



an envisaged collaborative project
in sub-Saharan Africa

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- What initiatives are there to mitigate the risks?
- What are the objectives of GEM Regional Programs?
- What benefits and opportunities does GEM offer?
- What is the status of the GEM Regional Program for sub-Saharan Africa?
- What tasks lie ahead?



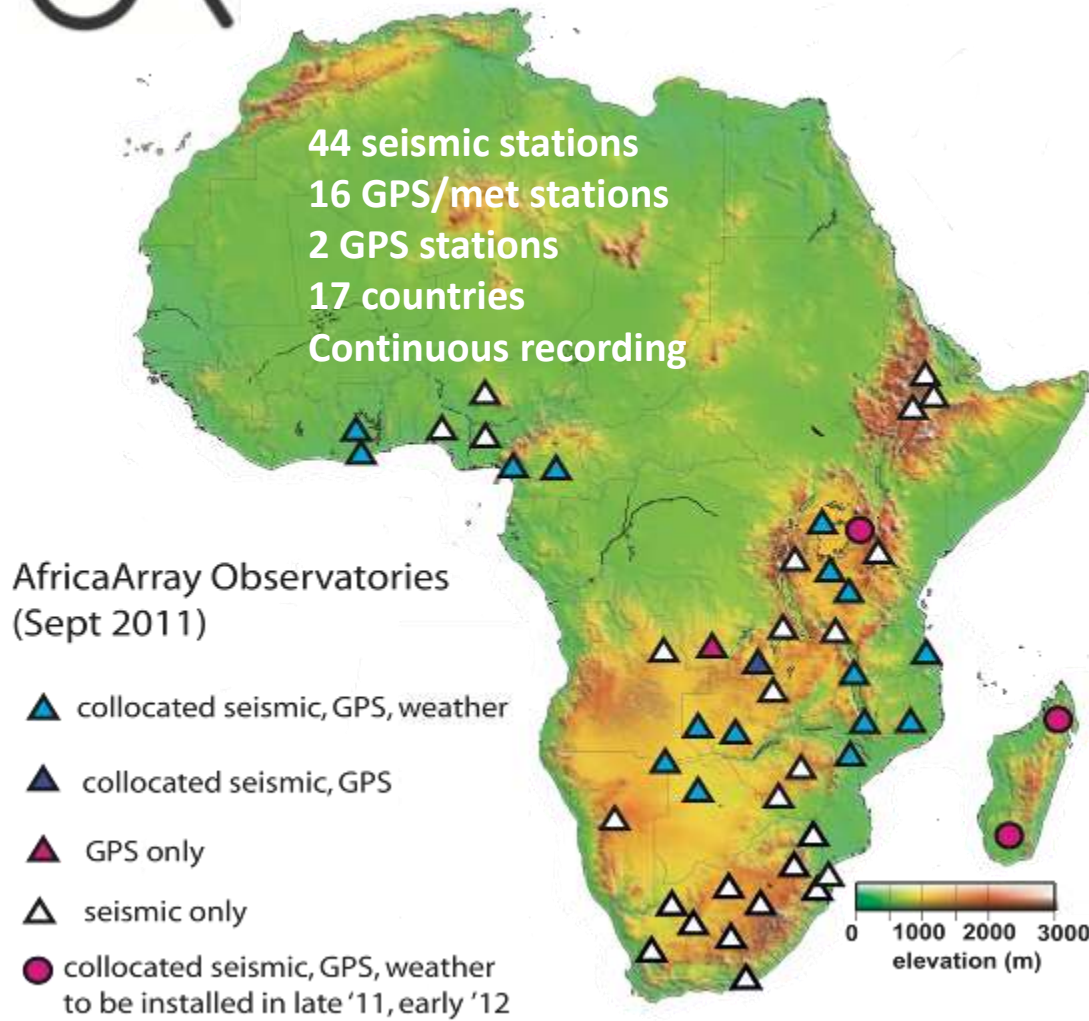
The Eastern and Southern Africa

Regional Seismological

Working Group

Welcome to the Eastern and Southern Africa Regional Seismological Working Group (ESARSWG) web page.

