OVERVIEW OF GEOTHERMAL RESOURCE UTILIZATION AND POTENTIAL IN EAST AFRICAN RIFT SYSTEM

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SECOND AFRICAN RIFT GEOTHERMAL CONFERENCE
ENTEBBE, UGANDA
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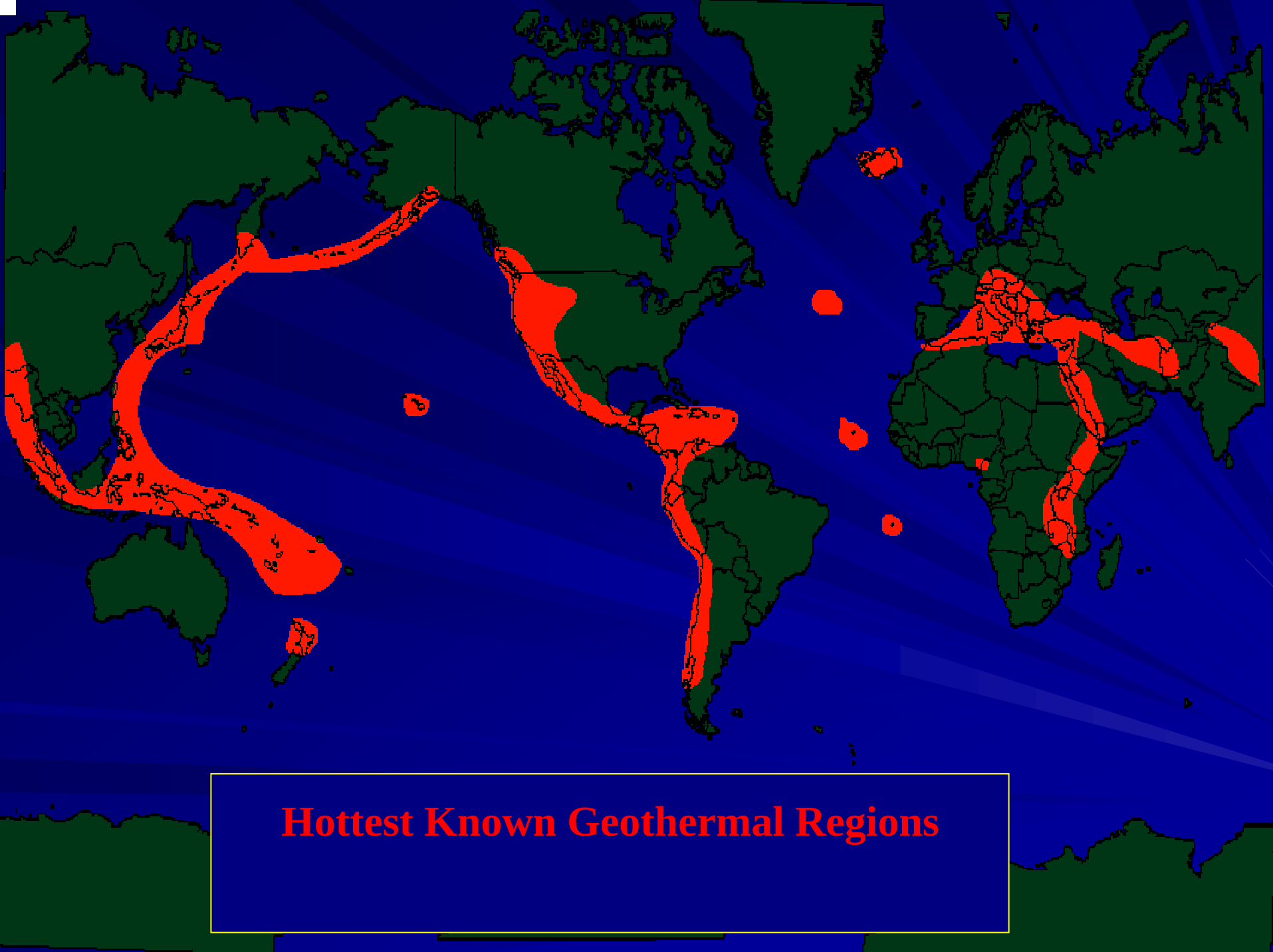
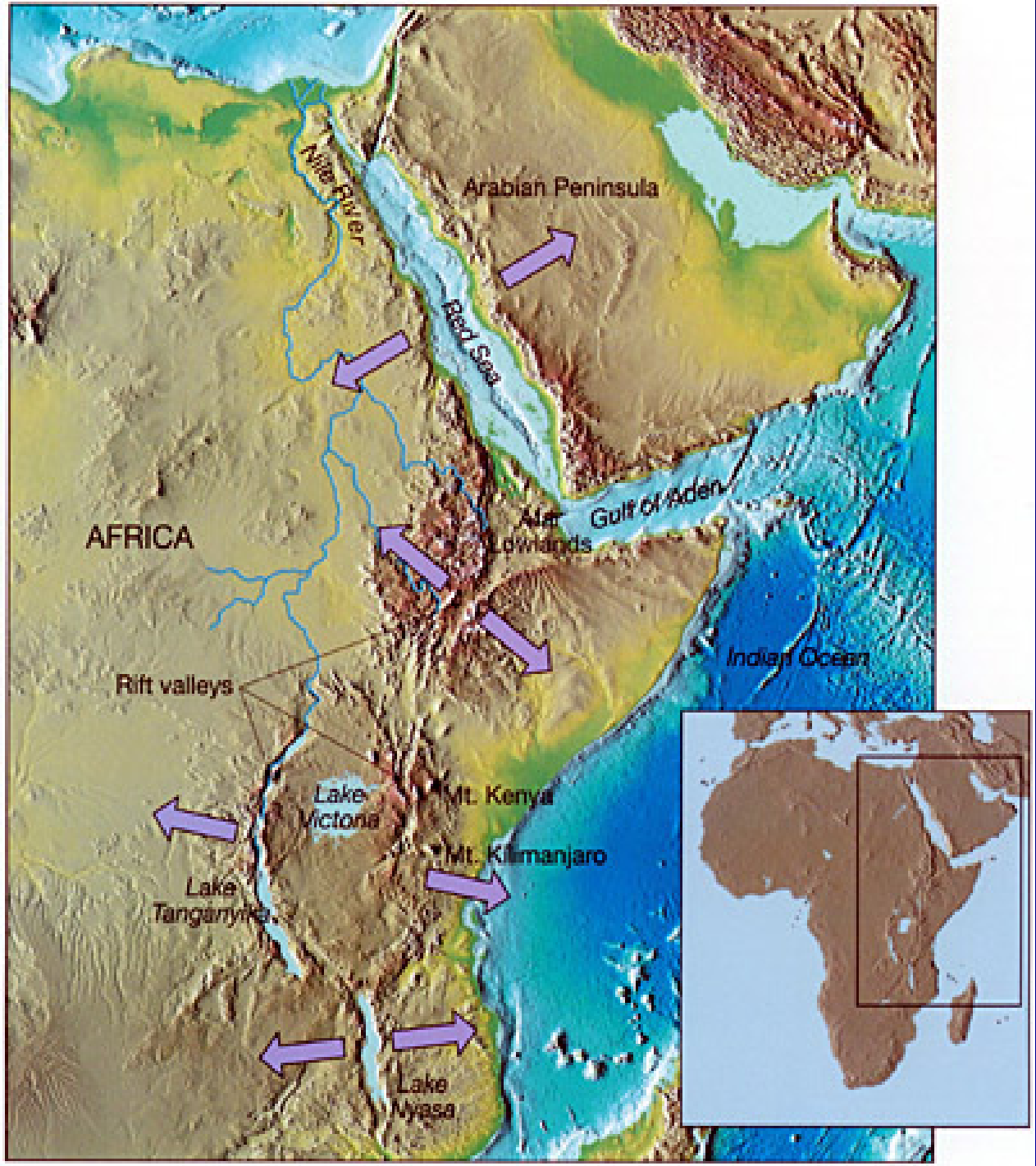
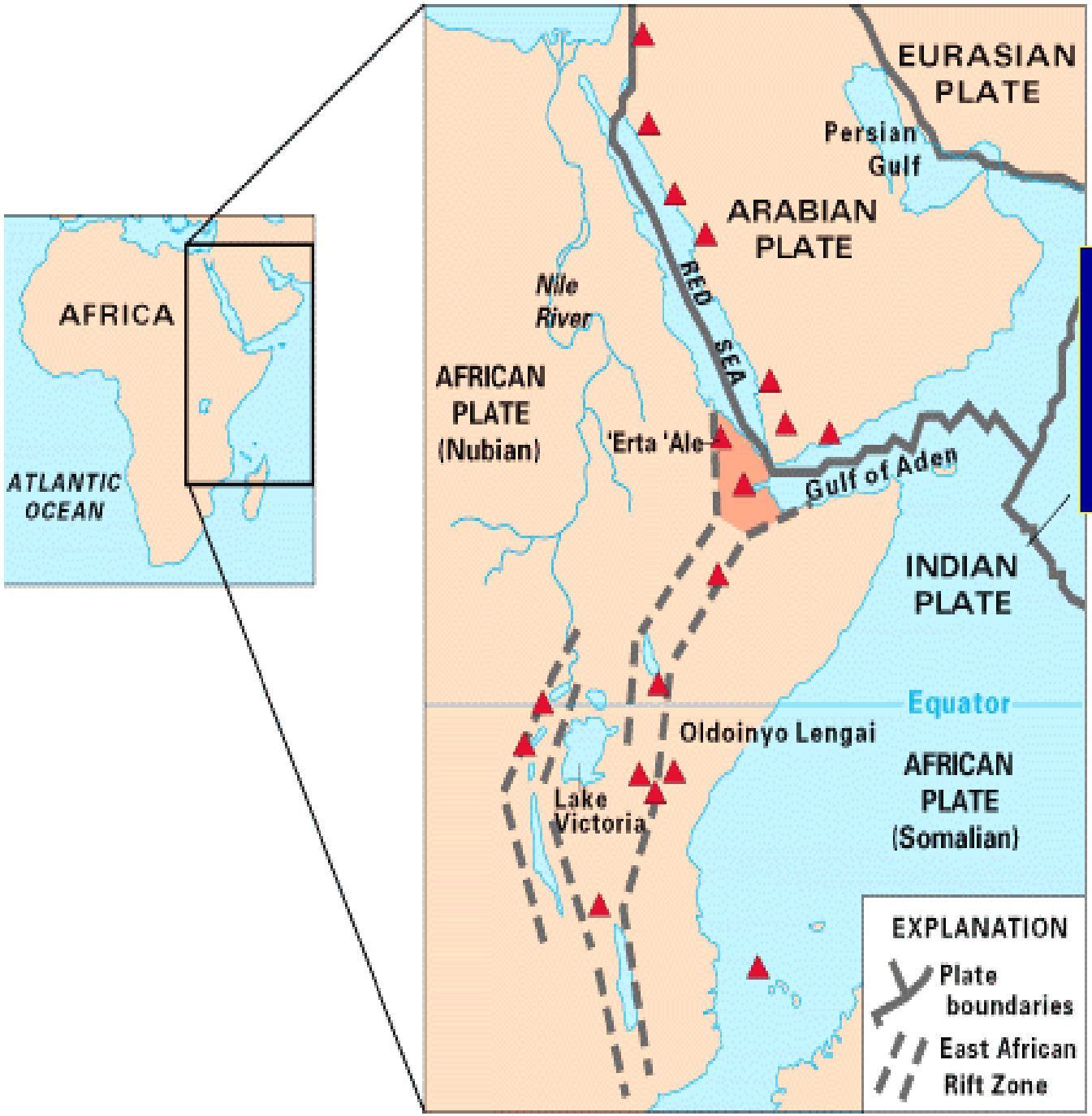
Plate Boundaries
EURASIAN PLATE
NORTH AMERICAN PLATE
Lake Baikal Rift
JUAN DE FUCA PLATE
Rhine Graben Rift
PHILIPPINE PLATE
Rio Grande Rift
CARIBBEAN PLATE
COCOS PLATE
"Ring of Fire"
AFRICAN PLATE
ARABIAN PLATE
NAZCA PLATE
SOUTH AMERICAN PLATE
PACIFIC PLATE
East African Rift
AUSTRALIAN PLATE
Volcano
(historical eruption)
SCOTIA PLATE
ANTARCTIC PLATE
ANTARCTIC PLATE


