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Earthquake Risk in South - Eastern Africa

East Africa is a developing market and constructing new infrastructure is one of the keys to the successful growth and prosperity for the region.

However, the region is prone to various natural catastrophes such as earthquakes, floods, tsunamis, volcanoes, and windstorms that might cause enormous economic losses and insured losses. South -Eastern African nations are prone to earthquake risks due to the active East African Rift System (EARS).

We present information on earthquake risk for three countries viz. Tanzania, Rwanda, Mozambique and Malawi in this edition and will provide information for other countries in coming newsletters.

East African Rift System (EARS)

The East African Rift System (EARS) is one of the world's great continental rifts that extends over 3,000 km from the Red Sea–Gulf of Aden junction in the north to Mozambique in the south. The South-eastern African region is prone to seismic hazard due to the presence of the East African rift system that crosses the region. Some of the strongest earthquakes occurred are:

- 7.4 Ms Rukwa Tanzania earthquake on 13 December, 1910
- 6.9 MS Subukia, Kenya earthquake on 9 January, 1928
- 7.2 Mw South Sudan earthquake on 20 May, 1990
- 7.0 MW Manica, Mozambique earthquake on 22 February, 2006

Figure 1 and 2 below show EARS and Figure 3 shows epicenters in EARS from 1900- 2012.



Fig 1: EARS

Source: <http://geology.com/articles/east-africa-rift.shtml>



Fig 2: EARS with country boundaries

Source: <http://geology.com/articles/east-africa-rift.shtml>

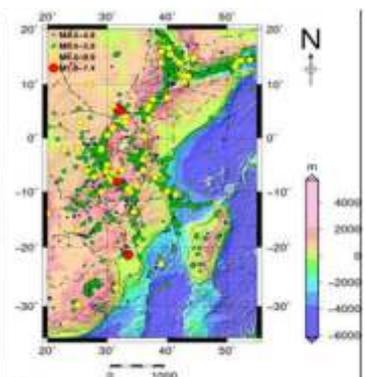


Fig 3: Seismicity in the eastern part of Africa between 1900-2012 for Mw 4.5
Source: *Ibs-vonSehtetal.*



Earthquake Risk in Tanzania

Central region of Tanzania is ranked as seismically active region. The region is at the southern tip of Gregory Rift System. Earthquakes occurring here are of tectonic origin and majority of epicenters cluster along NE-SW trend.

Research shows that the highest seismicity rates in the Eastern branch occur in northern Tanzania, encompassing the Eyasi and Manyara rift segments.

Tanzania does not have its own seismic design code. The old British codes do not have any provision of seismic design. Therefore, even minor events can damage buildings.

Table 1: Historic Earthquakes above magnitude 5 in Tanzania

Event Date	Location of Epicentre	Magnitude	Impact
July 1919	Near Lake Tanganyika	7.2	
July 5, 1964	Babati	6.3	
May 7, 1964	Dodoma		Many buildings in Mbulu and Kondoa districts were badly damaged. Older brick buildings were most seriously damaged but the newer construction experiences slight cracks. Felt at Kampala, Nairobi and other distant places.
August 18, 1964	Rukwa	6.4	
Swarm of Earthquakes in April 24 – May 18, 1965	Ngimu		Slight damage to Ngimu primary school
May 18, 2002	Bariadi	5.5	
October 2, 2002	Kipili	6.5	
November 4, 2002	Dodoma	5.5	Caused crack in Tanzanian Parliament building. Was also felt in other regions such as Morogoro, Singida, Iringa, Mbeya, and Arusha.
December 5, 2005	Near Lake Tanganyika	6.8	54 houses were collapsed, 705 experienced damage in Buhingu Division in Kigoma Rural District
September 10, 2016	Near Nsungu	5.9	

