

RELEVANCE OF THE CAPACITY BUILDING SYSTEM (CBS) IN ZAMBIA'S NDC.

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In April, 2016, CTBTO came to Zambia to configure and install the Capacity Building System at our National Data centre (NDC) office. The National Data Centre was commissioned in February 2006, in Zambia. With this new Capacity Building system that comes with some analysis programs, it has made our work much easier in analysis, getting data from other surrounding Countries and come up with a precise location of the earthquake.

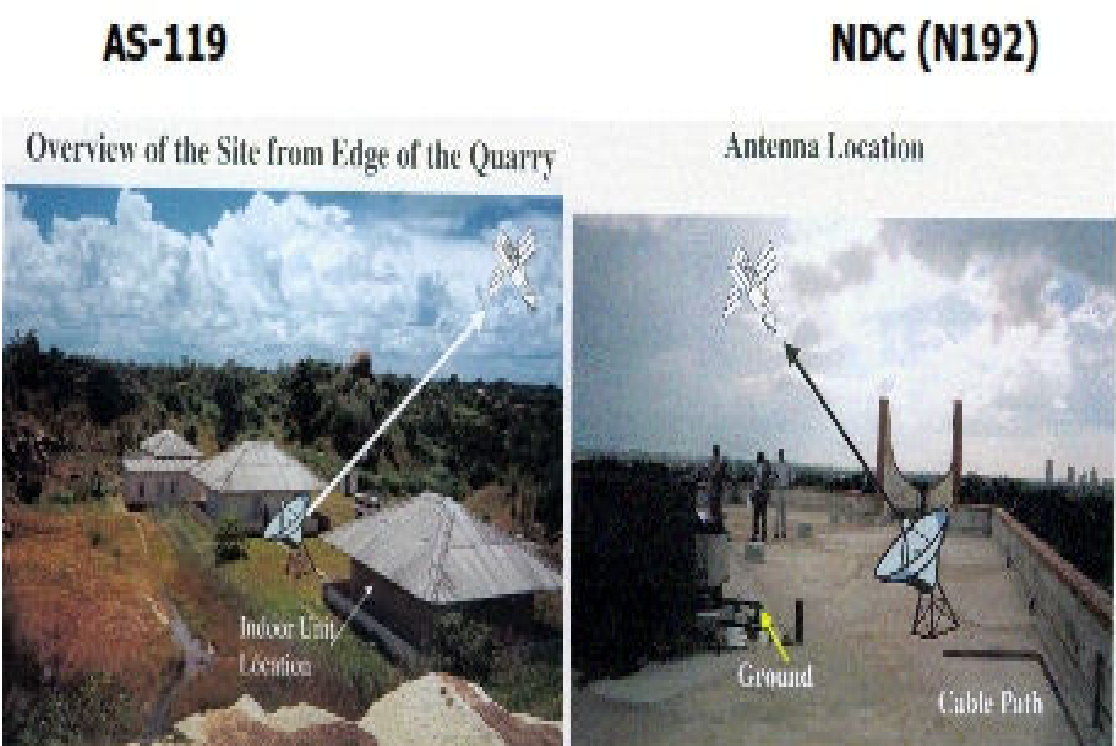
The Importance of setting up the national Data Centre is to enable us to constantly monitor, manage and coordinate both natural and man-made seismic activities in the country and around the globe. Also, uploading data to the International Data Centre (NDC), as well as receiving by using International Monitoring System (IMS) data and also IDC products for the treaty verification.

We access and analyze seismic waveforms, relevant to the International Data Centre and also make the data available to its stakeholder institutions for earthquake disaster mitigation and reporting on all aspects of disaster related to government agencies. NDC staff makes recommendations to the government of Zambia on earthquake safety measures to provide information to assist government institutions on appropriate land and building policies and submit data to its agencies.

BRIEF BACKGROUND

- The Zambian seismic network (ZSN) was established between 1983 to 1985.
- The National Data Centre was commissioned in February 2006, at the Zambian Geological Survey Department.
- Zambia, through the Ministry of Mines and Minerals Development, has a bilateral agreement with the Preparatory Commission, for the Comprehensive Nuclear Test – Ban Treaty Organization.
- Auxiliary Seismic Station CTBTO and USGS (**AS-119**).
- With the aim of monitoring the testing of nuclear explosions, which involve the use of Seismic methods.
- National Data centre NDC (**N192**).
- Currently, there are five Operational seismic stations in Zambia.
- The Lusaka (LSZ), being run in collaboration with United States Geological Surveys (USGS) and Comprehensive Nuclear Test Ban Treaty (CTBTO).
- Four are Africa Array seismic stations, namely; Kitwe (KTWE), Itzehitezhi (TEZI) and Mongu (MONG), Kasama (KSZ).

