who should be responsible for removal of debris and extraction of people from damaged buildings.

CONCLUSIONS

- The lessons learnt are enormous. But what has to be seen is that the research work leads the way to better understanding of the codes, their implementation, ground realities and actual re-construction in the earthquake affected areas of Northern Areas in Pakistan. The importance of monitoring agencies being setup by the government and various municipal bodies to regulate re-construction cannot be emphasized more.

- **“ Strategy for Dissemination of Technologies to Communities”, must also be emphasized, because, a educated and aware community is the biggest safe guard against such mishaps in future.**

- **It will be a long time before the effected regions recover, some may never be the same. But along with that rebirth comes not just the opportunity, but the responsibility.**



THANK YOU