

## EXTRACTION EFFECT OF NATURAL GAS ON EARTHQUAKE, FUTURE TREND IN RENEWABLE ENERGY

Apurba Sarker<sup>1,\*</sup> and Md. Jahirul Islam<sup>2</sup>

<sup>1,2</sup> Chittagong University of Engineering and Technology, Bangladesh

<sup>1,\*</sup> apurbadotsarker@gmail.com, <sup>2</sup>bipul\_baf27@yahoo.com

**Abstract-** Earthquake is the trembling or shaking movement of the earth's surface. Earthquake is a form of energy of wave motion. Bangladesh is extremely vulnerable to seismic activity. Again, Natural gas is the most important source of energy. It has been extracted so fast ignoring side effects especially related with earthquake. There are around 21 gas fields that cover huge area inside the earth surface. Present reserves would last about 17 years if rate of use increases at 10% per year. The extractions of natural gas will imbalance the earth layers containing the gas fields. Pressurized gas has much better tolerance to keep the earth layers in their proper balanced position. After extraction of natural gas, the impact of earthquake with relatively low magnitude will be more vulnerable. To meet increasing energy demand we can not rely only on natural gas, coal, oil and some limited other sources. We must focus on renewable energy to avoid devastations.

**Keywords:** Earthquake, Natural Gas, Earth Layers, Renewable Energy, Devastations

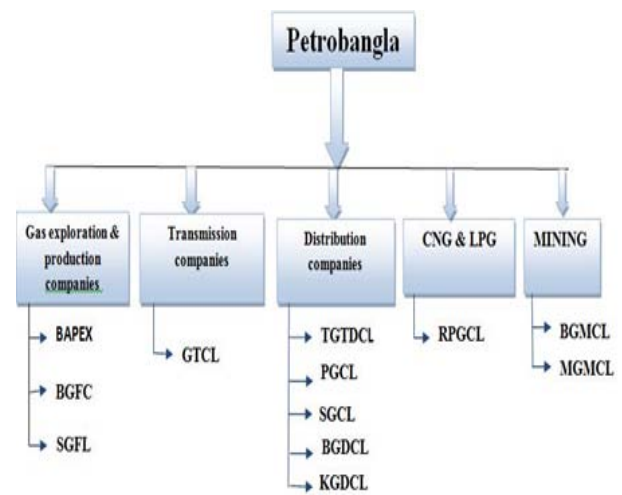
### 1. INTRODUCTION

Earthquake is the trembling or shaking movement of the earth's surface. Earthquake is a form of energy of wave motion, which originates in a limited region and then spreads out in all directions from the source of disturbance [1]. The shock of the earthquake is first experienced at the epicenter. Bangladesh is surrounded by three tectonic plates, which are always on the move [1]. In the generalized tectonic map of Bangladesh, the distribution of epicenters is found to be linear along the Dauki Fault [1].

In Bangladesh, natural gas is the most important source of energy. It has been used very widely to meet our daily energy consumption. There are huge resources of gas in Bangladesh. Places where gas is commercially refined include: Titas, Habiganj, Bakhrabad, Narshingdi, Meghna, Sylhet, Kailashtilla, Rashidpur, Beanibazar, Fenchuganj and Salda Nadi and so on.

The primary responsibility for the natural gas industry in Bangladesh has given to Petrobangla (Bangladesh Oil, Gas and Mineral Corporation) under the direction of the Ministry of Energy and Mineral Resources.

It comprises with several group of companies as follows:



### 2. SEISMIC ZONE

Bangladesh is extremely vulnerable to seismic activity. It is surrounded by three tectonic plates, which are always on the move. It includes the Himalayan Arc and SHILLONG PLATEAU in the north, the Burmese Arc, Arakan Yoma anticlinorium in the east and complex Naga-Disang-Jaflong thrust zones in the northeast. It is also the site of the Dauki Fault system along with numerous subsurface active faults and a flexure zone called Hinge Zone [1]. These weak regions are believed to provide the necessary zones for movements within the basin area.

In the generalized tectonic map of Bangladesh the distribution of epicenters is found to be linear along the Dauki Fault system and random in other regions of Bangladesh.

The Bangladesh Meteorological Department adopted a seismic zoning map in 1972. In 1977, the Government of Bangladesh constituted a Committee of Experts to examine the seismic problem and make appropriate recommendations. The Committee proposed a zoning map of Bangladesh in the same year.

