TANZANIA GEOLOGICAL SOCIETY (TGS)

2017 ANNUAL MEETING AND WORKSHOP

BOOK OF ABSTRACTS




MTWARA

26th August to 1st September 2017

Front cover photos:

Top Left: *The Old Boma at Mikindani (back) – was built in 1895 as a German fort, and was the Southern head quarters and remained an important administrative post under the British until 1947 when development moved to Mtwara town;* ***Top Right:*** *The new Dangote cement factory (3.0 Mta plant);* ***Bottom Left:*** *Mikindani harbor (Mikindani means young palm trees);* ***Bottom right:*** *Makonde sculpture/carving (The Makonde are an ethnic group in southeast Tanzania and northern Mozambique).*

Message to participants of the TGS 2017 workshop

Welcome to the Tanzania Geological Society (TGS) Annual Meeting and Workshop held in Mtwara region in August 2017, an event that is anticipated to provides a timely opportunity to bring together geoscientists in academia, extractive industry, government and related agencies and parastatal organization from all over the country and beyond to reflect on advances in the earth sciences and resources industry. The details accompanying individual topics covered under the theme "***Geosciences and Sustainable Energy for Industrialization and Economic Development***" are not only familiar to the main stakeholders (communities around extractive projects, journalists and some other decision makers in government) but even to the majority of the geoscientists attending this workshop, especially those from the minerals sector inter alia oil and gas. Workshop organizers have designed the flow of presentations in a rather simplistic style to make sure messages carried by in the abstracts and presentations on oil and gas exploration, development and production are articulated and understood by the wider public present here and beyond. The workshop provides an opportunity to engage in an informed discussion on the risks involved in the industry in platforms such as finance, health-safety and environment and how these risks are mitigated.

Although the main theme is sustainability of the energy sector for industrialisation and overall economic development, sub-themes such as the state of exploration for strategic minerals and gold deposits could not be avoided. This is given a large number of high level exploration and feasibility projects in graphite and REE, among other strategic mineral commodities, as well as a slow-down in gold discoveries from the gold-endowed Precambrian terrains of Tanzania.

In this volume, an array of topics are presented and discussed thoroughly under the following themes:

1. Geothermal energy for sustainable development: exploration and development
2. Local content in the extractive industry: exploration, development and production
3. Environmental, Health and Safety (EHS) for sustainable Exploration, Development and Production activities
4. Geosciences in oil and gas sector in Tanzania: exploration, exploitation and management
5. Strategic mineral deposits: exploration and mining
6. Geoethics and geotourism
7. The State and future of gold exploration in Tanzania

These topics are designed to cover various stages of the exploration process in the extractive supply chain. They include advanced but undeveloped projects with tangible or significant resources or reserves worth development to production when the right time is due. A sub-theme on local content couldn't have come at another time, given the historical June 2017 Parliament which amended certain laws not only to enhance control and compliance in the extractive industry (i.e. ensure proper management) to make sure the industry contributes significantly to the socio-economic development of the country. The laws provide direct government shareholding or indirectly involvement by the private sector (local content). In addition, TGS members will deliberate on the progress of the establishment of the registration body for geologists that aims at protection and development boost for Tanzanian Geologists.

The success of this TGS workshop depends completely on the effort, talent, and energy of geoscientists and researchers who have written and submitted abstracts on a variety of topics. Praise is also deserved for the secretariat and reviewers who have invested enormous time and space in analyzing and assessing multiple papers, who hold and maintain a high standard of quality for this conference. Each abstract submission, regardless of track, received at least three reviewers.

This work would not have been possible without tremendous support of all the stakeholders in the extractive industry, members of the academia, and individuals involved in the topics discussed in this workshop. The following organizations agreed to sponsor this workshop: University of Dar es Salaam- through the office of the Vice Chancellor-Research, Maurel Prom Limited and SHELL Exploration and Production Tanzania Limited. TGS is hugely indebted for the continued support from these sponsors.

Finally, TGS welcomes you to Mtwara, currently a destination of best cashew nuts in the country and emerging cement, oil and gas industry. We hope that you will take an advantage of the many sights to see in the region, as well as the many interesting historical, natural and man-made features that are nearby '*in-situ*' during your stay.

Dr. Joas Kabete,

Vice-Chairman

Tanzania Geological Society (TGS)

ORGANISING COMMITTEE

Sub-Committee	Members
Workshop secretariat	Dr. Elisante Mshiu Mr. Nyora Kobare Mr. Menan Sanga Mr. Isaac Bisansaba Prof. H. Nkotagu
Editorial committee	Dr. Emmanuel Kazimoto Dr. Kasanzu Charles Dr. Cassy Mtelela
Venue, accommodation and transport committee	Mr. Chone Lugangizya Mr. Erick Kivera Ms. Melania Maqway
Excursion and fieldwork committee	Mr. John Gama Mr. Didas Makoye
Social and Publicity committee	Mr. Ernest Mulaya Mr. Denis Dilip

Dr. Elisante Mshiu

Dr. Emmanuel Kazimoto

Mr. Chone Lugangizya

Mr. John Gama

Mr. Ernest Mulaya

TGS 2017 WORKSHOP ABSTRACT TITLES

Contents and abstract titles **page**

WORKSHOP PROGRAMME

DAY 1 (28-08-2017)

07:30 - 08:30	Registration	
08:30 - 08:40	Secretary, TGS: Opening	
08:40 - 08:55	Chairman, TGS: Welcoming remarks	
08:55 - 09:30	**Guest of Honor**: Regional Commissioner Mtwara, **Hon. Halima Ndendego**	
09:30 - 09.40	Group photo	
09:40 - 10:10	TEA BREAK	
10:10 - 10:30	**SHELL Exploration and Production Tanzania Limited** Beatus Rwechungura & Msomisi Mbenna	
Time	**Presenter**	**Title**
10:30 - 10.55	Obeid S. Lemna	The influence of inherited Precambrian lithospheric structures in the development of Rukwa rift basin in the western branch of East African Rift System, SW Tanzania
10:55 - 11:20	Sara Emanuel	Paleoenvironmental settings and assemblage changes of foraminifera and palynomorphs across the Eocene-Oligocene boundary of Southern Tanzania
11:20 - 11:45	Joyna L. Kabohola	Sedimentology and diagenesis of the Middle Jurassic Msata succession, Ruvu Basin, Tanzania
11:45 - 12:10	Agnes Matulanya	Sedimentology and diagenesis of the Middle Jurassic Lugoba succession, Ruvu Basin, Tanzania
12:10 - 13:15	LUNCH BREAK	
13:15 - 13:45	**Keynote speaker**: Prof. Randell Stephenson **Title**: Intraplate deformation: reactivation of inherited heterogeneity with the continental lithosphere	
Time	**Presenter**	**Title**
13:45 - 14:05	Ernest S. Mulaya	Petrophysical evaluation of a shaly sand reservoir
14:05 - 14:25	Epiphania G. Mtabazi	Tectonics of the Triassic-Jurassic Mandawa Basin of Coastal Tanzania: implication for Gondwana rifting and drifting
14:25 - 14.50	Charles H. Kasanzu	Ancient to recent geological archieves: past ''uturns'' and wisdoms from sedimentary geochemistry
14:50 - 15:05	TEA BREAK	
Time	**Presenter**	**Title**
15:05 - 15:30	Crispin Kinabo	Baseline survey for small scale miners in Tanzania, Phase II: demographic distribution in Tanzania
15:30 - 15:55	Emmanuel Owden Kazimoto	The use of Portable X-ray Spectrometer in monitoring urban soils and sediments pollution by toxic metals in Dar Es Salaam city Tanzania
15:55 - 16:05	TGS: Announcements & closing remarks	
18:00	**Cocktail Party**	

DAY 2 (29-08-2017)

Time	**Presenter**	**Title**
08:30 - 09:00	Taramaeli T. Mnjokava	Explorations for geothermal resources at Ngozi – Songwe geothermal field, South Western Tanzania
09:00 - 09:25	Shakiru Idrissa Kajugus	Geothermal development in Tanzania – current update
09:25 - 09.50	Mwita Maswi	Investigation of the geothermal resource potential sites in areas around Lake Natron in the East Africa Rift System (EARS) by using remote sensing satellite data
09:50 - 10:15	Ngereja M. Mgejwa	Characteristics of the geothermal system at Mtagata in Kagera -Tanzania
10:15 - 10.45	TEA BREAK	
Time	**Presenter**	**Title**
10:45 - 11:10	Richard Ferdinand	The September 10, 2016 magnitude 5.9 Kagera earthquake: Implication for seismic hazard in the region
11:10 - 11:35	Gabriel Mulibo	Macroseismic Survey of the 5.9 Mw September 10, 2016 Kagera Earthquake: Implication for the site effects amplification
11:35 - 12:00	Kenneth Lupogo	Correlation between surface geology and intensity variability in Kagera Region, Tanzania, after the 10th September 2016 Earthquake
12:00 - 12:25	Michael Msabi	Learning from earthquake disasters in Tanzania: lessons learnt from Kagera earthquake event (Mw 5.9) of 10th September 2016
12:25 - 13:25	LUNCH BREAK	
13:25 - 13:40	Representative, **StatOil** Tanzania	
Time	**Presenter**	**Title**
13:40 - 14:05	Cassy Mtelela	Synrift stratigraphy and nomenclature of the Late Cenozoic lake beds group, Rukwa Rift Basin, Tanzania, with comments on source, reservoir and seal rock potential for hydrocarbon prospectivity
14:05 - 14:30	John Gama	Spontaneous oil seepage as tool to assess the oil generative potential of Tanzanian coastal sedimentary basins
14:30 - 14:55	Faustine Matiku	Porosity-permeability relationships in siliciclastic reservoirs from core plug analysis and well logs; based on data from exploration wells off shore Norway
14:55 - 15:00	TGS: Announcements & closing remarks	
15:00 - 15:30	TEA BREAK	
15:30 - 17:00	**Poster session**	

