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# Seismic risk in Ghana: efforts and challenges

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**Abstract.** Since 1939, Ghana experienced its severest earthquake with a magnitude of 6.5 on the Richter scale which killed seventeen people and caused a lot of damage to property. There have been reported occurrences of earth tremors in recent times, though the region is generally considered a stable continental area with few active tectonic features.Three recent earth tremors were recorded in the country in March and December, 2018 and March 2019 with magnitude ranging from 3.0 to 4.8 on the Richter scale. These tremors caused a lot of panic to the inhabitants of the most affected areas. Earthquake occurrence and observation survey were conducted in March, 2019 in the southern part of the country where the events were most felt. The main objective of the survey was to assess the perception, experiences and adaptation strategies of randomly sampled residents of the area to seismic events. Questionnaires were administered for the survey in the Awutu Senya East and Weija-Gbawe Municipalities. There were divergent views from the inhabitants on their perception, experiences and adaptation strategies to earth tremors in the area. We realized that most of the people were aware that they live in an earthquake prone area, but have no measures in place to mitigate the seismic risk. Therefore there is the need for the responsible government agencies to conduct geological and geophysical investigation on every land acquired before releasing them to developers.

**Keywords:** Seismic risk, Coastal boundary fault, Akwapim fault zone, Awareness creation, Ghana,

## 1 Introduction

The seismicity of Ghana is attributed to possible recent movement along the Togo, Birimian and Dahomeyan thrust faults (Bondessen and Schmidt, 1972). Sykes (1978) emphasized the role of these faults to the high seismic activity in the region. The relative intense seismicity in the region is attributed to the resurgence of movement along ancient tectonic boundaries. Bacon and Banson 1979; Amponsah, 2002; attributed the seismicity of south eastern Ghana to the level of activity of the Akwapim fault zone with little activity along the Coastal boundary fault.

There have been reported occurrences of earth tremors in recent times in parts of southern Ghana namely Awutu Senya East and Weija-Gbawe Municipalities (Amponsah et al., 2012; Amponsah, 2004; Akoto and Anum, 1992). These events have thrown residents into fear and panic. Table 1 shows magnitudes and earthquakes recorded in Ghana from 1615 to 2019.

Table 1. Earthquakes recorded in Ghana from 1615 to 2019

| Magnitude/Richter scale | Number of earthquakes |
|---|---|
| Less than or equal to 2 | 47 |
| 2.1 - 3.0 | 117 |
| 3.1 - 4.0 | 49 |
| 4.1 - 5.0 | 66 |
| 5.1 - 6.0 | 4 |
| Greater than 6.0 | 2 |
| Total | 285 |

(Source:Amponsah et al.2012; Doku, 2013;CTBTO Sel 1)

Earthquake occurrence and observation survey were conducted in March, 2019 to assess the perception, experiences and adaptation strategies of residents of these areas to seismic events. Figure 1 is a map of Awutu Senya and Weija Gbawe Municipalities.. The purpose of the survey was to disseminate information on seismic hazard to ensure that effective measures are taken in land development. Information was also sought for policy making as well as advice the government on geo-scientific issues relating to seismic events.

The questionnaire which was prepared by the Staff of **the Ghana Atomic Energy Commission (GAEC)** had two sections. One section had to do with the socio-economic background of the people and the other part dealt with the perceptions, experiences and adaptation strategies of the people to earthquakes.

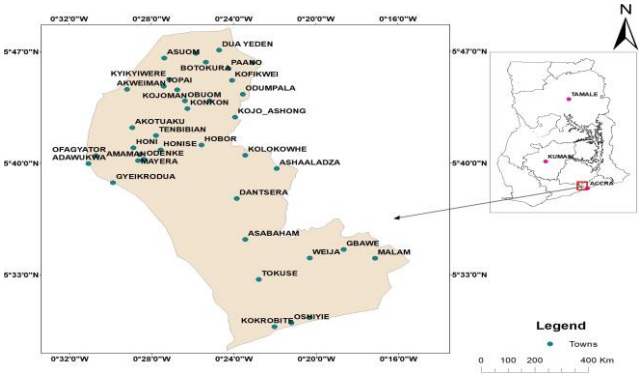


Figure1 Map of the study area

## 2 Materials and Methods

Questionnaires were administered by Staff of GAEC and NADMO. Residents who could not read were assisted. The elite completed the questionnaires themselves.Three days were allotted for the interview as indicated in Table 2 at Awutu Senya and Weija-Gbawe Municipalities respectively.

Table 2 Earthquake occurrence and observation survey in the Awutu Senya and Weija-Gbawe Municipalities

| | Awutu Senya East Municipality | Weija-Gbawe Municipality |
|---|---|---|
| Day 1 | Introductory visit to the National Disaster Management Organization (NADMO) office.<br>Planning of fieldwork, locations and schedule of personnel to administer questionnaire | Introductory visit to the National Disaster Management Organization (NADMO) office.<br>Planning of fieldwork, locations and schedule of field personnel |
| Day 2 | Training of NADMO Staff on seismic events and questionnaire administration | Training of NADMO Staff on seismic events and questionnaire administration |
| Day 3 | Administration of questionnaires and interview session | Administration of questionnaires and interview session |
| | Ninety seven questionnaires were administered | One hundred and twenty four questionnaires administered |

A total of two hundred and twenty one (221) residents in the area were interviewed.There were divergent views from the inhabitants on their perception, experiences and adaptation strategies to earth tremors in the area.

Through the briefing and interview sessions, the realization was that:

- Most of the people were aware that they live in an earthquake prone area but had no measures put in place to mitigate it in any form.
- The agencies and institutions responsible for permitting and regulating building activities in the area do not emphasize the need for geophysical investigation of their sites before development.
- There is the need to involve the chiefs and opinion leaders, real estate developers and the people themselves in the mitigation process since they are the custodians of the land.

**4 Discussion**

During the interview session it was observed that most of the inhabitants are aware of that the area is prone to earthquakes but have no other place to move to so have decided to live with the menace. Others were ignorant and felt it was a common occur-

rence so did not bother them much. There is therefore the need for the responsible government agencies to conduct geological and geophysical investigation on every land acquired before releasing them to developers. There should be intensive and consistent public awareness creation on the need for geophysical investigation on all sites before development.

## 5 Conclusions

It is important to recognize that the southern part of Ghana has the highest concentration of strategic assets and human population, therefore strategies must be devised to minimize the risks posed by some of these natural disasters that can strike the area. Seismologists have warned that the continuous earth tremors should not be taken for granted. As a precautionary measure, it is recommended that all residents of the earthquake prone areas should seek professional advice for a seismic and geotechnical evaluation of the sites where their structures are located to determine the hazards and possible solutions.

The Geological Survey Authority is mandated to monitor seismic activities in the country and advice accordingly. This is supported by other Agencies such as the National Data Centre of the Ghana Atomic Energy Commission.

For Ghana to become resilient to natural, manmade and technological hazards we must be proactive in our planning and development strategies.

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