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Earthquake preparedness limping

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In December last, a moderate earthquake measuring 5.5 on the Richter scale jolted parts of the country including the capital. The quake was felt in Dhaka, Chittagong, Cox's Bazar, Bandarban, Khagrachhari, Rangamati, Sylhet, Comilla, Gazipur and Brahmanbaria. No damage or loss of life was recorded in the incident.

But international statistics indicate that Bangladesh is among the 20 most vulnerable countries to earthquake. According to experts, 65 per cent area of Bangladesh is under the threat of severe earthquake as the country is situated between three plate boundaries. One of these boundary lines is connected to the foothill of the Himalayas and is marked as the most dangerous source of severe earthquake. One study carried out by Comprehensive Disaster Management Programme (CDMP) identified several active faults within Bangladesh based on historical events and evidence from geological investigations. In addition, inside the country and in the surrounding areas, there are numerous geographic scratches which are also the sources of earthquake. Among the scratches, the most dangerous one is Rakhaine scratch, which is within 300 km of Chittagong and the Madhupur and Dauki faults are about 90 and 230 miles away from Dhaka respectively.

The 1985 Mexico City earthquake caused considerable damage, even though the source was 240 miles away from the city. In recent years, experts have found that these lines are so active that it has started shaking frequently in other places like Assam and Myanmar. These two areas have been also declared as the most risky zones for earthquake. So due to these geographical orientation, Dhaka, Chittagong, Sylhet, Mymensingh, Rangpur and north-eastern extended areas of Bangladesh are under constant threat. The following chart shows the recent frequency of earthquakes in Bangladesh:

| Year | No. of Earthquakes |
|------|--------------------|
| 2005 | 26 |
| 2006 | 16 |
| 2007 | 11 |
| 2008 | 22 |
| 2009 | 24 |
| 2010 | 21 |
| 2011 | 13 |

Source: Bangladesh: Disaster Report 2011, NARRI

Dhaka is listed among the top 20 earthquake-prone cities, both because of geographical location and unplanned urbanisation.

According to geologists, if an earthquake of magnitude 7 takes place near Dhaka, about 72,000 buildings among 3,26,000 will be severely damaged and about 0.184 million people will instantly become homeless. This will cause deaths of minimum 70,000 people and at least 1,86,000 families will undergo untold sufferings as electricity, water and gas lines will be damaged. Urban planners worry that in this case, about 16,000 electric poles among 55,000 will fall down, 191 meter gas lines among 834 km will break down, 272 km of 1,118 km water supply will stop working and 360 km of 630 km waste management system line will collapse because of unplanned system. [Bangladesh: Disaster Report 2011, NARRI]. It will consequently create a crisis of drinking water as there is no alternative emergency service supply system developed in Dhaka. In addition, there is a high possibility of bursting of sewerage pipelines situated underground, which surely will create an unhealthy environment. Also, chances are high that right after the earthquake, the gas lines might explode causing severe fire outbreaks.

Underlying risk factors: Dhaka city has not gone through a comprehensively planned urbanisation process and due to lack of supervision from the concerned authorities, numerous unauthorised buildings and structures have been built without or defying proper approval. Over 5,000 buildings in Dhaka have been built without any proper design and about 15,000 more were built without any permission. As a result, we might see more cases like Begunbari collapse where the building was built on marshy land. Over the last 7 years, 103 people died in five such incidents. The buildings were built without following the national building code.

A recent study by CDMP on the liquefaction susceptibility of Dhaka indicates that the city's eastern and south-western parts lie within the high to very high liquefaction susceptibility range. These parts are recently filled and developed marshy lands. Liquefaction is a physical process of ground failure that takes place during earthquake. In Dhaka, an earthquake from either Madhupur or Dauki fault might cause severe liquefaction effects to buildings, especially those developed on marshy lands on the eastern and western fringes, and even within the city in the infill areas like Begunbari and parts of Mirpur.

Construction error: As per the Town Improvement Act 1953 (TI Act 1953), Rajdhani Unnayan Kartipakkhya (RAJUK) is the legitimate authority to prepare land use plan, to take care of implementation process and to control development and manage the growth of Dhaka. But in reality, RAJUK only ensures if the design and planning are being followed during a construction. They never investigate the quality of construction materials used. Asian Disaster Preparedness Centre (ADPC), through a research, identified several earthquake vulnerability factors in the major cities of Bangladesh:

| Vulnerability Factors | City | Percentage (%) |
|--|------------|----------------|
| Soft story buildings | Dhaka | 53% |
| | Chittagong | 23% |
| | Sylhet | 14% |
| Presence of heavy overhangs in infrastructures | Dhaka | 41% |
| | Chittagong | 36% |
| | Sylhet | 39% |
| Presence of short column in infrastructures | Dhaka | 34% |
| | Chittagong | 15% |
| | Sylhet | 16% |

In the fast tempo of urbanisation, Dhaka city has turned into a concrete jungle. Every available vacant land in and around the metropolis is being used for constructing buildings, in most cases, violating building code. Considering the current context, the need for a national institute to enforce the national building code can hardly be over emphasised.