DAY 3 (30-08-2017)

08:30 - 09:00	**Keynote speaker**: Dr. Joas M. Kabete **Title**: An industry-academia-government collaboration model for precompetitive scientific targeting: a solution for an apparently slow rates of discoveries in Tanzania	
09:00 - 09:25	Neema Masinde	Women in small scale mining in Tanzania: a case study of small scale sand and aggregate mining in the city of Dar Es Salaam Tanzania
09:25 - 09:50	Elisante E. Mshiu	The role of the Tanzania mineral sector in industrial development
09:50 - 10.10	TEA BREAK	
Time	**Presenter**	**Title**
10:10 - 10:35	Chone L. Malembo	Geoethics as a tool for Integrity in research and sustainable development and extraction of earth resources: a review
10:35 - 11:00	Chonge Shekarata	Seismic structural interpretation: a case study from 2D seismic profiles in the northern part of East Pande Block, Southern coast of Tanzania
11:30 - 11:55	Janeth Matoke	Subsurface investigations of the Rufiji basin in Tanzania using Digital Elevation Model (DEM), gravity and magnetic data: constrains to hydrocarbon potential of the basin
12:00 - 13:00	LUNCH BREAK	
13:00 - 15:30	**TGS ANNUAL MEETING (TGS MEMBERS ONLY)**	
17:30 - 20:00	**Workshop Dinner**	

POSTER PRESENTATIONS	
Juma Mheluka	Characterization of reservoir rocks and evaluation of hydrocarbon potential using petrophysical parameters at Mkuki-1 well in Block 7, offshore Tanzania
Aneth Lyaka	Petrophysical Analysis of Tende-1 Well Logs in the East Pande Block, Southern Offshore Tanzania
Doreen Nyahucho	Structural investigation of Block 7, Mafia deep basin, offshore Tanzania
William Mremi	1D Basin modeling of Mbuo-1 Well in Mandawa salt basin
Ezra Kavana	Geoparks and geotourism for promoting earth heritage and culture

PETROPHYSICAL EVALUATION OF A SHALY SAND RESERVOIR

Ernest Stephano Mulaya

University of Dar-es-Salaam, Department of Geology, P.O. Box 35052, Dar-es-Salaam
E-mail: ernestsm@udsm.ac.tz or mulaya1985@yahoo.com

Shaly sands as the name implies refers to sands with a shale component. These shales are a very significant component of shaly sand reservoirs. The increased volumes of shale decrease the effective reservoir capacity. At the same time, the electrical properties i.e conductivity of shales reduce the formation resistivity hence must be corrected for the evaluations and identification of net pay and reliable assessment of hydrocarbon saturation.

The problem becomes acute in a thin-layered/laminated and shaly sand formation whose beds are thinner than the vertical resolution of the conventional resistivity and porosity measurement tools. The saturation estimated from the conventional resistivity measurements give the cumulative or weighted average of the individual layers response of both shale and sand laminae and are dominated by high conductive shale/clay effects which obscure the presence of more resistive hydrocarbon bearing sands. Direct interpretation of the log reading therefore results in a significant underestimation of hydrocarbon saturation in shaly sand reservoirs. Because one of the common parameter to derive water saturation is from porosity and resistivity and since the conventional resistivity is dominated by high conductivity shales in shaly sand reservoir, then the correct possible formation resistivity must be sought for before evaluating different saturation models related to shaliness effects through petrophysical approach for reliable assessment of hydrocarbon potential.

The effects of resistivity anisotropy on the induction resistivity measurement have been known since the 1950s, but until recently there has been no way to resolve the horizontal and vertical components. By taking the 3D triaxial induction measurement in essence a tensor rather than a scalar approach, these types of ambiguities and errors can be fully resolved. Many of the limitation inherent in induction logging have now been overcome with the Rt Scanner triaxial induction service providing true resistivity in deviated wells and dipping beds (Anderson et al, 2008).

The aim is to propose a petrophysical approach to account for clay and thin laminations effects in shaly sand reservoir and to infer its impacts to the reservoir quality in terms of fluid saturation model and suggest the reliable

assessment of hydrocarbon saturation and volume hence the study is expected to deliver plausible petrophysical parameters and saturation calculations to be used in reserve calculation for the particular reservoir under study.

The data for this study comprises of core report for one well, log prints in PDF and in Digital Log Interchange Standards (DLIS) format composed of different curves for various petrophysical measurements and all the work done using the Techlog™ software.

Calculation of water saturation using basic Archie equation and shaly sand equations by comparing and discussing the results gives further insights into the variation of hydrocarbon potential under different techniques and petrophysical parameters.

PALEOENVIRONMENTAL SETTINGS AND ASSEMBLAGE CHANGES OF FORAMINIFERA AND PALYNOMORPHS ACROSS THE EOCENE-OLIGOCENE BOUNDARY OF SOUTHERN TANZANIA

Sara Emanuel[1,*], Charles Happe Kasanzu[1], Amina Karega[2]

[1]*University of Dar-es-Salaam, Department of Geology, P.O. Box 35052, Dar-es-Salaam*
[2]*Tanzania Petroleum Development Corporation (TPDC), P.O. Box 2774, Dar-es-Salaam*
**saraemanuel17@gmail.com*

A quantitative micropaleontological analysis was performed on outcrop and core samples across a shallow borehole drilled in the southern coastal basin of Tanzania with the aim of characterizing foraminifera and palynomorphs assemblage changes aiming at reconstructing paleoenvironmental settings across the Eocene-Oligocene transition (EOT). The data reveal high diversity and abundance of calcareous benthic foraminifera assemblages in the Late Eocene succession and a decline of their abundance and diversity across the EOT to Early Oligocene. Planktonic foraminifera assemblages were low in abundance and diversity in the Late Eocene succession and decreased through the EOT when most planktonic foraminifera species from Hantkeniide family and Turborotaloiide groups went extinct. Additionally, marine palynomorphs/dinoflagellate dominated the oldest sedimentary succession (Late Eocene). Their abundance and diversity declined towards the EOT to the Early Oligocene while terrestrial palynomorphs (spores and pollens) dominated the youngest succession. The palynomorphs assemblage changes responded rapidly to environmental variations across the Eocene-Oligocene boundary which was associated with a global cooling event. Both foraminifera (i.e. calcareous benthic foraminifera) and palynomorphs assemblages as well as planktonic/benthic ratios indicate that the EOT paleoenvironment settings were compatible with shallow marine of inner to outer shelf environments.

SEDIMENTOLOGY AND DIAGENESIS OF THE MIDDLE JURASSIC MSATA SUCCESSION, RUVU BASIN, TANZANIA

Joyna L. Kabohola[1,*], Emmanuel Owden Kazimoto[1], Henk Duyverman[2]
[1]*University of Dar-es-Salaam, Department of Geology, P.O. Box 35052, Dar-es-Salaam*
[2]*Antiquariaat Terra Incognita*
**kjoyna@gmail.com*

The Middle Jurassic Msata succession in Ruvu basin, Tanzania overlies in parts the basement rocks of the Neoproterozoic Mozambique Belt and the Permo Carboniferous sedimentary succession (Karoo). The latter are known for their qualities as source rocks for hydrocarbons. This work presents the sedimentological and diagenetic information of the Msata succession in order to evaluate their qualities as reservoir rocks for hydrocarbons that may derive from underlying Karoo rocks. The study was accomplished through combination of mapping and documentation during the fieldwork and petrographic analysis of rocks thin sections.

The fieldwork enabled recognition of 3 facies associations that were interpreted basing on 10 identified lithofacies. Facies association 1 (FA1) that is characterized by both matrix and clast supported inclined polymict conglomerate and calcareous sandstone, Facies association 2 (FA2) containing interbedded laminated shale and calcareous siltstone/sandstone, and Facies association 3 (FA3) characterized by bioclastic matrix supported conglomerate. These facies associations indicate deposition environment of sediments in terrestrial settings involving fluvial deposits (alluvial to channel), and marginal marine setting of a deltaic deposit. Petrographic investigations of thin sections suggest that the rocks in Msata have been modified by diagenetic processes of micritization, cementation, neomorphism and compaction with a negative impact on the porosity of rocks. Secondary porosity in the rocks is only minor (<5%), deriving from dissolved feldspar and calcite. In addition, primary features like angularity and poor sorting also contributed to poor porosity that made the rocks unfavourable as reservoir. Nevertheless, descriptions provided here will be useful in future oil/gas exploration efforts in Tanzania.