OVERVIEW OF NDC (N192) and AUXILIARY (AS-119) SEISMIC STATIONS



Geophysics and seismic building houses the Zambia NDC (N192)

- ✓ Location of Antenna and equipment
- ✓ Networking
- ✓ Coordination issues
- ✓ Site preparation (civil works)
- ✓ VSAT shipment
- ✓ Antenna Site
- ✓ Indoor Equipment Location
- ✓ Cable Run, Grounding and Power
- ✓ Capacity Building System (CBS)
- ✓ Outdoor environment
- ✓ Access to site



THE NATIONAL DATA CENTRE (NDC)

- The Importance of setting up the national Data Centre, is to enable us constantly monitor, manage and coordinate both natural and man-made seismic activities in the country, and around the global.
- But also uploading data to the International Data Centre (NDC), as well as receive, and use International Monitoring System (IMS) data and also IDC products for the treaty verification.
- NDC staff accesses and analyzes seismic waveforms, relevant to its need from the International Data Centre.
- Also makes data available to its stakeholder institutions, for earthquake disaster mitigation; reports on all aspects of disasters related to government agencies.
- Makes recommendations to the government of Zambia on earthquake safety measures; to provide information to assist government institutions on appropriate land and building policies and submit data to its agencies.

CAPACITY BUILDING SYSTEM (CBS)

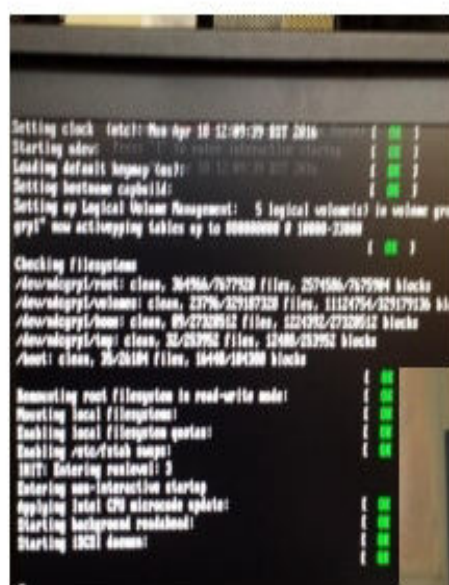
- The coming of the CBS has really helped us in timely reporting to the relevant authorities when an earthquake occurs in the country.
- This has eventually cut on time, costs incurred in data collection (from Remote Seismic Stations) and earthquake management reporting system to the relevant authorities; such as the **media, Parliament** and other **stakeholders**.
- We are able to do the following using our CBS:
 1. Location of the earthquake.
 2. Analyze the data/ waveforms.
 3. Produce a report for the authorities and Media.
 4. Produce a Bulletin.
 5. Automatic processing
- NDC through the Geological Survey Department provides seismic data to its stakeholders and agencies such as:
 - ✓ Disaster Management and mitigation Unit (DMMU) a government wing Department.
 - ✓ Mining Companies.
 - ✓ Construction Companies.
 - ✓ Road development Agency and Dams constructions.
- It has made our analysis work easier, getting data from other surrounding Countries and come up with a precise location of the earthquake.

CBS BEING ASSEMBLED AT NDC



Network, Printer, Workstation and Power-on!