Current Initiatives: AfricaArray



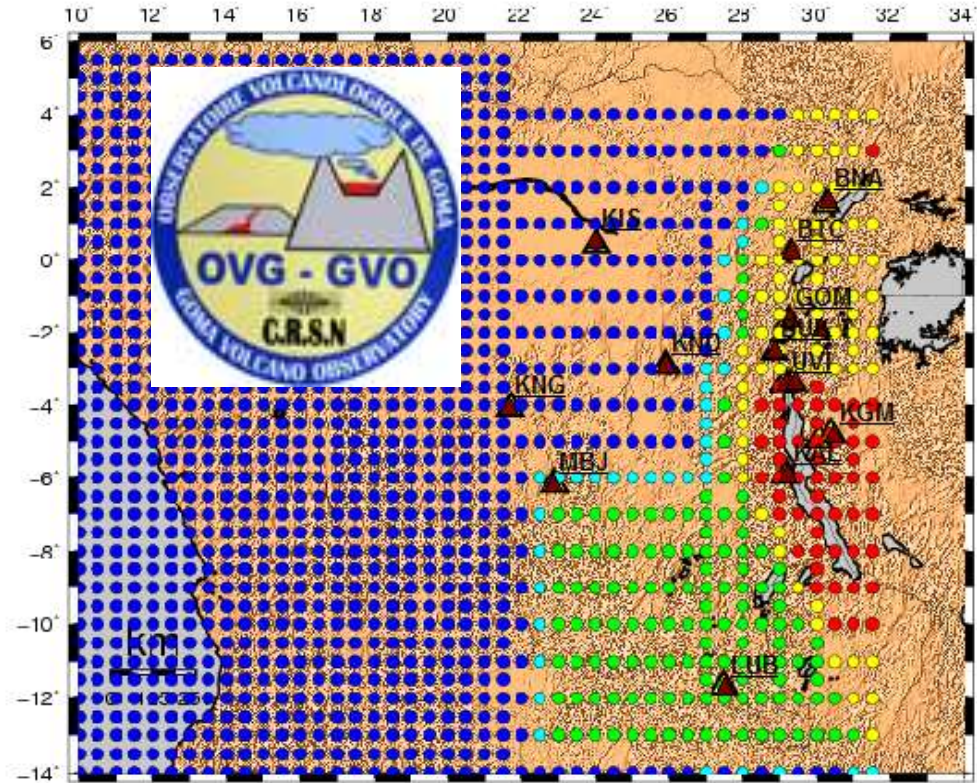
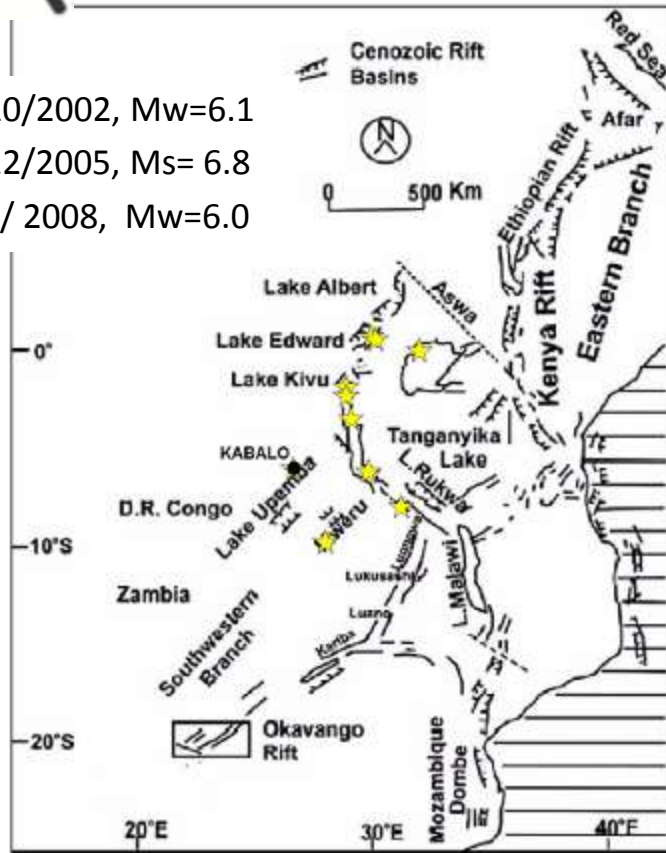