SEDIMENTOLOGY AND DIAGENESIS OF THE MIDDLE JURASSIC LUGOBA CARBONATE SUCCESSION IN THE RUVU BASIN, COASTAL TANZANIA

Agnes J. Matulanya[1,*], Cassy Mtelela[1], Boniface Nelson[1] and Henk Duyverman[2]

[1]*University of Dar-es-Salaam, Department of Geology, P.O. Box 35052, Dar-es-Salaam*
[2]*Antiquariaat Terra Incognita*
**agnesmatulanya@yahoo.com*

This study presents the first detailed, outcrop-based sedimentologic investigation and petrographic analysis of the Middle Jurassic (Bajocian-Bathonian) Lugoba succession of the Ruvu Basin, located in the northern coastal Tanzania. The aim of this investigation is to document sedimentary facies, reconstruct depositional environments and determine carbonate diagenesis and their effect on porosity of these strata. Three diagnostic facies associations comprising seven facies were identified and provide the basis for recognition of three key depositional environments: 1) lagoon; 2) reefal; and 3) beach environments. Petrographic analysis of the carbonate facies reveals four main diagenetic processes: 1) cementation; 2) micritization; 3) bioclastic neomorphism; and 4) dolomitization. The diagenetic processes occurred mainly in the eogenesis diagenetic regime. Calcite cementation and neomorphism are the major diagenetic processes that occluded the porosity in some intervals of the Middle Jurassic Lugoba carbonates. The observed porosity is low in reefal and lagoonal deposits, typically less than 6, but relatively higher (moderate reservoir quality) in beach related deposits. This discovery of potential new Jurassic hydrocarbon reservoir in coastal Tanzania basin could be important for future on/offshore oil and gas exploration in East Africa.

INTRAPLATE DEFORMATION: REACTIVATION OF INHERITED HETEROGENEITY WITH THE CONTINENTAL LITHOSPHERE

Randell Stephenson
University of Aberdeen, Scotland
r.stephenson@abdn.ac.uk

Recently, I've been co-author of several papers published by Phil Heron (a postdoctoral fellow first at the University of Toronto in Canada and now at Durham University in England) and others that has documented the results of a series of numerical modelling experiments investigating the role of inherited or "frozen in" heterogeneities in the continental lithosphere. The model set-up is generally one in which crustal depth heterogeneities of variable orientation, penetration and weakness and/or mantle lithosphere depth heterogeneities with similar kinds of variabilities are tested for their responses to externally imposed extensional or compressional tectonic forcing. In this short presentation I wish to summarise some of the main results of these studies and, in particular, focus on whether the results are robust enough to argue that mantle depth lithosphere heterogeneities may be more significant than those at crustal depths – such as those that may be revealed or implied by mappable geological structure – in controlling intraplate deformation. If so, there may be important implications for understanding intraplate geodynamics and enhanced arguments for deep geophysical exploration of the lithosphere.

THE INFLUENCE OF INHERITED PRECAMBRIAN LITHOSPHERIC STRUCTURES IN THE DEVELOPMENT OF RUKWA RIFT BASIN IN THE WESTERN BRANCH OF EAST AFRICAN RIFT SYSTEM, SW TANZANIA

Obeid S. Lemna[1, 2] *, Randell A. Stephenson[1], David G. Cornwell[1]

[1]*School of Geosciences, University of Aberdeen, Meston Building, King's College, Aberdeen, AB24 3UE, Scotland, UK*

[2]*University of Dar-es-Salaam, Department of Geology, P.O. Box 35052, Dar-es-Salaam*

**o.lemna@abdn.ac.uk/oblemna@gmail.com*

Rift basins have been the focus of research in tectonic, structural geology and basin analysis. One of the reasons being rift basins is found in all passive (Atlantic-type) continental margins and provide a record of early stages of the continental breakup. They often follow the pre-existing zones of weakness and/or tectonic boundaries diverging around the craton. In some areas it has been observed that rift-related faults show little or no correlation with basement structures, raising the possibility that continental rift development may be linked to deeper-seated lithospheric structures. Thus, the influence of pre-existing/inherited lithospheric structure remains a question for study in unravelling the evolution of continental rifts. The Rukwa Rift Basin is a northwest trending half graben developed along the trend of the Paleoproterozoic Ubendian belt in southwest Tanzania. This belt is a linear, NW-SE trending orogenic belt in western Tanzania. It is part of a larger Paleoproterozoic orogenic belt, developed around the west and southwestern margin of the Archaean Tanzanian craton. This belt is characterised by a consistent NW-trending fabric and by the presence of large shear zones that persist along the whole of the belt. As such, it offers the opportunity to examine the role of preexisting Precambrian structures on the development of the Rukwa Rift Basin. Digital Elevation Models (DEMs) extracted from Shuttle Radar Topography Mission (SRTM) and aeromagnetic data are used in this study. The results suggest that the orientation and geometry of Rukwa Rift Basin has been influenced by the structural grains of the Paleoproterozoic Ubendian belt. Pre-existing structures within the Paleoproterozoic terrains facilitated the strain localisation within border faults that exploited the existence of inherited lithospheric heterogeneity. The southern border fault of the rift has been influenced by the NW-trending Mugese shear zone (MSZ). This shear zone has prominent NW-trending pre-existing structures in the form of transcurrent shear fabric and zones of Proterozoic cataclasites favouring a strong strain localisation during rifting leading to the development of Ufipa fault as a southern border fault of the rift. South of the Rukwa Rift Basin, the Mbeya fault zone develops between the Lupa terrane and the Mbozi block. This fault is parallel to pre-existing mylonitic structures flanking the Mesoproterozoic shallow level sedimentary basin at the southern part of the Rukwa Rift Basin. Therefore, aeromagnetic data together with SRTM provide substantial evidence for the role of pre-existing structures in controlling the geometry and development of the Rukwa Rift Basin and, accordingly, for continental rifts generally.

TECTONICS OF THE TRIASSIC-JURASSIC MANDAWA BASIN OF COASTAL TANZANIA: IMPLICATION FOR GONDWANA RIFTING AND DRIFTING

Epiphania G. Mtabazi[1],*, Nelson Boniface[1], Isaac Marobhe[1], Arild Andresen[2], Hudson Wellington[3] and Makoye Didas[4]

[1]*University of Dar-es-Salaam, Department of Geology, P.O. Box 35052, Dar-es-Salaam*
[2]*Dept. of Geosciences, University of Oslo, P. O. Box 1047, Blindern 0316 Oslo Norway*
[3]*Tanzania Petroleum Development Corporation, P. O. Box 2774, Dar-es-Salaam*
[4]*Tanzania Geothermal Development Company, P. O. Box 14801, Dar-es-Salaam*
**mtabaziepiphania@yahoo.com*

Our new data from field structural observations, digital elevation model (DEM), seismic and magnetic data from the Triassic-Jurassic Mandawa Basin of coastal Tanzania demonstrate tectonic results of Gondwana rifting and dextral strike slip movements associated with the rifting and drifting of Madagascar from East Africa in Jurassic time.

The results reveal two major deformation events, in the history of Mandawa Basin formation, named D1 and D2 in this study. The D1 event generated the NNW-SSE trending deep-seated normal faults, and tensional fractures. The geometry of these structures suggests that, the ENE-WSW extensional movements, probably associated with the rifting of Gondwanaland during Permo-Triassic time, generated them. The D2 event was the most important deformation episode, which is widely distributed on regional scale as well as on outcrop scale. The NNE-SSW, NNW-SSE and ENE-WSW Riedal shears, dextral strike slip faults, sinistral faults, normal faults and T-fractures characterize D2 event. The D2 event is probably related with the NNW dextral shear zone with NW-SE extensional movements, probably generated during the drifting of Madagascar along the Davie transform fault during the Jurassic time. The geometry of the Mandawa Basin suggests pull-apart origin, generated by transtensional event, followed by successful reactivations.

ANCIENT TO RECENT GEOLOGICAL ARCHIEVES: PAST ''U-TURNS'' AND WISDOMS FROM SEDIMENTARY GEOCHEMISTRY

Charles H. Kasanzu*, Makenya A.H. Maboko, Shukrani Manya

University of Dar-es-Salaam, Department of Geology, P.O. Box 35052, Dar-es-Salaam

** kcharls16@yahoo.com*

Conclusions made from Kasanzu et al. (2008), (2016a), (2016b), Kasanzu (2017) and Dirk et al. (2017) on the various sedimentary basins of Tanzania employing geochemical approaches in the reconstruction of paleo- to recent geological histories recorded in clastic sedimentary facies demonstrate the efficacy of low temperature geochemistry sensu lato. Precambrian to circa 250,000 years old basins have been investigated in the region for the past 12 years using major, trace and isotopic abundances on fine grained sedimentary rocks with the aims of constraining and/or making inferences on provenance, past climates, tectonics and paleo-geography of Tanzanian basins. We have been able to constrain provenances, weathering intensities, climatic variability/change, past precipitation magnitudes, paleo-drainage shifts and temporal changes of upper crustal geochemical compositions. This unique use of geochemical compositions of clastic sedimentary rocks reveals a complex, dynamic interplay between tectonics and Earth surface processes.

BASELINE SURVEY FOR SMALL SCALE MINERS IN TANZANIA, PHASE II: DEMOGRAPHIC DISTRIBUTION IN TANZANIA

Crispin Kinabo

University of Dar-es-Salaam, Department of Geology, P.O. Box 35052, Dar-es-Salaam
kinabo_2003@yahoo.co.uk

Small scale mining (SSM) in Tanzania plays an important role as a dynamic contributor to local economic growth and survival of a rapidly growing population estimated at more than 44.9 million people. The government's efforts to improve the sector however face challenges, as stated in the new 2010 Mining Act. In order to evaluate performance of SSM activities and prepare viable social economic programs, Government has in 2011 conducted its second baseline survey (last survey was 1996).

This paper outlines the demographic distribution people engaged in small scale mining activities in Tanzania. Statistics show that the SSM number is on rise; it increased from 150,000 in 1987 to 550,000 in 1996. The 2011 census show that people directly engaged in mining is about 680,000 of which 72.3% are men miners and rest is women miners. Activities include mining of gold (58.2%); development minerals or building / construction materials (23.6%); coloured gemstones (12.0%); copper (1.5%), diamonds (2.5%), salt (2.1%) and remaining minerals accounts for 1.0%. It's noteworthy to mention that, compared to 1996 census, new emerging mining activities include mining of gemstones, moonstones, base metal (Pb, Zn and Cu) ores.