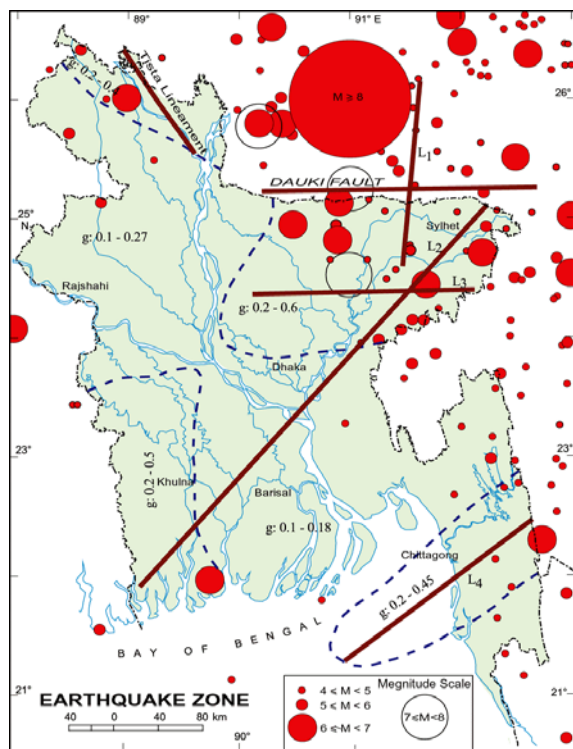


Fig.1: Zoning map of Bangladesh [1]

In the zoning map, Bangladesh has been divided into three generalized seismic zones [5]:

Table 1: Seismic zones in Bangladesh

Zoning	Active regions
I.	North and eastern regions of Bangladesh (Seismically most active)
II.	Lalmai, Barind, Madhupur Tracts, Dhaka, Comiila, Noakhali and western part of Chittagong Folded belt.
III.	Khulna division S-E Bangladesh (Seismically relatively quit)

### 3. DISTRICT WISE EARTHQUAKE ZONE

Bangladesh has been divided into three generalized seismic zones: zone-I, zone-II and zone-III. Zone-I comprising the northern and eastern regions of Bangladesh with the presence of the Dauki Fault system of eastern Sylhet and the deep seated Sylhet Fault, and proximity to the highly disturbed southeastern Assam region with the Jafong thrust, Naga thrust and Disang thrust, is a zone of high seismic risk with a basic seismic co-efficient of 0.08.

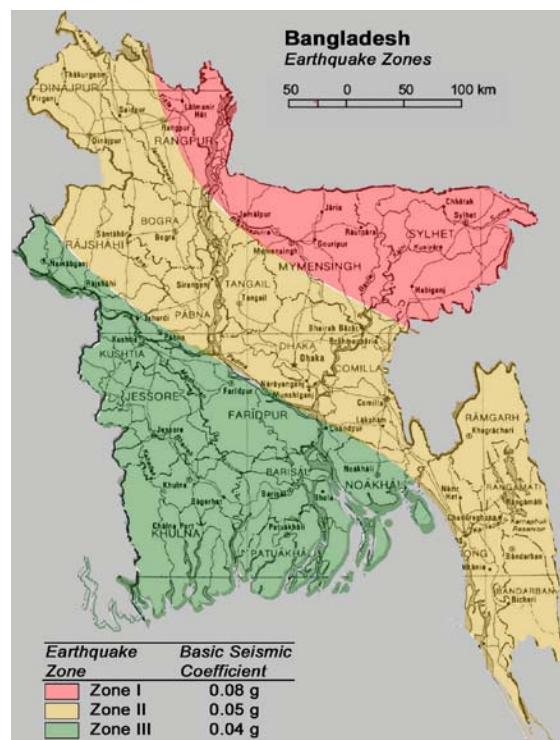


Fig.2: District wise zoning map of Bangladesh [13]

Northern Bangladesh comprising greater Rangpur and Dinajpur districts is also a region of high seismicity because of the presence of the Jamuna Fault and the proximity to the active east-west running fault and the Main Boundary Fault to the north in India. The Chittagong-Tripura Folded Belt experiences frequent earthquakes, as just to its east is the Burmese Arc where a large number of shallow depth earthquakes originate. Zone-II comprising the central part of Bangladesh represents the regions of recent uplifted Pleistocene blocks of the Barind and Madhupur Tracts, and the western extension of the folded belt. The Zone-III comprising the southwestern part of Bangladesh is seismically quiet, with an estimated basic seismic co-efficient of 0.04. [1]