Goma DRC,
17 January 2002



Seismic hazard assessment & volcanogenic seismicity in the Democratic Republic of Congo

Kalehe 24/10/2002, Mw=6.1
 Kalemie 5/12/2005, Ms= 6.8
 Bukavu 3/2/ 2008, Mw=6.0



The Western Rift Valley of Africa (WRA) has experienced several severe earthquakes of $M \geq 6$ in recent historical times, and 3 since 2002

ICSU Regional Office for Africa
SCIENCE PLAN

Natural and Human-induced Hazards and Disasters in sub-Saharan Africa

September 2007



2.2 Geological Hazards

Currently, disasters due to geological hazards have a far smaller impact on sub-Saharan Africa than those due to hydro-meteorological hazards. Earthquakes account for 2%, and landslides and volcanic hazards account for 1% of the number of hazards occurring on the continent (OFDA-CRED, 2002). However, the impact of these hazards may change in future.

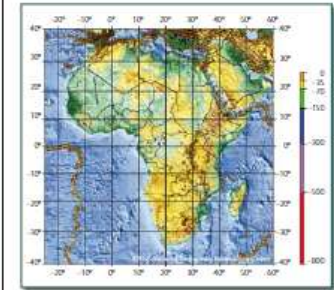
2.2.1 Earthquakes

Sub-Saharan Africa is largely a stable intra-plate region characterized by relatively low levels of seismic activity, with earthquakes randomly distributed in space and time (see Figure 3). The only parts of sub-Saharan Africa that do not display the characteristics of an intra-plate region are the East African Rift System and the Cameroon Volcanic Line, where earthquakes are associated with active fault zones and volcanic activity.

Devastating earthquakes with magnitudes greater than 6 occur almost annually in the East African Rift. Recent events include the February 2006 Mozambican M7.5 earthquake, which was one of the largest ever recorded in southern Africa. Tremors were felt as far away as in Zimbabwe and South Africa. Four people were killed, 27 injured, and at least 160 buildings damaged. The extent of economic loss was not evaluated. In December 2005, a M6.8 event in the Democratic Republic of Congo (DRC) caused several deaths and damaged school buildings. The event also killed people in the Lake Tanganyika region of western Tanzania, and left more than 400 families homeless. The Cameroon Volcanic Line experiences earthquakes associated with volcanoes and fault movements. They do not exceed magnitude 6, and so far have caused no human casualties.

Earthquakes also occur occasionally in the Cape Fold Belt in South Africa. In this region, the most destructive recorded earthquake was a M6.3 event that took place on 29 September 1969 in the Ceres-Tulbagh region of the Western Cape, which killed 12 people. Aftershock activity had virtually ceased when a M5.7 event occurred on 14 April 1970, causing further damage in the towns of Ceres and Wolkeley.

Figure 3: African seismicity, 1990-2000



Source: <http://mc.usgs.gov/ncis/general/seismicity>

The impoundment of reservoirs has also triggered earthquakes. For example, the filling of Lake Kariba (on the border between Zambia and Zimbabwe) and subsequent fluctuations of water level have been accompanied by seismicity, the largest event having a magnitude of 6.2. Seismicity has also been associated with the Gariep Dam in South Africa and the Kase Dam in Lesotho.

Mining-related earthquakes pose a significant hazard to mineworkers in the gold and platinum mining districts of South Africa. Thousands of mineworkers have perished during the last century as a result of rock bursting. No member of the public has suffered fatal or even serious injuries due to mining-related earthquakes, although some events have damaged surface structures. The M5.3 event on 9 March 2005 near Salfontein (South Africa), for example, caused serious damage to schools, commercial properties, apartment blocks, the civic centre, and 25 houses.