Demographically the statistics is based on eight SSM zones; the Central, Central-Western and Lake Zones, commonly referred as Lake Victoria Gold Field hosts about 84.8% % of artisanal gold miners in Tanzania. Western and South Western Zones, covering most of Mpanda Mineral Field hosts about 7.5% of gold miners. Eastern Zone, namely Handeni and Kilindi Districts in Tanga engages 5.9%, which are new gold prospects in Tanzania. Furthermore, the Eastern and Northern Zones engages 75.6% of total population engaged in mining of building materials. Construction material markets for development minerals are also found in major towns which are concentrated in these zones. Gemstone mining is rather widely distributed in

Tanzania. The SSM population in gemstone mining is found in Northern (27.6%), Southern (12.3%), Eastern (42.5%) West and Central (17.6%) Zone. Most of gemstone deposits are located on the Usagaran-Mozambique belt, Usambara and Uluguru Mountain Ranges.

THE USE OF PORTABLE X-RAY SPECTROMETER IN MONITORING TOXIC METALS POLLUTION IN SOILS AND SEDIMENTS OF URBAN ENVIRONMENT OF DAR ES SALAAM

Emmanuel Owden Kazimoto*, Charles Messo, Filberta Magidanga, Emmanuel Bundala

*Department of Geology, University of Dar es Salaam, P.O. Box 35052, Dar es Salaam, *ekazimoto@udsm.ac.tz*

Recent developments in portable X-ray fluorescence (pXRF) spectrometers have provided a way to make field oriented, fast, accurate and cheap geochemical analyses and proved to be efficient and cost effective in geochemical surveys. In the present study, the levels of toxic metals in sediments and soils in the high traffic Sam Nujoma highway and densely populated Sinza area in Tanzania were determined using pXRF and atomic absorption spectrometer (AAS) in order to evaluate the use of pXRF in monitoring anthropogenic toxic metal pollution in the urban environment.

Soils and sediments from different areas in Sinza, especially those occurring near metal workshops, contained up to 1799 ppm Mn, 300 ppm Cr, 334 ppm Pb, 1168 ppm Zn, 186 ppm Co, and 10078 ppm Ti. These toxic metal contents decrease sharply (~ 5m) away from the workshops, and so reflecting toxic metal pollution by workshop activities. Along Sam Nujoma highway, toxic metal contents of sediments and soils were lower than those of samples from Sinza, but also decreases as one moves from the road to the surroundings of the highway. Chromium and Zn contents in parts of Sam Nujoma highway were found, in places, to be above the maximum permissible allowable limit by the Tanzania Bureau of Standards (TBS; 150 ppm Cr and 200 ppm Zn). As the geology of Dar es Salaam is mainly clean sands (detritus), which are not likely source of the metals, then results of this study reflect anthropogenic addition of the metals to the Dar es Salaam environment.

Similarity in concentration of Pb in sediments determined from previous study in the year 2009 along Sam Nujoma highway and those presented in this study suggests that Pb and most likely other metals as well, are not accumulating along or near the highway over time, but disperse by water during wet season, when water table is high and most of roads and street are

covered by surface runoff. Part of these contaminated surface runoff ends up in water, sediments and soils in downstream in the Msimbazi River, where most of vegetables are grown and other food sources like fish thrive, which highlights a potential risk of exposure to toxic metals in human food chain.

Successful application of pXRF in monitoring of anthropogenic toxic metals pollution in urban environment of Dar es Salaam open up possibility for similar applications in fast growing cities in the country and abroad. Moreover, another potential use of pXRF would be in monitoring toxic metals pollution in or around fast growing and expanding artisanal miners' sites in the country and elsewhere where environmentally unfriendly mining practices prevail.

EXPLORATIONS FOR GEOTHERMAL RESOURCES AT NGOZI – SONGWE GEOTHERMAL FIELD, SOUTH WESTERN TANZANIA

Taramaeli T. Mnjokava

Tanzania Geothermal Geothermal Development Company Ltd,
P.O. Box 14801, Dar es salaam, Tanzania
mnjott@yahoo.co.uk / taramaeli.mnjokava@tanesco.co.tz

The most detailed surface exploration work in Tanzania to date has been carried out in the Ngozi-Songwe area in Mbeya and Songwe regions, where TGDC is currently preparing to carry out exploration drilling at the sited locations. The drilling locations and subsurface drilling targets had been defined based on new surface exploration data collected with support from international experts commissioned by the UNEP-ARGEO program. Ngozi geothermal area which is generally mountainous and hilly with Ngozi shield volcano summit being the highest point at above 2,200 m above sea level is located in Mbeya region, just in the southern outskirts of Mbeya city, in South Western Tanzania 833 km from the Dar es Salaam.

Surface explorations for geothermal resources in Ngozi-Songwe stated in early 50s; some of these early reconnaissance surveys included measurements of surface temperature, water and gas flow as well as water and gas analyses of the hot springs in Songwe area. These studies on geothermal energy provide basic information on planning current geothermal projects. The Ngozi-Songwe area is at the triple junction of the East African rift system, where eastern, western and Nyasa branches meet at the Rungwe Volcanic province in southwest Tanzania

The geothermal explorations have identified two geothermal systems in Mbeya (Rungwe volcanic province), of which Ngozi is one with high enthalpy geothermal resources suitable for electricity generation with a total potential estimated to be over 800 MW. The second geothermal system is the Songwe which is medium enthalpy suitable for power generation by binary technology and direct uses. In order to confirm the geothermal resource, the program for undertaking drilling of three exploratory wells in the Ngozi geothermal area is in the government plan for 2017/18 financial year. This drilling work-plan will open a new era for geothermal development in Ngozi and Tanzania in general. It will also attract private sector participation and investment opportunities in geothermal energy resources in the country.

The successful of exploratory drilling, TGDC intends to develop Ngozi geothermal project for generation of 30MW and utilise heat in the brine for direct uses such as domestic heating, aquaculture, geo-agricultural drying and other uses. The planned business model for Ngozi project is for TGDC to carry out the upstream activities including detailed surface studies, infrastructure development, exploration and appraisal drilling, undertake feasibility study, production drilling, steam gathering, thereafter invite private developers through a competitive bidding process to finance, undertake plant design and construction, commission as well as operation and maintenance. It is anticipated that there will be steam supply agreement between TGDC and private developer and PPA between the private developer and the off taker.

GEOTHERMAL DEVELOPMENT IN TANZANIA – CURRENT UPDATES

Shakiru Idrissa Kajugus

Tanzania Geothermal Geothermal Development Company Ltd, P. O. Box 14801, Dar es salaam, Tanzania

Shakiru.idrissa@tanesco.co.tz; shakiru_idrissa@yahoo.co.uk

The country geothermal potential is estimated at 5,000 MW and Tanzania Geothermal Development Company Limited (TGDC) mandated to spearhead the development of geothermal resources in the country. Since its establishment, TGDC has been working to appraise most of the geothermal prospects to a level of confirming the resources as the measure to de-risking the fields for further investments. Priority prospects includes Ngozi (Mbeya), Songwe (Songwe), Kiejo-Mbaka (Mbeya), Luhoi (Coast region), Kisaki (Mororogro), Meru (Arusha) and Ibadakuli (Shinyanga).

This paper presents new developments in geothermal energy resources since the establishment of TGDC in 2014 and much emphasize will be put for the flagship project, the Ngozi geothermal project. The paper will also introduce possible opportunities for geothermal direct heat uses.

AN INVESTIGATION OF THE GEOTHERMAL RESOURCE POTENTIAL SITES IN AREAS AROUND LAKE NATRON IN THE EAST AFRICA RIFT SYSTEM BY USING REMOTE SENSING SATELLITE DATA

Mwita Maswi*, Elisante Elisaimon Mshiu[1]

University of Dar-es-Salaam, Department of Geology, P.O. Box 35052, Dar-es-Salaam
**maswi.mwita@yahoo.com*

Geothermal power is a reliable, low-cost, environmental friendly, alternative energy supply and an indigenous, renewable energy source, suitable for electricity generation. The government of Tanzania is currently looking for other sustainable sources of energy so as to combat the current power shortage problems. Geothermal energy is among the sources in the government focus, has formed company called Tanzania Geothermal Development Company (TGDC) with a mandate to spearhead geothermal resources in Tanzania. Potential areas for geothermal resources in Tanzania are shown by evidences including geothermal surface manifestations such as thermal springs. At least 15 areas with hot (T > 40ºC) spring activity have been identified in Tanzania. Ten (10) of these springs occur over and near to the active rift segments with Quaternary volcanism. Other hot springs lie over the Tanzanian Archean Craton and the surrounding Precambrian terrains. Studied saline thermal springs in Lake Natron have temperatures ranging between 32 and 52 oC. Despite of several studies that have been conducted, there is limited information about the surface extent and precise location of the potential target areas around Lake Natron. This study aims to delineate the potential sites for geothermal resources in areas around Lake Natron by using remote sensing data. ASTER, aeromagnetic and SRTM data were used for mapping of surface manifestations of the geothermal resources such as geothermal alteration minerals (clay, sulfates and calcite), carbonates, silica sinters, surface temperature anomalies, hot springs and structures. Results from ASTER and aeromagnetic data analysis were integrated with other geological information. The interpretation realized strong correlation between the detected geothermal surface manifestations and major lineaments extracted from magnetic and SRTM data and find the available geothermal features are linearly oriented with major dominant trend of NNE -SSW, NE-SW and lesser dominant trend of NNW- SSE and N-S. The dextral and sinistral offsets were observed at southern end of the study

area. Field observation were identified the geothermal features such as thermal spring to be linearly oriented following the major EARS with temperature ranging between 32 and 51 oc and pH between 8 and 10. Overall, the study area has been identified to be geographically and geologically prospective for geothermal resources.