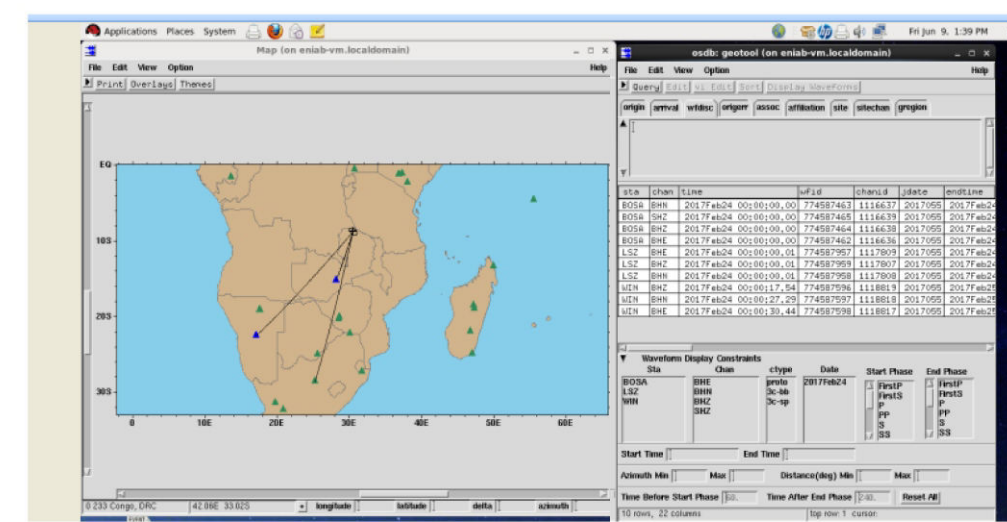
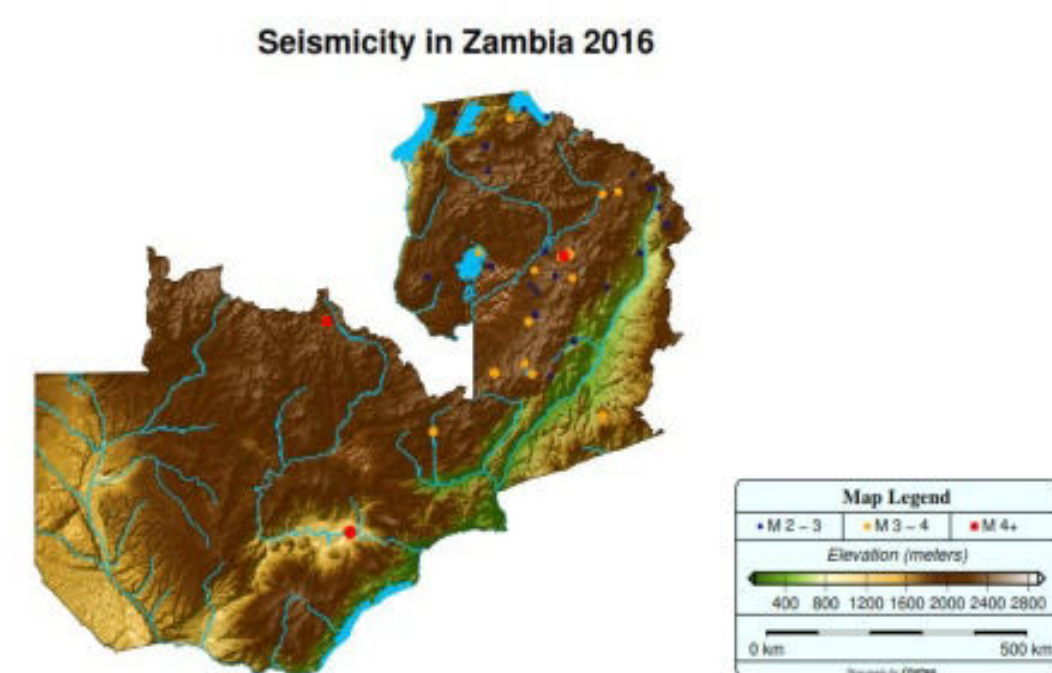
Server Power On!



Set up of the Server, Workstation and printer on the network and sharing of resources.



THE SEISMICITY MAP OF ZAMBIA



This is the event that occurred on 24/02/2017 at 00:32 GMT in the Northern part of Zambia and caused some damages in the District.

The seismotectonic set up of Zambia is composed of a general earthquake faulting pattern related to the East African Rift System and extends on the component called the southern-western branch.

The rift system in Zambia is in its incipient stage and has no magmatic manifestations, expressed boarder faults can be seen extending from the south Tanganyika rift through the Mweru rift system.

LARGE MAGNITUDE EARTHQUAKES IN ZAMBIA

- Although Zambia is considered to be relatively quiet seismically, large magnitude earthquakes have been known to occur within and near Zambia.

