



# STATUS OF GEOTHERMAL EXPLORATION AND DEVELOPMENT IN UGANDA



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Second African Rift Geothermal Conference (ARGeoC2)  
Imperial Resort Beach Hotel, Entebbe, 24-28<sup>th</sup> November 2008



# Outline

- Objective of the study
- Why develop geothermal energy?
- Study areas
- Recent studies
- Current exploration results
- Next steps
- Conclusions
- Recommendations
- Acknowledgements



# Objective of the study

- To develop geothermal energy to complement hydro and other sources of power to meet the country's energy demand and in particular rural areas far away from the present grid.



# Why develop geothermal energy?

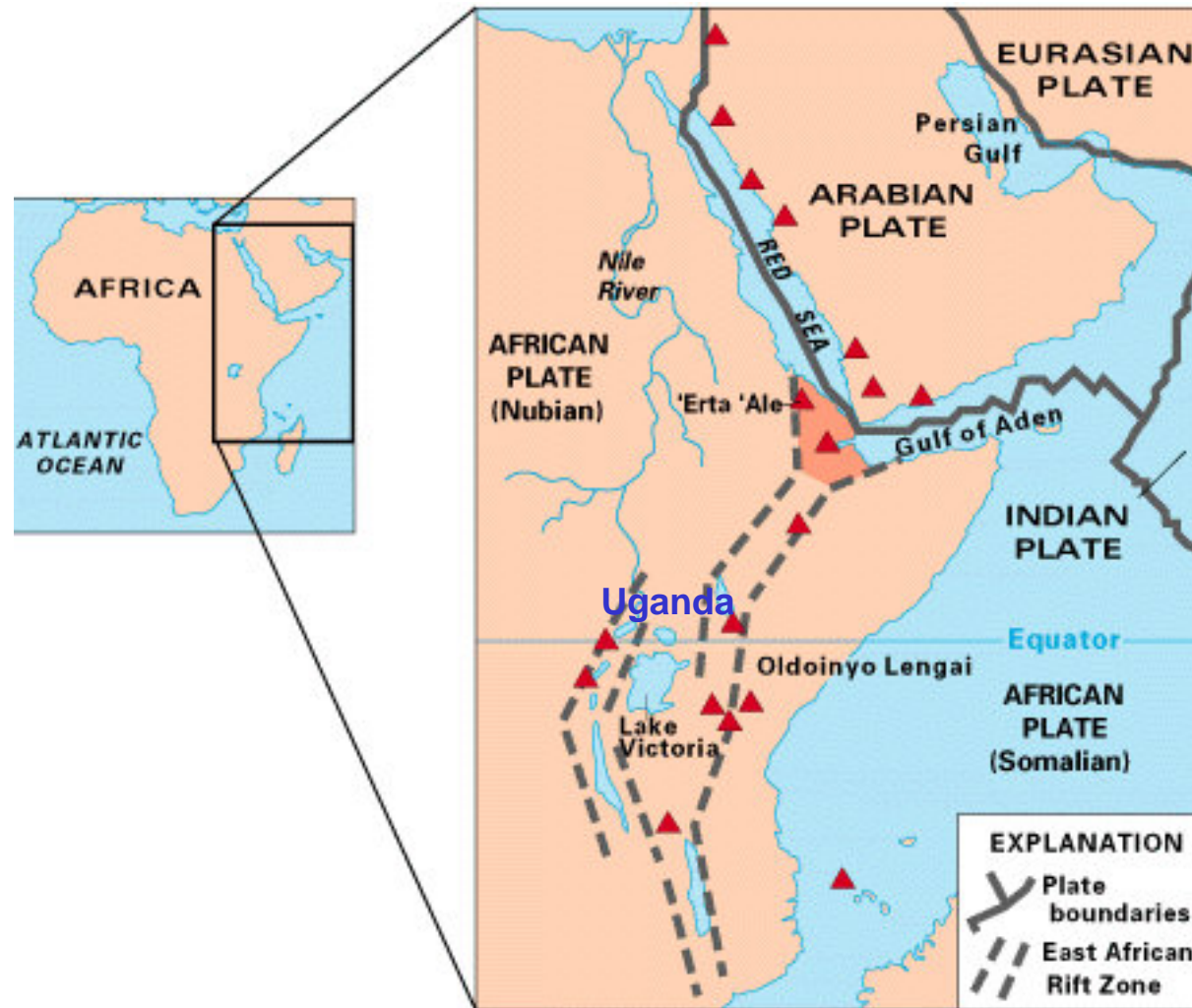
- Hydro - electricity sites are more or less concentrated in one area (along the River Nile) resulting in long transmission distances and high energy losses;
- Uncertainty of continued availability of hydropower arising from climatic fluctuations and therefore a need to diversify energy sources;
- Location of geothermal fields in isolated areas without grid connection;
- International treaties e.g. The Nile Basin Initiative that may limit water usage;