Hottest Known Geothermal Regions

THE EAST AFRICAN RIFT SYSTEM



THE EAST AFRICAN RIFT SYSTEM GEOTHERMAL POTENTIAL

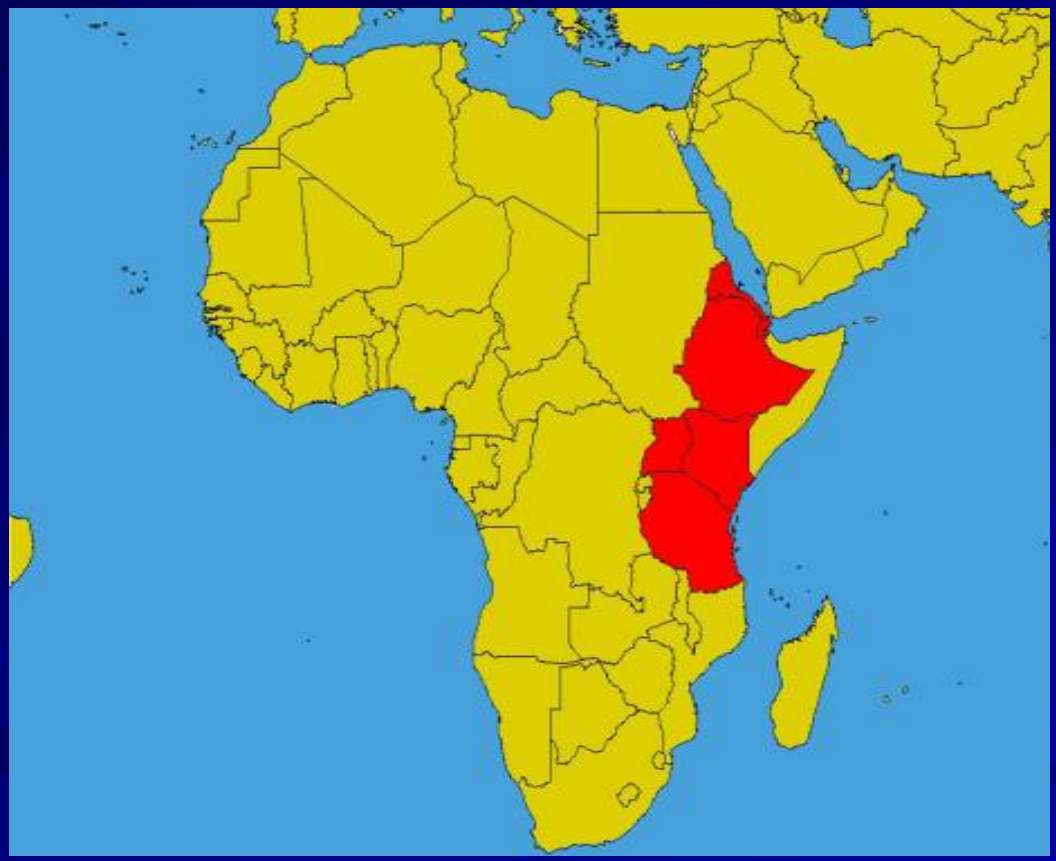


THE EAST AFRICAN RIFT GEOTHERMAL POTENTIAL

E. G. R.P = > 7 GWe

- **Most of the EA countries are dependent on TBF= 70- 90%: Causes Deforestation &Environmental degradation**
- **East African Countries are committed to investigate and further develop GE due to:**
  - **Strong growth in electricity demand in the countries**
  - **Hydro proven unreliable as a base load source due to Recent effects of drought**
  - **Volatile nature of petroleum fuels etc..**
- **RE sources (hydro, geothermal, solar) represent a small portion of TEP averaging 2%.**

East African Countries Using Or Having Carried Out Research On Geothermal Resources



- Djibouti
- Eritrea
- Ethiopia*
- Kenya*
- Malawi
- Tanzania
- Uganda
- Zambia *
- Rwanda
- Burundi
- DRCongo
- Comoros Islands

