

Target Export Country : CANADA

GEO-ENERGY EUROPE

Target Export Country : TURKEY

Target Export Country : MEXICO

Target Export Country : CHILI

Target Export Country : KENYA

Target Export Country : INDONESIA

GEO-ENERGY EUROPE Webinar #3

December 16, 2019

ESCP⁴i
GEO-ENERGY EUROPE Partnership



The GEO-ENERGY EUROPE project is funded by the European Union's COSME Programme (2014-2020)

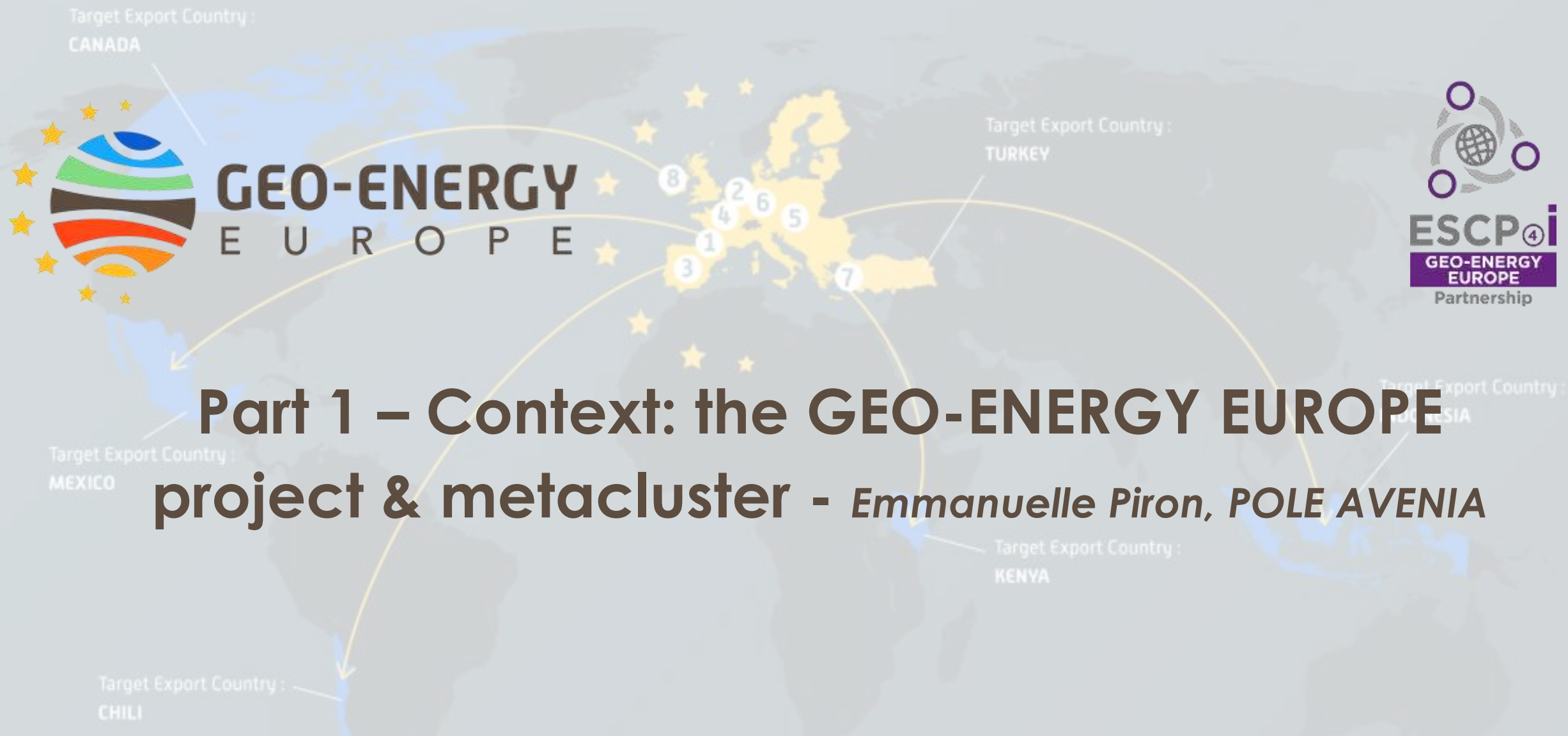


Webinar agenda



1. Context: the GEO-ENERGY EUROPE (GEE) project & metaccluster
2. The GEE Internationalisation strategy & implementation road map, by Thomas Garabetian, EGEC
3. Highlights from a GEO-ENERGY EUROPE fact-finding mission to Kenya - Emmanuelle Piron, POLE AVENIA
4. Outlook on geothermal energy in East Africa – E. Piron & Andrew Gaynor (Geocience Ireland)
5. Q&A session





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Working together to go beyond frontiers ...



