

Earthquake made easy

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SOMETIMES we shy away from delving into an issue because it appears too complicated, beyond comprehension and 'not my cup of tea'.

An earthquake is simple; it is the trembling of the earth. Why it will tremble involves complex issues and those matters not all of us necessarily need to know.

When the ground will move precisely an earthquake it will be felt clearly, as the more meaningful ones are, and will not be too difficult to understand either because those quakes that matter will also shake buildings, roads, mountains...

Earthquakes are neutral and can strike anyone within its proximity. Originating below the ocean they can also initiate powerful waves that can strike even faraway lands as devastating tsunamis. Therefore, whether one is drinking tea or is a teetotaler, it matters naught to the movers and shakers.

Hasan Ahmed Chowdhury, an architecture graduate, in today's piece tries to explain in simple terms an 'impending' earthquake in this region and the damage possibilities. More importantly he touches on the terrible consequences should an earthquake cripple any one of our key installations that include Zia International airport, Jatiya Sangsad Bhaban, Secretariat, courts, radio and

television.

To our credit we have a government-sponsored Disaster Management Bureau at Moakhali, Dhaka; albeit in its embryonic stage. Much-needed funds are not being allocated in its entirety, hampering preparedness for rescue operation. Given that Dhaka is not the only possible target the bureau will need to expand across the country.

Present efforts should be channelled to inform the general public about making both old and new constructions safe as much as feasible, as well as what to expect if indeed there is a strike and how to behave under the difficult circumstances.

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DHAKA CITY AND EARTHQUAKE The risks and the challenges

ARCHITECT HASAN AHMED CHOWDHURY

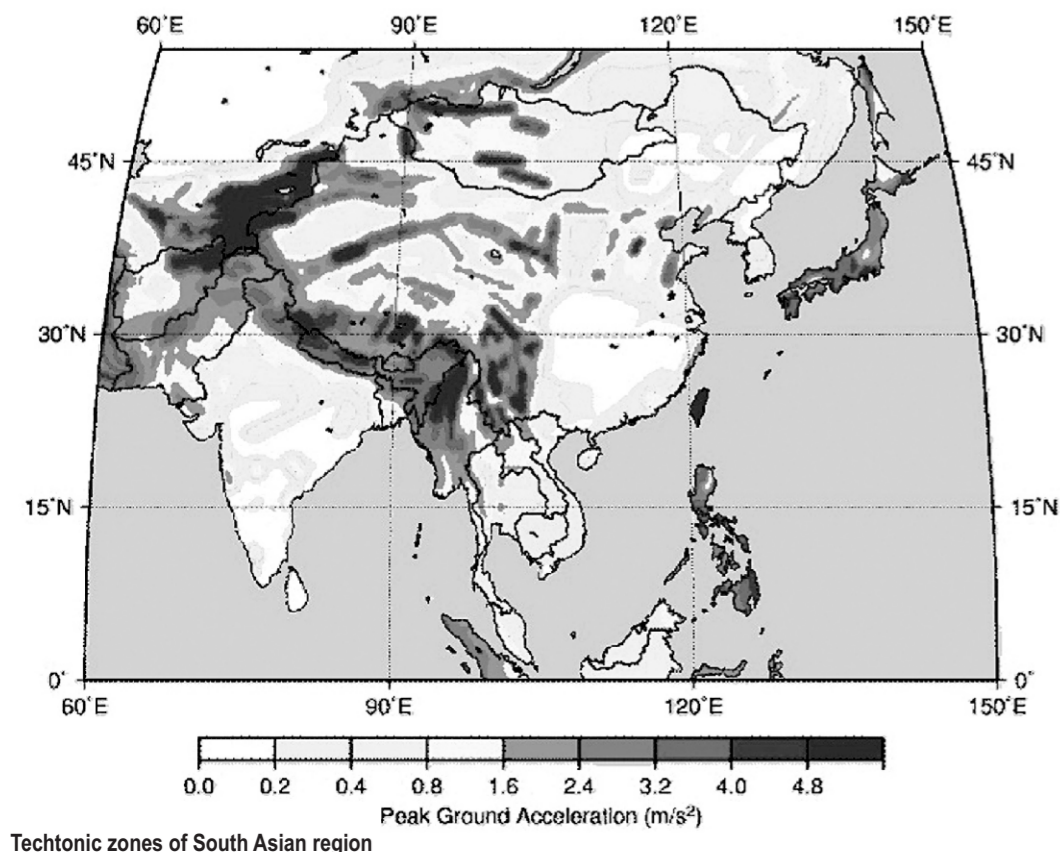
BANGLADESH is one of the most disaster prone countries in the world. Although it is located in a region of significant seismic activity, most of the people do not perceive seismic risk to be of great importance. The severest zones include northern part of Dinajpur, Rangpur, Mymensingh, Sylhet, Tangail, northern part of Dhaka, Khulna, Jessore, Kushtia, and Chittagong.