The multitude of active faults in the East African Rift System poses a significant hazard. Several large dams have been built there, such as Cahora Bassa (Mozambique) and Kariba (on the Zambezi river, between Zambia and Zimbabwe). However, African research institutions have limited capability to mitigate and respond to earthquake hazards and disasters. Currently, no earthquake warning system in the region comes close to the required level of reliability. A sustainable earthquake disaster mitigation strategy requires the compilation of base maps of known faults, as well as efforts to detect possible unknown faults. It is also necessary to build interactive databases of high-risk areas and integrate them with population distribution, seismic history, and vulnerability to hazards and disasters. To advance seismic research, cooperation needs to be developed amongst existing institutions and networks such as AfricaArray at the University of Witwatersrand (South Africa), a pan-African research

Current Initiatives: Nuclear safety



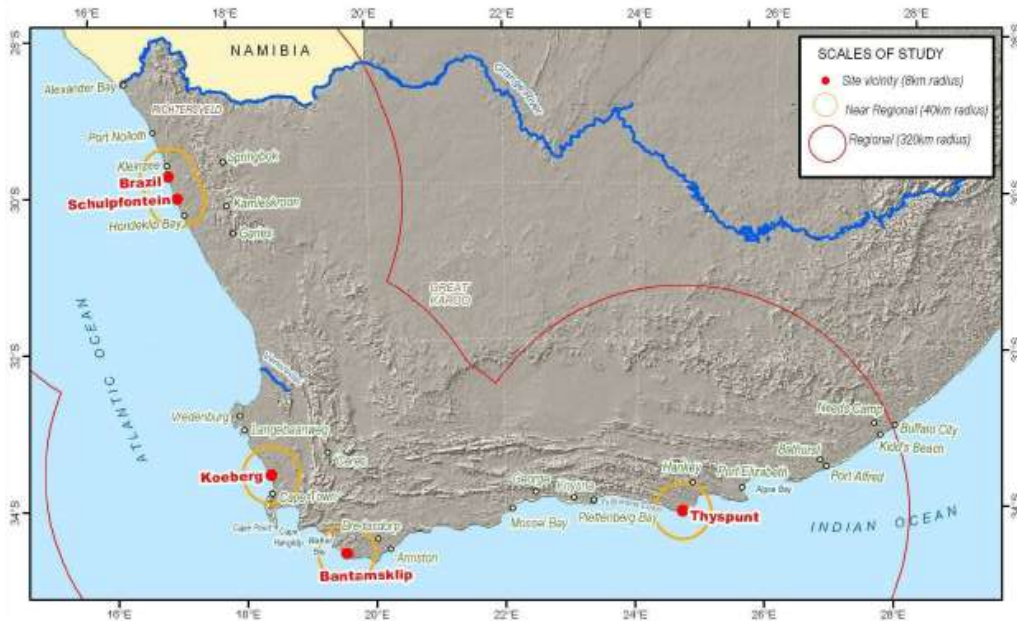
ESKOM HOLDINGS LIMITED
GENERATION DIVISION



NUCLEAR 1 ENVIRONMENTAL IMPACT
ASSESSMENT AND ENVIRONMENTAL
MANAGEMENT PROGRAMME

FINAL

SPECIALIST STUDY FOR
SCOPING REPORT



SPECIALIST STUDY: GEOLOGY AND SEISMICS
NSIP-NSI-020565#P1-41

J27035

SEPTEMBER 2007

Current Initiatives: mine tremors



*M=5.3, Stilfontein,
9 March 2005*



東北大学
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our future through science





(a) General layout of the dry stack masonry test structure; (b) Photograph of the test structure—North Wall



Figure 13: Damaged test structure showing the North wall after the base is subjected to a 22 mm, harmonic 3 Hz motion for 15 seconds.

An Effective Retrofitting System for Dry-Stack Masonry Subject to Seismic Loading