... and helping European SMEs to increase their business overseas



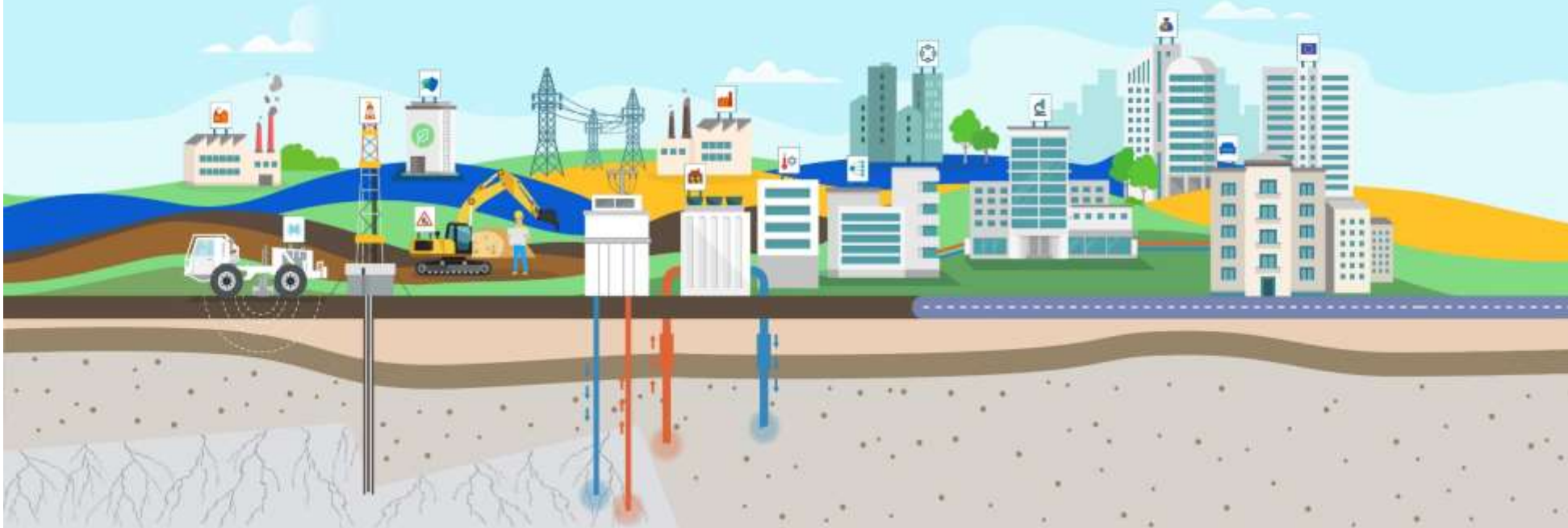
GEO-ENERGY
EUROPE

GEE's vision is to develop a stronger and more integrated European sustainable geo-energy sector, (especially SMEs) with an initial focus on geothermal energy

- Export the European know-how and experience by helping the EU geo-energy SMEs increase their business and outside Europe
- Contribute to industrial deployment and market uptake of deep geothermal in Europe and across the world



BUILDING A STRONG EUROPEAN CLUSTER PARTNERSHIP FOR THE DEVELOPMENT OF DEEP GEOTHERMAL ENERGY WORLDWIDE



101	→ Research, training & education	61	→ Drilling	13	→ Manufacturers subsurface
5	→ Financing, investment insurance	15	→ EPC	31	→ Manufacturers surface
11	→ Authorities (state, local, etc...)	10	→ Production, Maintenance, Optimization	88	→ Cross-sectional services
105	→ Project developers/operators	45	→ Power/district heating suppliers	13	→ HSE
84	→ Geoscience	3	→ Power/heat users/clients		

GEO-ENERGY EUROPE currently represents over 600 members, including 300+ SMEs, from 23 EU countries, and covers the entire deep geothermal value chain



www.geoenergyeurope.com



Page	Main functionality
Home & About	General presentation of GEE project & metaccluster
Members	Listing, mapping & filtering of all 600+ members
Case studies	Examples of skills, services and experience provided by members through achieved or ongoing concrete projects (industrial or R&I)
Media & News	News related to GEE metaccluster &/or members
Events	List of relevant events to the geo-energy/geothermal sectors and GEE participation to these events
Contact	Contact form

Your feedback needed!

Your INPUT wanted!

**This is a tool for YOU
to use & boost your
international visibility!**

- Get to know each other with the Members and Case studies pages
- Display your case studies to make what you are proud of visible to the world
- We are here for you: help us make this website suitable to your needs!





Part 2 – The GEE Internationalisation strategy & implementation road map, by T. Garabetian, EGEC



The GEO-ENERGY EUROPE project is funded by the European Union's COSME Programme (2014-2020)



GEE Internationalisation Strategy



- Objective:
 - Helping the European geo-energy SMEs increase their business and export the European know-how and experience outside Europe.
 - Contributing to the industrial deployment and market uptake of sustainable & decarbonized geo-energy, starting with deep geothermal, in Europe and across the world.
- 3 pillars:
 - Make the metaccluster stronger, e.g. by involving strategic new partners
 - Increase the awareness about the metaccluster
 - Develop internationalisation services for the metaccluster SME members, such as market intelligence, trade missions, competency & country checks, etc.



GEE target countries for internationalisation



- Criteria: significant potential, security of investment, and a sound legal and financial framework
- Selected countries:
 - Kenya
 - Canada
 - Chile
 - Mexico & Indonesia as lower priority due to political instability
- Of the list, Canada flagged as priority market by SMEs involved in GEE.



Internationalisation Strategy



- Instruments for the internationalisation:
 - International events;
 - B2B, C2C meeting;
 - E.g. Trade missions
 - Webinars: capacity building.



Internationalisation roadmap

Action	Timing	Expected Results	Partners involved
Cooperation Agreement <ul style="list-style-type: none"> Canada Kenya 	Oct-December 2019	Basis for deep cooperation between Canadian & Kenyan geothermal sectors and the GEE Metacluster	EGEC, CAPES, Pole Avenia, GSI
Cross-Sectorial cooperation agreement	Oct-Dec 2019	Capacity building for the metacluster, creating cooperation opportunities for SMEs	Pole Avenia
Fact finding mission to Kenya	Sept 2019	Assessment of Kenyan geothermal sector & first contact with main geothermal players	Pole Avenia
Participation international geothermal conference (Turkey)	Nov 2019	First major capacity building opportunity of members SMEs in a both a partnering country and a booming geothermal market	JESDER (host) & all partners
Trade Mission Kenya	Nov 2019	Internationalisation of GEE SMEs	GSI
Capacity building webinar Kenyan Market	December 2019	Capacity building for GEE SMEs	EGEC, Pole Avenia, GI, all

Internationalisation actions beyond 2020

- Capacity building & communication
- Building synergies with EU & international R&D projects and partnerships
- Cross-sectorial cooperation (e.g. agrifood, lithium...)
- Cooperation agreements
- Missions, webinars, B2Bs
- International events (GEOTHERM, GRC, WGC, ARGEO...)