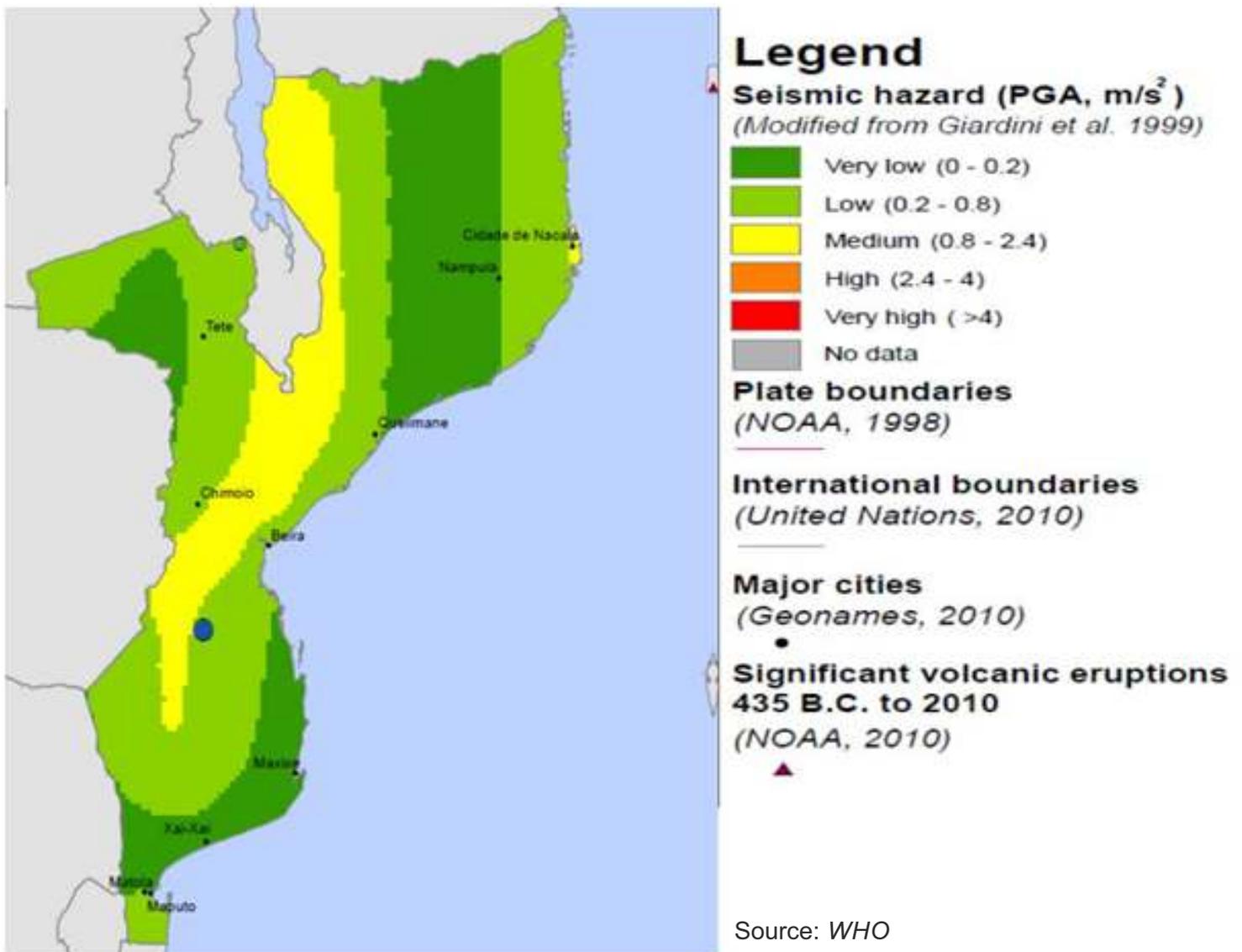


Earthquake Risk in Mozambique

Mozambique is situated on the southern end of the East African Rift Valley. Although seismic activities are not frequent in this area, researchers advise the need to consider earthquake preparedness as a priority for contingency planning.

Mozambique is exposed to seismic activity from fault activity along the East African Rift. Awareness of seismic risk increased following a damaging magnitude Mw7 earthquake on February 23, 2006 which struck the southern province of Manica, killing four people, destroying almost 300 houses and causing damage to infrastructure leading to power outages.

Figure 1: Seismic Hazard Distribution Map of Mozambique



Areas closer to Malawi border are more vulnerable to earthquakes. Mozambique does not have its own seismic design code. Old Portuguese codes do not have any provision of seismic design. Events like the February 23, 2006 might cause considerable losses.



Earthquake Risk in Rwanda

Rwanda and the Western Rift Valley of Africa have experienced several shallow focus - depth of earthquake epicenter is up to 40 kilometer - earthquakes. The entire population of Rwanda is exposed to earthquake of different intensities. Population in all the districts in the western province are exposed to earthquake intensity VII including some districts in the southern and northern provinces. The rest of country is also exposed to earthquake at intensity MMI VI. With increased economic activities in hazard prone areas, risk is increasing.

Table 2: Historic earthquakes above magnitude 5 in Rwanda

Event Date	Location of Epicentre	Magnitude	Impact
March 20, 2003	Rubavu	6	
February 3, 2008	Rwanda – DRC border	6.1	Structural damage in Rusizi, Nyamasheke
August 7, 2015	37 km N of Cyangugu, Rwanda	5.8	Several houses collapsed

Majority of the poor Rwandans exposed are from the districts of Rubavu, Rutsiro, Rusizi, Ngororero, Nyabihu, Nyamagabe, and Nyamasheke including Gatsibo and Nyagatare.

