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Challenges of Geothermal Exploration in the Western Branch of the East African Rift System

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1. ABSTRACT

Several Geothermal resources of the western branche of the East African Rift System (EARS) are located in the Democratic Republic of Congo. The high density of geothermal manifestations are between The Virunga volcanic province and Lake Tanganyika. The goal of geothermal exploration is to identify favourable reservoirs that can be exploited for applications [1].

The WBEARS is the second target for of African geothermal exploration after the Eastern Brach which is well studied and, countries are active members of the African Geothermal Association.

Despite the difficulties encountered and limitations in the western branch, extensive geothermal exploration is increasingly focusing on the integration of multidisciplinary data and each country updates.

The challenges facing exploration and development include: high geological risks, inability to attract financial support from development partners; inadequate data and workforce. However, the lack of qualified personnel and financial difficulties.

Collaboration and shared expertise within the branch are still low due not only to language barriers and limits but also geopolitical differences, regional governance issues, political crises and safety lack. Consequently, several projects focus on specific areas even though reservoirs are probably transboundary.

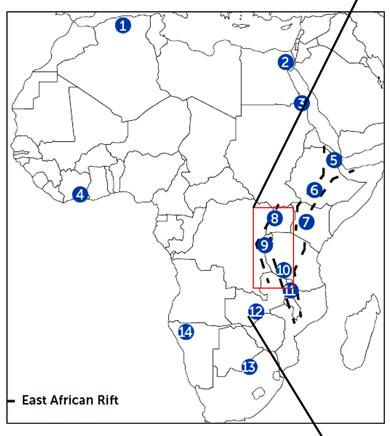


Fig.1a: high African potential geothermal Energy [2]

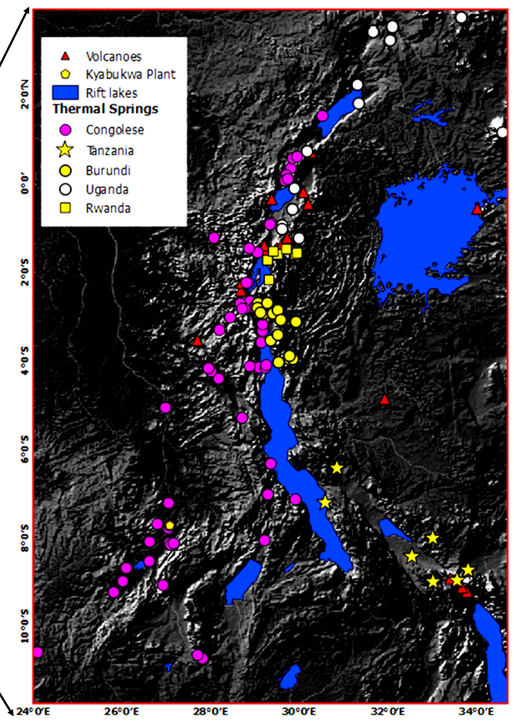


Fig.1b: Geothermal manifestations of the WBEARS

2. INTRODUCTION

African geothermal resources lie within the East African System (EARS), which has two branches: the Eastern and Western (Fig.1). This geothermal potential is yet quantified.. The western crosses the central Africa through Burundi, Rwanda, Tanzania and Uganda. However, the limited access accompanying low safety issues level of certain geothermal fields make favourable decision-makings difficult.

We summarise the latest developments in geothermal exploration in the western branch of the East African Rift System. To fulfil the ongoing investigation, the challenging issues that need to be resolved must be listed.

Some techniques were useful for collecting the data for this poster:

- Documenting conference reports and papers.
- Exploiting websites of IGA, UNU-GTP, AGA and KenGen.
- Referring to databases for collections.
- Software for statistics and diagram representation.
- GIS was used for modelling or special views.

3. RESULTATS

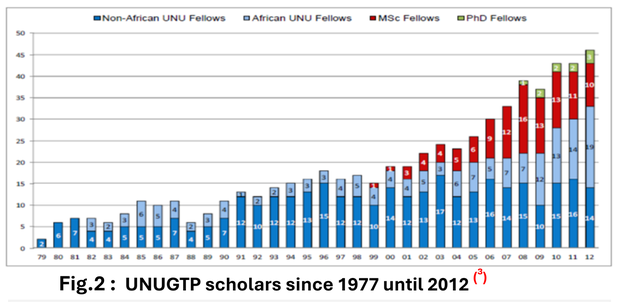


Fig.2 : UNUGTP scholars since 1977 until 2012 [3]