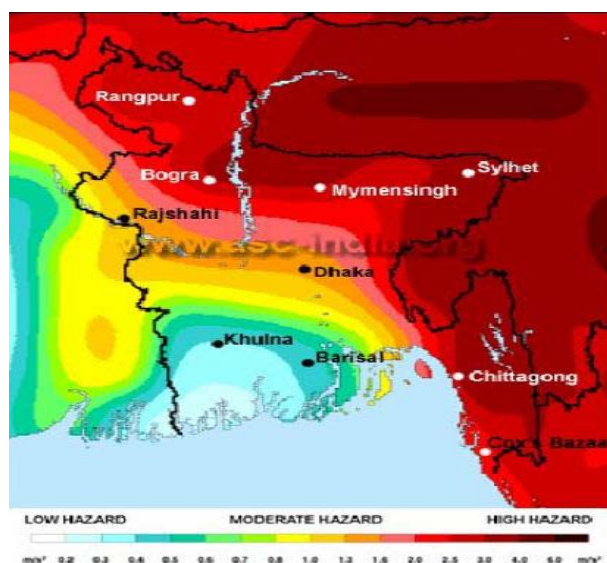


Fig.3: Earth quake zone in Bangladesh [7]

Table 2: District wise seismic zone

Zoning	Districts
I.	Sylhet,Habigonj,Maulovibazar,Jamalpur, Mymensingh,Sunamgonj,Rangpur, Lalamonirhat etc.
II.	Lalmai, Barind, Madhupur Tracts, Dhaka, Comiila,sirajgonj,Pabna,Bogra,Feni, Rajshahi, Noakhali and western part of Chittagong Folded belt etc.
III.	Khulna, Jessore, Bagerhat, Faridpur, Bhola, Barisal, Kustia, Potuakhali etc.

#### 4. CHRONOLOGY [1]

Year	Introduction	Effected Regions
1548	First recorded earthquake. It was a terrible one.	Sylhet, Chittagong
1762, April 2	500 persons lost their lives in Dhaka. Permanent submergence of 155.40 sq km near Chittagong.	Dhaka, Chittagong
1812, May 11	Violent earthquake in Sylhet.	Sylhet
1869	Known as Cachar Earthquake. Severely felt in Sylhet.	Sylhet
1885, July 14	Magnitude 7.0 and known as Bengal earthquake. Associated with the deep-seated Jamuna Fault.	Manikganj
1918, July 18	Known as Srimangal Earthquake. Magnitude is 7.6. Intense damage occurred in Srimangal.	Srimangal, Dhaka
1930, July 3	Known as Dhubri Earthquake. Magnitude is 7.1 at the epicentre Dhubri, Assam	Parts of Rangpur district
1934, July 3	Magnitude 7.1. Epicentre is Dhubri, Assam	Greater Rangpur
1997, 22 Nov.	Magnitude 6.0. Minor damage around Chittagong town.	Chittagong

1999, 22 July	Magnitude 5.2. Severely felt around Maheshkhali island adjoining Sea.	Maheshkhali Island
2003, 27 July	Magnitude 5.1. Occurred at Kolabunia union of Barkal Upazila	Rangamati
May 2006- July 2008	The meteorological department detected at least 90 earthquakes. 9 of them with magnitude above 5 on the Richter scale. 95% epicenters were within 600km radius of Dhaka city. Four active sources in the Bay of Bengal can generate tremors with magnitude of over 7.0 [6]	Around the country

#### 5. NATURAL GAS SCENARIO IN BANGLADESH

Table 3: Natural gas scenario in Bangladesh

Gas Field Name	Location	Recoverable Gas (BCF=Billion Cubic Feet)
Titas gas field	Brahmanbaria, 100 km away from Dhaka, Bangladesh.	4,740 BCF
Narsingdi gas field	Narsingdi, 45 km away from Dhaka, Bangladesh	345 BCF
Habiganj Gas Field	Madhabpur Habiganj, 100 km away from Dhaka, Bangladesh	2,787.00 BCF
Bakhrabad gas field	Muradnagar, Comilla, 40 km away from Dhaka, Bangladesh	1,387.00 BCF
Meghna gas field	Bancharampur, Brahmanbaria, 40 km away from Dhaka, Bangladesh	101 BCF
Srikail gas field	It lies at Comiila, Bangladesh	161 (initially estimated about 300bcf).
Fenchuganj gas field	It lies at Maulovi Bazar, Bangladesh	334.30
Salda nadi gas field	Bangladesh	116.1 BCF
Semutang gas field	Chittagong Hill Tracts, bangladesh	150.30BCF
Begumganj gas field	Noakhali, Bangladrsh	32.70 BCF
Sangu gas field	Sangu river, Chittagong,	848.5BCF