Part 3 – Highlights from a GEE fact-finding mission to Kenya, by Emmanuelle Piron, POLE AVENIA

Context of fact-finding mission

- Business meetings organized by « Business France », a public agency that helps French companies with export business, on Sep 23-26, 2019 in Nairobi, Kenya
- 15 B2B meetings with high level & well qualified geothermal stakeholders over 4 days:

- | | |
|---|---|
| ✓ Business France Kenya & East Africa | ✓ Kenya Power |
| ✓ French Embassy of Kenya | ✓ Olsuswa Energy |
| ✓ MAZARS | ✓ Geothermal Association of Kenya |
| ✓ Kenya Electricity Generating Company (KenGen) | ✓ Aegide International Kenya |
| ✓ Energy & Petroleum Regulatory Authority | ✓ European Investment Bank |
| ✓ AquaPower | ✓ French Chamber of Commerce |
| ✓ Ministry of Energy | ✓ Geothermal Development Company (GDC) |
| | ✓ Agence Française de Développement (AFD) |

→ Thorough overview of the Kenyan geothermal sector and Kenyan exposure for GEO-ENERGY EUROPE

The GEO-ENERGY EUROPE project is funded by the European Union's COSM



**RENCONTRES D'AFFAIRES
ENERGIES RENOUVELABLES**

Kenya – Nairobi
Du 23 au 25 septembre 2019

Découvrez les projets et opportunités du Kenya,
Leader du continent dans les énergies renouvelables

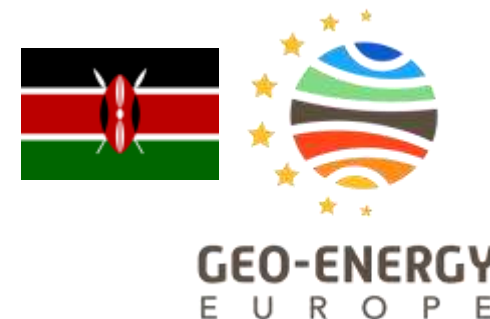
▶ VOUS ÊTES...
Une entreprise française spécialisée dans équipements EnR (solaires, éoliens, géothermiques, biomasse, hydrauliques), développeur de projets, EPC, porteurs de solutions de financements ou d'ingénierie, prestataires de services, etc...

▶ VOUS VOULEZ...
Découvrir le secteur de l'énergie kenyan, comprendre les aspects réglementaires, vous informer sur les projets en cours et à venir, rencontrer les porteurs de projets et organismes de financements et développer votre réseau local.

Avec le soutien de :

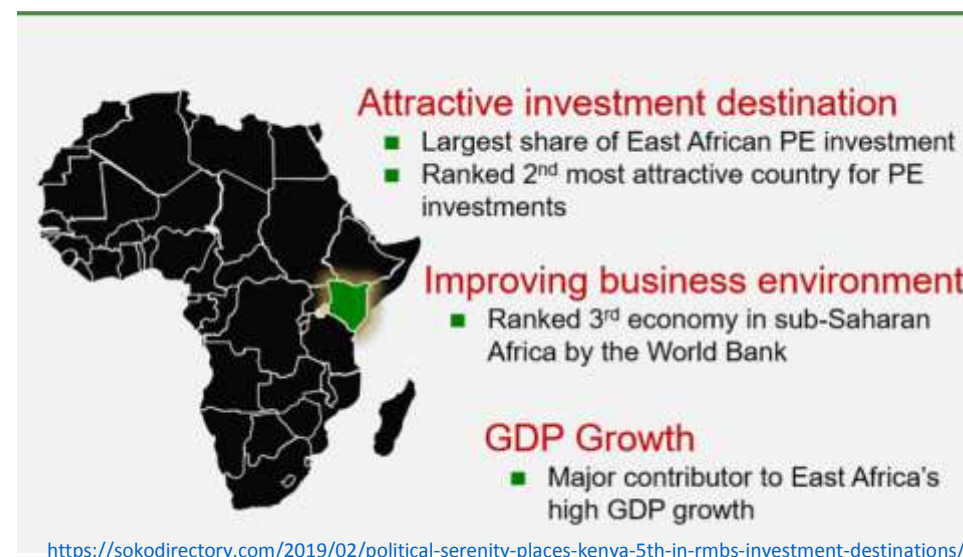
En partenariat avec :

Kenyan demographics & macro-economics

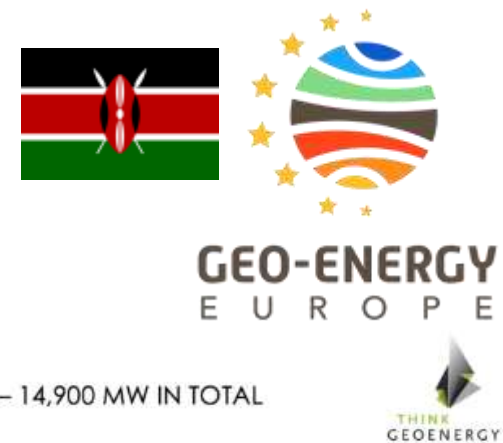


- 49.7 million inhabitants
- Median age 19.5, 900 000 youth on job market /yr, > 80% informal economy
- GDP 2018: 75 Billion USD
- Strong financial & ICT sector (Silicon Savannah)
- Kenya ranks #61 on World Bank's « Doing Business » scale
- 6% growth rate sustained by public investment in infrastructure over last 10 years, financed by IFI & China, but going down, and leading to growing debt → downgraded fr. low to moderate risk