*Plant installed

DJIBOUTI

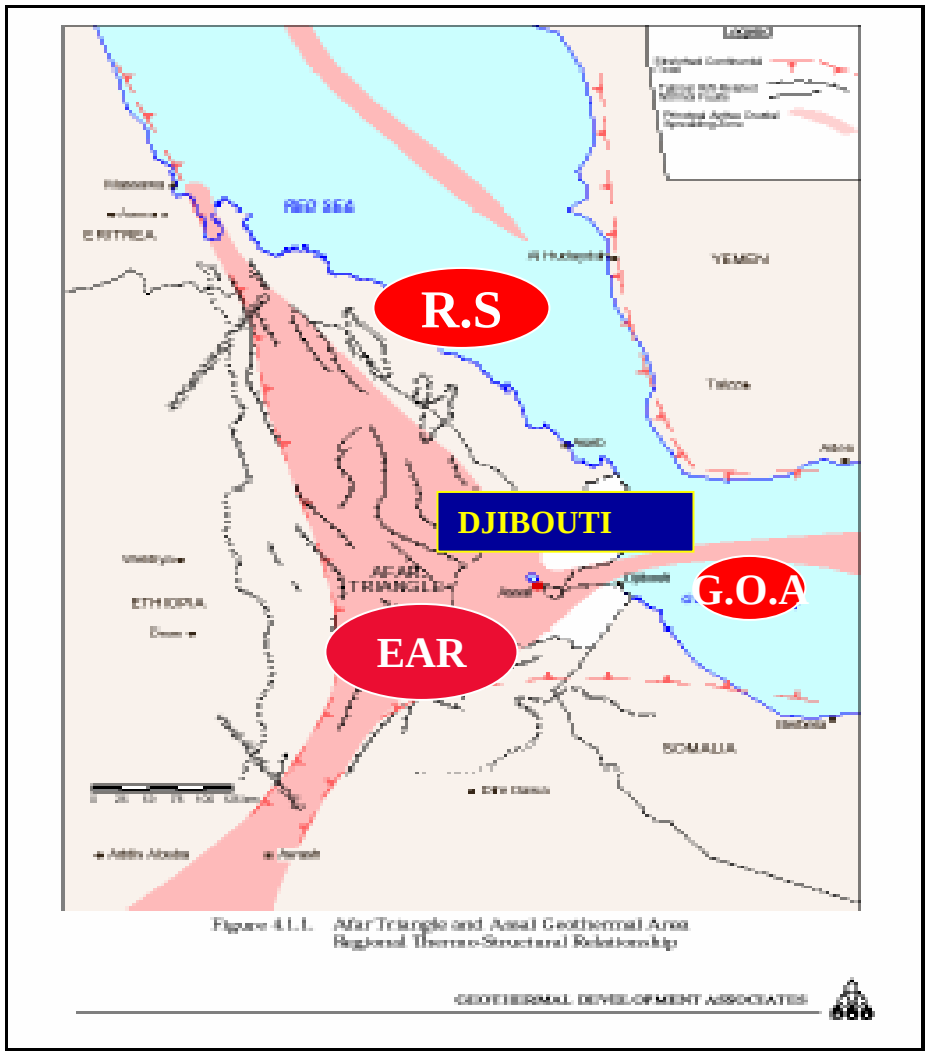
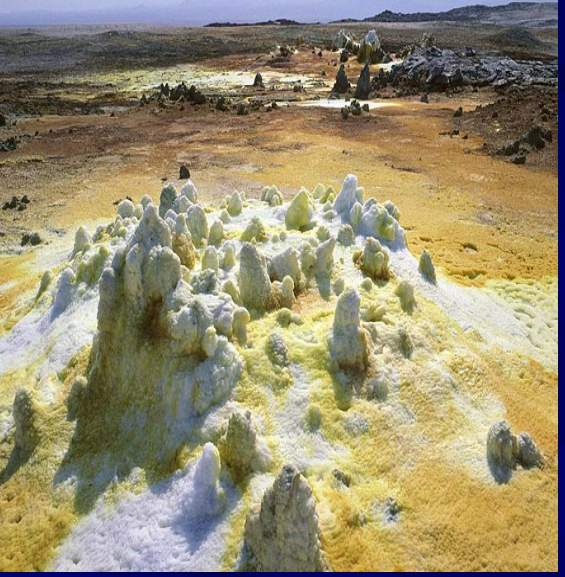


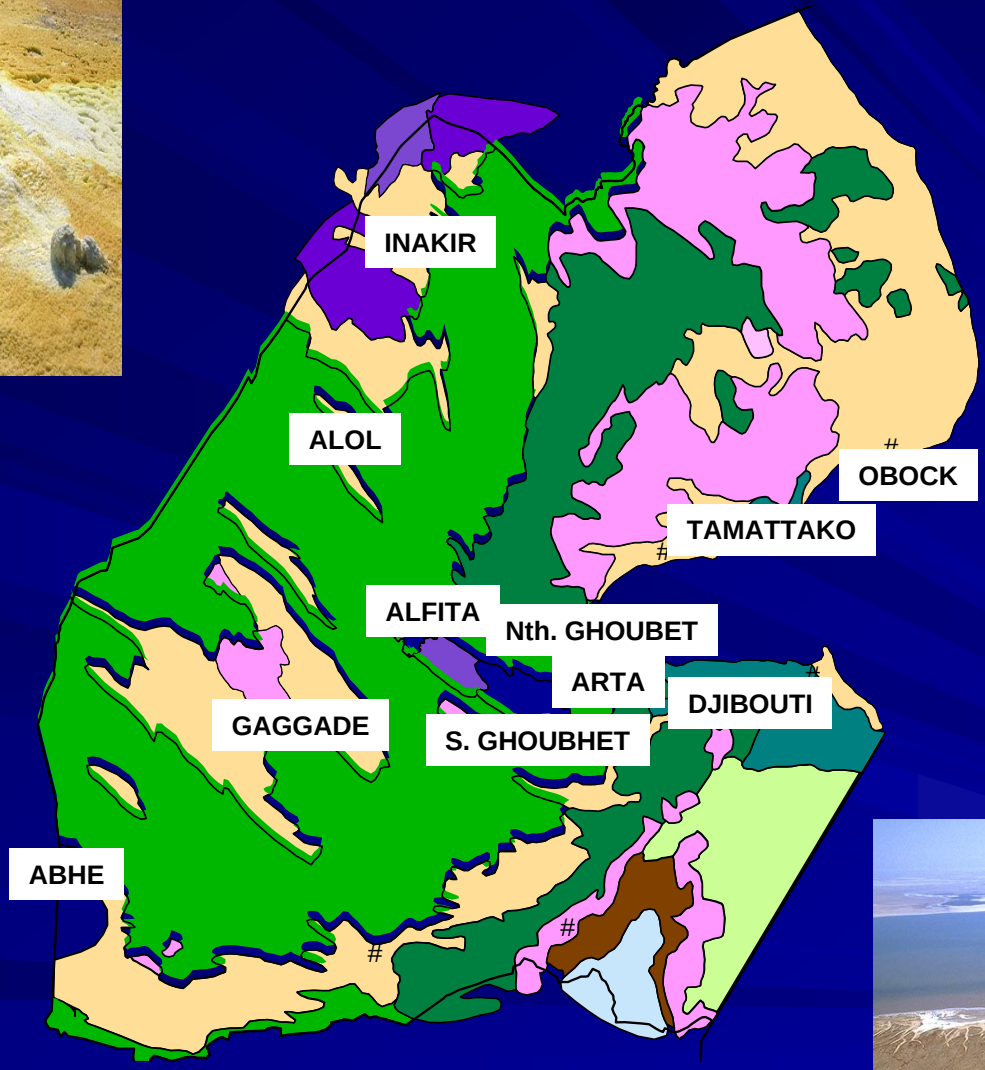
Figure 4.1.1. Afar Triangle and Asal Geothermal Area Regional Thermo-Structural Relationship

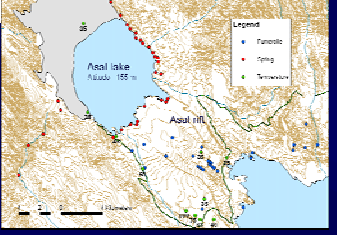
GEOTHERMAL DEVELOPMENT ASSOCIATES

TIC= 85 MWe (Thermal)



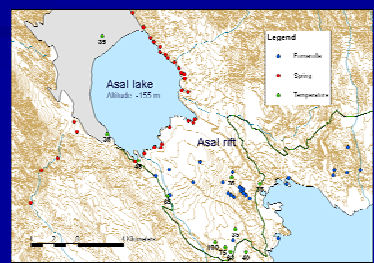
GEOTHERMAL PROSPECT AREAS OF THE REPUBLIC OF DJIBOUTI





