

Application of the Capacity Building System (CBS) at National Data Centre (NDC) of Bangladesh

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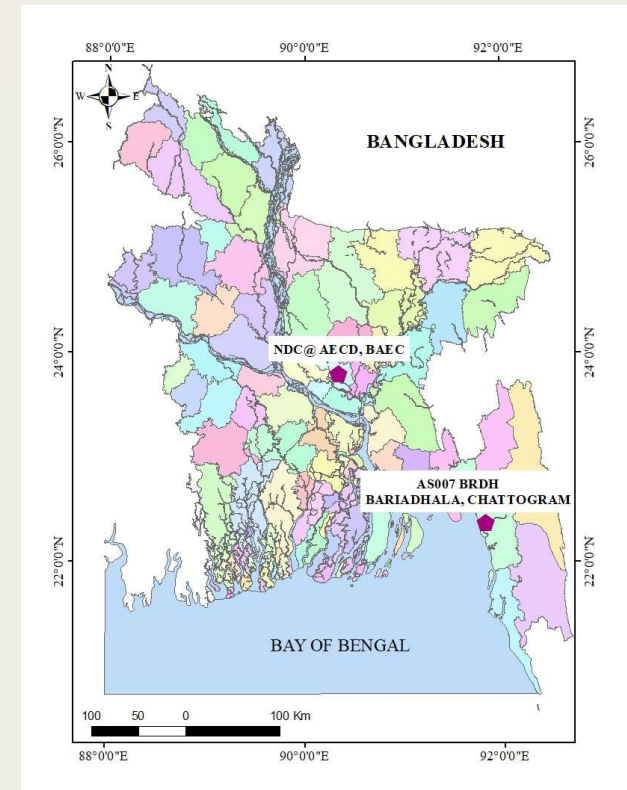


10 September 2025

DEEBA, Farah*, RASUL Md. Golam and RAHMAN Md. Hasinur

Introduction

- ❑ Bangladesh- a CTBT signatory country since 24 October, 1996
- ❑ It is the 54th state to ratify CTBT on 8 March 2000.
- ❑ Bangladesh Atomic Energy Commission (BAEC) was nominated as the Institution to cooperate with CTBTO to establish the Auxiliary Seismic Station **AS007 station**.
- ❑ AS007 was established at **Bariadhala (BRDH)**, Sitakund, Chattogram (22.7°N, 91.7°E).
- ❑ National Data Centre (NDC) of Bangladesh has been established in **Atomic Energy Centre, Dhaka** campus with the financial and technical support from CTBTO.



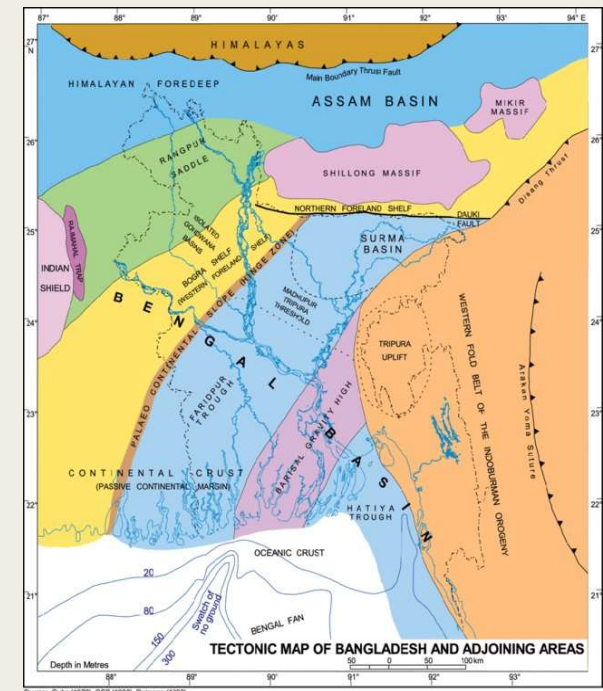
Location of NDC-BD and AS007 BRDH



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Country overview: Geology

- ❑ Bangladesh constitutes the major part of the Bengal basin, which is one of the most prominent Tertiary sedimentary basins in the world.
- ❑ Tectonically, Bangladesh is located at the junction of Indian plate, Burmese plate and Eurasian plate.
- ❑ The region is considered to be an earthquake-prone area
- ❑ Bangladesh is surrounded by the regions of high seismicity which include:
 - Himalayan Arc and Shillong Plateau in the north
 - Burmese Arc and Arakan Yoma anticlinorium in the east
 - Dauki Fault system and Complex Naga-Disang-Jaflong thrust zones in the northeast of Bangladesh.