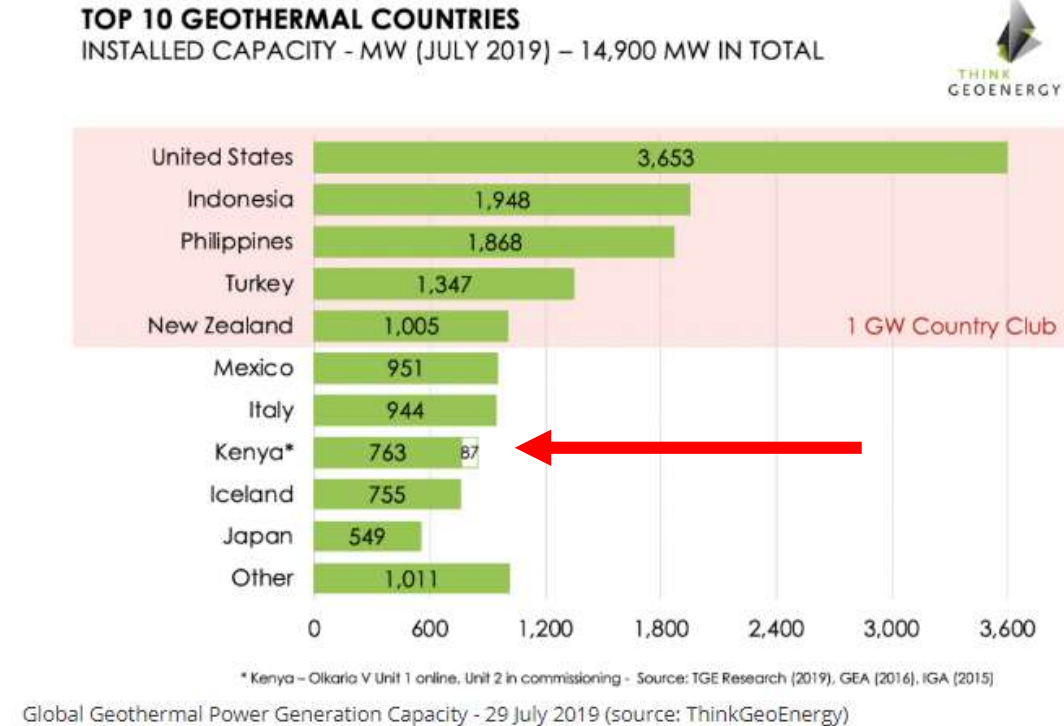
Share of GDP



Kenya Power & geothermal sector



- Kenya Vision 2030 & Big 4 Agenda
 - 1- Universal health care
 - 2- Manufacturing
 - 3- Food security
 - 3- Affordable housing
- Electrification is part of the development strategy: electrification rate fr. 30% in 2013 to 73% in 2018!
- Installed capacity x 2 since 2007 to 2.7 GW in 2018
- Peak demand 1.8 GW in end 2017
- Over capacity → Policy shift to demand support
- **Geothermal energy:**
 - Geothermal potential of ~10 GW in Rift Valley
 - Installed geothermal power capacity: 750+ MW
 - Ranking #8 worldwide & #1 in Africa



Alexander Richter
29 Jul 2019

With the start of the first unit of the new Olkaria V geothermal power plant, Kenya has overtaken Iceland in the Top 10 rankings of geothermal countries, based on power generation capacity.