GEOTHERMAL PROSPECT AREAS OF DJIBOUTI

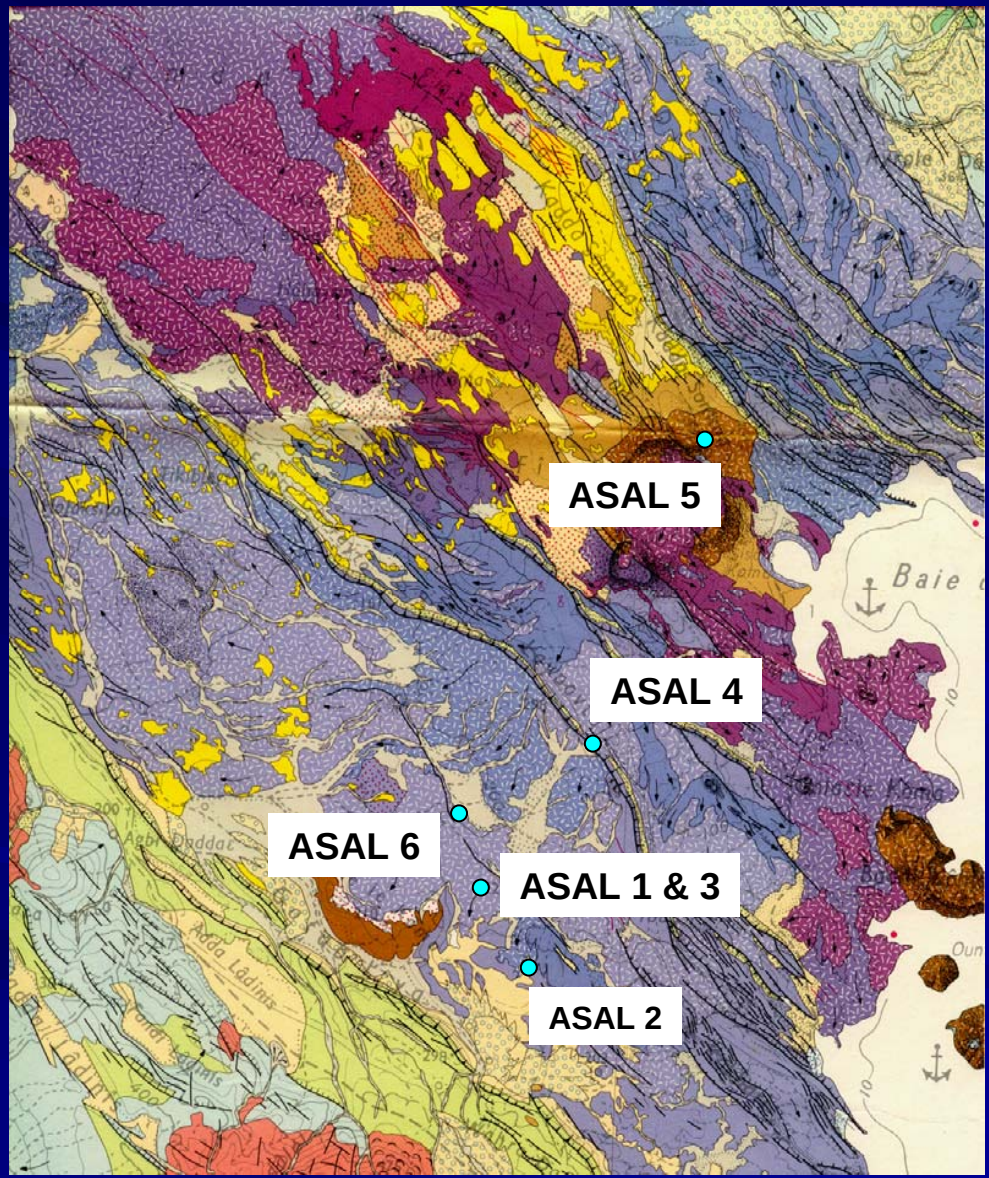
	Geothermal Area	Detail Survey	Drilling	Max. Temp ^{o}C
1	As Bahalto	Yes	No	137 -176^{+}
2	Allailou	Yes	No	
3	Hanle	Yes	Yes	118-260^{+}
4	Gaggade	Yes	No	
5	Assal Rift	Yes	Yes	300
6	N. of Ghoubbet el Kharab	Yes	No	170^{+}
7	S. of Ghoubbet el Kharab	No	No	87
8	Arta	No	No	100
9	Tamattako - nieille	No	No	48
10	Obok	No	No	210^{+}
11	South of Djibouti City	No	No	
12	NW of Kadda Alifita	No	No	
13	Alol -Sakallol	No	No	
14	Dora-Musa Ali	No	No	82
	Note: $^{+}$ Interpreted value			



STATUS OF GEOTHERMAL EXPLORATION

- Exp. Began in the Assal Area (1970-83) funded by French Govt.
- Geo-scientific studies including drilling of six wells in Assal
- Exp. in Hanle-Gaggade area (1984-92) funded by Ital Gov+ADB+OPIC+UNDP and WB
- Scaling and Corrosion Study of deep brines of the Assal area (1989) by the Icelandic company
- Devt. & Prod. of the deep Assal resource funded by Ita. Govt. and WB.
- REI has carried out Pre-Feasibility study in Assal Geothermal field

ASAL GEOTHERMAL FIELD



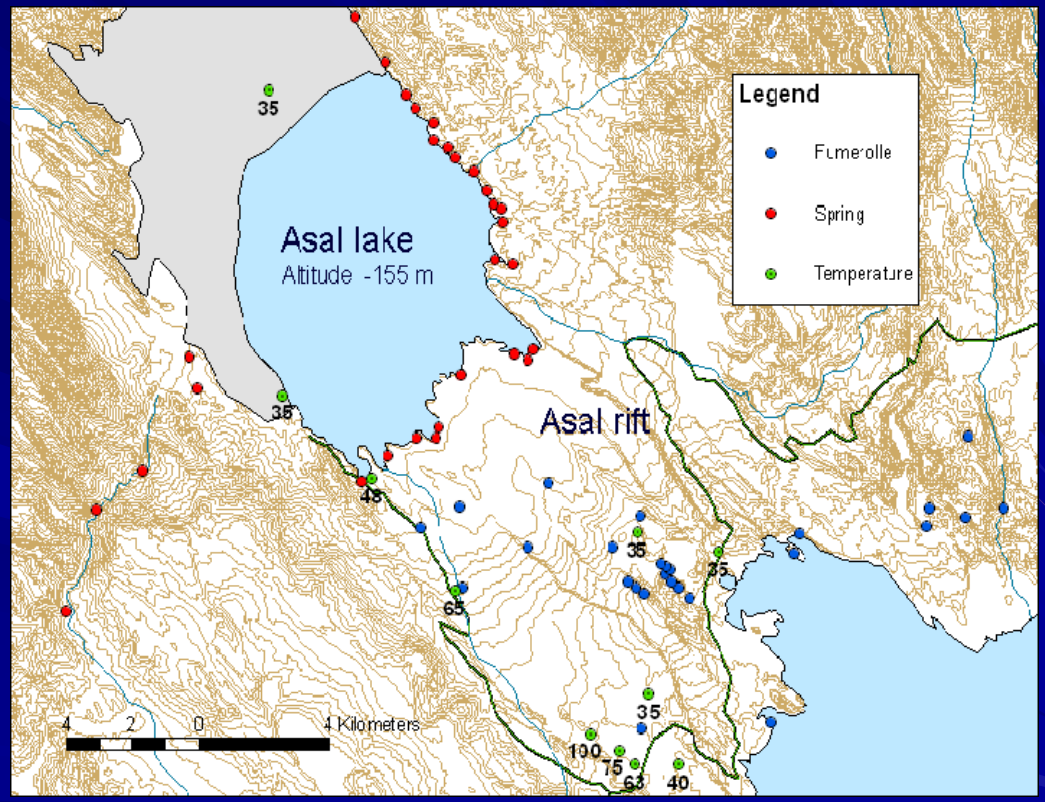
MAIN AREAS OF FOCUS

ASAL GEOTHERMAL FIELD

PROPOSED GEOTHERMAL PROGRAM

- **Plan to drill additional wells and develop Geothermal Power Plant in the Lake Assal Region**