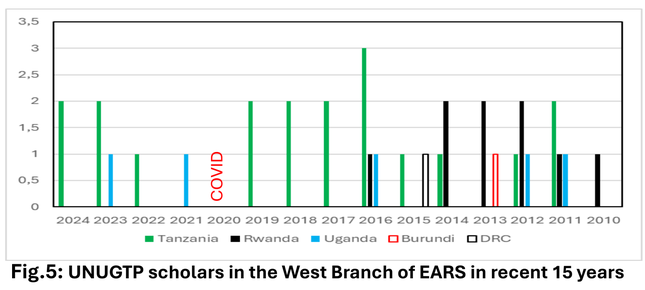


Fig.5: UNUGTP scholars in the West Branch of EARS in recent 15 years

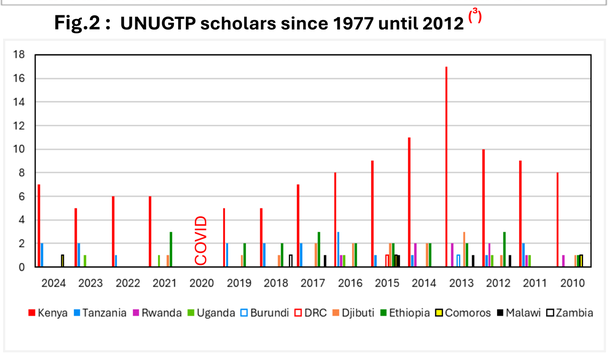


Fig. 3 : UNUGTP scholars in the East Africa Rift system in recent 15 years [3]

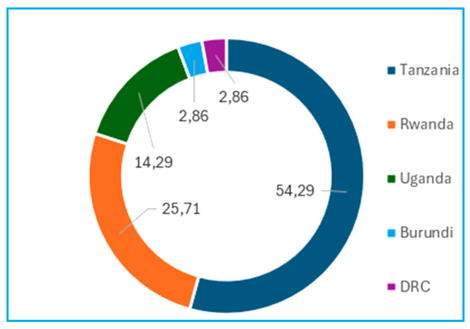


Fig.6: Percentages of UNUGTP scholars in the West Branch of EARS recent 15 Years

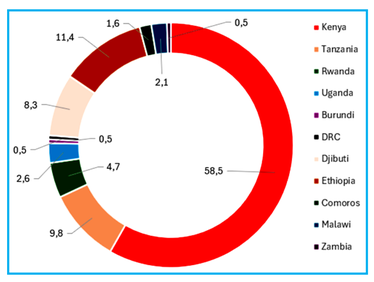


Fig.4: Percentages of UNUGTP scholars in the East Africa Rift system on 15 Years [3]

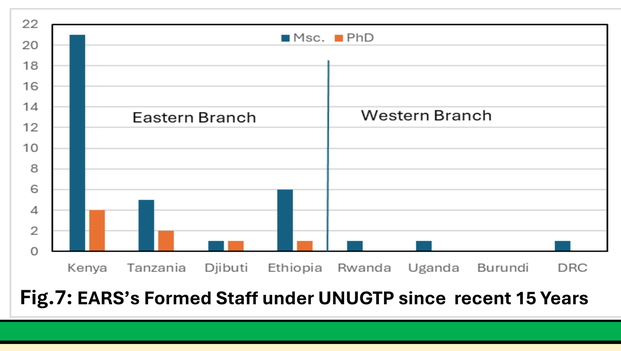


Fig.7: EARS's Formed Staff under UNUGTP since recent 15 Years

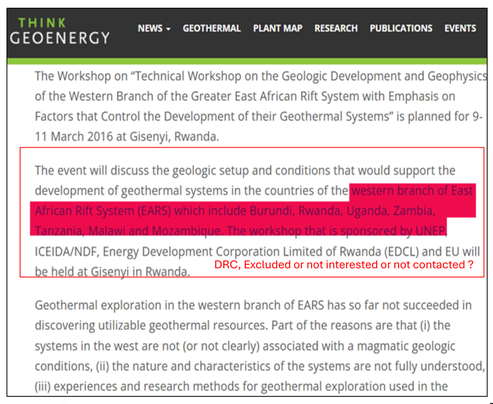


Fig.9: Miss collaboration or political effects



Fig.10: Armed groups including children by foreigners (Ugandans ADF) living in the DRC's rift (*@Nicaise Oka*)

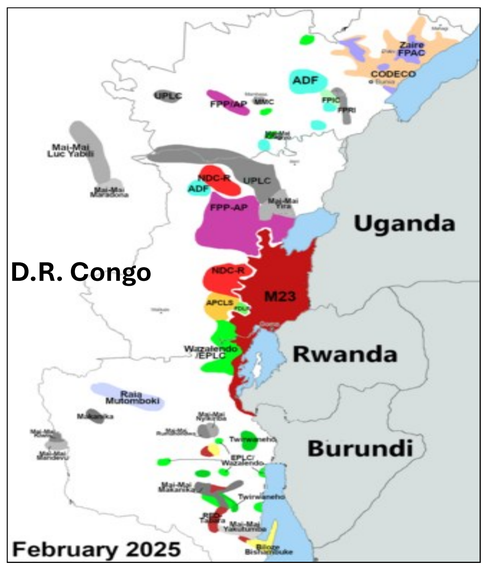


Fig.11: Army groups in the WBERAS (Wikipedia)