FIGURE: SUMMARY OF MAJOR EARTHQUAKES

DATE	TIME	LATITU	LONGITU	MAGNITU
13/12/1910	11:34	8	31	7.1
13/12/1942	13:40	11.4	34.5	6.7
25/09/1963	07:03	16.73	28.4	6.4
18/07/1986	15:07	16.36	28.48	5.4
10/05/1991	01:12	17.35	24.98	4.8
13/02/2010	16:00	13.4	30.84	5.3
18/01/2011	16:31	8.6	31.74	5.7
21/07/2011	15:55	15.96	25.98	5.2
02/10/2013	14:23	13.4	31.8	4.5
3/11/2014	18:25	10.97	29.69	5.3
19/08/2015	00:15	9.66	28.61	5.1
09/01/2016	0305	16.046	28.55	4.6
24/02/2017	00:32	8.437	30.054	5.9

SOME OF THE EARTHQUAKES RECORDED BY OUR NDC

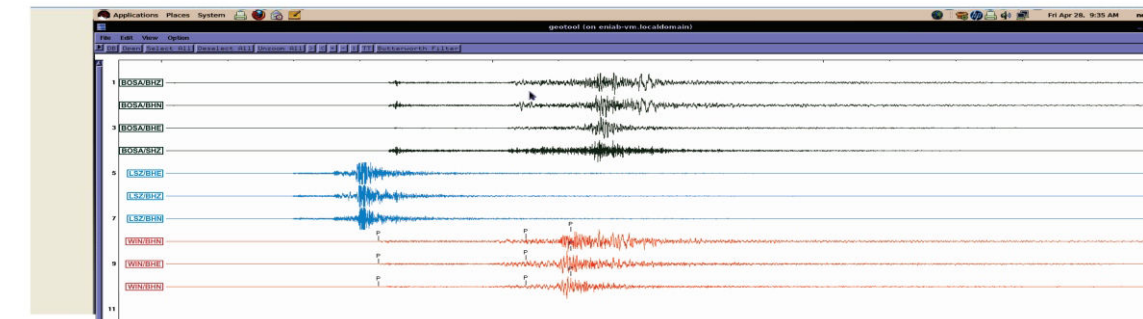


Figure 1.0: shows the waveforms from our NDC of the 5.9 magnitude earthquake that happened in Kaputa District, Northern part of Zambia on 24/02/2017, 00:32 UTC. The stations here are: BOSA and LSZ. LSZ recorded it at: 00:33 UTC. BOSA recorded it at: 00:36 UTC. This earthquake caused damage to housing infrastructure in some villages where some people were injured.