Tectonic map of Bangladesh and adjoining areas



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Seismic Zones of Bangladesh

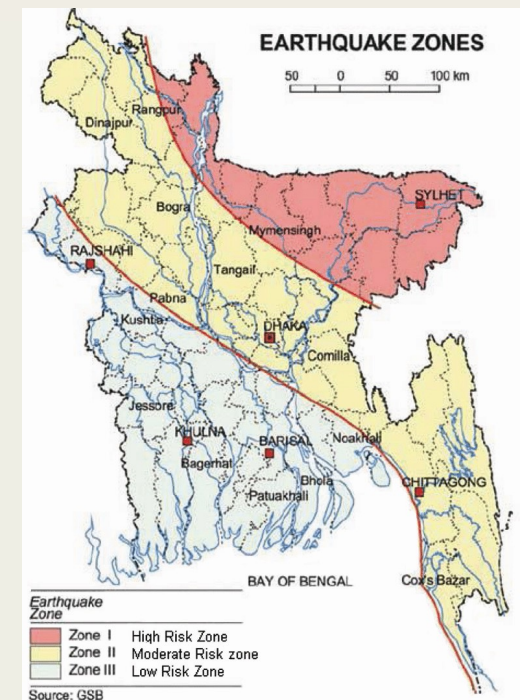
Bangladesh is divided into three generalized seismic zones based on earthquake activity:

Zone-I (most active, northeastern regions)

Zone-II (moderate activity, central and western regions)

Zone-III (least active, southwestern region)

zones are determined by the distribution of earthquake epicenters and the geological characteristics of the region.



Seismic Zone of Bangladesh



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CBS Installation in Bangladesh

- ❑ CTBTO recently installed a Capacity Building System (CBS) on 04 to 08 November, 2024 at NDC-BD
- ❑ The Capacity Building System (CBS) equipment was donated to the Government of the People's Republic of Bangladesh, through NDC at BAEC by the Preparatory Commission for the CTBTO
- ❑ The CBS is designed to help technical staff use the CTBTO's International Monitoring System (IMS) data and International Data Centre (IDC) products more efficiently and accurately.



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Goals achieved by the CBS installation

- ☐ Installation of the Capacity Building System equipment
- ☐ Configuration of CBS server to receive data from different stations (including four IMS stations: BRDH, CMAR, LZDM and WRA)
- ☐ The data is being delivered to the CBS server in real-time mode from the IDC and from various SEEDlink servers available in the Internet
- ☐ Arrangement of two working places for NDC analysts
- ☐ Installation of SHI and RN NDC-in-a-Box Virtual Machine component on the workstations.
- ☐ Hands-on training on using NDC-in-a-Box components for the NDC staff



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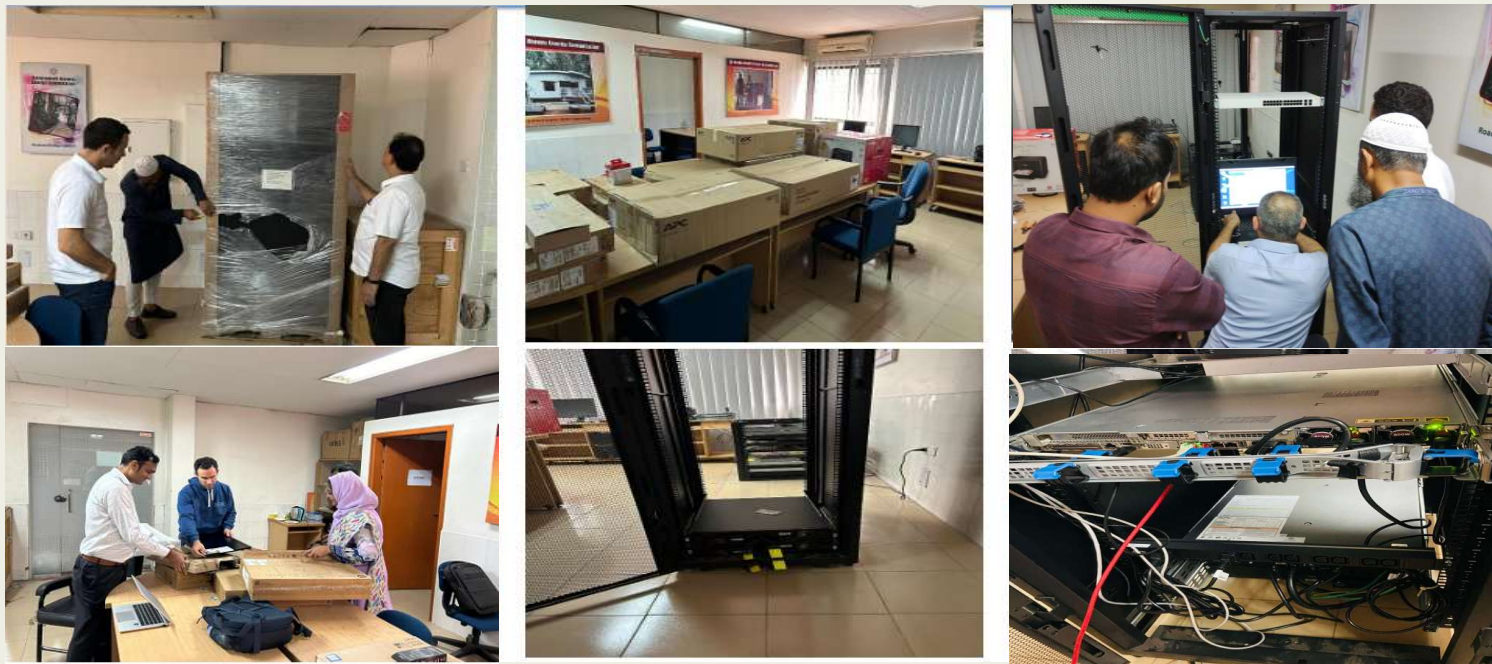
List of stations from where data is continuously received and archived in seiscomp