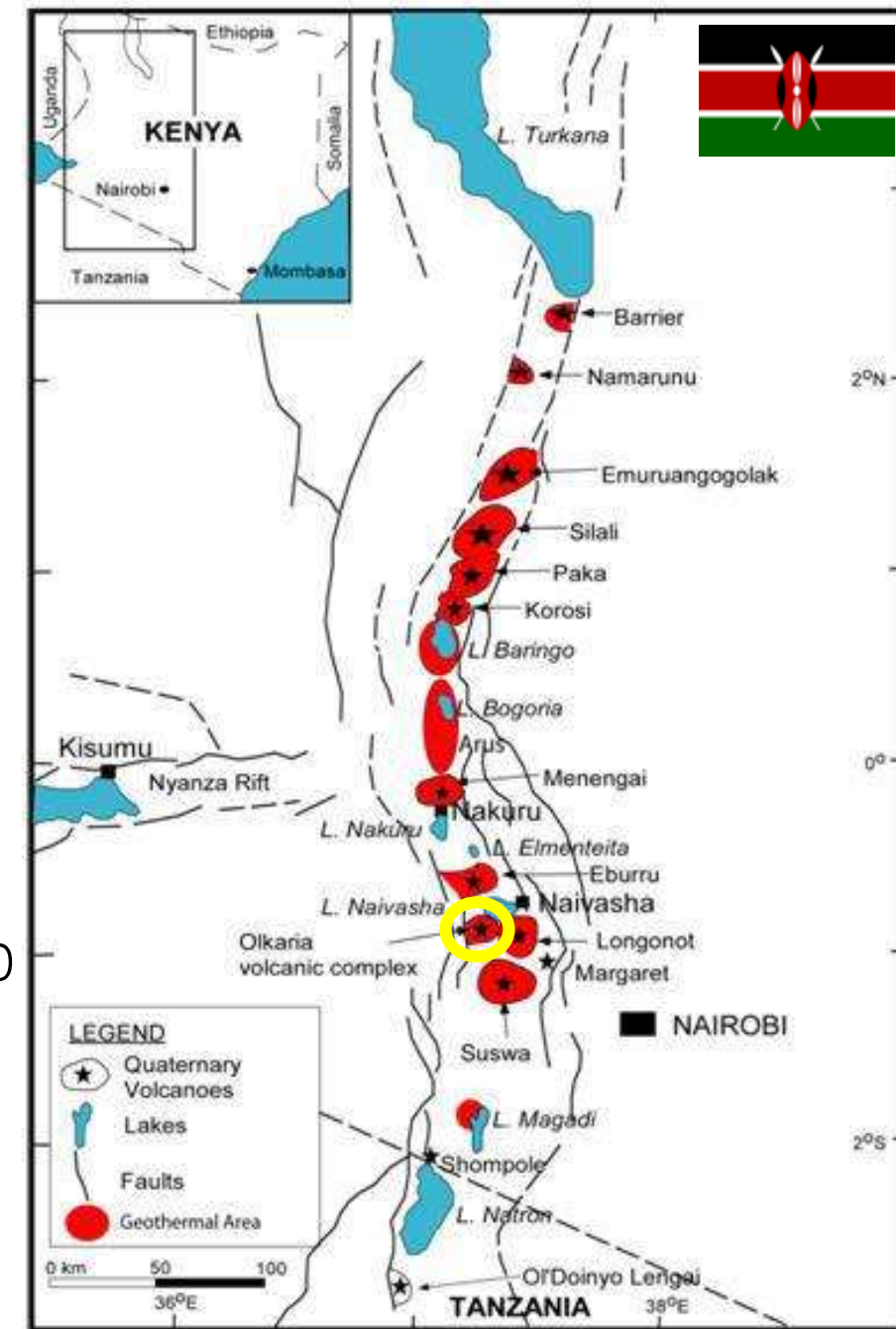


Kenya geothermal sites & projects

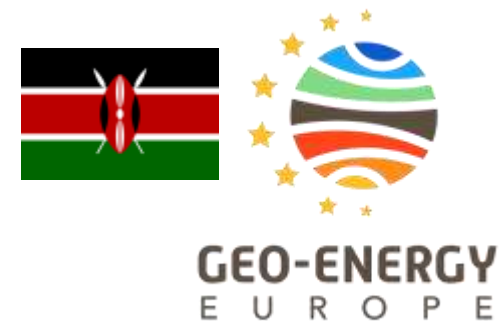
- Installed capacity > 750 MW, all at Olkaria site
- Last addition: 165 MW at Olkaria V, online 2019



- Current program: 860 MW in 2022, + another 300 MW by 2030
- Upcoming projects:
 - Menengai I in construction phase (35 out of proven 105 MW)
 - Baringo-Silali area in testing phase
 - Other areas such as Barrier Lake, Longonot, Suswa, etc. in exploration phase



Main geothermal stakeholders in Kenya



Operators

- State-owned or controlled operators:
 - **Kenya Electricity Generating Company (KenGen)**
 - **Geothermal Development Company (GDC)** in charge of exploring, testing & producing the steam
- Independant Power Producers (IPPs)
 - Producing: Orpower 4 (Ormat Technologies subsidiary)
 - Non producing license holders: Akiira Geothermal, **Olsuswa Energy**, Africa Geothermal International Limited (AGIL), Kaishan, Quantum, Sosian, Orpower 22, etc.



Authorities

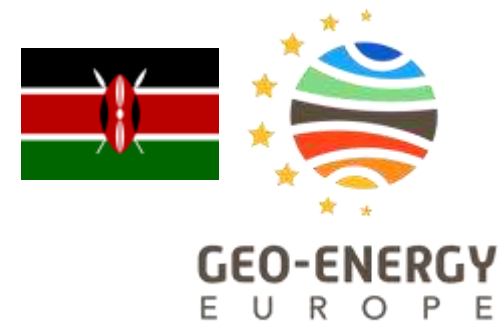
- **Ministry of Energy** & County governements
- **Energy & Petroleum Regulatory Authority:** technical (standards...) & economic aspects of geo-energy projects

Others

- **The Geothermal Association of Kenya**
- UNEP supported African Geothermal Centre of Excellence
- Etc.



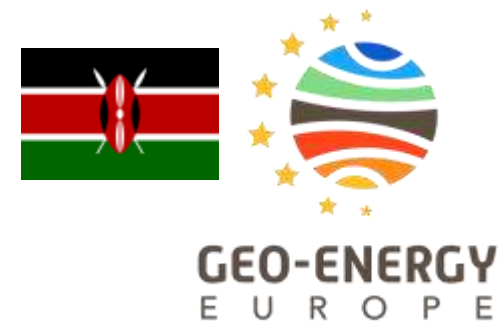
Financing schemes & institutions



- Exploration to test drilling phases
 - The African Rift Geothermal Development Facility (ARGeo), supported by UNEP, AU, KfW, ICEIDA, BGR
 - The Geothermal Risk Mitigation Facility for Eastern Africa (GRMF), supported by EU, AU, KfW & DFID
 - Up to 80% or 1 M€ subsidies for exploration studies
 - Up to 40% of 15-20 M€ subsidies for test drilling
- Power capacity construction, operation and maintenance phases - IFIs loans from:
 - World Bank (WB)
 - African Bank of Development (ABD)
 - **Agence Française de Développement (AFD)**
 - **European Investment Bank (EIB)**
 - The Japanese XX XX XX (JICA)
 - Etc.