The 1885 earthquake of Manikganj, the 1897 earthquake of Great Assam, the 1918 earthquake of Srimangal, the 1930 earthquake of Dubai, and the 1950 earthquake of Assam are all quite matured to recur at any time and may create devastation in Bangladesh. Sadly though, the awareness regarding the nature and the level of earthquake activities in Bangladesh are not very clearly discernible. As a result, conscious efforts on collection of data on micro-seismicity are lacking, although the occurrence of small magnitude earthquakes in Bangladesh is quite frequent. According to the experts, the northern part of the country, covering greater Sylhet, Mymensingh, Rangpur, and a portion of the Chittagong Hill Tracts are very much exposed to earthquakes.

A good background of historical earthquake information is essential to evaluate the seismicity. Information on earthquake events in and around Bangladesh is available for the last over 350 years. The earthquakes that affected Bangladesh and its surrounding regions, including the historical earthquakes, are on record from 1664. The earthquake record

Name of Earthquake	Magnitude	Distance (km) (from epicentre)
Cachar Earthquake, 1869	7.5	250
Sengal Earthquake, 1885	7.0	170
Great Indian Earthquake, 1897	8.7	230
Srimangal Earthquake, 1918	7.6	150
Dubai Earthquake, 1930	7.1	250

Source: Report of United Nations Centre for Regional Development by Ali, M. H. (1997)



suggests that more than one hundred moderate to large earthquakes occurred inside Bangladesh since 1900, out of which more than 65 events occurred after 1960. Fifteen new epicentres have been identified inside Bangladesh since January 2001. This clearly indicates an increased frequency of earthquakes in Bangladesh. Although Bangladesh is extremely vulnerable to seismic activity, the nature and the level of this activity is very poorly defined. The main constraint is the earthquake observational and monitoring facilities, which is markedly absent in Bangladesh.

Nevertheless, records of the earthquakes show that Bangladesh and its surrounding areas experienced at least 1000 earthquakes having magnitude greater than or equal to 4 in Richter scale in the last 100 years.

Table 1 presents a list of historical earthquakes in the neighbourhood of Bangladesh. The metropolis Dhaka is an integral part in the southern tip of Madhupur tract encircled by some very active tectonic units.

SCOPE
5. The scope of the study has been limited to evaluate the effects of earthquake in Bangladesh in general and Dhaka city in particular. The paper sources various write-ups on disaster management and issues related with earthquake response, mainly from the reference materials available at the Disaster Management Bureau and earthquake related websites. The paper is structured in the following sequence.

a. How risky is Dhaka city?

b. What could be the consequences of an earthquake in Dhaka

City?

c. How can we meet the challenges of risk factors?

d. Open forum

HOW RISKY IS DHAKA CITY?

The recurrence of earthquakes in an earthquake prone region cannot be prevented. Rather what could be done is to make a prediction and issue warning to minimize loss of lives and property. Although precise prediction is not always possible, an acceptable valid prediction of an earthquake will certainly minimize the loss of lives and property.

Most earthquake experts and civil engineers feel that all the non-engineered structures of Dhaka city would totally collapse in a moderate intensity earthquake. This view is jointly sponsored by the Safety Assistance For Emergencies (SAFE) and the Civil Engineering Division of the Institution of Engineers Bangladesh (IEB). Based on the statistical data of Dhaka city, the experts assume that only five percent of all houses are of reinforced concrete structure, 30 percent are of engineered masonry, nine percent of non-engineered masonry, five percent are mud-wall structures are of combined wood and bamboo. The Survey Module of this study was Zone 10, Uttara Sector that is in the danger zone.

Fig: Satellite Image of Zone 10 Uttara. Source www.geo-cities.com. A sample study based on questionnaire survey and visual inspection of the existing buildings of the old part of Dhaka has been conducted recently in BUET, which shows that about 60 per cent of the structures in that area are non-engineered. Among these non-engineered structures, over 50 percent are made of flammable materials. Besides, most of the roads in that area are inaccessible to fire-fighting vehicles.

According to the Earthquake Risk Index (ERI), Dhaka is unfortunately among the riskiest cities in the world. "Although geologically Dhaka is in the second earthquake-prone zone, its vulnerability is due to its non-engineered structures," according to the experts.