SYNRIFT STRATIGRAPHY AND NOMENCLATURE OF THE LATE CENOZOIC LAKE BEDS GROUP, RUKWA RIFT BASIN, TANZANIA, WITH COMMENTS ON SOURCE, RESERVOIR AND SEAL ROCK POTENTIAL FOR HYDROCARBON PROSPECTIVITY

Cassy Mtelela[1,*], Eric Roberts[2]

[1]*Department of Geology, University of Dar es Salaam, P. O.Box 35052, Dar es Salaam*
[2]*Department of Geosciences, James Cook University, Townsville, QLD 4811, Australia*
**cassy.mtelela@gmail.com*

This study reports on the synrift stratigraphy of the late Cenozoic Lake Beds strata in the Rukwa Rift Basin, SW Tanzania, based on extensive sedimentologic, geochronologic and paleontologic investigations conducted between 2012 and 2015 with the aim of: (1) documenting sedimentology and stratigraphic relationships; (2) establishing the first formal nomenclature for the late Cenozoic Lake Beds succession; and (3) evaluating the hydrocarbon prospectivity of this important depositional succession. The results of these investigations provide the basis for formally establishing a three-fold lithostratigraphic framework for the Lake Beds succession, which is herein raised to Lake Beds Group. Two new formations are recognized and named at this stage within the Lake Beds Group for the lower and upper portions of the stratigraphy. The lower Lake Beds is termed the Malangali Formation, which represents a previously unrecognized 170+ m-thick late Miocene to Plio-Pleistocene unit in the Rukwa Rift Basin, which is internally subdivided into the lower Mpona and upper Hamposia members. A major unconformity and provenance shift marks the transition between the two members of Malangali Formation. The Hamposia Member is particularly significant because it preserves an important new vertebrate fauna in this part of the East Africa. The middle Lake Beds Group remains problematic, and more detailed investigation of the middle Lake Beds Group is required to fully understand the stratigraphic relationships and aerial extent of these deposits. Hence, the middle Lake Beds Group is informally referred to only in terms of informal members (A-C) for the time being. The uppermost late Pleistocene-Holocene Lake Beds succession is termed the Ilasilo Formation. The Ilasilo Formation records an important continental ichnofauna, as well as abundant disarticulated fish remains, and rare, isolated large vertebrate macrofossils.

The revised stratigraphy, along with detailed sedimentology, petrology and mineralogy presented herein, is critical for evaluating the hydrocarbon prospectivity of the Lake Beds Group in the Rukwa Rift Basin. Lithofacies analysis reveals that regionally extensive profundal lacustrine environments developed several times throughout the late Cenozoic history of the basin, depositing thick organic-rich (diatomaceous) units that could act as potential hydrocarbon source rocks. The Hamposia Member and a large portion of the middle Lake Beds unit have high-quality reservoir characteristics. However, it is the uppermost Ilasilo Formation that has the most intriguing hydrocarbon potential, with high-quality source rocks, whereas the mixed siliciclastic to volcanoclastic-rich sandstones have the potential to provide both high-quality, porous reservoirs and good seal rocks, respectively. Sandstone petrography and XRD analysis show that siliciclastic sandstones are typically quartz and feldspar, with high porosity and permeability, making them effective reservoir possibilities. Similar studies categorize the volcaniclastic units as potential seal rock with typically low porosity (<7%) and thin, impermeable smectite-dominated devitrified ash beds. These positive results encourage follow up exploration techniques across the basin, as well as sampling and analysis of the subsurface portion of the strata and underlying older units.

GEOETHICS AS A TOOL FOR INTEGRITY IN RESEARCH AND SUSTAINABLE DEVELOPMENT AND EXTRACTION OF EARTH RESOURCES: A REVIEW

Chone Lugangizya Malembo

Department of Geology, University of Dar es Salaam, P. O.Box 35052, Dar es Salaam
cmalembo@gmail.com

Geoethics is a social science aspect of geoscience that deals with regulation of all activities that involve interactions between human and nature in geo-research and extraction of earth resources. In the current worth creation and monetary economy driven world, it very imperative for geoscientists to discern that their undertakings have social, economic, cultural and environmental implications to the society within which they carry out their activities. This necessitates concocting strategically the ways in which geoscientists are educated, communicate with one another, and share knowledge with the general public and on how they act on the environment.

Geoethics provides a quality standard checklist to geoscientist and other practitioners involved in the search for, development and extraction of geo-resources that ensure fully compliance with the basic values of humanity and professionalism when dealing with one another, the society or the environment. It has the main role of reminding geo-researchers of the importance of adhering to the set standards for sustainable extraction of earth resources while conserving geo-diversity, geo-heritage and bio-diversity. It also provides a link between geosciences, bio-conservation, law, sociology and philosophy so that the impacts of human activities that may have significant consequences on the environment are counterchecked beforehand.

Geoethics as an ethical field of geoscience is required to re-institute the intrinsic responsibility of the geoscientific community in improving geo-education and the quality of professional work, promote transparency in geo activities, ensuring sustainable gains to the communities hosting geo-resources and most importantly environmental protection at both the local and global level so that the livelihood of the future generation is not compromised.

It is through Geoethics and most importantly its fundamental values as stipulated on the Cape Town Statement on Geoethics of 2016, that

geoscientists can: effectively communicate, honestly interact and share knowledge, increase openness and disseminate accurate information to the general public, increase cooperation, raise integrity in research, conserve both geo- and bio- diversity, provide quality geo-education to the future generation of geoscientists and making sustainable development a central agenda when planning and implementing geo-activities. All these can best be achieved if geoscientists either individually or through professional associations like TGS endorse the International Association for Promoting Geoethics (IAPG) which is an international, scientific, multidisciplinary community formed in 2012 by dedicated geoscientists for the purpose of addressing how both theoretical and practical geoscientific problems can be solved through the application of ethical principles.

INDUSTRY-ACADEMIA-GOVERNMENT COLLABORATION MODEL FOR PRECOMPETITIVE SCIENTIFIC TARGETING: A SOLUTION FOR APPARENTLY SLOW RATES OF DISCOVERIES IN TANZANIA

Joas M. Kabete

Mazoka Resources Limited, 11 Usutu Avenue, Sandton, Johannesburg RSA
jkmuganyi@gmail.com

Tanzania has been part of the global mineral supply chain, mainly from high-grade gold deposits in the Lake Victoria Goldfields Region since colonial times. Despite early 1990s government's implementation of attractive regulatory frameworks, and improved geological attractiveness (GST), many high-ranking low-grade projects including old gold mines such as Buckreef and Buhemba have remained un-developed into economically viable mines. Although size and grade (citing poor geological attractiveness) and infrastructure (electric power and roads) and technology could have been cited as main reasons behind un-development inconsistent and poor company strategies may have played a significant decision making role. Such low-ranking prospects, commonly under cover of deep regolith, some seen multiple deformation and metamorphic overprints, and others constituting refractory ore requiring expensive extraction techniques (Kukuluma Matandani, Geita Gold District) would require robust country-company strategies.

Despite claims that lack of or slower rate of new discoveries in Tanzania is due to terrane maturities, under-endowment from under-explored belts (e.g. central Tanzania) and lack of quick adaption to the rapidly changing paradigms in predictive metallogeny are among reasons for an apparently lack of new discoveries. The paradigm shift including scale-factors when targeting deposits under thick in-situ and transported regolith profiles; target size (belief that numerous small-scale deposits are transformable into ~1-5 Moz Au mines); poor infrastructure in under-explored provinces; and use of conventional targeting criteria to predict complex ore shoot geometries overprinted by multiple tectonothermal events, must be embraced. Modern exploration utilises globally available datasets to

develop and refine the understanding of the geological controls on deposition of metals in respective sites. This includes spatial relationships and temporal evolution histories between hosting lithologies and metal deposition events, the most useful key components for quantifying and ranking mineral endowment and targeting districts and camps for exploration.

This abstract originates from Project P1169 – Central East-Africa Exploration Initiative (EAXI) initiated by the author through WITS University to AMIRA International Ltd in 2015 in view of attracting mineral exploration through scientific targeting. It is an industry-academia-government collaboration based model for precompetitive geoscience research in developing nations. It has successfully been used to jump start and drive new discoveries in West Africa. The outcomes of this initiative is to enable the minerals exploration stakeholders (public sector and private industry) to more effectively assess and promote the prospectivity and geological context of key mineral systems. It also aims at providing geological framework for mineralisation, and advances in mineral exploration targeting to allow geologists to predict fertile geological environments with a higher degree of certainty, thus reducing exploration risk and expenditure. This approach is to focus geoscientists on high-ranking mineral districts likely to lead into new discoveries in the shortest periods (~1-5 Moz, average grade 0.78-2g/t Au deposit types), improved acquisition and management of high-quality data. Centralization of academia-government- and company-acquired data, is an example of an efficient way of re-distributing data back to exploration companies as a key approach that should lead into new discoveries.