Network Station Code	Description	Type	Data Source/IP
IM.BRDH	Bariadhala, Bangladesh	-	IDC: 10.49.76.2
IM.CMAR	Chiang Mai, Thailand	Array	IDC: 172.22.242.245
IM.LZDM	Lanzhou, China	Array	IDC: 172.22.242.245
IM.WRA	Warramunga, Australia	Array	IDC: 172.22.242.245
IU network	Global Seismograph Network-IRIS/USGS	-	rtserve.iris.washington.edu
GE (many station)		-	Geofon.gfz-potsdam.de



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Installation of Capacity Building System (CBS) at NDC-BD



Unpacking & Assembling the rack and testing the UPS



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Installation and Training activities



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NDC staff review events detected by SeiscomP automated system



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Different products of the IDC and Regional Seismic Travel Time (RSTT) data from NDC-BD are being utilized for natural earthquake monitoring as well as subsurface geological information.



National Data Center (NDC) with recently installed CBS equipment



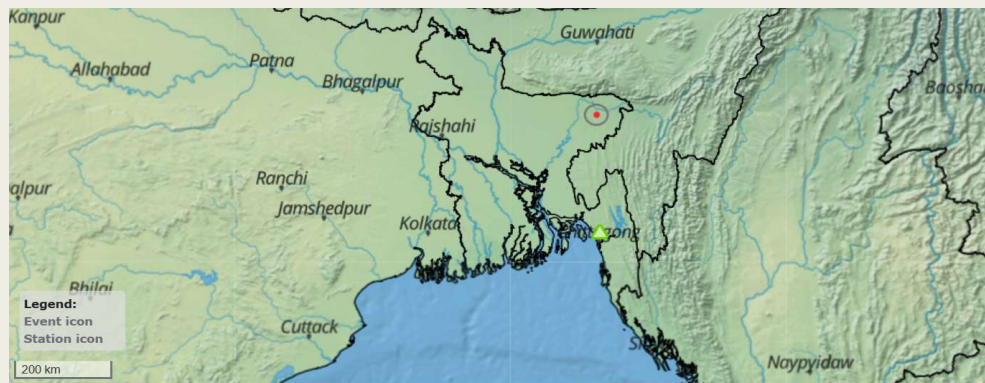
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Table: Magnitude ≥ 4 Earthquakes (2020) in and around Bangladesh (BD)

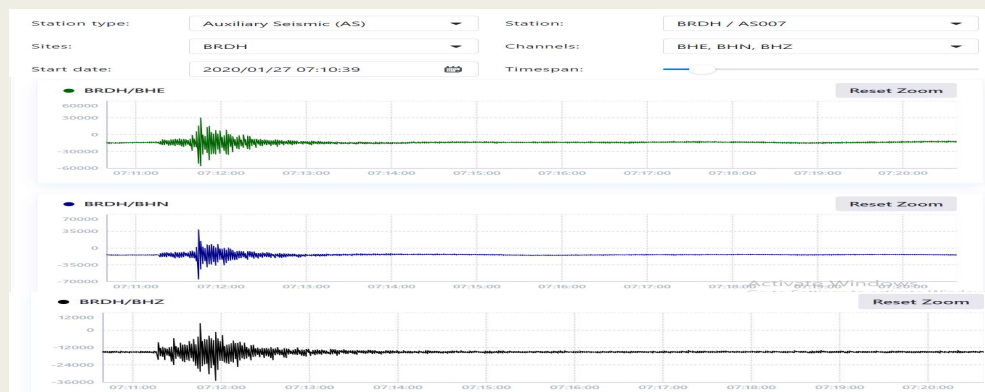
Date	Local Time (Bangladesh)	Lat.	Long.	Mag.	Location
27-Jan-2020	07:10 am	24.7999	91.7639	4.6	19 km southwest of Sylhet, BD
25-Feb-2020	06:16 am	24.5467	90.1767	4	25 km N of Sakhipur, BD
03-Jun-2020	01:40 am	24.8316	91.1391	4.2	41 km NNW of Baniachang, BD
26-Aug-2020	02:24 am	23.9650	88.4834	4	13 km W of Karimpur, India
30-Aug-2020	01:47am	23.4101	92.0138	4.9	33 km N of Khagrachhari, BD
02-Nov-2020	07:43 am	25.7773	91.1728	4.5	30 km NNW of Nongstoin, India