Regulatory framework



Legislation (all revised in 2012)

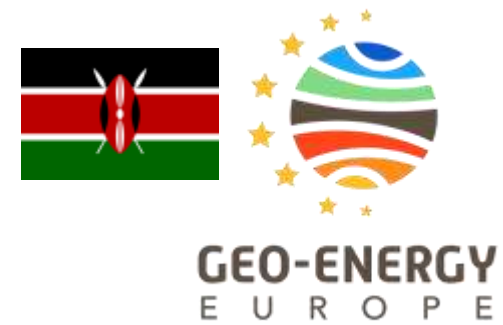
- Geothermal Resources Act
 - Environmental Management & Coordination Act
 - Energy Act
- + Feed-in tariffs established 2008, replaced in 2016 by a least cost auction mechanism

2 ways to develop geothermal resources

- Unsolicited / IPP: expression of interest (by an IPP) to the regulator, licensing, exploration drilling & testing, detailed engineering study & environmental assessment, approval by EPR & county government, Power Purchase Agreement (PPA) with Kenya Power, financing (private &/or IFIs), project construction & tie-in
- Competitive bids open by government once GDC has proven steam resources: companies can submit development plan with an auction mechanism on feed-in tariff



Opportunities for GEE members in Kenya



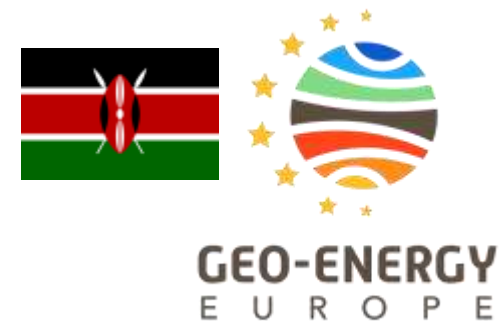
- **Argeo-C8 conference Oct 26-Nov 1, 2020 in Nairobi, Kenya**

→ [Call for papers](#) open until Feb 28, 2020!

- Calls for tenders on technical components from stated owned/controlled operators
- Joint-venture with license holding IPPs or full process fr. licensing to PPA & power plant construction
- Seek support & services of local intermediaries
- Regional study over the Greater Rift Valley (see Part 4)
- Research & co-development on Kenyan hot topics: well head systems, mineral extraction, decentralized units, binary technologies (see next slide)
- Capacity building (training & workshops) via collaboration with GAK (see next slide)



Technical & non technical topics of interest



KenGen & GDC Subjects

- Well head systems, decentralized units using binary technologies
- Cascade use of power & heat
- Mineral extraction
- Hybrid systems
- Energy efficiency
- Drilling training

Exerpt of MOU signed between GEE and GAK

Collaboration is seeked on capacity building activities and development of training programs in Kenya, more specifically, but not limited to:

- Resource assessment technologies and practices such as the use of seismic, MT and other subsurface imaging technologies to evaluate geothermal resources
- Structural Modeling
- Isotope Analysis
- Hydrogeology Data Interpretation
- pH Controls
- Well Maintenance and Prevention of Scaling/Corrosion
- Downhole Well Analysis
- Well Design and Construction
- Directional Drilling



Part 4 – Outlook on geothermal energy in East Africa

E. Piron (POLE AVENIA) & A. Gaynor (Geoscience Ireland)

Regional perspective

- Tanzania

New legislation (2019), first exploration & test drilling project at Lake Ngozi + capacity building program on going

- Uganda:

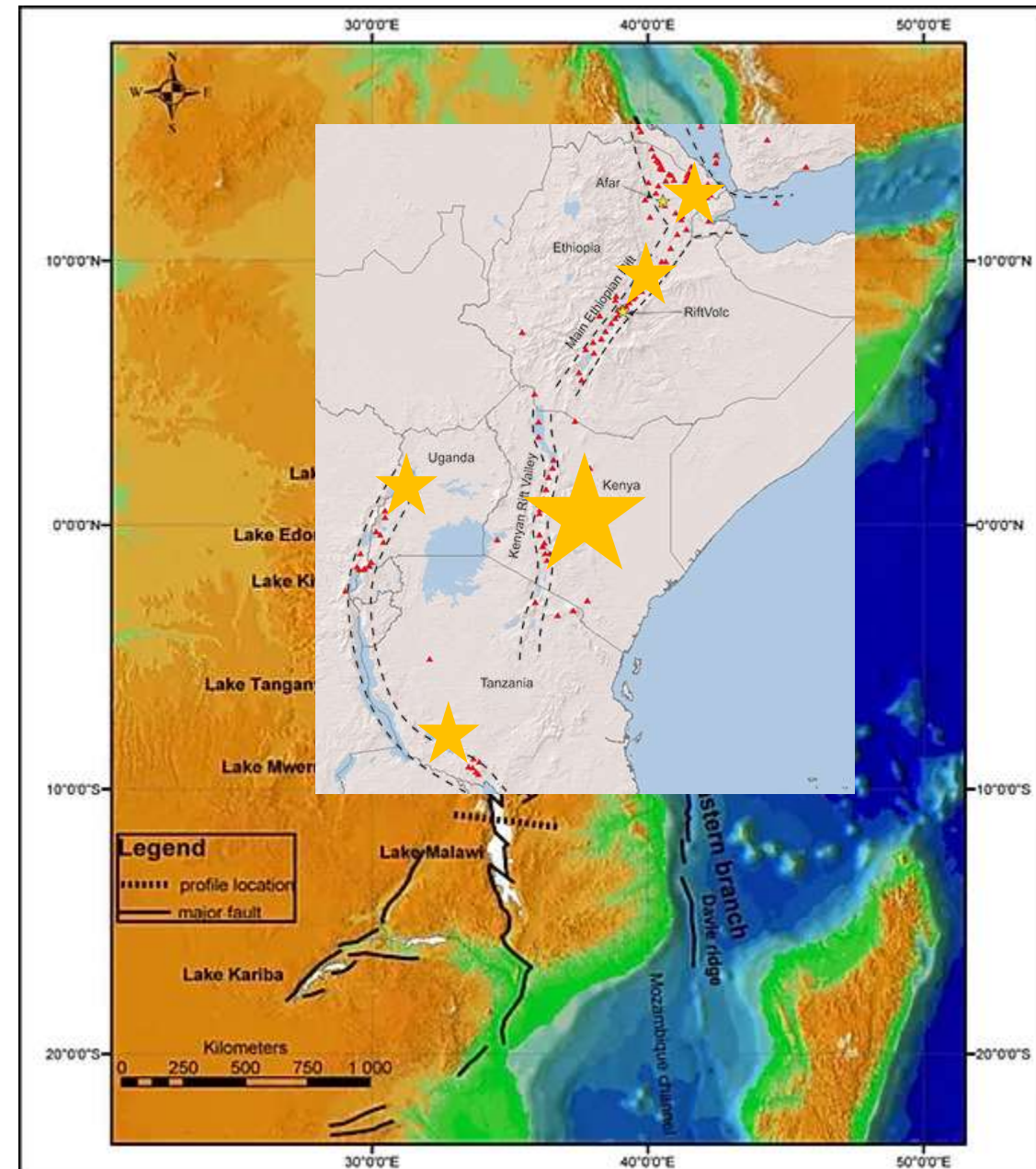
24 known areas with geothermal potential, 3 with licenses held by private companies, 16 thermal gradient wells recently commissioned by the Ministry of Energy

