

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

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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

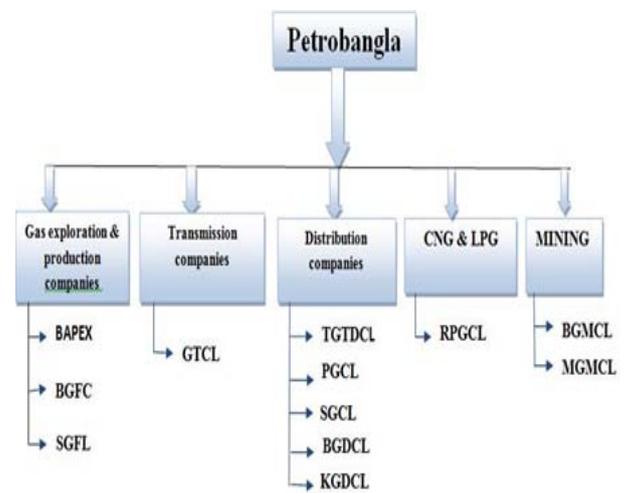
1. INTRODUCTION

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.

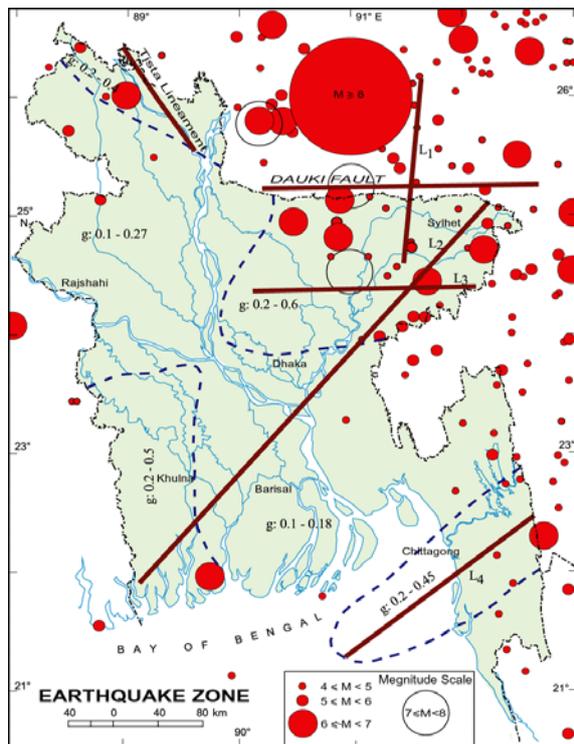


Fig.1: Zoning map of Bangladesh [1]

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 Jaflong thrust, Naga thrust and Disang thrust, is a zone of high seismic risk with a basic seismic co-efficient of 0.08.

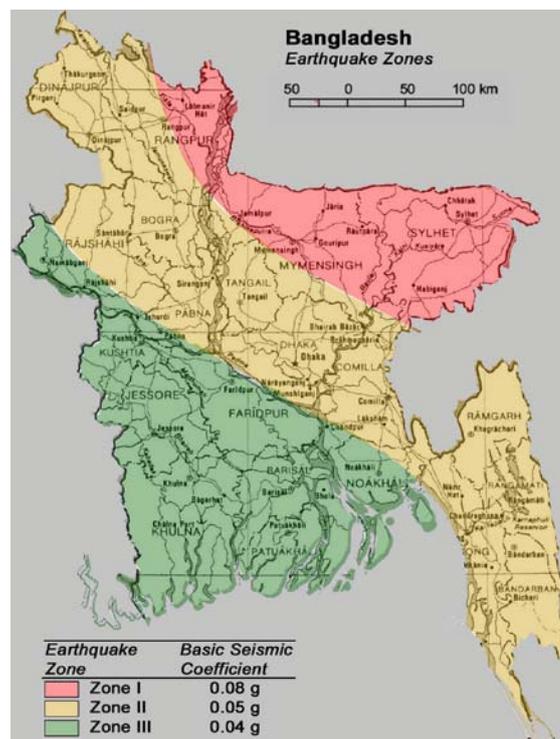


Fig.2: District wise zoning map of Bangladesh [13]

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]

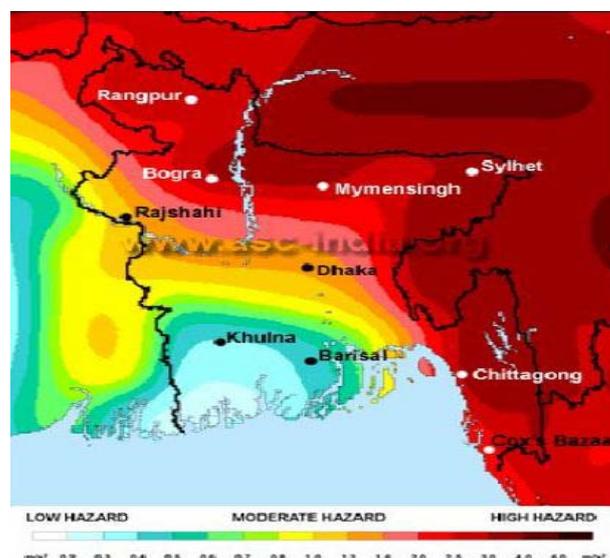


Fig.3: Earth quake zone in Bangladesh [7]

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 |
| Kailashilla 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 | Kailashilla 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.

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9. NOMENCLATURE

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