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EVENT 18402227 INDIA-BANGLADESH BORDER REGION



Event 18402227 India-Bangladesh Border Region

- Earthquake at Sylhet region was identified by the seismic data of BRDH, with a highest magnitude of 4.6
- The epicentre of the earthquake was near Gowainghat in Sylhet, about 205 km North East at NDC-BD, Dhaka
- The source of the earthquake was identified only 10 km below the surface



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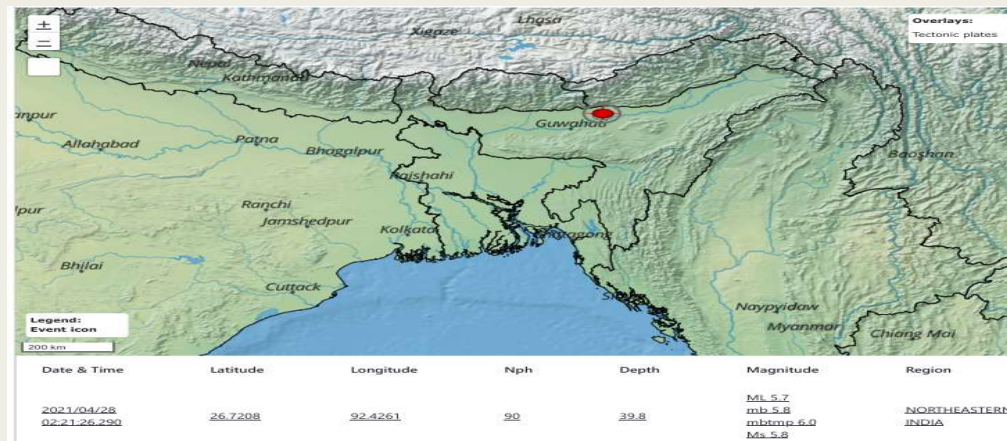
**Table: Magnitude ≥ 4 Earthquakes (2021)
in and around Bangladesh**

Date	Local Time (Bangladesh)	Magnitude	Location
28-Apr-21	8:21 AM	6	Near Sylhet (Assam earthquake) Bangladesh
29-May-21	7:58 AM	4	Sylhet region, Bangladesh
07-Jul-21	9:15 AM	5.3	Near Cumilla, Bangladesh
10-Nov-21	4:48 PM	4.4	Near Sarankhola, Khulna
26-Nov-21	5:45 AM	6.2	Hakka, Myanmar



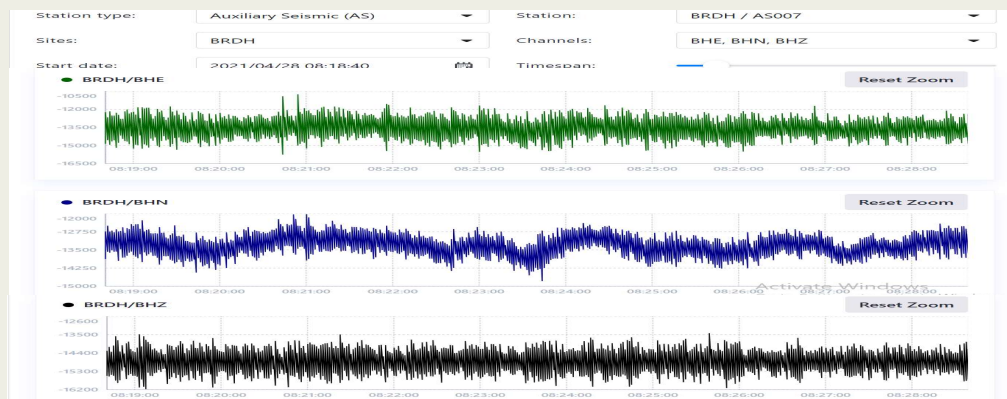
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Seismic waves generated by the earthquake On 28 April, 2021, Sylhet area



EVENT20445912 NORTHEASTERN INDIA

- ❑ This earthquake epicentered in North-Eastern India, was strongly felt across northeastern parts of Bangladesh, including Dhaka and Sylhet.
- ❑ The epicenter was 140 km north of Guwahati, with a magnitude of 6.0
- ❑ The depth of the earthquake was identified as 39.8 km below the surface.