In summary, this model will have direct benefits to private and public stakeholders including, but are not limited to:

1. Data compilation required to support the development of a seamless solid geological map: delineating lower to higher-order structures; contiguous crustal blocks, small-giant gold deposits across goldfields, province and camp scales.
2. Exploration geoscience and gap analysis: identify and collect pre-competitive data and information required for targeting of camps with

potential medium-scale gold deposits (i.e. ~1-5 Moz, 0.78-2.0g/t Au deposits) from pilot study areas. Conventional targeting for these deposits is complicated by the lack of obvious footprints.

3. Capacity building programs: training the next generation of government, industry and academic geoscientists through field trips and workshops (pilot studies). Business-oriented geoscientists.
4. Organise and conduct seminars and workshops to main stakeholders (government) and attract potential stakeholders to future stages of the program: explain aims and objectives of the pilot study.

SPONTANEOUS OIL SEEPAGE AS TOOL TO ASSESS THE OIL GENERATIVE POTENTIAL OF TANZANIAN COASTAL SEDIMENTARY BASINS

John Gama*, Ernest Mulaya, Elisante Mshiu, Meshack Kagya

Department of Geology, University of Dar es Salaam, P. O.Box 35052, Dar es Salaam
**johngama71@yahoo.com*

Exploration drilling is commonly used to test the presence of Hydrocarbons and to obtain information such as lithologies, source rocks qualities, deposition environment, and to assess maturation level of a particular sedimentary basin though it is very expensive, time consuming and risky. It estimated that about $ 20million to $ 1billion cost to drill a single exploration well. In order to reduce the risks and costs associated with exploration drilling, spontaneous oil seep techniques is used in area whereby hydrocarbon seeps have been reported. This technique relies on the determination of biomarker compounds derived from biological tissue of plants and animals which were fossilized into Hydrocarbon. Biomarkers are analyzed from oil seeps and correlated with biomarkers from other oil seeps/known source rocks extracts to determine its similarities in term of deposition environment, maturity level without drilling a well.

This study geochemically characterizes 9 oil, 2 gas seeps and 2 condensate samples from Coastal sedimentary basins. Maturity of the possible source rock of the oil or natural seeps and oil to source correlation or a genetic link between hydrocarbon phases (oil in the seeps and discovered gases) of all collected sample were determined by using results from GCMS.

A preliminary chromatogram result from GC/MS indicates that all hydrocarbons seeps collected at wingayongo, Makukwa, Mnuyo, Kilwa Masoko and condensate samples from Mnazibay and are typical oil samples with some anomalous peak of biomarkers identified. Wingayongo seep samples have been highly biodegradation leading to the depletion of n-alkanes and concentration of heavier end members. Chromatogram indicates that, source rock of the Wingayongo oil seep sample were in pre- oil window and has been impacted by the nearby hydrothermal system which is fingerprinted it's by unusual hopanes. Oil seeps and condensate samples collected from Mnazibay and nearby seeps in Ruvuma onshore basin are distinctive and not correlated, revealing their differences in genetic source. Gas Chromatogram indicates gas condensate samples from Mnazi bay are mature and its distinctive diasterane peaks suggest there are originated from

different source. This study suggests that, in Coastal Sedimentary Tanzania there are different family of natural gases and oils sources, observed from geochemical fingerprints. Oil Seeps collected at Wingayongo, Makukwa and Condensates sample from Mnazibay are distinctive and not correlated. Geochemical difference of oil seep, extract of rock sample and condensate sample collected from Ruvuma suggest that, there is more than one source of petroleum in this basin.

SUBSURFACE INVESTIGATIONS OF THE RUFIJI BASIN, TANZANIA USING DIGITAL ELEVATION MODEL (DEM), GRAVITY AND MAGNETIC DATA: CONSTRAINS TO HYDROCARBON POTENTIAL OF THE BASIN

Janeth Matoke*, Isaac M. Marobhe

Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam
**janethmatoke21@gmail.com*

Here we present first results of subsurface investigations of the Rufiji basin, which is one of the onshore coastal sedimentary basins of Tanzania, by using Digital Elevation Model (DEM), gravity and aeromagnetic data. The aim of this study is to delineate subsurface geological structures, establish the spatial variation in sedimentary deposits and link between structures and the Rufiji basin configuration. DEM results have revealed structures in the basin flanks and none within the middle or centre of the basin. Gravity and magnetic data have unveiled different prominent structures with different trends: E-W, NE-SW, NNW-SSE and NW-SE. Some of these structures influence the general trend and/or configuration of the basin itself. Depth estimations obtained from located Euler deconvolution indicate the Rufiji basin has a range of depth between 1.8 km and 6.3 km, with the maximum depth being on the northwestern part of the basin. Results of this study suggest that the Rufiji basin consists of young sediments deposits, most likely deposited between Pliocene to Pleistocene epochs. Furthermore, estimated depth of the sediments would be suitable for the formation of hydrocarbons in the basin.

PETROPHYSICAL ANALYSIS OF TENDE-1 WELL LOGS IN THE EAST PANDE BLOCK, SOUTHERN OFFSHORE TANZANIA.

Aneth L. Lyaka*, Gabriel Mulibo

Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam
**anesteve2014@gmail.com*

This study presents preliminary results of log analysis from Tende-1 well which is located in the East Pande Block, southern offshore Tanzania. The aim of this study is to identify types of lithology across Tende-1 well, delineate reservoir zones and hence to evaluate petrophysical properties of the reservoir zones which include porosity, permeability and fluid saturation. A suite of wire-line logs comprising of gamma ray, photoelectric factor, resistivity, neutron porosity and bulk density logs, were analyzed for reservoir characterization of Tende-1 well.

Preliminary results, based on gamma ray log, Pef values, neutron- density combination, three types of lithology were identified which include sandstone, shale and limestone. Five sandstone (shale free lithology) marked zones A, B, C, D and E were identified with their tops and bases at depth interval from 3000 m to 4080 m. Due to the presence of neutron and density crossovers and relatively high resistivity, zones B and D were identified as reservoir zones. Computed petrophysical parameters for the reservoir zones gave a fair porosity ranging from 6.5% to 15.2% with permeability in the range of 40 mD to 1443.5 mD. The fluid type defined in the reservoir zones was basically water with high saturation ranging from 92% to 99%.

These findings indicate that, the lower hydrocarbon saturation (1% to 8%) suggests that the actual reservoir quality for hydrocarbon exploration of Tende-1 well is poor.

SEISMIC STRUCTURAL INTERPRETATION: A CASE STUDY FROM 2D SEISMIC PROFILES IN THE NORTHERN PART OF EAST PANDE BLOCK, SOUTHERN COAST OF TANZANIA

Shekarata Chonge Rashid*, Evelyn Mbede, Nelson Boniface

Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam

**csheka85@gmail.com*

Seismic reflection data was employed to characterize geological structures in the northern east Pande Block for the aim of assessing the hydrocarbon potential of the area, which lies in the zone of the offshore east southern coast of Tanzania. Structures were evaluated using 8 2D seismic profiles; 6 cross-lines trending EW and 2 in-lines trending NS directions and Well data; well tops, well header and well logs all of which were imported into the interactive workstation with the use of PETREL and Techlog Software. In our preliminary results we could successful pick 12 horizons and 96 faults trending in N-S, NE-SW, SE-NW, NNW-SSE and NNE-SSW directions. Identified horizons were traced to produce Time structure map in which later were converted to depth structural map using Time-depth relation curve. The lithology identification helped to delineate 2 reservoirs in the area at depth range of 3406.4m – 3837.3m and 4480.3m – 4592.3m For Top Tikiti North deep Channel-Base Tikiti North deep Channel and Top Tende-Base Tende respectively. Principal structures responsible for the hydrocarbon entrapment is structural high that correspond to normal faults as observed on seismic profiles.

CHARACTERIZATION OF RESERVOIR ROCKS AND EVALUATION OF HYDROCARBON POTENTIAL USING PETROPHYSICAL PARAMETERS AT MKUKI-1 WELL IN BLOCK 7, OFFSHORE TANZANIA

Juma M. Mheluka*, Gabriel Mulibo

Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam
**mmheluka@gmail.com*

The present study deals with estimation of values of petrophysical parameters and lithology computation in order to characterize present reservoir rocks at Mkuki-1 well located at deep offshore basin Tanzania. The aim of this study was achieved through carrying out some petrophysical measurements of porosity, fluid saturation and permeability of the reservoir rocks to determine reservoir characteristics and quality. The preliminary results through interpretation of well logs reveal three (3) non hydrocarbon-bearing reservoir rocks Mkuki splay, Mkuki deep sand 1 and Mkuki deep sand 2 with gross thickness of 94.335 m, 28.905 m and 12.967 m, average permeability values of 827 md, 550 md and 1000 md, while average porosity values of 27.7%, 23.7% and 20.8%, with average volume of shale 9.7%, 12.1% and 10.6% respectively, signifying excellent reservoir quality. Fluid type defined in the reservoirs on the basis of neutron/density log and resistivity logs signatures was basically saturated with water only. High water saturation (90.6-97.7%) in the reservoirs of the Mkuki-1 well indicates that the proportion of void spaces occupied by water is high, thus, indicating very low to null hydrocarbon saturation. Plots of porosity values against permeability values show fairly strong linear relationships between two variables in all reservoirs indicating that Mkuki-1 well reservoirs are permeable and have pores that are interconnected. The findings indicate study high quality reservoir rocks but with non-hydrocarbon-bearing such that it is not potential for hydrocarbon production.