- Ethiopia

First 50 MW of Tulu Moya geothermal project in Ethiopia targeted for completion in 2022 + 100 M to be added by 2024, operated by TMGO, a shareholding company of the French investment firm Meridiam SAS (51 percent share) and the Icelandic geothermal company Reykjavik Geothermal (49 percent share).

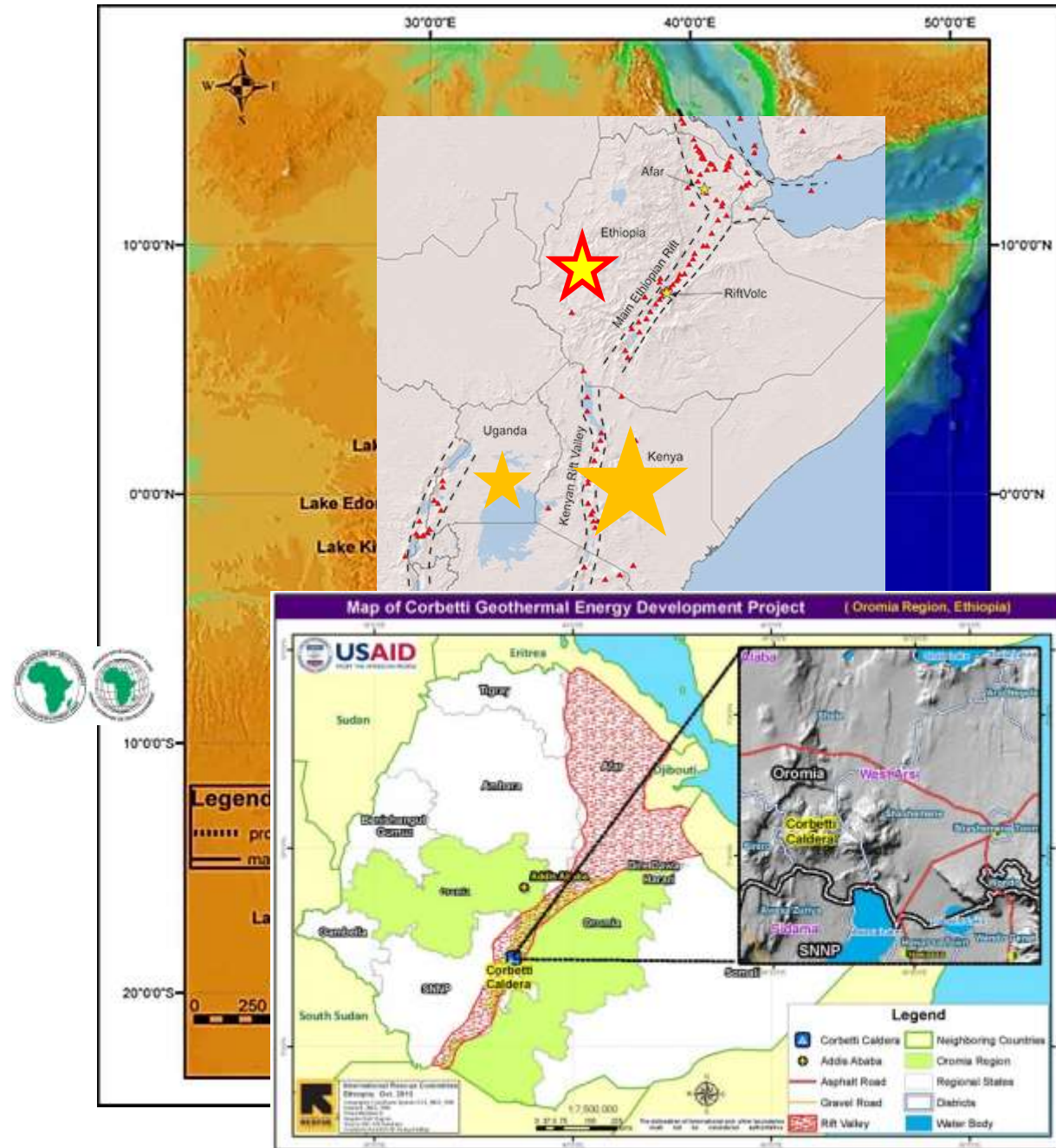
- Djibouti:

Ongoing Fialé Caldera project (exploration & test drilling) led by Electricity of Djibouti & cofinanced by AFD, the [World Bank](#), [African Development Bank](#) and a number of other partners ([OFID](#), [GEF](#), [ESMAP](#) + the Government of Djibouti)



Zoom on Ethiopia

- Geoscience Ireland's trade mission to Kenya & Ethiopia in November 2019, aiming at:
 - Assessing markets:
 - Natural resource surveying and development
 - Renewable Energy projects including geothermal
 - Conduct meetings and B2B with in-market agencies and companies
 - Meet with African Development Bank to assess projects of interest to Geoscience Ireland members in East Africa
 - Meeting with the Ethiopian Ministry of Mines and Petroleum (focus: projects and capacity building) Ireland's Department of Foreign Affairs and Trade to assess market entry conditions
- Agreement on principle to draft a cooperation MoU on specific topics of interest for the emerging Ethiopian geothermal sector