	Bangladesh	
Maulivibazar gas field	Maulivibazar, Bangladesh	400 BCF
Bibiyana gas field	Habiganj, Bangladesh	4.42 Trillion Cubic Feet.
Bangura gas field	Pushkarinir par Mosque under Comilla District, Bangladesh	20.561 Trillion Cubic Feet.
Kutubdia gas field	Lies at Bay of Bengal	45.50 BCF
Feni gas field	Lies at Feni, Bangladesh	129 BCF
Kamta gas field(now off)	Lies at Gazipur, Bangladesh	50 BCF
Beanibazar gas field	Lies at Beanibazar, Sylhet, Bangladesh	170.20 BCF
Haripur gas field	Lies at Jointapur, Sylhet, Bangladesh	444 BCF
Kailashtilla gas field	Lies at Golapgonj, Sylhet Bangladesh	1335.6 BCF
Rashidpur gas field	Lies at Bhahubal,, Habigonj, Bangladesh	1362.02 BCF

## 6. NATURAL GAS FIELDS LOCATED IN SEISMIC REGION

Table 4: Natural gas fields located in seismic region

Seral No.	Common Region	Gas Field(s)
1.	Sylhet	Kailashtilla gas field Haripur gas field Beanibazar gas field
2.	Habigonj	Habiganj Gas Field Rashidpur gas field Bibiyana gas field
3.	Maulivibazar	Maulivibazar gas field Fenchuganj gas field
4.	Chittagong	Semutang gas field Sangu gas field
5.	Comilla	Bakhrabad gas field Srikail gas field Bangura gas field
6.	Brahmanbaria, Gazipur	Titas gas field Meghna gas field Kamta gas field(now off)
7.	Narsingdi	Narsingdi gas field
8.	Feni, Noakhali	Feni gas field Begumganj gas field

Here analyzing the above data, we conclude that most of the gas fields of Bangladesh are located in the seismic region. At present all the gas fields are active and gas is recovered continuously without considering the negative impact of earthquake. Due to excessive extraction of the natural gas, all of the gas field will be empty within next 17 to 20 years [2][3][4]. Therefore inside the earth layer huge amount of empty space will be created. In a result the pressure between the earth layers will be imbalanced. Hence an earthquake with relatively low magnitude will cause collapsing of earth layers as well as structures surrounding the earth surface which will bring unthinkable devastation of human life, wealth and environment.

## 7. CONCLUSION

From the analysis it is definite that within next two or three decades an earthquake may cause a unthinkable disaster to the common regions. So the following steps should be taken to prevent the devastation:

- Building code must be followed strictly.
- Raise consciousness about extraction side effects of natural gas related with earthquake.
- Prevention of misuse of natural gas to lengthen the life time of gas fields.
- To meet the increasing demand priority should be given to the renewable energy such as Solar energy, Hydro power, Wind energy, Tidal energy, Wave energy etc.

## 8. REFERENCES

- [1] Bibliography MH Ali and JR Choudhury, *Assessment of seismic hazard in Bangladesh*, Disaster Research Training and Management Centre, Dhaka University, Dhaka, 2001; JR Choudhury and MH Ali, *Seismic Zoning of Bangladesh*, paper presented in the Seminar on Recent Development Earthquake Disaster Mitigation, Organised by IEB and TAEE, Dhaka, 1994; KM Hossain, *Tectonic significance and earthquake occurrences in Bangladesh*, 7th Geological Conference, Bangladesh Geological Society, 1989
- [2] M. Raihanul Abedin. Use of CNG as an Alternative Fuel for Transport-Air Pollution Control Perspective (2001) p.49-54, International Seminar on Air Pollution in Dhaka City, October 30, 2001; France Bangladesh Association of Scholars and Trainees (FBAST)
- [3] Dhaka Clean Fuel Project: Bangladesh at Asian Development Bank
- [4] Lisa Schroeder (March 25, 2009). "Compressed natural gas clears the air in Bangladesh: Cleaner-burning fuel is reducing dangerous levels of pollution – and saving money, too." *The Christian Science Monitor*. Retrieved 2012-06-12.
- [5] [http://www.banglapedia.org/HT/S\\_0180.HTM](http://www.banglapedia.org/HT/S_0180.HTM)
- [6] Daily Star, Friday September 23, 2011
- [7] Disaster Risk Reduction Program For Bangladesh 2010-12, ASC India

- [8] Annual report of Petrobangla- 2011
- [9] <http://www.bgfcl.org.bd>
- [10] <http://sgfl.org.bd>
- [11] Speech about Natural Gas reserve Estimate of Bangladesh by Zaved chowdhury, Manager, Pertbangla
- [12] Speech By Mr. Tapan Chowdhury, power and energy adviser, Bangladesh.
- [13] Author Mayeenul Islam, founding Executive Committee Member of Wikimedia Bangladesh

## 9. NOMENCLATURE

Symbol	Meaning	Unit
<i>BCF</i>	Volume of gas	(ft) <sup>3</sup>