So, the most pertinent questions referring to Dhaka City's earthquake vulnerability, and hazard reduction and response capabilities are:

a. What are we going to do with the flawed existent structures?

b. What is our level of preparedness to meet the impending threat of earthquake?

From the recent collapse of the Spectrum garments building May 2005 at Savar, and the sudden collapse of the Phoenix garments building in the city in February, 2006 it may be concluded that these are due to structural failure the trial experience of an earthquake situation.

WHAT COULD BE THE RESULTS OF AN EARTHQUAKE IN DHAKA CITY?

Immediately after an earthquake in Dhaka, some of the matters that we shall have to address and manage include:

a. Medical

i. A major earthquake would create a tremendous demand of emergency medical services
ii. Injuries serious enough to require hospitalization are estimated to be so high that the hospitals may not be able to cope up with the existing infrastructures, and there will be acute shortage of hospital beds, medical supplies, doctors, nurses and support staffs.

iii. Healthcare may be seriously impaired by damage to the hospital buildings and temporary measures may have to be adopted.

b. Economic

i. Business communities may not be prepared adequately to respond to an earthquake.
ii. Economic damage to the area could be caused by failure of banking systems, specially those who use electronic means for funds transfers, management, etc.
iii. An earthquake may cause a serious loss of employment. This employment loss could affect the economy.

c. Relief efforts

i. Following an earthquake, the affected area may be cut off from its surrounding areas. Therefore, coordination among communities within the affected area is essential for effective emergency response.
ii. Food supply lines could break down.

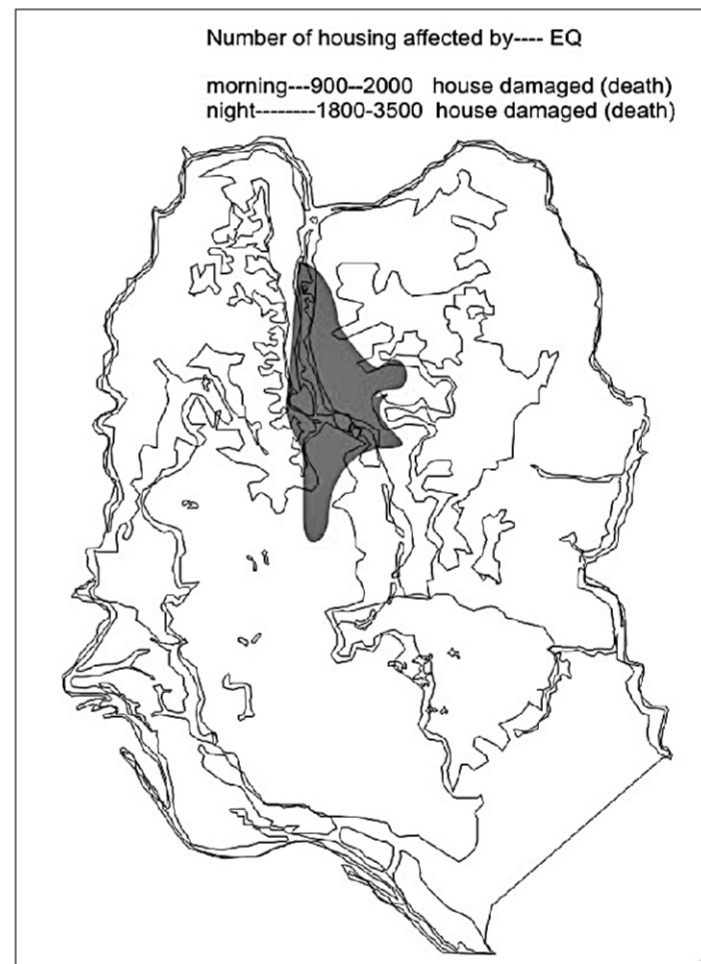
iii. Rubble and debris resulting from an earthquake may prevent access to the affected area for a considerable length of time. In this event, helicopters may be necessary to lift rescue teams into and casualties out of the area.

iv. The first few hours following an earthquake are critical in saving the lives of people trapped in collapsed buildings, where specialized support is needed as quickly as possible. However, officials should be prepared to rely on local resources during the initial response period.

v. Several hours may be required before external personnel and equipment can be mobilized for search and rescue, including the military and the fire services. Therefore, local rescuers will be relied upon heavily in the period immediately following the earthquake.