Ethiopia: country overview



- **Country Overview**

- Population: 105 million (2017; World Bank)
- GDP growth: 80.56 million (2018; World Banks)
- Commitment to renewable energy: COP signatory (2017)
- Outline geothermal potential: 10,000 MW and draft legislation re licensing process

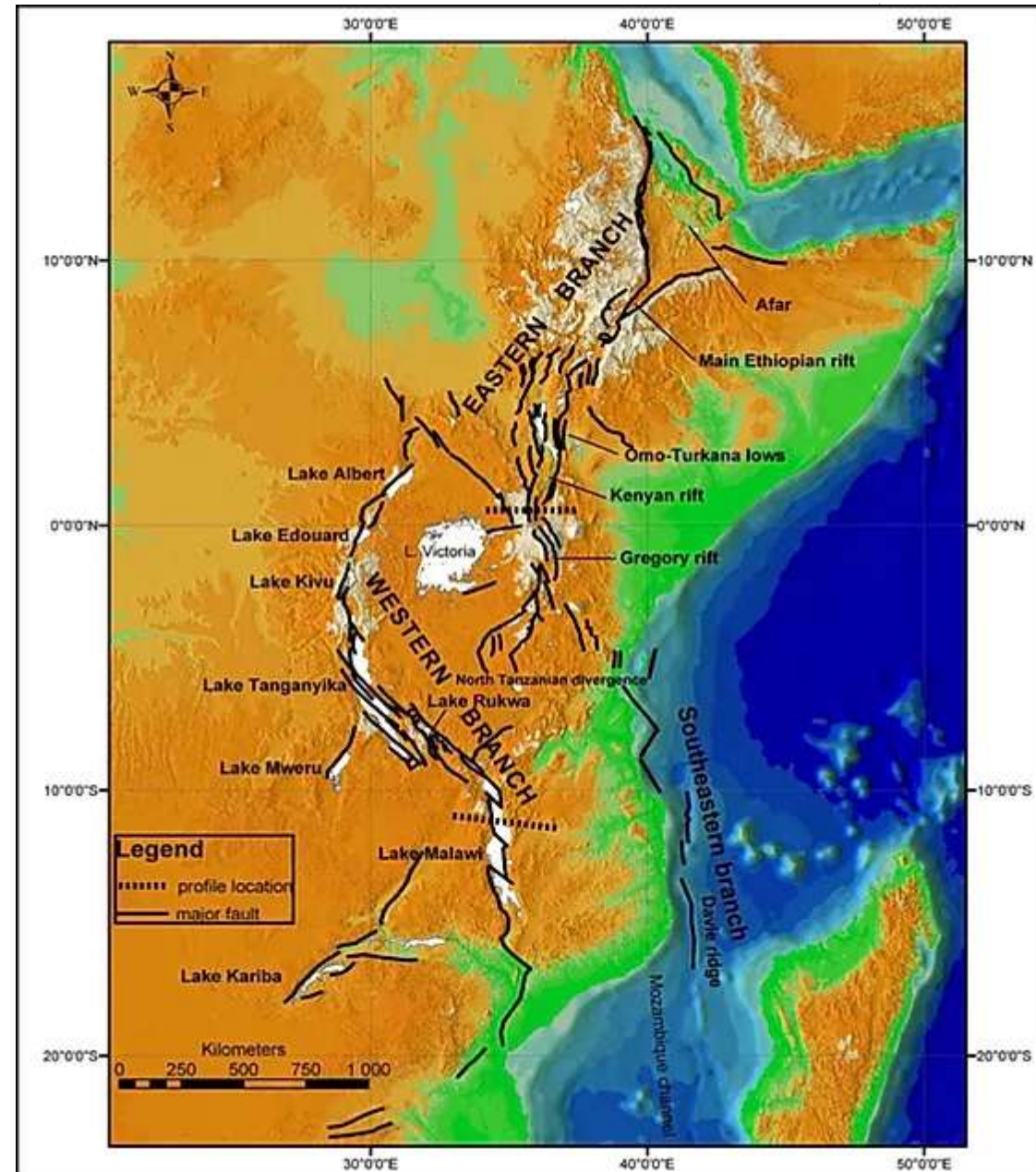
- **Electricity Overview and National Policy**

- Total Electricity Consumption (TWh): **10.0 TWh**
- Electricity Consumption per Capita: **0.1MWh/capita**
- Share of (total) electricity generation by fuel: **Geothermal at 0% or 0GWh**
- Share of (total) heat generation by fuel: **Geothermal at 0% or 0GWh**
- Geo-location of geothermal resource (**see map**)
- **Sector eco-system:** Ethiopian Electric Power, the Ministry of Water, Irrigation, and Energy, regional energy bureaus, environmental bureaus, revenue bureaus, foreign companies, and various donors.



Conclusion on Kenya & E. Africa

- Huge geothermal potential in Greater Rift Area
- Kenya is the most mature country, ranking #1 geothermal power producer in Africa and #8 worldwide
 - + Geothermal legislation and dynamic business environment in place, strong presence of international institutions, technical and capacity-building needs that the EU geothermal sector can help with
 - Slowdown in geothermal capacity addition due to country's current power overcapacity situation, competitive place for foreign partners (e.g. China, Japan), strong dependance on international financing
- Neighbouring countries on greater rift trend Djibouti, Ethiopia less mature but also more open





GEO-ENERGY
EUROPE



THANK YOU FOR YOUR ATTENTION!

Contact:

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MEXICO

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KENYA

Target Export Country :
INDONESIA

Target Export Country :
CHILI

or via website www.geoenergyeurope.com Contact page



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