Disregard to soil testing and DAP: Soil-testing, a mandatory part for building a structure, is rarely done by any developer or owner. Also, the Detailed Area Plan (DAP) is not being implemented yet. As a result, it is creating a situation where buildings are being constructed filling up water bodies and marshy lands. Sixty per cent of the buildings are being built on hard soil and 40 per cent on soft soil. Earth is filled up with either soft soil or loose sand. All these factors are adding to the threat of larger impacts in an earthquake in future.

Densely populated buildings: Since the establishment of Dhaka as a capital, people from all over the country are streaming in. Now Dhaka is congested with thousands of risky high-rise buildings. There is very narrow space between the buildings which is not enough to allow a fire truck or an ambulance during an emergency. Comprehensive rescue operation is also

impossible during an emergency like earthquake in areas like old Dhaka resulting in mass casualties. According to RAJUK, there have been nearly 50 incidents of building collapse or tilt since 1997 till date. There were human casualties in eight such major accidents. Thus, in last seven years, accidents of five high-rise building collapse occurred with 103 people losing their lives.

RAJUK categorises buildings at risk in four categories: the number of buildings under extreme risk in Dhaka is 321. Moreover, 95 per cent buildings in Dhaka are constructed violating building construction rules. As a result, Dhaka is turning into a city at risk.

Population burst: One threat for Dhaka is its over-growing population. Statistics shows that in 1951, population of Dhaka City was 276,033 while in 1991, it stood at 6,950,920 and in 2001, it was 9,672,763. There are estimates that unless effective measures are taken to reduce this population burst, the population in Dhaka will reach 20 million by 2025. This will make a significant effect on underground water level. Overuse of the underground water to meet the demand will create empty space under the ground level, which will increase the impact of an earthquake.

Lack of response mechanism: Risk and vulnerability to earthquake are higher compared to natural hazards as there is no mechanism to provide any early warning. Response to earthquake is also difficult as it requires high-tech machinery and technologies to conduct a post earthquake search and rescue operation. So damage limitation in an earthquake depends on high performance machinery and rescue equipment. Though in recent years some modern instruments and equipment have been added to the fire stations such as smoke ejector, breathing apparatus, turntable ladder, emergency tender, lighting unit, snorkel, special water tender and foam canon, these are not enough to meet the demands of a major city like Dhaka. There is also lack of trained local community members who would act as the first respondents to an emergency before the service providers arrive on the scene. Unless the necessary community-based response groups are formed and proper response mechanism is developed, the damage in an earthquake will be catastrophic.

Consideration for earthquake safety: According to the experts, we are in wait for a major earthquake any time soon. Considering the risk factors and the looming threat, we need to consider some issues for very urgent consideration if we want to reduce our vulnerability to an earthquake:

I Community has to be sensitised about the threat and vulnerability of earthquake.

I Community-based first respondent groups have to be formed and trained on risk and resource assessment, risk reduction measures and emergency response mechanism.

I The community representatives and groups have to be involved in the preparedness planning and implementation process.

I Earthquake preparedness has to be included in the text curriculum from the school level and mainstreamed at institutional level through formation of task forces.

I Earthquake resilient construction has to be promoted to mass people and relevant stakeholders like developers.

I Strict policy and monitoring mechanism has to be enforced to ensure implementation of guidelines under Bangladesh National Building Code including Detailed Area Plan (DAP) should be ensured in all constructions.

I Service delivery institutions/structures should be built in such a way that they become earthquake-resistant and accessible even after earthquake.

I All infrastructural development initiatives have to take earthquake resilience into consideration. Old and risky infrastructures should be identified immediately and appropriate actions should be taken.

I The infrastructures of the emergency service providers and probable shelters after an earthquake such as hospitals, fire stations, schools etc have to be built and reconstructed in a way so that these are accessible and not damaged after an earthquake.

I An Inter-departmental body should be formed by the government to ensure all necessary services during and post earthquake period.

Taking lessons from the recent earthquakes in Japan, Chile and Haiti, our government stakeholders and NGOs alongside the community members should start preparing so that we do not have to face a major earthquake unprepared.

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