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Table: Magnitude ≥ 4 Earthquakes (2022) in Bangladesh

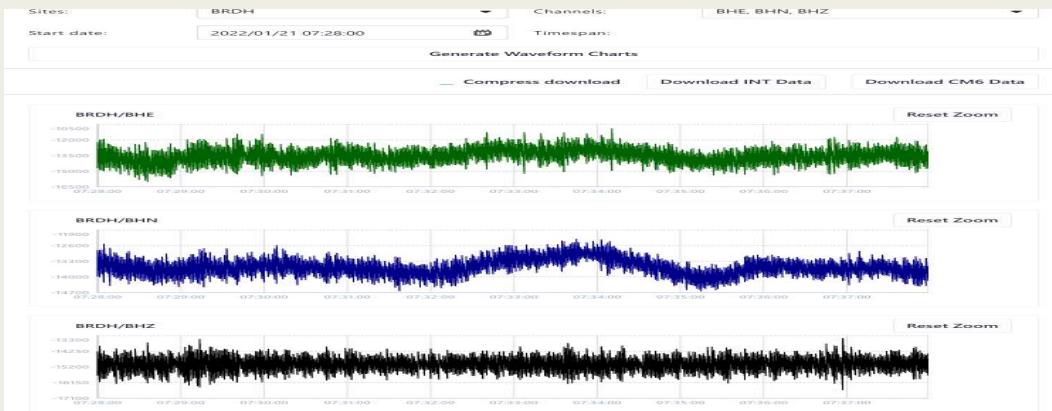
Date	Local Time (Bangladesh)	Magnitude	Location
21-Jan-2022	07:28 am	5.4	220 km ENE of Chattogram, Bangladesh
10-Feb-2022	06.45 pm	5.4	Sherpur, Bangladesh
22-May-2022	07:10 am	4.5	Chattogram region, Bangladesh
16-Jun-2022	10.46 am	5.0	23 km SE of Sylhet, Bangladesh
30-Jul-2022	08.00 pm	4.0	27 km NE of Shibganj, Bangladesh
13-Dec-222	0620 am	4.3	Near Cox's Bazar, Bangladesh



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Date & Time ↑	Latitude ↑↓	Longitude ↑↓	Nph ↑↓	Depth ↑↓	Magnitude ↑↓	Region ↑↓
2022/01/21 10:12:31.560	23.042	93.9102	89	61.3	mb 5.1 mbtmp 5.4 Ms 4.3	MYANMAR- INDIA BORDER REGION



EVENT 21670682 MYANMAR-INDIA BORDER REGION

- This earthquake occurred in Myanmar-India border region.
- It was felt across several parts of Bangladesh, including Dhaka and Chattogram.
- The magnitude of the earthquake was 5.4 and depth was 61.3 km

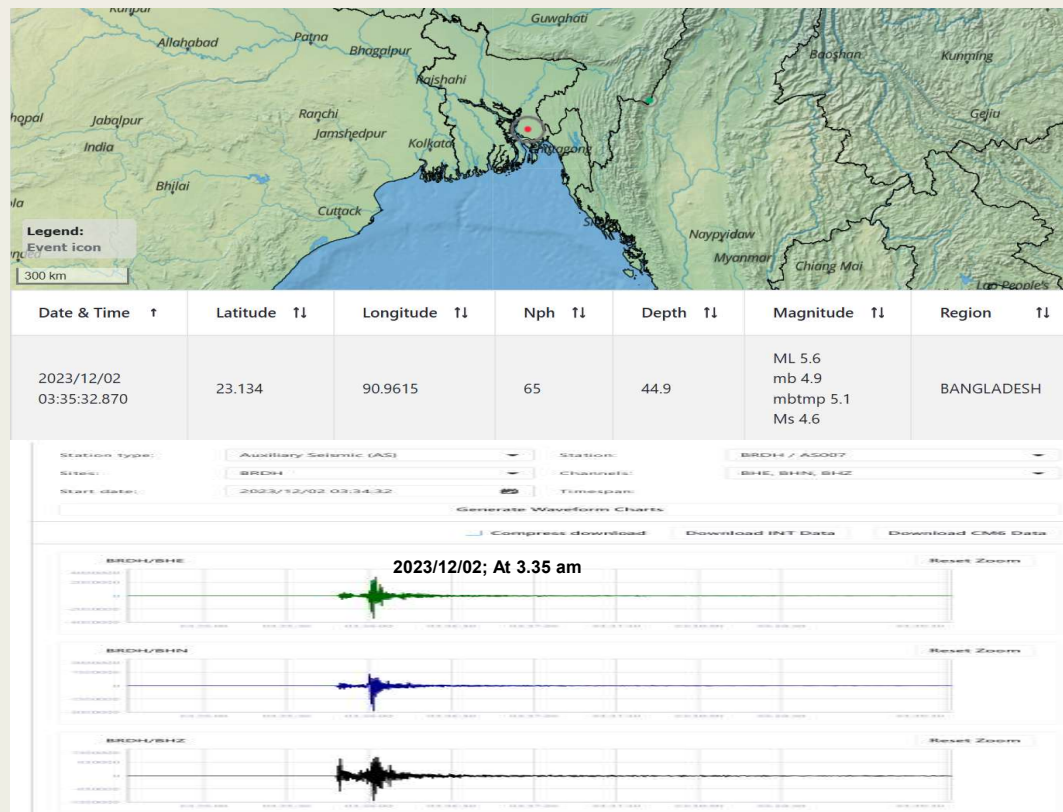


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Table: Magnitude ≥ 4 Earthquakes (2023) in and around Bangladesh