# Why develop geothermal energy? Contd.

- Long-term effects of cascaded hydropower development along the River Nile are not known;
- Environmental degradation as a result of extensive harvesting of existing natural forests for biomass and land use for subsistence agriculture that in turn are leading to silting of water bodies;
- Geothermal can also provide direct heat for use in industry and agriculture and with possibility of recovering minerals from the geothermal spent brines; and
- Environmentally benign energy source.

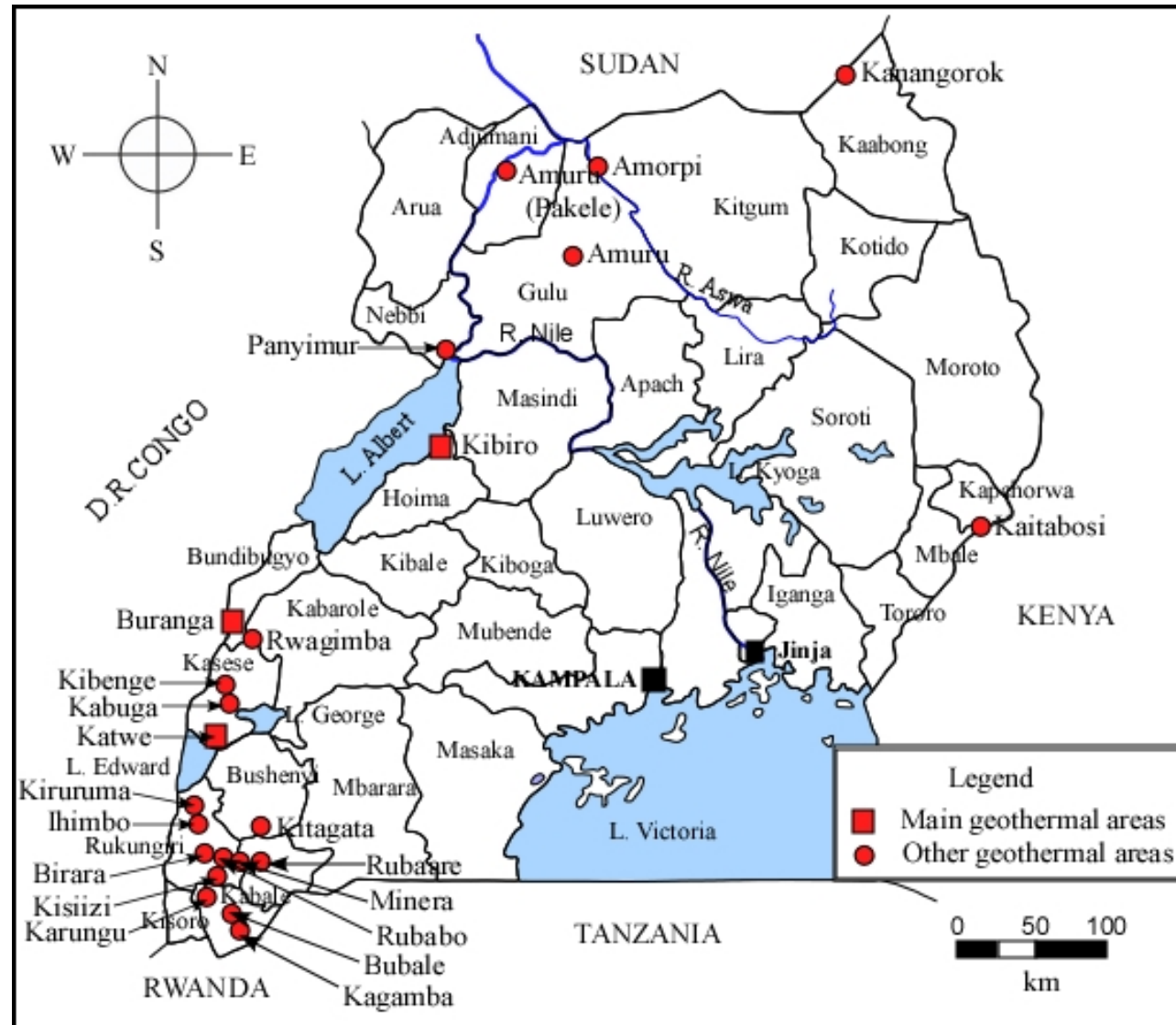


# Study areas: East African Rift System





# Study areas: Uganda geothermal areas





# Recent studies

- 1993–1994: Geochemical and geological investigations at Katwe, Buranga and Kibiro prospects - GoU and Iceland, UNDP & OPEC.
- 1999 to 2007: Isotope hydrology studies to delineate flow characteristics of geothermal waters and identify their recharge areas - GoU & IAEA.
- 2003: Geological, geochemical & initial geophysical surveys at Katwe - GoU & AfDB.



# Recent studies contd.

- 2004: Geological and initial geophysical surveys at Kibiro - GoU & Iceland (ICEIDA).
- 2005-2007: Detailed geological, geochemical & preliminary geophysical surveys at Buranga - GoU & BGR.
- 2005-2007: Further detailed geological, geophysical surveys and temperature gradient measurements at Katwe and Kibiro - GoU, WB & ICEIDA.

# Study results: 3 Geothermal Prospects

- Tectonic and volcanic environment suggest a source of heat and high permeability for the geothermal systems
- Sub-surface temps predicted by geothermometry:  
**Katwe:** 140-200°C,  
**Buranga:** 120-150°C,  
**Kibiro:** 200-220°C.



Katwe craters with Lake Mahiga in foreground



# Results cont'd.

- Fluids are suitable for electricity production & direct heat in industry & agriculture.
- Possibility of mineral recovery at Katwe, Kibiro and Buranga areas e.g. salt, gypsum, sulphur.



Muntere salt gardens at Kibiro

# Results contd.

- Geophysical surveys in Kibiro and Katwe have identified anomalous areas for drilling
- Shallow Temperature Gradient wells were drilled in Kibiro & Katwe prospects to 300m depth; results indicate absence of a shallow geothermal reservoir



Katwe TEM measurements