by

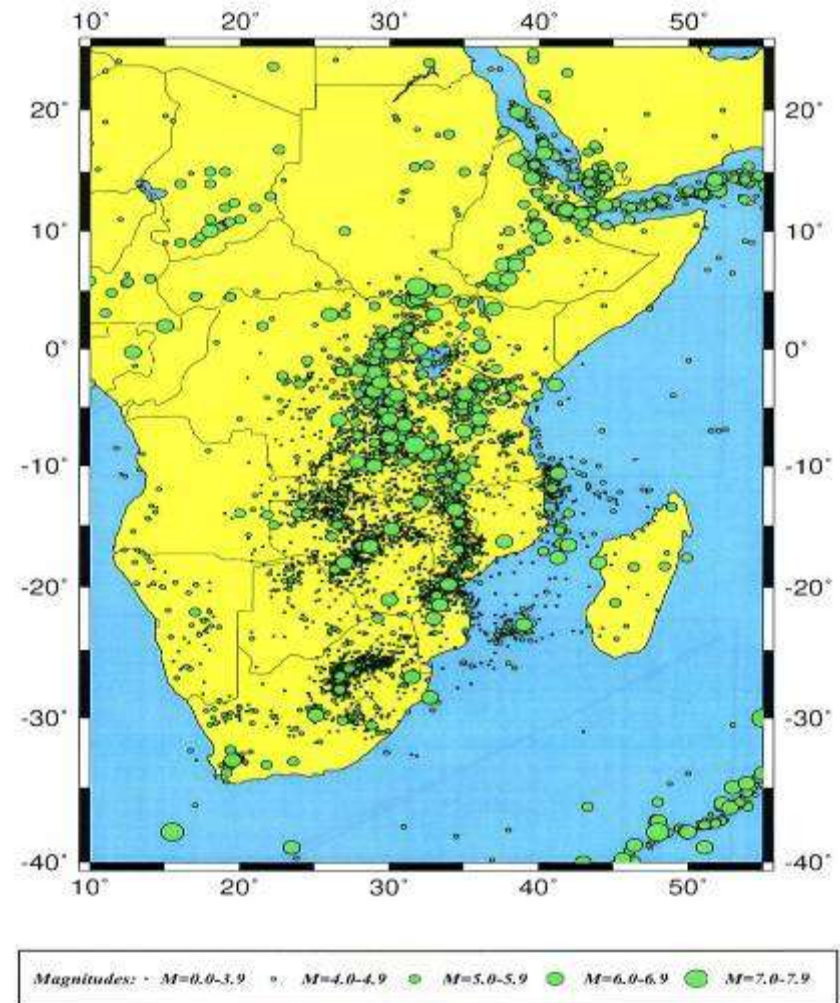
H.C. UZOEGBO¹ and R. SENTHIVEL²

¹ Associate Professor in Structural Engineering

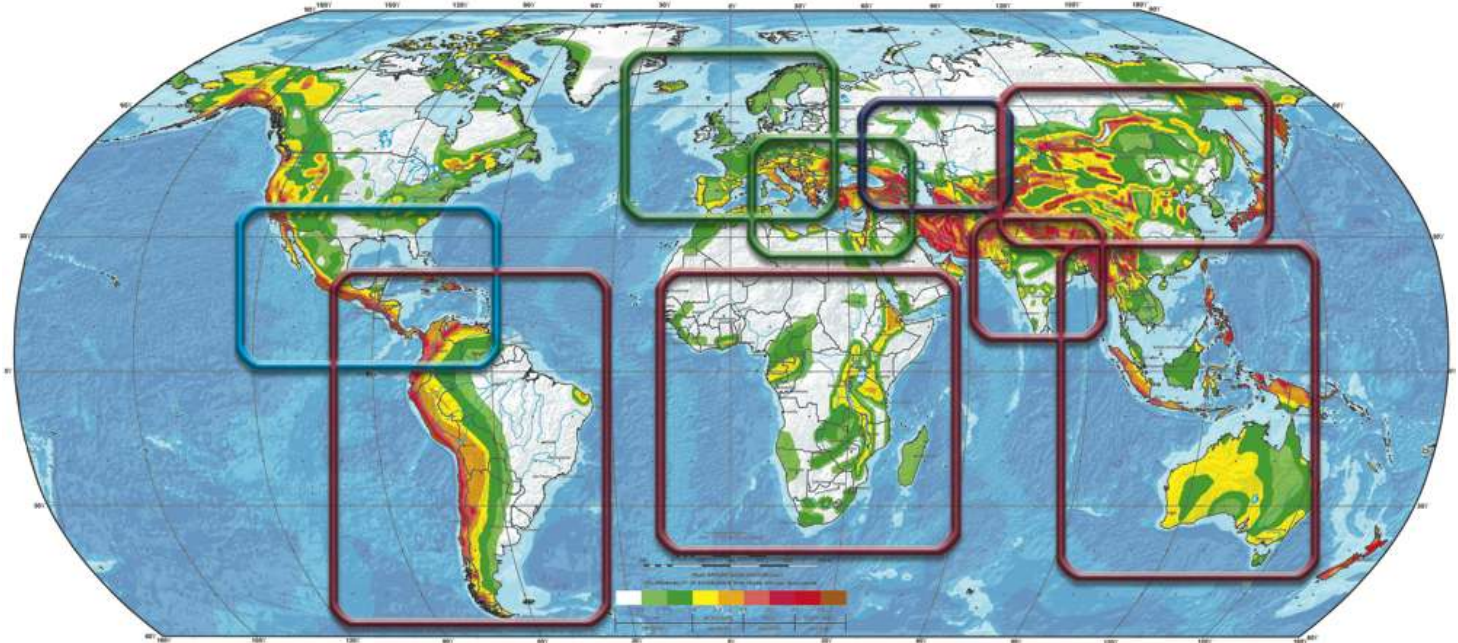
² Post-Doctoral Research Fellow

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- Incomplete & uncertain seismic catalogues
- Sparse seismograph network coverage
- Poor knowledge of active faults
- Shortage of skilled technicians, seismologists and engineers

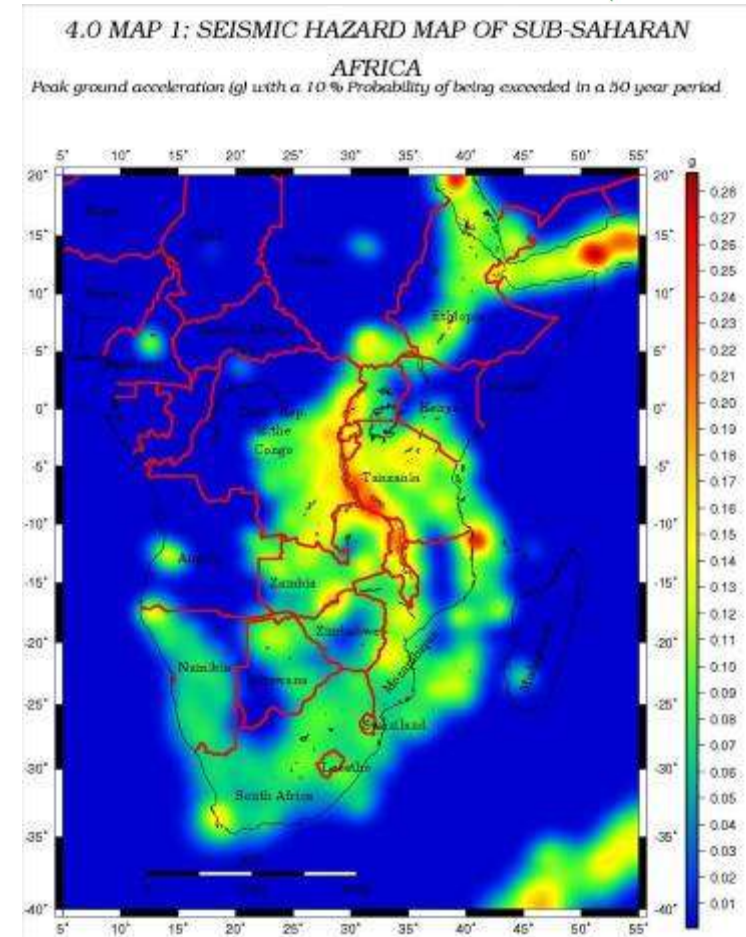


Objectives of regional programs



- Cover whole regions and all countries in each region
- Independently funded, bottom-up initiatives
- “Approved” by GEM
- Adopt GEM standards and computational infrastructure
- Contribute regional and national data to global models
- Contribute to build the GEM Global Components

- Ensure GEM standards and procedures are compatible with African conditions
- Transfer knowledge and technology to African practitioners and scientists
- Apply GEM tools to reduce earthquake risk in Africa
- Contribute to the development of African infrastructure