THE ROLE OF THE TANZANIA MINERAL SECTOR IN INDUSTRIAL DEVELOPMENT

Elisante Elisaimon Mshiu*, Makenya A. H. Maboko
Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam
** mshiutz@gmail.com*

Most objects we are using today contain mineral substances; it is because they were made using different minerals depending on their properties. Tanzania is rich in such mineral resources (minerals, metals, rocks) potential as raw materials in the manufacturing of different objects. Minerals found in Tanzania can be used in making equipment in the areas of information technology and robotics; they can be used in aerospace industry as well as in the production of eco-friendly products such as solar panels, wind turbines, water filters, and batteries for electric vehicles. The above mentioned high technology areas are defining the current new economy and it is where first world countries have focused their investment. Tanzania endowed by some of the minerals used in high technology manufacturing industry which gives the possibility for it to participate in the above mentioned economy.

In the transformation to industrialization by the fifth government, Tanzania must focus on creating a stable manufacturing industry by ensuring consistent supply of raw materials. The Tanzania mineral sector is among the sectors potential as feeders of raw materials to the country manufacturing industry, it is because mining products are the fundamental raw materials in the production of different objects we are using today. Apart from making high technology equipment, mining products are used in making different other products; this includes food and medicines additives, construction materials, machines and agriculture fertilizers. The recent huge discoveries of natural gas have further widened the number of Earth resources prospective as raw materials to the manufacturing industry; natural gas is widely used in the petrochemical industry for manufacturing different goods. Hence, with this simple observation, the country's mineral sector has a central role to play in the efforts shown by the fifth Tanzanian government towards industrial development.

For a proper industrial development, a policy to strengthen Tanzania mineral sector by transforming it into a source of raw materials must be in place.

Effort in educating Tanzanian community of entrepreneurs and financial institutions is as well needed so as to create awareness and increase local and international investors. In this chapter it is suggested that effective use of mineral resources by the Tanzanian local manufacturing industry will accelerate and ensure stability of country's industrialization process. Moreover, it is recommended that extraction of earth resources need to be done with maximum caution so as to ensure the extracted products are used properly for essential needs of the society; also, their use has to ensure economic and social sustainability of the Tanzanian community.

WOMEN IN SMALL SCALE MINING IN TANZANIA: A CASE STUDY OF SMALL SCALE SAND AND AGGREGATE MINING IN THE CITY OF DAR ES SALAAM TANZANIA

Neema Masinde, Crispin Kinabo*
Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam
**kinabo_2003@yahoo.co.uk*

According to 2011 census, ASM in Tanzania directly engages 680,000 people, of which mining of gold amounts 58.2% followed by building /construction materials which is 23.6%. The rest are engaged in coloured gemstones (12.0%), copper (1.5%), diamonds (2.5%), salt (2.1%) and other minerals 1.0%. The contributions to women miners range between 25% and 40%, of which the highest number are engaged in low value minerals and materials (LVMM) mining activities. This sub sector, small scale aggregate and sand mining is the most important segment of the mining sector engaging women in the urban and peri-urban areas of Tanzania. Conservative estimates are that 50,000 - 100,000 women miners are engaged in LVMM and are responsible for producing 30 - 40% of the minerals in construction and building industry in the country. With their dependents, this means 300,000 to 600,000 people are directly dependent on this activity.

Women working in artisanal and small-scale mining dealing with LVMM in Tanzania face a huge array of issues, challenges and threats. This paper briefly reviews socio-economic challenges facing women in aggregate and sand mining in Tanzania.

STRUCTURAL INVESTIGATION OF BLOCK 7, MAFIA DEEP BASIN, OFFSHORE TANZANIA

Doreen Nyahucho

Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam
doreennyahucho@gmail.com

The Mafia Deep Offshore Basin (MDOB) is one among the petroliferous sedimentary basins, located offshore Tanzania. Numerous surface and subsurface exploration data have reported the presence of structural and stratigraphic traps, oil seeps and oil shows. Despite all this indicators of an active petroleum system, there has been no commercial discovery in block 7 located offshore east of Dar es Salaam, where wells such as Mkuki-1 and Mlinzimbali were recently drilled.

This study investigates subsurface structures in relation to the petroleum potential of the basin by using 2D seismic reflection and Mkuki-1well data on Schlumberger's Petrel visualization and interpretation software. This study shows that there are two major fault sets that are linked to the regional tectonics in block 7, MDOB. The dominant being N-S fault set and less dominant NNW-SSE fault set. The structural framework reveals that there are numerous number of structural and stratigraphic traps that are responsible for trapping hydrocarbons. The NNW-SSE faults are associated with the displacement of the major fault lineation that provides a number of potential traps for hydrocarbons. Therefore, suggest that the new drilling target should focus on the NNW trending faults. Also this study revealed that, reactivation of faults during the EARS resulted into migration of hydrocarbon. This might account for the recent two dry wells in the area.

CHARACTERISTICS OF THE GEOTHERMAL SYSTEM AT MTAGATA IN KAGERA -TANZANIA

Ngereja M. Mgejwa*, Shakiru I. Kajugus

Ministry of Energy and Minerals, P.O.Box 2000, Dar es Salaam, Tanzania

**ngereja.mgejwa@mem.go.tz*

The Mtagata geothermal prospect is within the Karagwe-Ankolean Supergroup. The supergroup formed during the Mesopretorezoic era, approximately 1300 Ma ago, and contains mainly mafic and ultramafic intrusions and granites. Other rocks found in the Mtagata area include shales, mudstones and quartzites. Several exploration activities have been carried out within the Karagwe-Ankolean Supergroup especially on minerals, in surface assessment of geothermal resources, particularly temperatures (52.5°C) and flow rate (5kg/s) of the hot springs. The Mtagata geothermal resources can be utilized for power generation to increase the installed capacity in Tanzania, and for directly thermal applications, mainly domestic uses, agriculture and tourism. The Mtagata geothermal resources need extensive exploration program in order to confirm the reserve before it is economically and sustainably exploited. Mtagata geothermal system could be mainly recharged by Rumanyika - Olugundu game reserve. Presently, geothermal resources are among the crucial sources of energy that are expected to contribute to the energy security of Tanzania.

1D BASIN MODELING OF MBUO-1 WELL IN MANDAWA SALT BASIN

William Mremi*, Mr. Emily, Kiswaka

Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam
**williefariji@gmail.com*

The Mandawa Basin of southern Tanzania is the most prospective onshore basin for hydrocarbons in Tanzania. Geophysical hydrocarbon exploration (using gravity, aeromagnetic and seismic reflection data) and surface data have encountered a number of structural and stratigraphy traps and the presence of oil seeps. Oil shows have also been encountered by several wells example Mbuo-1 well and Mandawa-7 well. However, no economic hydrocarbon accumulations have been discovered, from all six drilled wells (Mandawa-7, Kizimbani-1, Mbuo-1, Mita Gamma-1, East Lika-1 and Kianika-1) in spite of the available potential indications and key elements for hydrocarbon generation and accumulation.

This study was an effort to look on the depositional history, source rock maturity and timing of hydrocarbon generation in the basin through basin modeling to better understand the petroleum system of the study area. Basin modeling was constructed using PetroMod 1D (Version 2012) program. Input parameters can be divided into 3 groups. (1) Stratigraphic and source rock properties data were extracted from Kagya 1996 and Mbuo-1 Well data sheet. (2) Boundary conditions, the surface water interface temperature (SWIT) values are based on a publication by Wygrala (1989). Other boundary conditions, the paleo water depths (PWD) used in this study are estimated based on the deposition environments of each unit. (3) Calibration is based on vitrinite reflectance and Tmax data to adapted models by varying heat flow (HF). The basin modeling of Mbuo-1 well shows depth of petroleum generation at approximately 3000m. The generation started during the Late Jurassic to the Early Cretaceous in both Mbuo Claystone and Mbuo Sandstone and continues up to recent. Other Overlying Formation Nondwa Evaporites (intercalated with shales), and minor Claystone in the Mihambia formation are immature based on the modeling.

Petroleum system event chart prove a working petroleum system and good timing of events. But the uncertainty is still in the quality of the reservoir in

terms of porosity and permeability which is not defined by the model. The recent East Africa Rifting might be responsible for the creation of the weak zones that probably migrated the generated and accumulated petroleum to the destruction points on the surface. This might be well explained by the observed oil seeps within the geologic vicinity of the Mandawa Basin (e.g. Wingayongo seep in the northern flank of the Rufiji trough; Msimbati oil and gas seeps near Mnazi bay; Tundaua oil seeps along the west coast of Pemba Island and; the recently discovered seeps in the Ruvu Basin). The heat energy generated during the East African Rift might also be responsible for the destruction of the already generated hydrocarbons from the Mbuo claystones. This is because the timing of hydrocarbons generation predicts that the East African rifting postdate the petroleum generation by the Mbuo claystone. The very long preservation time (about 152 My) predicted by the events chart might have contributed to expose the already generated hydrocarbons to different destruction mechanisms and/ or tertiary migrations. Then this very long geologic preservation times my account the absence of discoveries in the Mandawa Basin.

CORRELATION BETWEEN SURFACE GEOLOGY AND INTENSITY VARIABILITY IN KAGERA REGION, TANZANIA, AFTER THE 10th SEPTEMBER 2016 EARTHQUAKE

Keneth Kajugus Lupogo, Gabriel Mulibo, Richard Ferdinand

Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam
**kennlupogo@udsm.ac.tz*

This abstract presents a correlation between macro seismic survey and surface geology carried out in the Kagera region after the 10 September 2016, Mw 5.9 earthquake. The aim was to investigate the spatial and correlation relationship between intensity data and surface geology. A database has been created to store a large amount of information on soil profiles, geotechnical information and micro seismic data. The results shows that surface geology was critical in variability of ground shaking observed in the region. The significant variation of intensity observed is related to spatial variation and geometry of geologic formations present in the area. Intensities increased by about two intensity class inside the areas where lateritic deposits are encountered. Major amplification occurred in alluvial deposits in the western part of the region. These results provided initial understand of seismic response in the Kagera region and its associated damage observed in the region after earthquake.