# Results contd.

- Micro-seismic and preliminary geophysical surveys were conducted in Buranga; the survey was limited to a small area and the anomalous zones could not be delineated. There is need expand the survey area to delineate anomalous areas for drilling.
- The current study has identified other geothermal potential areas – Rubaare in Ntungamo, Kitagata in Bushenyi, Panyimur in Nebbi, Kanangorok in Kabong, Ihimbo in Rukungiri among others, which need detailed exploration.

# Conclusions

- Subsurface temperatures of 140-200°C for Katwe, 120-150°C for Buranga & 200-220°C for Kibiro have been predicted by geothermometry - suitable for electricity production & direct use in industry and agriculture.
- The geothermal activity is related to the tectonic and volcanic activity of the rift, and the three hydrothermal systems appear to be relatively old and rise from volcanic rocks rather than from the young overlying sediments.
- The above conclusion is supported by the current results which suggest deeper geothermal systems in Katwe and Kibiro and a need to probe into the deeper layers of the crust to locate the geothermal reservoirs.
- The study has identified other geothermal potential areas in Uganda with subsurface temperatures of 120 -160°C, which need further investigations.

# Recommendations

- Geophysical survey, MagnetoTerrullics (MT) Measurements, in Katwe and Kibiro to look for a deep reservoir, delineate the geothermal anomalous areas and locate drill sites.
- Detailed geophysical (MT,TEM,Gravity) survey and micro – seismic measurements in Buranga to delineate geothermal anomalous areas for drilling.
- Feasibility study: drilling of 2-3 wells to discover a geothermal reservoir in the most promising of the three prospect(s), i.e Katwe, Buranga and Kibiro.
- Detailed surface exploration of other identified areas.
- Mobilize Funds both locally and through our Development Partners to support the above initiatives.

# Acknowledgements

- United Nations University – Geothermal Training Programme
- Iceland International Development Agency (ICEIDA) / Government of Iceland
- United Nations Development Programme (UNDP)
- Organization of Petroleum Exporting Countries (OPEC)
- International Atomic Energy Agency (IAEA)
- African Development Bank (AfDB)
- World Bank (WB)
- Federal Institute for Geosciences and Natural Resources (BGR) of Germany, and
- Government of Uganda.





Thank you