Date	Local Time (Bangladesh)	Magnitude	Location
04-May-2023	11:57 pm	4.3	8 km WSW of Dhaka, Bangladesh
16-Jun-2023	04:46 am	5	India-Bangladesh border region
16-Jul-2023	02:23 pm	4.3	24 km NNE of Nongstoin, India
14-Aug-2023	08:19 PM	5.4	Near Cherrapunjee, Meghalaya, 39 km ENE of Sylhet
17-Sep-2023	06:49 am	4.2	12 km W of Narsingdi, Bangladesh
01-Nov-2023	11:00 am	4.2	Sylhet region, Bangladesh
02-Dec-2023	03.35 am	5.6	Ramgonj, Cumilla region, Bangladesh
08-Dec-2023	09.00 am	4.2	9 km E of Cherrapunjee, India





EVENT 25152074BANGLADESH

- ❑ On 02-Dec-2023, Bangladesh experienced an earthquake near Ramganj, Lakshmipur District with a magnitude of 5.6
- ❑ It is located 86 km southeast of NDC-BD, Dhaka
- ❑ The source of the earthquake was identified 44.9 km below the surface

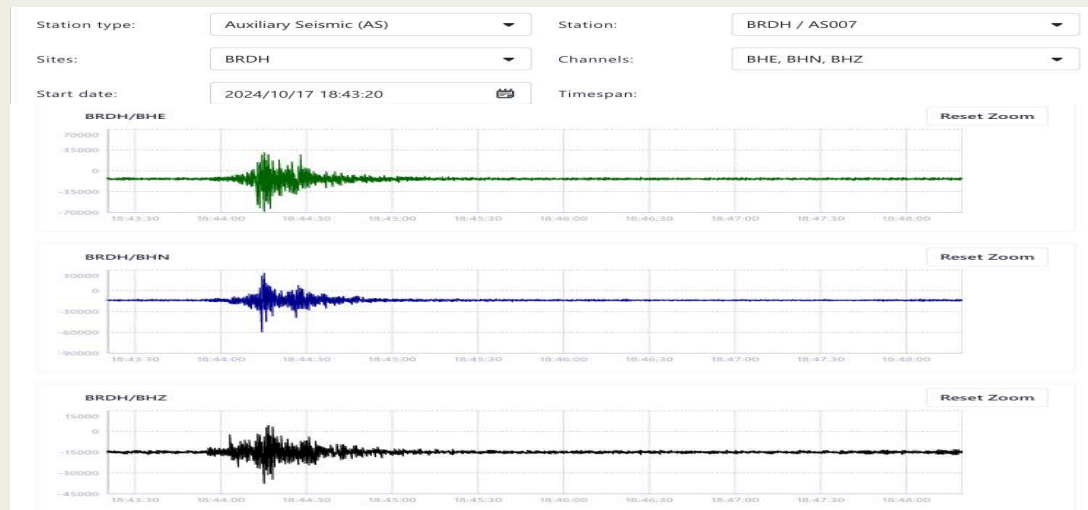


Table: Magnitude ≥ 4 Earthquakes (2024) in Bangladesh

Date	Local Time (Bangladesh)	Magnitude	Location
12-Mar-2024	08:57 am	4.4	26 km NNE of Tura, India
11-Apr-2024	04:52 pm	4.0	Near India–Bangladesh border
31-May-2024	02:20 am	4.1	35 km NW of Nongstoin, India
02-Jun-2024	02.44 pm	5.0	441 km SE of Dhaka, Bangladesh
23-Sep-2024	07:03 pm	4.2	173 km SSE of Gosaibari, India
17-Oct-2024	00:43 am	4.2	41 km S of Bangladesh
16-Dec-2024	02:10 pm	4.3	40 km ENE of Tura, India



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EVENT 26926121 BANGLADESH

- ❑ On 17 October 2024, this earthquake felt across Dhaka, Chittagong, Barisal, Shariatpur, and surrounding areas.
- ❑ The epicentre of the earthquake was approximately 41 km south of Dhaka with a magnitude of 4.2
- ❑ The source of the earthquake was identified 10 km below the surface