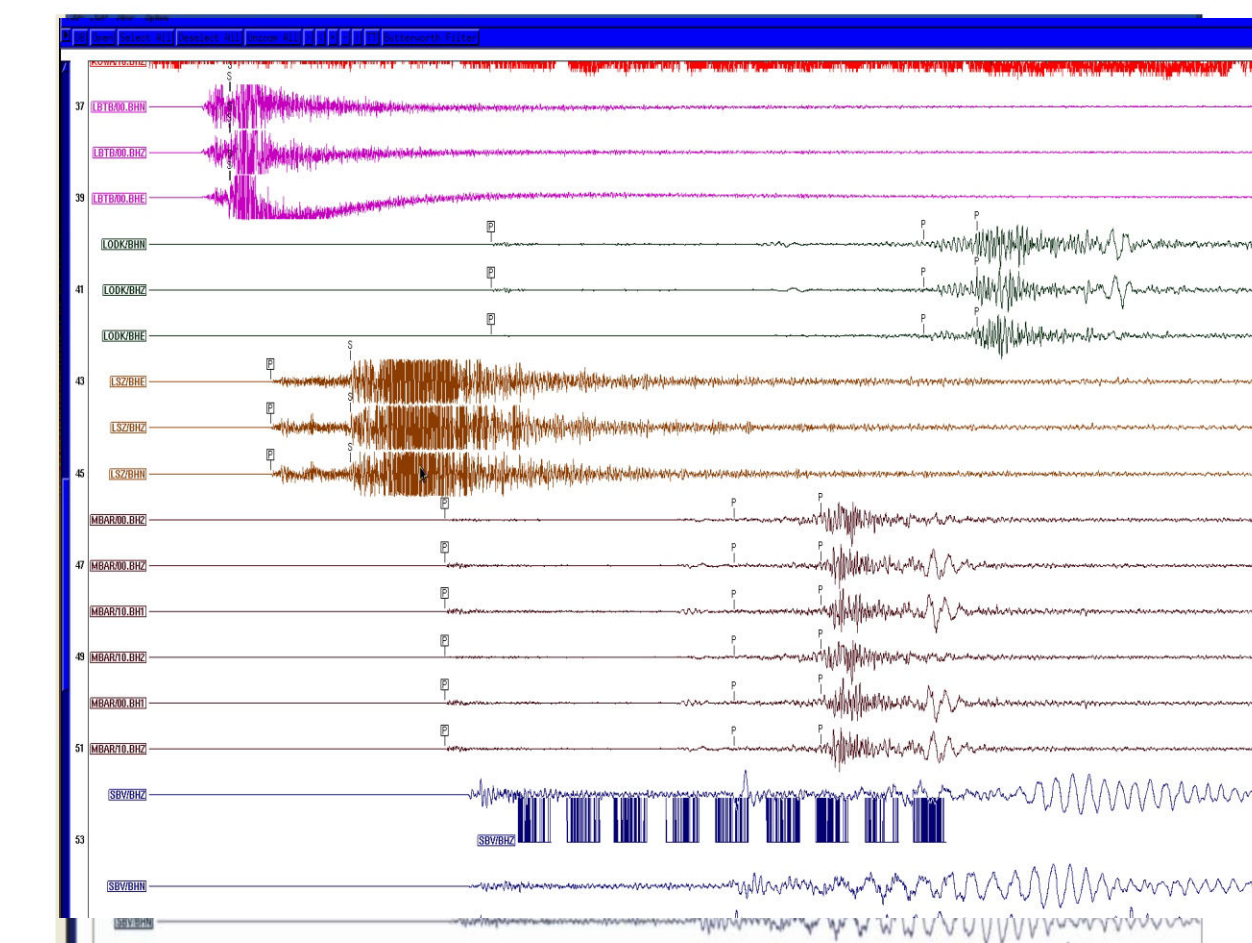
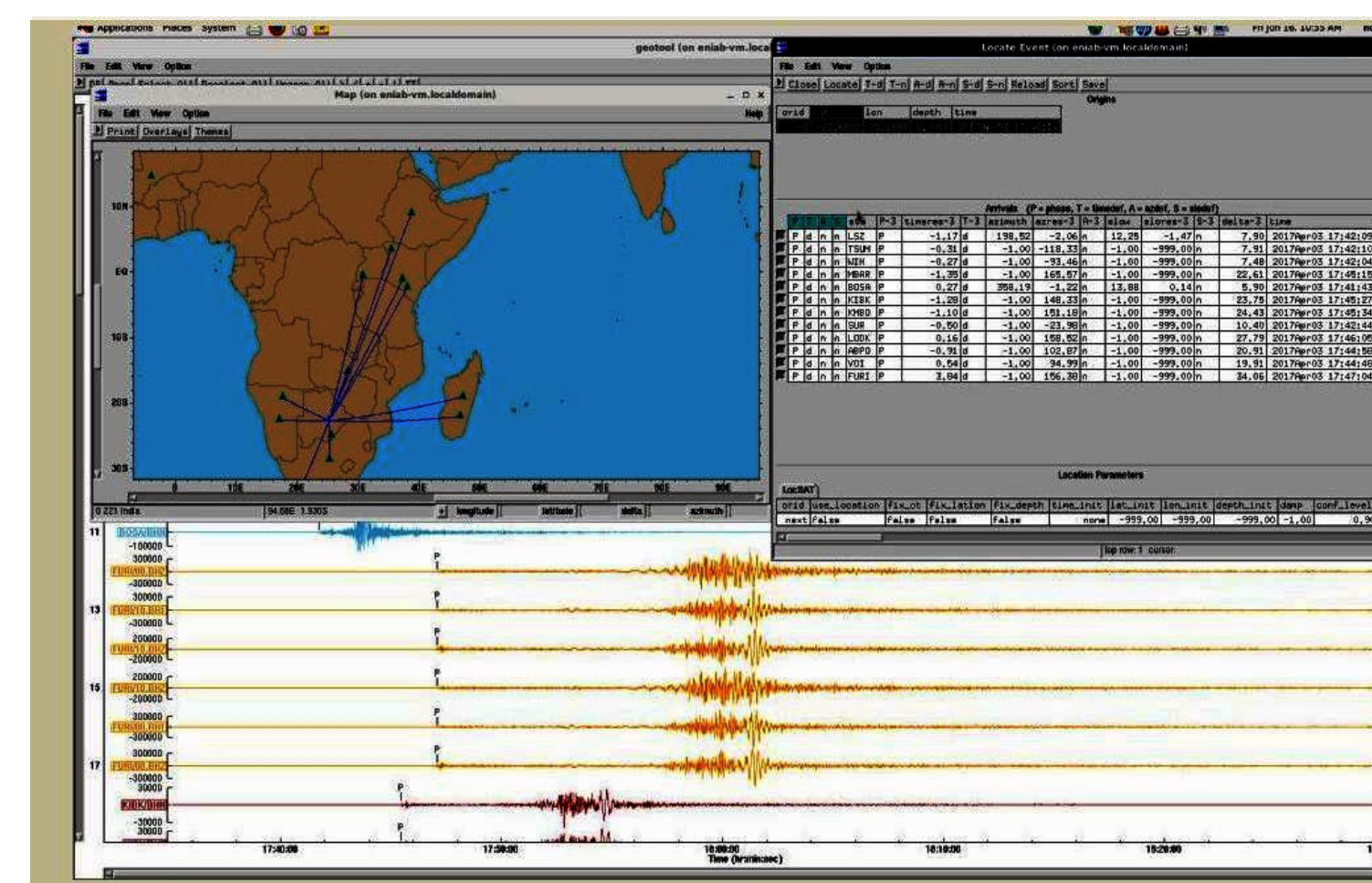