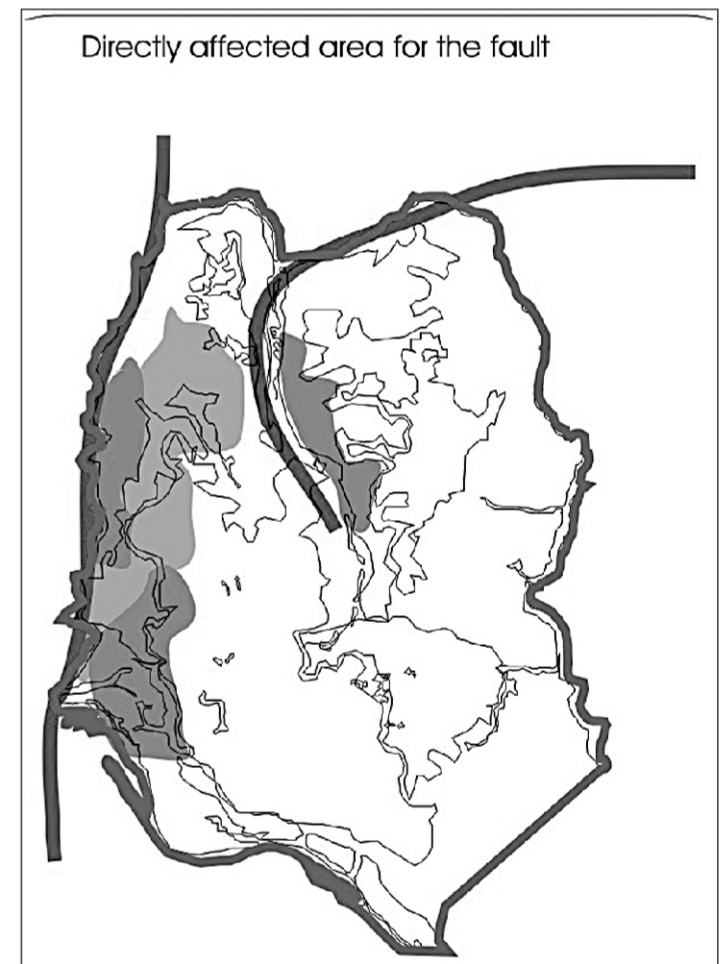
d. Secondary Effects

i. The earthquake and aftershocks may trigger one or more secondary events such as landslides, release of hazardous mate-



Probable danger Zones of Dhaka City

rials, dam failure or flooding.
ii. Fires breaking out of control involving major parts of the city are very much likely because of the nature and density of construction in Dhaka city. However, there may be some individual or small group of fires which may occur as the result of miscellaneous damage-related factors.
iii. Should high water condition exist during the time an earthquake occurs, low-lying areas may be flooded.
e. Structural Damage
Death and injuries are expected to be caused principally because of failure of man-made structures, particularly old multi-storied buildings of un-reinforced brick and masonry buildings built before the adoption of earthquake-resistant building code.
f. Utilities
i. In the civil sector there may be minimal communication for a considerable length of time as roads will be disrupted
ii. Many gas lines are vulnerable to rupture in the event of an earthquake
iii. Commercial telephone services are vulnerable, particularly due to the possible rupture of underground cables that cross (earth) faults
iv. Electrical power systems are among the most fragile in the event of an earthquake. Because they are also among the most essential of the utilities, even a short-term loss can be a major setback to a community. The loss of electric power during an earthquake may mean no water to fight fires or for drinking, no light or heat, no communication, no sewage pumps, etc.
g. Transportation
i. Damage to transportation system may severely hamper recovery efforts following an earthquake. The loss or impairment of major rail and highway links serving Dhaka city may significantly



Fault Lines of Dhaka City

What is our Preparation for any possible quake?
After the Spectrum disaster it took the Bangladesh Army and Fire Services personnel, rescue equipment, cranes and medical teams 7-9 days to finish their operation. Their efforts are most commendable under the circumstances, but when innumerable buildings will collapse in an earthquake, WHAT WILL WE DO?

Some measures need to be taken immediately:
i. Identify the vulnerable structures and repair or rebuild them
ii. Draw up a long-term Master Plan not for five years (i.e. the term of an elected government) but for several more years considering the future
iii. Develop public awareness
Unfortunately, the fault lines around Dhaka City are located through the Zia International Airport and the Rampura TV Station. After any major quake, we may lose physical communication with the rest of the world as well as the means to air appeal for international support.

It is already too late for us to take steps; but better late than never. Already we have faced two tragic disasters Spectrum and Phoenix. Are they not enough to make us stand up and think? Will we wait for another disaster or a real earthquake?

Additional sources:
CRED, 2002: International Disaster Database, Belgium
Bangladesh National Building Code, 1993
HBRI-BSTI
Active Tectonics
<www.mouhio.edu/tectonics/active_tectonics.htm>
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3d geological model of Bangladesh region. Source www.geo-cities.com

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