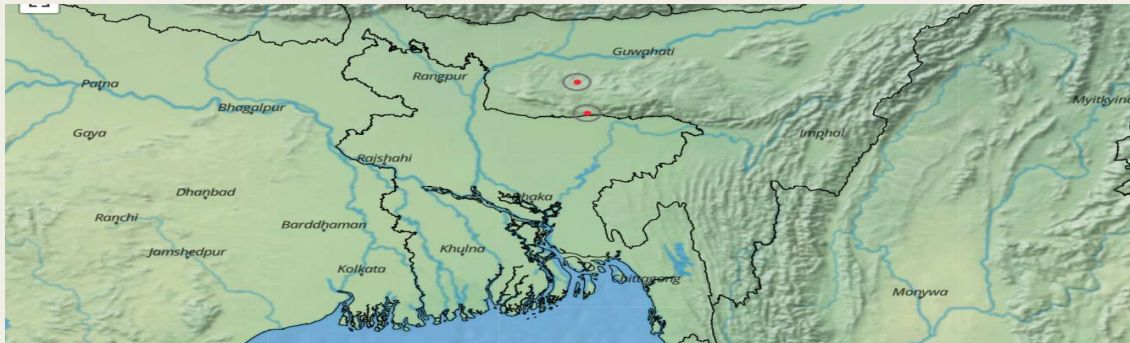
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Summary Table: Magnitude ≥ 4 Earthquakes (2025)

Date	Local Time (Bangladesh)	Magnitude	Location
07-Jan-2025	7.05 am	7.1	Nepal quake, 618 km North-West from Dhaka
21-Jan-2025	07:04 am	4.6	India-Bangladesh border region (Meghalaya)
20-Feb-2025	06:02 am	4.3	42 km S of Goalpara, Assam, India
05-Mar-2025	11:36 AM	5.6	Near India-Myanmar boarder
11-Apr-2025	4:52 PM	4.3	19.5 km away from Ashuganj, Chattogram



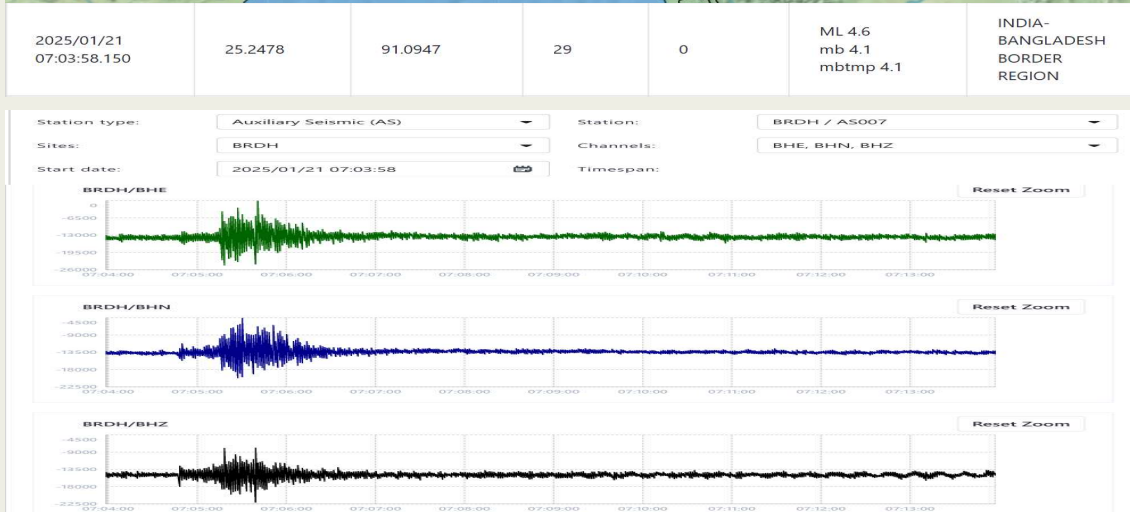
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EVENT 27402253 INDIA-BANGLADESH BORDER REGION

On 21 January 2025, Bangladesh experienced a moderate earthquake, near India-Bangladesh border region (Meghalaya), with a magnitude of 4.6

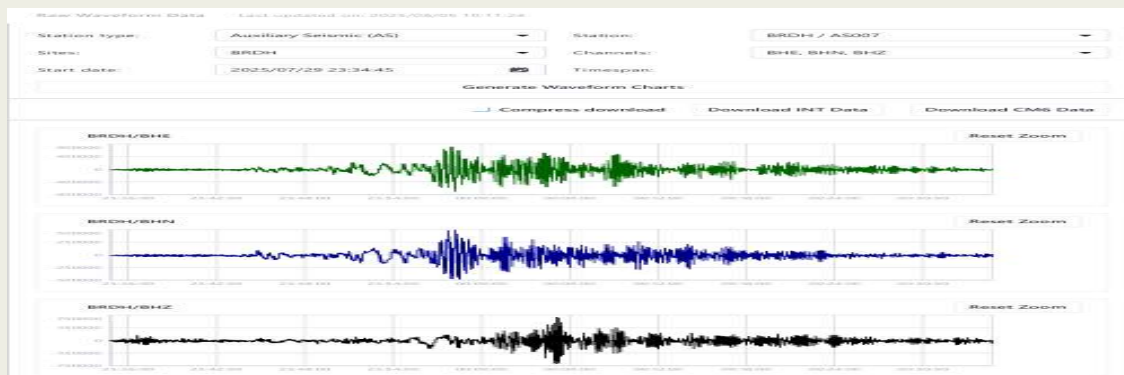
The source of the earthquake was identified 10 km below the surface