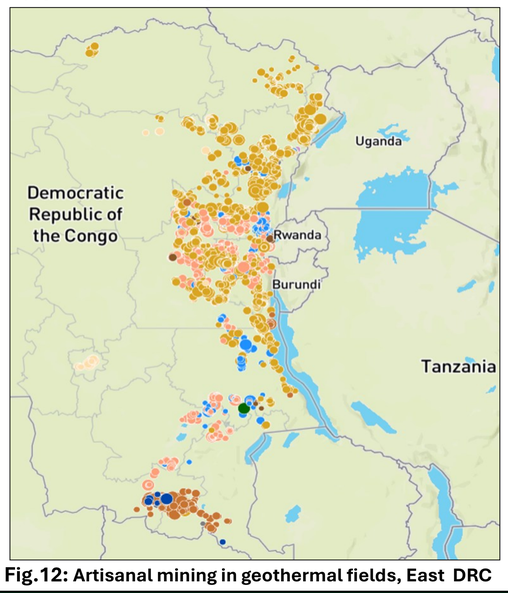


Fig.12: Artisanal mining in geothermal fields, East DRC

4.DISCUSION

Sate of knowledge of geothermal resources along the Western Branch of the EARS (WBEARS) is limited to minor work in the form of surface surveys conducted independently[4]. Existing data indicate that geothermal systems may be developed along the borders of the DRC-Uganda, DRC-Rwanda, DRC-Burundi and DRC-Tanzania (Fig.1),which would justify new ad hoc exploration along the Rwenzori, Nyarogongo-Kivu Lake and Tanganyika Lake axes, which coincide with countries borders.

There are enough challenges which are diverse from local to foreign. The branch has insufficient qualified human resources (Figs 5, 6 and 7)[5] to better investigate resources. However, regional geothermal training is offered by UNUGTP (GRÓ) and KenGen. Most of trained staff are from Kenya and Ethipia who end up working in the Eastern Branch of the EARS (Figs. 3, 4 and 7).

A team of specialists is needed to determine a site's suitability for geothermal resource exploration[6]. Low levels of collaboration have emerged from the crisis in regional governance and the instability in eastern DRC caused by Internal and external factors army groups (Fig. 10, 11), which poses a significant challenge to geothermal exploration. A 2025's master thesis on noble gases isotopic composition on the DRC-Burundi- Rwanda left out springs in Rwanda, as the study was jugged less relevant to that side.

The colocation of geothermal springs (Fig. 1) with Congolese mining fields (Fig. 12) seems to be indirect limitation, as well as minerals activing the crisis. Instability influences partnerships that could boost joint ventures in geothermal exploration.

KenGen, a Kenyan agency, leads geothermal exploration and drilling in Ethiopia and Djibouti, as well as identifying potential geothermal resources in Sudan, Uganda, Rwanda, Tanzania, Zambia and the Comoros Islands[6]. However, in case of the DRC and Burundi, Congolese leaders are focusing solely on hydroelectricity, perhaps due to safety concerns or lack of interest. Promising surface manifestations include isotopic geochemistry of fluids and gases, come to be used to locate the depth of Kivu reservoirs [7] and requires geophysical studies to determine the depth of the reservoirs.

5. CONLUSIONS

1. Considering the geothermal potential along the border between countries in the western part of the EARS, regional projects are highly recommended to improve understanding of the potential on both sides. Public institutions such as ministries, responsibles for energy are mandatory interested in collaboration for linking scientists and professionals under their supervision.
2. The peace missing and political crisis along the branch pose a significant challenge that must be overcome, otherwise, no meaningful geothermal investigation or estimation of energy potential will be possible, means the EARS will not be fully realized.
3. The eastern DRC is the largest geothermal field in the branche. It's safety and peace are indeed pivotal for any total geothermal definition in the branch. As geothermal exploration or projects are coordinated by UNUEP and UNUGTP, hopefully as UN agencies, their contribution to the pre-feasibility of a regional project in the area will be significant. Until the DRC is no longer unsafe, regional geothermal potential will not totally known, **Geothermal maybe a peace solution.**
4. The lack of qualified human resources in terms of professional and scientific reinforcement needs to be addressed.

6. ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to the various geothermal steering committees in the countries investigated for sharing their data and opinions with the large public present at the World Geothermal Congress, and for their consideration and trust. The authors would also like to thank the organising committee for accepting our invitation to this international event, and for the attention they have given to this poster. Short-and long-term solutions that will benefit the industry will emerge from it.

7. REFERENCES

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