- **Government of Djibouti is committed to diversify the primary energy resource particularly use of RE resources (Geothermal).**



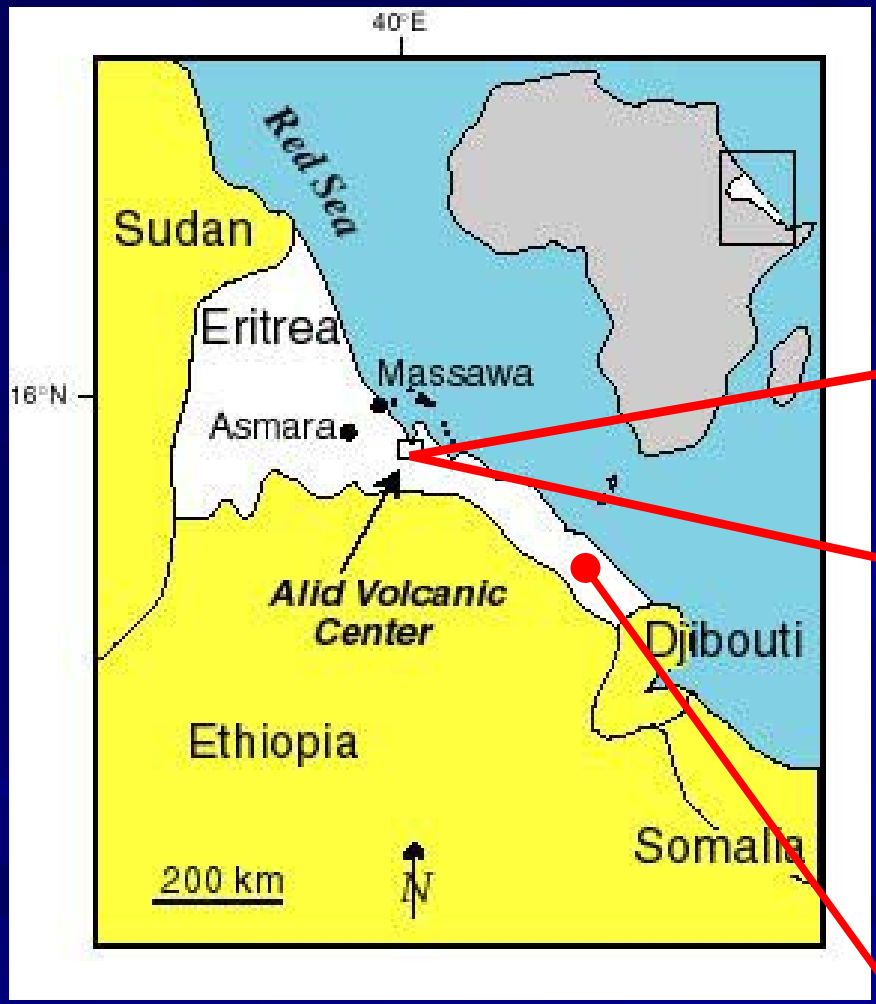
ERITREA

TIC= 130 MWe; Thermal

- **Asmara-Massawa HW Sp.**
- **Red Sea Coast**
- **Gulf of Zula**
- **Acfat Group**

MAIN AREAS OF FOCUS

ALID-112 Km S. of Massawa

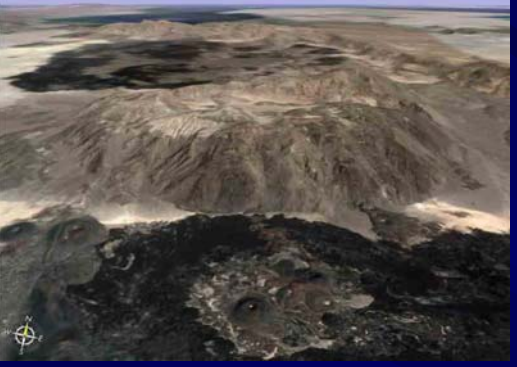


NABRO-DUBBI

SURFACE THERMAL MANIFESTATIONS IN ERITREA

Status of Geothermal Exploration

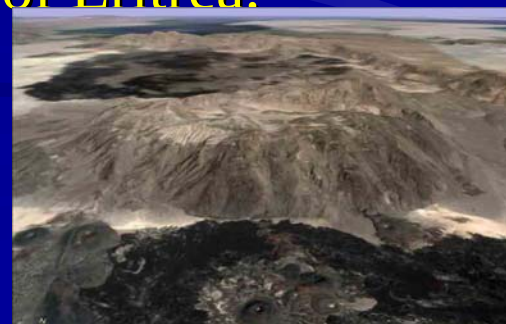
- In 1973, UNDP identified significant Geothermal Resources.
- In 1995, USAID financed USGS to explore possible use of geothermal resources for power generation in Eritrea, and gave priority to Alid V.C.
- Geological and Geochemical including isotopes were carried out in the Alid Volcanic Area
- Further investigations are being carried out by local staff
- Results indicate-
  - Occurrence of magmatic chamber (heat source)
  - Gas geothermometer = T>250ºC
  - Presence of Fractured Permeability
  - Favourable for power generation



PROPOSED GEOTHERMAL PROGRAM

Further Exploration and Analysis in the Alid.V.Area These include:

- Upgrading of Geological, Geochemical and Geophysical information (ICEIDA)
- Funds for MT and other geoscientific studies are applied from ARGeo.
- Exploratory drilling, well testing & installation of a pilot power plant at Alid.
- Reconnaissance Survey in the eastern lowlands of Eritrea.



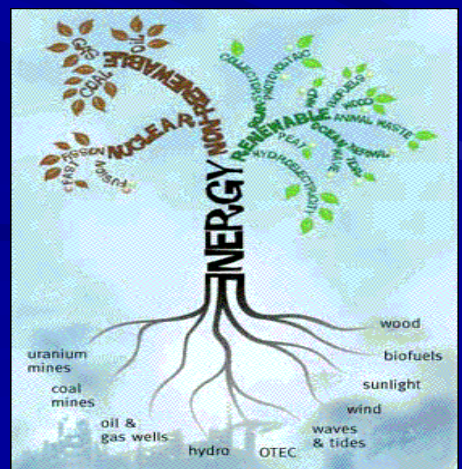
ETHIOPIA

- LAND AREA = 1.1 M SQ.KM
- POPULATION ~ 75 MILLION
- Has Largest portion of the GREAS (1000 Km)

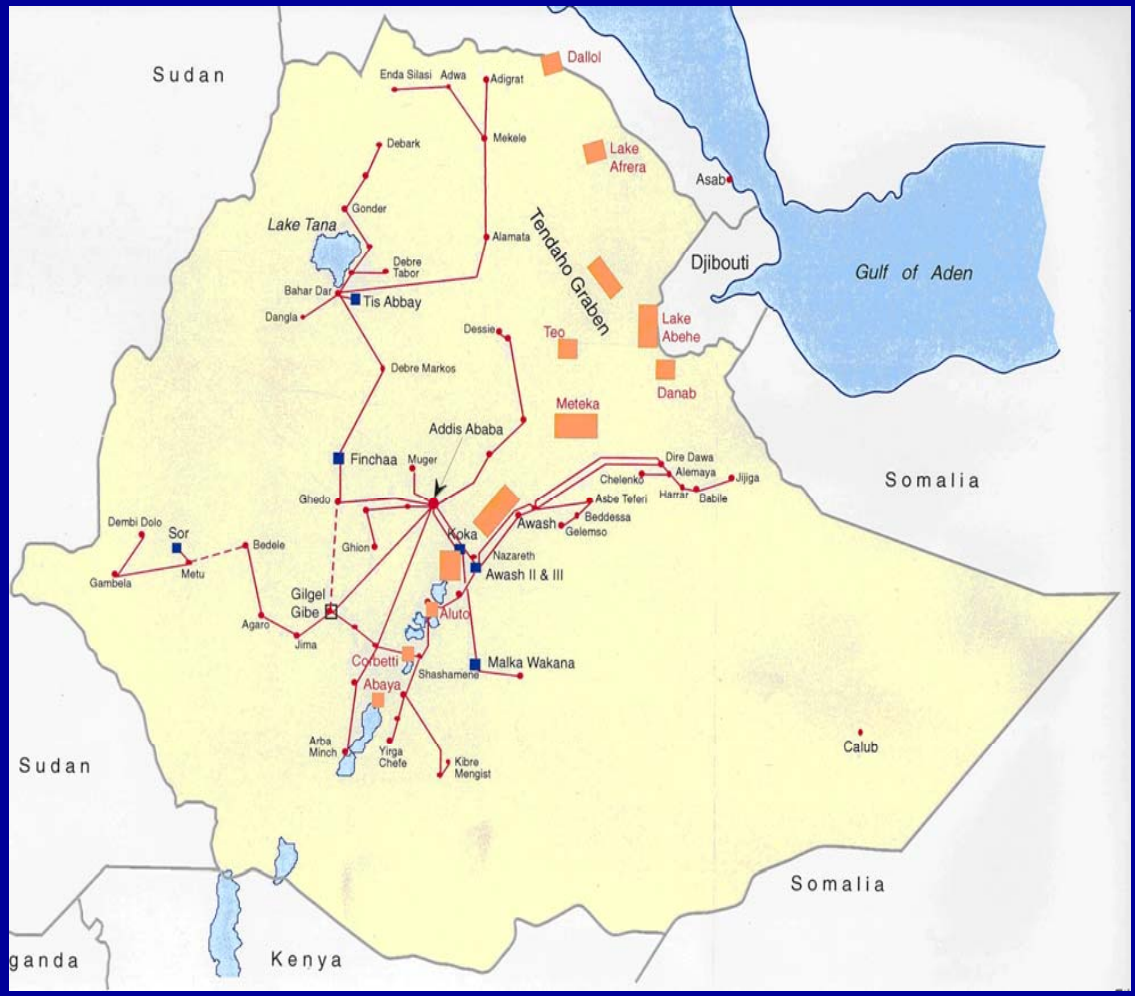
(E.G.P: > 5000 MWe)