Rwanda has building regulations manual from Rwanda Ministry of Infrastructure, which include seismic code; however, implementation is rare. Therefore, moderate and even small earthquakes might be disastrous.

Earthquake with an intensity VII could cause losses around 10 billion Rwandan Francs due to damaged houses. In addition, damaged health care facilities could cause economic loss of around 11 Rwandan Francs due to an intensity VII earthquake. The highlands of Rubavu, Rusizi, Nyamasheke, Nyamagabe, Karongi, and Rutsiro are more vulnerable.

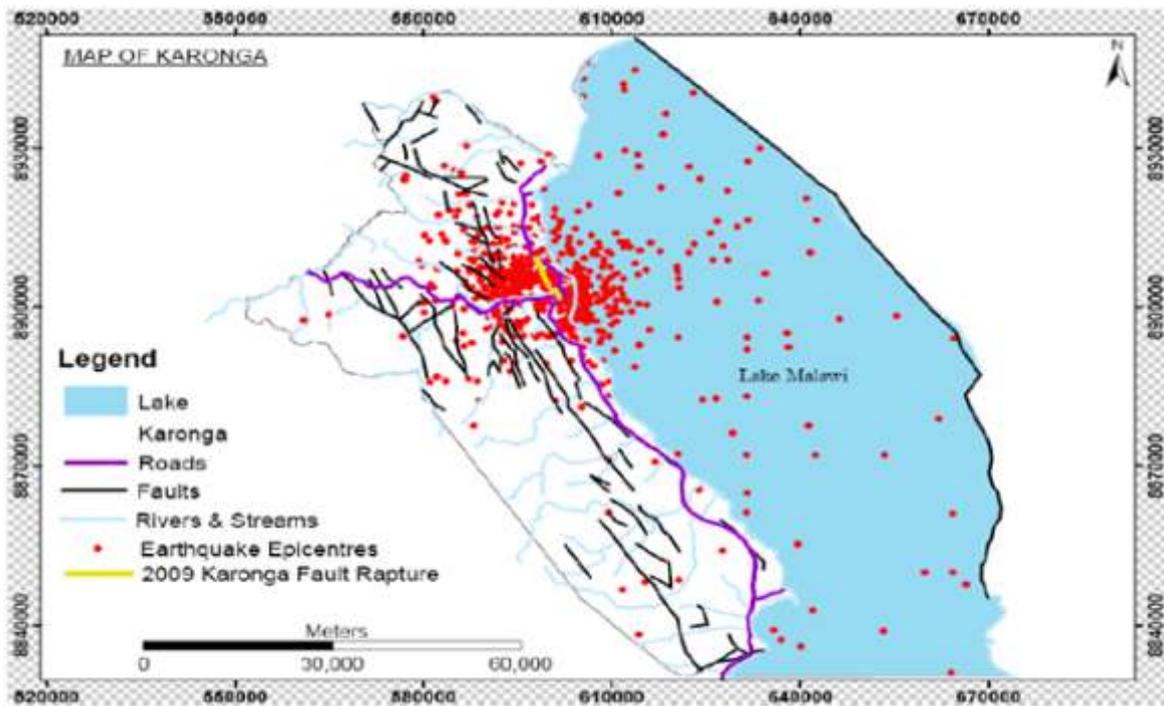


Earthquake Risk in Malawi

Malawi is located in the EARS and, therefore, continuously experiences a series of low to medium magnitude earthquakes. Most earthquakes are shallow focus earthquakes with depths range from 0-15 kilometers within the Malawi Rift.

Seismicity is intense and concentrated along the major NW trending fault zones which extend into Lake Malawi. Areas around Karonga are prone to earthquakes.

Figure 1: Epicenter of earthquakes occurred in Karonga since 1904



Source: Mdala 2016
Geological Surveys
Mzuzu

Table 3: Historic earthquakes above magnitude 5 in Malawi

Event Date	Location of Epicentre	Magnitude	Impact
1966	Karonga	6.2	
March 10, 1989	Central Malawi	5.9	
December 19, 2009	Karonga	6.2	Over 1000 houses collapsed, Economic Loss around US\$ 21 million. Damaged a flood control dyke. Also felt in Tanzania and Zambia.
Swarm of earthquakes January 2010	Karonga	6.0	
Swarm of earthquakes July – Sep 2015; total 210 earthquakes	Nkhotakota, Rumphi, Karonga and Mulanje	5.0	

The country has various standards for building material and construction practices but they do not include seismic design code.

All four countries have experienced earthquakes in the past. With increased exposure in hazard prone areas due to increased economic activities and lack of implementation of building codes is making buildings more vulnerable. Therefore insurance companies should be vigilant while buying reinsurance protection.

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