Figure 1.2: shows the waveform of the earthquake with magnitude of 6.2 that happened in Botswana. This was on 3/04/2017 at 17:40 UTC and the waveforms shown above are from BOSA and LSZ; recorded at BOSA at: 17:41 UTC and LSZ at: 17:42 UTC.

LSZ is the only Zambian Seismic Station on real time data streaming and the coming of the Capacity Building System through NDC, has helped us to see the data and be able to analyze and report to relevant authorities and the Media promptly.

POSSIBLE SEISMOLOGY RESEACH IN ZAMBIA

- Seismic activity in Zambia is closely related to the East Africa Rift System (EARS), which stretches from the Red Sea in the north through Eritrea, Ethiopia, Uganda, Kenya, Burundi, Rwanda, Tanzania, Congo DR, Zambia and Malawi.
- Zambia embraces the southern extremity of the EARS. In Zambia the rifting can be narrowed down to the Zambezi rift where the Kariba dam is located, the Luangwa rift, and the Mweru and Mweru Wantipa rifts.

AREAS OF RESEARCH.

Development of seismic parameters which would lead to the formulation of a seismic code for incorporation into the building code for Zambia.

- Seismic zoning maps
- Attenuation relation
- Mining and dam induced seismicity in Zambia.

SEISMIC ACTIVE AREAS IN ZAMBIA.

It has been recognized that Zambia is seismically active especially within the following areas:

1. The area stretching from Lake Tanganyika through Lake Mweru and the Copperbelt to the Zambia-Angola border.
2. The area along the Zambia-Tanzania border and Luangwa valley.
3. The area along the Zambezi River from Capriv Strip to Lake Kariba.
4. The area of insipient rifting stretching from Lake Kariba, through Itzehitezhi, to the Copperbelt.

BENEFITS

- Acquisition of application software's (In a Box) for analysis.
- Accessing of data from the surrounding stations.
- Ease to give information to relevant authorities in earthquakes related matters.
- Help in bulletin production for information dissemination.
- Zambia through NDC has been able to get data for use to end users.
- The various supports from CTBTO such as the **Seiscomp3** software.
- NDC staffs have been trained on how use of the CBS.
- Accessing data and other CTBTO products for the end users has been made possible through the use of secure web portal.
- The coming of the CBS has enabled us to receive seismic data from the following stations:
 - ❖ BOSA-South Africa
 - ❖ TSUM- Namibia
 - ❖ LBTB-Botswana
 - ❖ KMBO-Kenya
 - ❖ LSZ –Zambia and many more stations.
- It has made our work much easier in analysis, getting data from other surrounding Countries and come up with a precise location of the earthquake.
- We also intend to connect our local seismic stations to the NDC server in the near future.
- Automatic data processing via Seiscomp3 software.