ENERGY RESOURCES IN THE COUNTRY

- HYDRO
- GEOTHERMAL
- NATURAL GAS
- BIOMASS
- COAL
- WIND
- SOLAR



Energy supply



ETHIOPIAN ELCTRIC POWER SUPPLY

TIC= 783 MWe

Hydro= 671 MWe

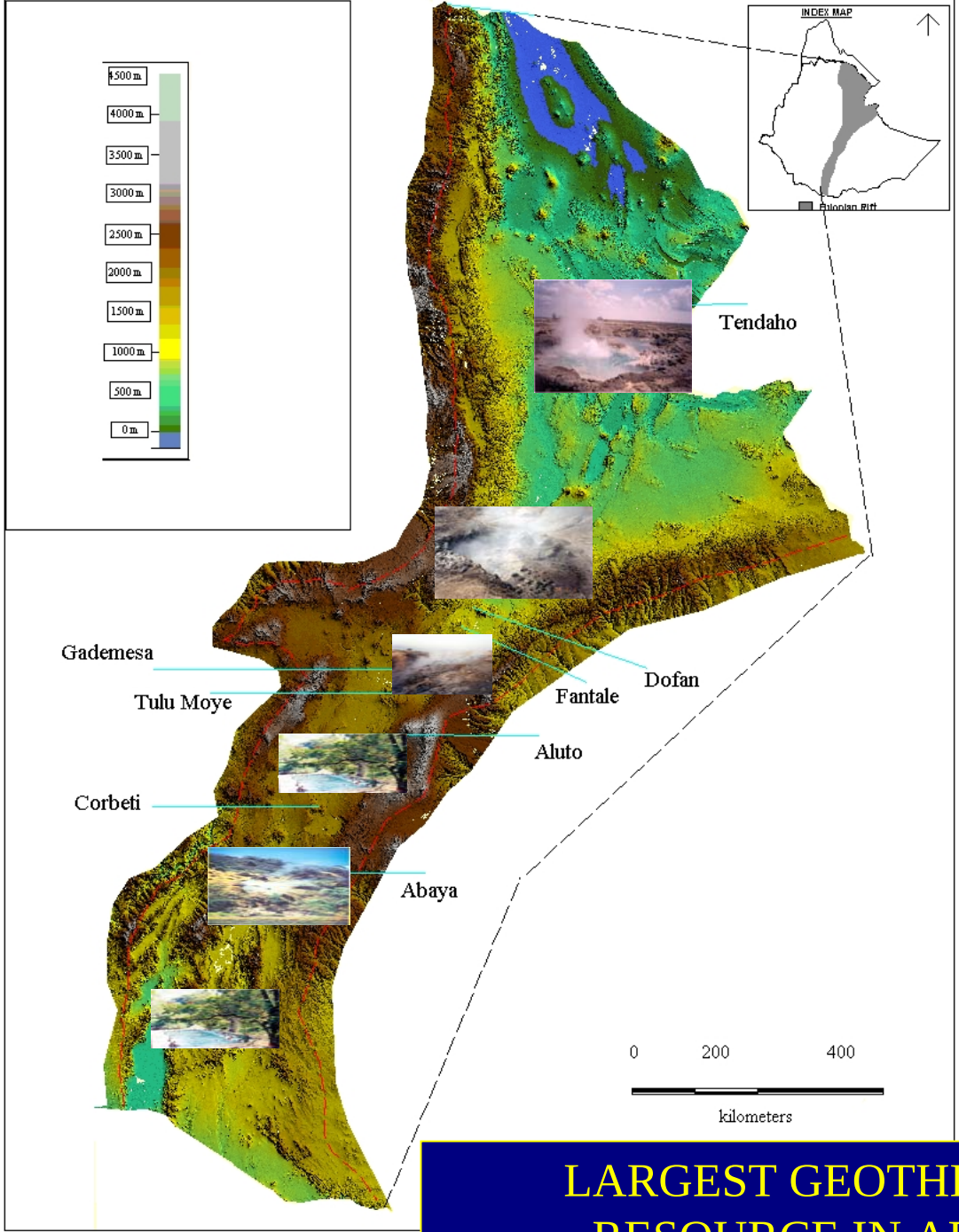
Thermal= 112 Mwe

Geothermal= 7.33 MWe

- **22% of the Population have access to E**

- **PLANNED TO REACH TO 50 % BY 2015**

Others- traditional Biomass



- **Exploration began in 1969 (UNDP & EG)**
- **About 18 Geothermal Prospect areas were identified in the whole ERV (covers 13% of the country)**
- **Much larger are for direct uses (agriculture, agro-industry etc)**

LARGEST GEOTHERMAL RESOURCE IN AFRICA

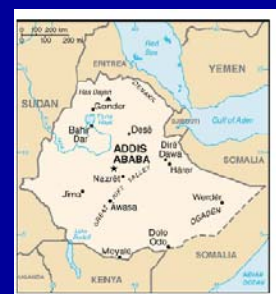
FILWIHA

SODERE

WONDO GENET

GEOTHERMAL PROSPECTS OF ETHIOPIA

	Geothermal Area	Detail Survey	Drilling	Max. Temp ^{o}C
1	Abaya	Yes	No	
2	Corbetti	Yes		94
3	Aluto Langano	Yes	Yes	350
4	Tulu Moye	Yes	No	60-80
5	Gedemsa	No	No	60-80
6	Kone	No	No	
7	Fantale	Yes	No	
8	Dofan	Yes	No	
9	Meteka	No	No	
10	Danab	No	No	
11	Teo	No	No	
12	Abe	No	No	
13	Tendaho	Yes	Yes	270
14				
	Note: $^{+}$ Geothermometer value			
	16 sites known			