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Date & Time ↑	Latitude ↑↓	Longitude ↑↓	Nph ↑↓	Depth ↑↓	Magnitude ↑↓	Region ↑↓
2025/01/07 01:05:16.320	28.5325	87.3924	105	8.8	ML 5.0 mb 5.7 mbtmp 5.7 Ms 7.0	XIZANG



EVENT 27325801 XIZANG

- ❑ Seismic waves generated by the earthquake on 7/1/2025 was recorded at BRDH
- ❑ A major earthquake of magnitude 7.0, epicenter in China's Xizang (Tibet), at depth 8.8 km located about 618 km from Dhaka



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Largest Earhquake in Bangladesh from 2020-2025

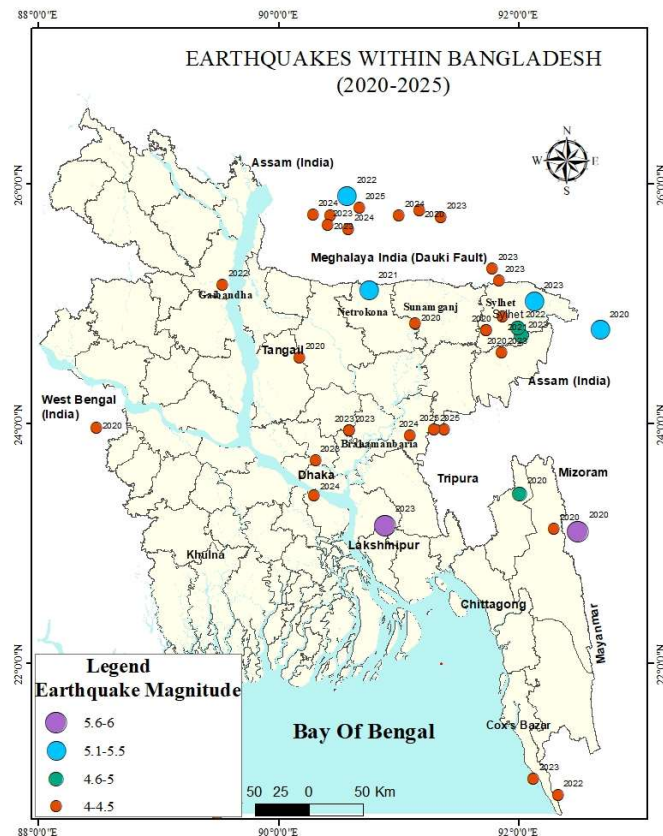
Date	Mag.	Epicenter Location	Depth
30-Aug-2020	4.9	Approximately 33 km north of Khagrachhari, Bangladesh	~37.66 km
28-Apr-2021	6.0	217 km NNE from Sylhet, Bangladesh	39.8 km
21-Jan-2022	5.4	220 km ENE of Chattogram	56.8 km
02-Dec-2023	5.6	Ramganj, Lakshmipur, Bangladesh	~55 km
02-Jun-2024	5.0	441 km south east from Dhaka	~110 km
05-Mar-2025	5.6	449 kilometers northeast from Dhaka	10 km



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Status of earthquakes in Bangladesh

- ☐ Earthquake magnitude map of Bangladesh based on CTBT-IDC data shows the distribution of earthquake which is found along the Dauki Fault system and random in other regions of Bangladesh.
- ☐ Epicentres are lying in the weak zones comprising surface or subsurface faults.
- ☐ Most of the events are of moderate rank (magnitude 4-6) and lie at a shallow depth, which suggests that the recent movements occurred in the sediments overlying the basement rocks.



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Conclusion

- ❑ In Bangladesh, seismic data from the IDC and IMS have been continuously monitored for natural earthquakes and usual or unusual seismic activities both nationally and globally.
- ❑ Recently installed CBS at the National Data Centre (NDC) in Bangladesh contributes in fundamental earthquake research, allowing scientists and university students to study seismic waves, and understand sub-surface geological information.
- ❑ CBS has made our work much easier in analysis, getting data from other surrounding countries and providing sufficient knowledge and assistance.
- ❑ Other research organizations can utilize the NDC data for various applications.
- ❑ The NDC makes the data available to its stakeholders and reports on disaster-related information to government agencies.



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Comments and Suggestions, please..

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