January 2009

Ad hoc meeting, IASPEI Assembly, Cape Town, SOUTH AFRICA

June 2009

GEM Outreach Meeting, Schloss Hohenkammer, GERMANY

November 2009

1st GEM-SSA Workshop, Nairobi, KENYA



12TH -13TH NOV 2009 AT NAIROBI SAFARI CLUB

2012 UR Forum Mapping Global Risk

- January 2011 GEM Outreach at the Colloquium of African Geology, Johannesburg SOUTH AFRICA
- May 2011 Launch GEM Regional Program for North Africa, Rabat MOROCCO
Dr Mohammed El Gabry appointed as Operations Manager for North Africa
- June 2011 GEM Outreach meeting, Beijing CHINA
- August 2011 **Dr Atalay Ayele** appointed as Operations Manager for sub-Saharan Africa
- September 2011 Promotion of the UNESCO Seismotectonic Map of Africa project at Organization of African Geological Surveys meeting, Windhoek NAMIBIA



- November 2011 2nd GEM-SSA Workshop, Johannesburg SOUTH AFRICA
- January -July 2012 Work on catalogues & contribute information to GEM Global Component Teams
- July 2012 Understanding Risk Forum & 3rd GEM-SSA Workshop, Cape Town SOUTH AFRICA



- Contribute data to GEM Global Component teams
 - Historic seismicity catalogues
 - Instrumental seismicity catalogues
 - Active fault data
 - Ground motion prediction models
- Evaluate GEM Global Component outputs
- Raise support to expand regional activities
- Transfer GEM standards and technology
 - Pilot study: assess seismic hazard using OpenQuake
 - Pilot study: map active faults
 - Pilot study: assess vulnerability of urban areas

MANAGEMENT COMMITTEE
(7 members)

General management and coordination
Fund-raising

SCIENTIFIC COMMITTEE
(10 members)

Liaison with GEM Global Scientific Board
Testing of GEM1
Coordination between sub-regions

SUB-REGIONAL COMMITTEES
(6 – 10 members each)

East African Rift (ESARSWG)
Central Africa
West Africa
Southern Africa

GEM SUB-SAHARAN AFRICA

MANAGEMENT COMMITTEE

- Overall scientific coordination
 - Testing of GEM1 (Java code global engine) and interaction with Global Components
 - Assess progress of Africa sub-regions
 - Ensure other components are addressed in due course (geodetic strain, vulnerability + exposure, socio-economic impact)
- Members
 - Coordinators of each sub-Region Hlatywayo, Midzi, Akpan
 - Admin coordination ICSU-ROA (Enow)
 - Scientific coordination Kianji, chair of Scientific Committee
 - Interim chair Durrheim

SCIENTIFIC COMMITTEE

- Coordinating across sub-Regions. Set standards.
- Liaising with GEM GLOBAL SCIENTIFIC BOARD
- Evaluation of GEM1(Java code global engine)
- Members of sub-Regional committees
 - Catalogue Ayele, Singh, Akoto
 - GMPEs & Site Effects Ferdinand, Strasser
 - Source Zones Malephane, Chapola
 - Modelling (includes methodology) Kijko, Tabod
 - Vulnerability (structural & socio-economic) Wium

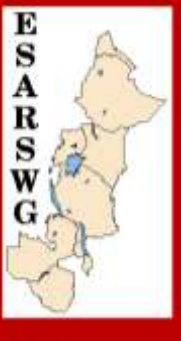
EXTERNAL ADVISORY PANEL

SUB-REGIONAL COMMITTEES

	East African Rift ESARSWG, Burundi, DRC, Rwanda, Sudan, etc	Southern Africa Angola, Botswana, Lesotho, Namibia, South Africa, Swaziland, etc	Central/West Africa Cameroun, Congo, Ghana, Mali, Nigeria, etc.
Coordinator	Hlatywayo (Zimbabwe)	Midzi (RSA)	Akpan (Nigeria)
Catalogues	Ayele (Ethiopia)	Singh (RSA)	Akoto (Ghana)
GMPE's & Site Effects	Ferdinand (Tanzania)	Strasser (RSA)	Amponsah (Ghana)
Source Zones	Chapola (Malawi)	Malephane (Lesotho)	Cisse (Mali)
Modelling		Kijko (RSA)	Tabod (Cameroun)
Vulnerability		Wium (RSA)	

2012 UR

Prospects



2012 UR Forum Mapping Global Risk

- GEM Foundation
 - Operations manager post
 - Participation in GEM workshops
- African universities & government departments