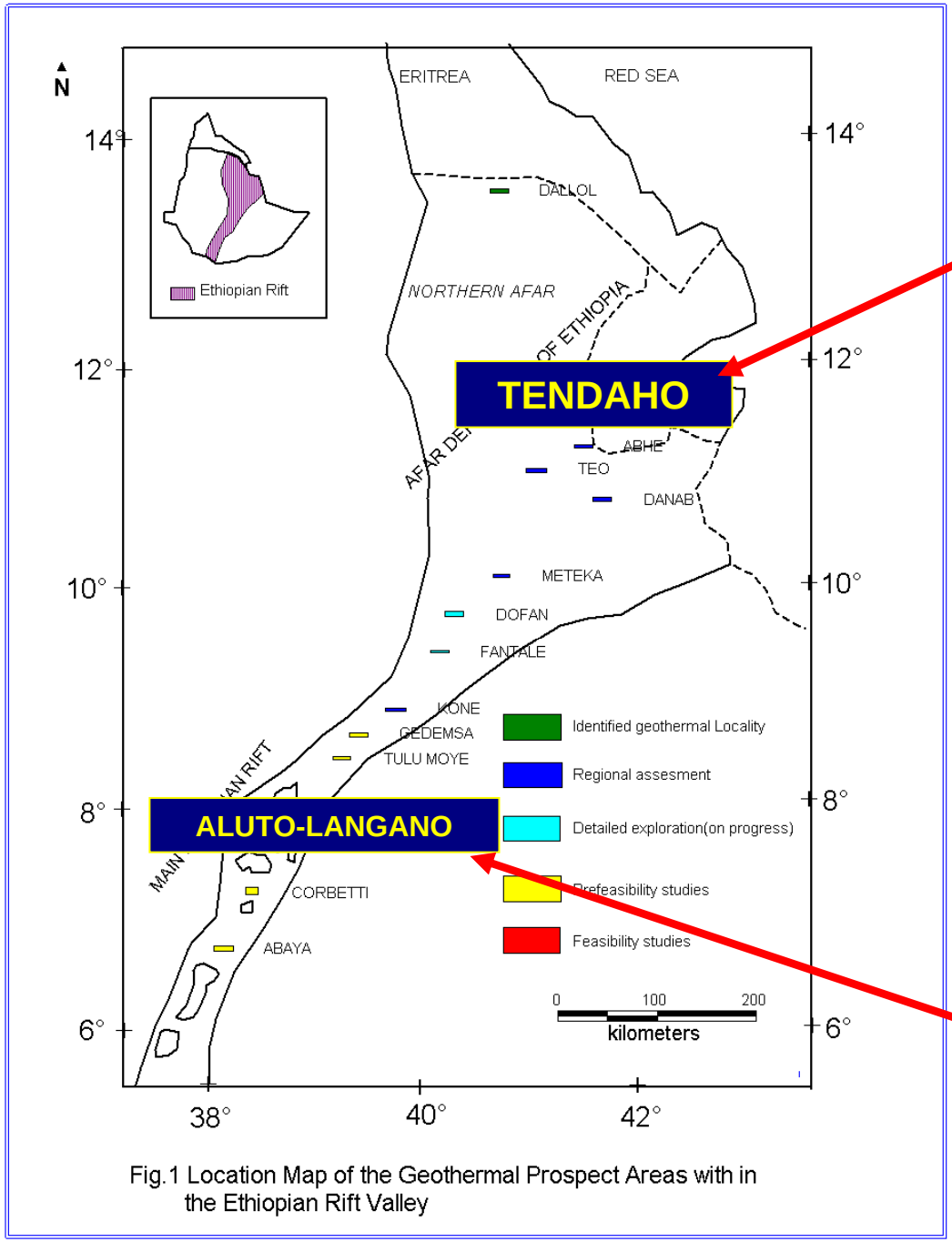
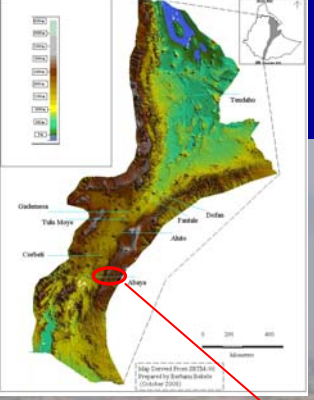


Fig.1 Location Map of the Geothermal Prospect Areas with in the Ethiopian Rift Valley

ONLY TWO AREAS ARE SUBJECTED TO DRILLNG

- **ALUTO-LANGANO (LD-AREA) 200 KM S. OF A.A**
- **TENDAHO (N.AFAR)- 650 KM NE OF A.A**

THE ALUTO-LANGANO GEOTHERMAL FIELD



LA-6

LA-4

Wonji Fault Scarps

LA-3

One of the Discharging Wells At Aluto, LA-6

- 8 Deep wells with a maximum depth of 2500m were drilled

- Estimated Capacity of the field > 30 MWe for 30 Years (Feasibility Study, 1986)

- In 1995, the field handed over to EEPCO for Development

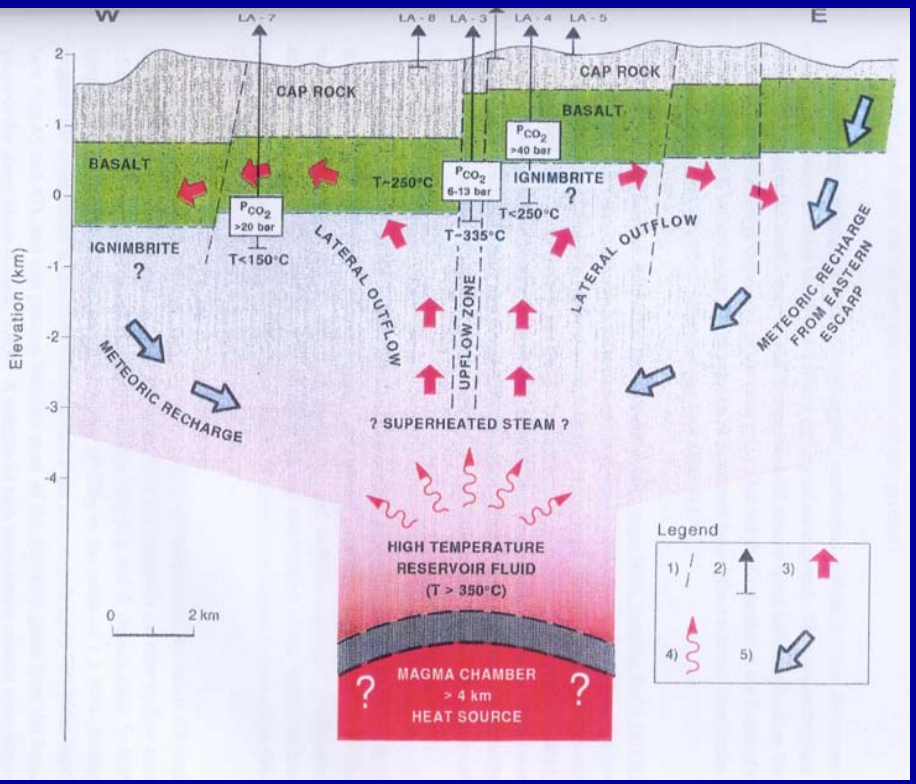
THE ALUTO-LANGANO GEOTHERMAL PILOT POWER PLANT 3MWe