MACROSEISMIC SURVEY OF THE 5.9 MW SEPTEMBER 10, 2016 KAGERA EARTHQUAKE: IMPLICATION FOR THE SITE EFFECTS AMPLIFICATION

Gabriel D. Mulibo*, Richard W. Ferdinand

Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam
**gmbelwa@yahoo.com*

The ultimate practical aim of macroseismic survey is to understand the pattern of earthquake effects as a function of magnitude, distance, local conditions and other factors. The Mw 5.9 September 10, 2016 Kagera earthquake resulted in the widespread damage within the Kagera region with officially announced death toll of 17, many residential structures destroyed, and some of them damaged beyond repair. Studying earthquake effects is an important component of preparing for the effects of future earthquakes. Results of macroseismic survey on the isoseismal map indicate that the orientation of the intensity pattern is elongated towards the southeast in accordance with the rupture directivity towards Bukoba town. This finding is in agreement with the orientation of the fault rupture from the focal mechanism, measurements of magnetic anomaly collected around the epicenter and the distribution of aftershocks.

The more frequently assigned values of intensity ranges from VI-VII on the MSK-64 scale with maximum intensity of VIII. Much of the duration time of shaking of over 20 seconds was observed in Bukoba rural and Missenyi Districts and a few from Bukoba Municipal. The observed longer duration of earthquake suggests a resonance effects at those sites that changes with the local geology and soil conditions. The catastrophic consequences of the event were attributed to the proximity of the epicenter and the poor construction quality of the residential structures. Site effects played a key role in the damage distribution, with sediment-induced amplification and ray focusing within the strong topographic relief being most likely phenomena explaining the macroseismic observations. This effect is evidenced by the maximum intensity of VIII, which corresponds to the instrumental magnitude of 6.2. This result differs from the instrumental result of magnitude 5.9, the difference that is attributed by the amplification due to site effects i.e., the overburden soil and topographic features within the region.

THE SEPTEMBER 10, 2016 MAGNITUDE 5.9 KAGERA EARTHQUAKE: IMPLICATION FOR SEISMIC HAZARD IN THE REGION

Richard Ferdinand[1,*], Gabriel Mulibo[1], Keneth Kajugus Lupogo[1] and Sudian Chiragwire[2]

[1]*Department of Geology, University of Dar es Salaam, P. O. Box 35052 Dar es Salaam*
[2]*Geological Survey of Tanzania, Dodoma, Tanzania*
** rf@udsm.ac.tz*

The September 10, 2016 damaging earthquake occurred along the fault at 15:27:33.110 in Minziro village near the border of Tanzania and Uganda. The focal mechanism of the earthquake indicates a double couple source (81%) with the two sheared planes oriented NNE-SSW and WNW-ESE. The sense of slip along the NNE plane and WNW are -151° and -28° respectively indicating oblique strike-slip with left lateral movement. The duration of the earthquake (fault rupture time) is 4.4 sec. indicating the lateral extent of the fault ruptured of about 14 km which was initiated at an epicenter location of 1.030° S and 31.560° E at a depth of 36 km. The strength of the earthquake is 8.891x1017 N-m, equivalent to a moment magnitude, Mw, of 5.9. Selection of the fault plane based on results from the measurement of magnetic anomaly and the distribution of large aftershocks, indicates the reactivated fault is oriented along ESE-.

The location of the September 10, 2016 earthquake, the orientation and the sense of slip along the fault parallels major shear zones ascribe the earthquake to be a transfer fault connecting to the extension structures along the WB. Hence the cause of the earthquake could be a failure along a transfer fault resulting from strain accumulation due to the extension along the WB. The depth of the earthquake (36 km) indicates a thicker seismogenic zone, i.e., a thick, cool and strong lithosphere that can accommodate high strain energy. The energy radiated from the earthquake source is dominated by shear waves (S waves) and is oriented along the direction of the fault plane towards SE. This predicts the orientation of the damage in the first order. For example, the Bukoba town, that lies SE of the epicenter had more damage as compared with other centers.

POROSITY-PERMEABILITY RELATIONSHIPS IN SILICICLASTIC RESERVOIRS FROM CORE PLUG ANALYSIS AND WELL LOGS; BASED ON DATA FROM EXPLORATION WELLS OFF SHORE NORWAY

Faustine Matiku

Norwegian University of Science and Technology, Norway
fmatiku@tpdc-tz.com

In petroleum industry petrophysicists are actually employed to answer three main questions; first is how much fluid a reservoir rock can hold, how much of that is water and how quickly it can be extracted. In other words to find out porosity, saturation and permeability. Porosity and permeability are two important petrophysical parameters used as input to building reservoir models. The porosity is an expression for the storage capacity of the rock whereas permeability is one of the parameters controlling the fluid flow in the reservoir. Porosity can be determined quite accurately from analyses of core plugs and well logs. However, the permeability of a rock can only be measured accurately on core plugs. For many reservoirs there is a lack of core material for much (if not all) of the reservoir. We then have to rely on available well logs to determine the reservoir parameters.

By finding relationships between porosity and permeability we can obtain continuous permeability values for the entire reservoir. These relationships are often not the same for the entire reservoir section and different correlations need to be established for each part of the reservoir. Due to the high costs of coring and laboratory analysis, permeability in most un-cored wells is estimated using correlation equations developed from limited core data. Most commonly, permeability is estimated from various well logs using either an empirical relationship, or some form of statistical regression.

The empirical models may bring wrong estimations in regions having different depositional environments if adjustments to constants and exponents in the model are not applied and significant uncertainty exists in the determination of irreducible water saturation. On the other hand, Statistical regression has been proposed as a more flexible solution to the problem of permeability estimation. Conventional statistical regression is

generally performed parametrically using multiple linear or nonlinear models that require a priori assumptions regarding functional form.

All the methods presented above are applied to a heterogeneous hydrocarbon bearing of Intra-Melke formation, and the results are compared to core-determined permeability. The objective is to inaugurate the porosity-permeability model suitable for permeability determination from well log data from PIL oil field offshore mid-Norway.

GEOPARKS AND GEOTOURISM FOR PROMOTING EARTH HERITAGE AND CULTURE

Ezra Kavana
North Mara Gold Mine, Acacia Mining PLC
ezrakavana2@gmail.com

Geoparks are the unified areas with geological heritages of international significances which use those heritages to promote awareness of key issues facing societies in the context of the dynamic planet we all live on. They operate as a partnership of people and land managers working to promote Earth heritage through education and sustainable tourism. The concept of a Geopark originated in Europe in the late 1960's, when a group of European scientists recognized the need for new ways to protect Earth resources. Their work led to the formation of an international organization dedicated to this purpose, the European Working Group on Earth Science Conservation. Many geoparks exist in different parts of the world, but for any geopark to be known globally, it should be registered on the Global Geopark Network (GGN), the network which works under support of the United Nations Educational, Scientific and Cultural Organization (UNESCO). For a geopark to be registered by the Global Geopark Network (GGN), it should fulfill the UNESCO criteria which are, to have a management plan designed to foster socio-economic development that is sustainable based on geotourism, demonstrate methods for conserving and enhancing geological heritage and provide means for teaching geoscientific disciplines and broader environmental issues, have joint proposals submitted by public authorities, local communities and private interests acting together which demonstrate the best practices. Tanzania is endowed with a multitude of geological features that are suitable for educational, cultural, ecological and tourist purposes. OlDoinyo Lengai, the only active carbonatite volcano in Tanzania, which erupted at the lowest temperature lava in the world, at 500-600 °C. The lava is natrocarbonatite dominated by nyerereite and gregoryite. Geopark is among of currently streaming issues in the world and hence there is the need for Tanzania to promote its endowned geoparks to be globally known.

LEARNING FROM EARTHQUAKE DISASTERS IN TANZANIA: LESSONS LEARNT FROM KAGERA EARTHQUAKE EVENT (Mw 5.9) OF 10th SEPTEMBER 2016

Michael M. Msabi

College of Earth Sciences, University of Dodoma
mmsabi@yahoo.com

The Kagera Earthquake event of moment magnitude (Mw) 5.9 which occurred at 15:27:33.11 on 10thSeptember 2016, caused unprecedented devastation in Tanzania, Kagera Region and its Districtsin particular, with 17 people officially confirmed deadand leaving others with minor to major permanent injuries. Furthermore, the earthquake led into the destruction of the residential buildings, public buildings such as schools, religious buildings, hospitals and lifelines utilities such as roads, powerlines and water supplies and the environments in general. A disaster of this extent has never before been experienced by Kagera residents and the Nation as a whole. The Kagera earthquake event has saved as a 'National wakeup call' to look within and introspect again on the state of disaster preparedness, policy, legal and institutional framework of the country. This event can be considered as a learning opportunity. There should be a national learning to take appropriate or specific measures towards disaster reduction, mitigation, prevention, preparedness, recovery and rehabilitation. In this paper an attempt has been made to highlight the lessons learnt from recent devastating Kagera earthquake event and a plan must be designed for the areas located within the earthquake prone areas to mitigate the impacts of future earthquake events if are to occur.

Sponsors

ACACIA
UNEARTHING AFRICA'S POTENTIAL

MAUREL & PROM

University of Dar Es Salaam

SHELL Exploration and Production Tanzania Limited

Statoil