CURRENT ACTIVITY

PROBLEM IDENTIFICATION

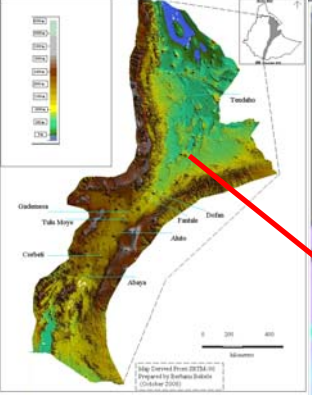
REHABILITATION OF THE PLANT

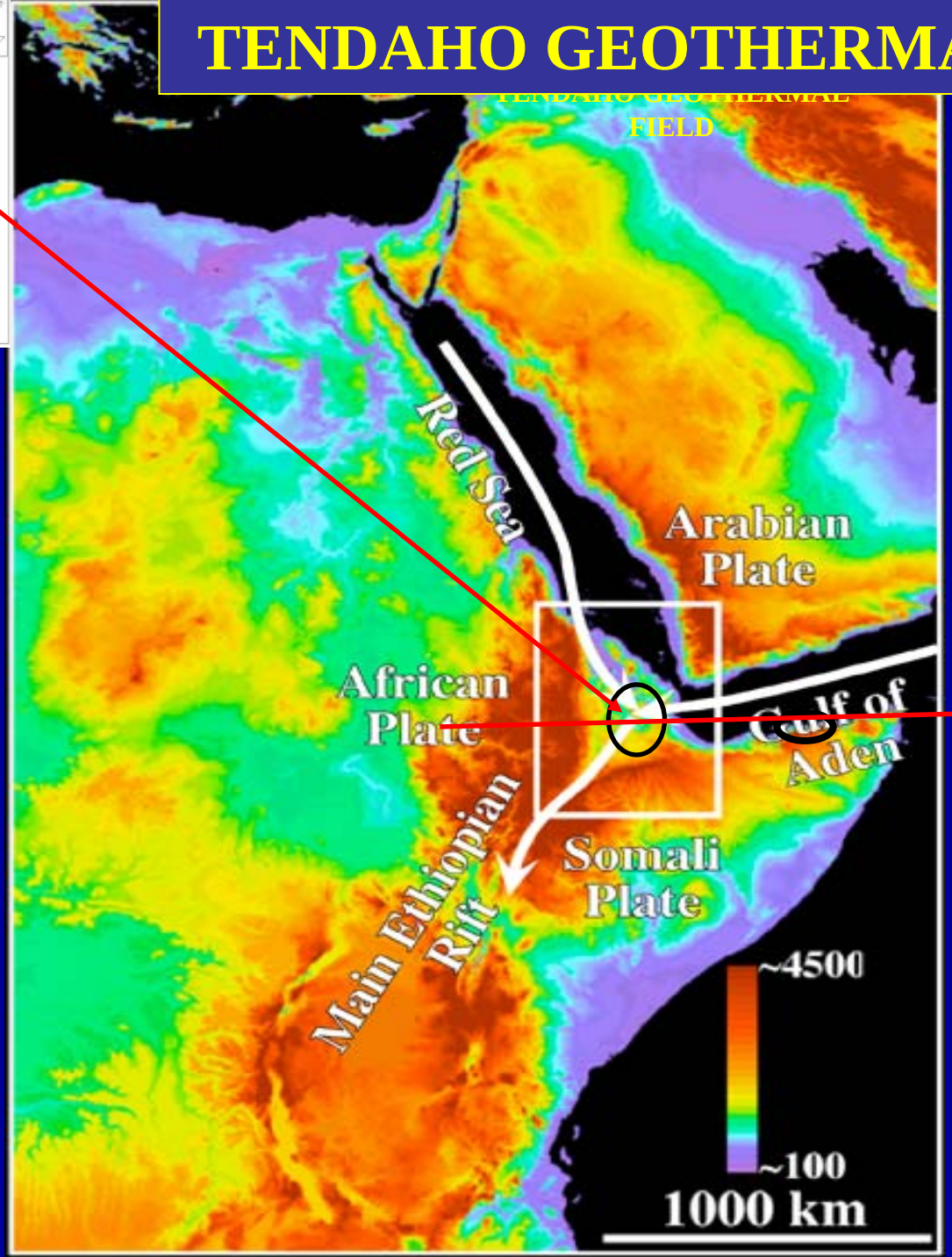
THE WAY FORWARD FOR ALUTO



- **Further Rehabilitation of the pilot plant**
- **Detailed study of the field**
- **Expansion and Resource Development in various phases**

TENDAHO GEOTHERMAL FIELD





T.G.F

AFAR TRIPLE JUNCTION

TENDAHO GEOTHERMAL FIELD

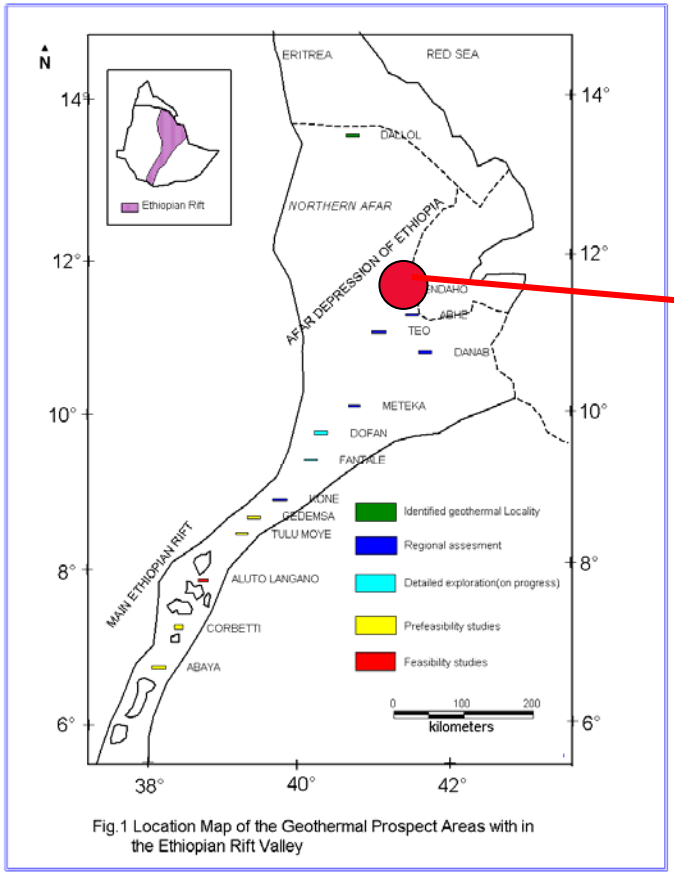
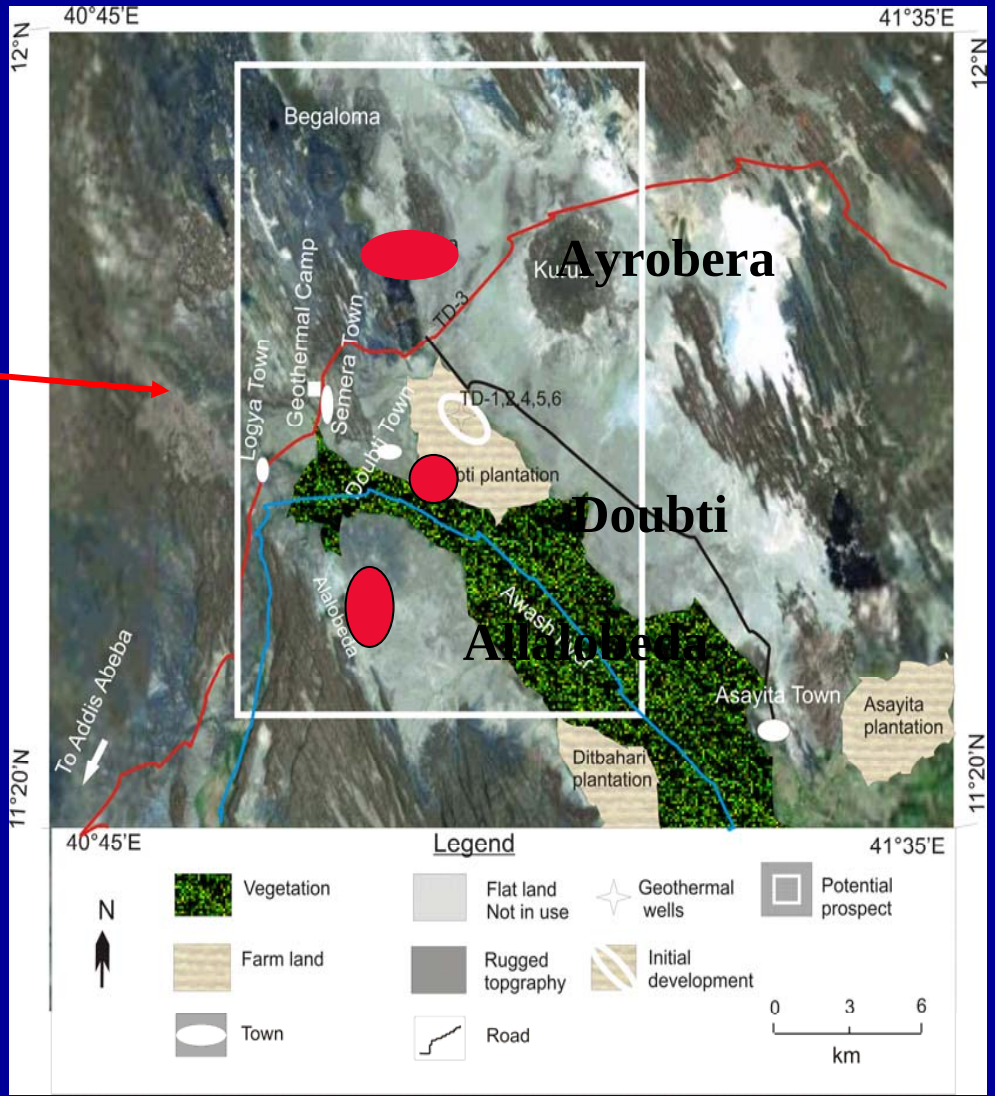


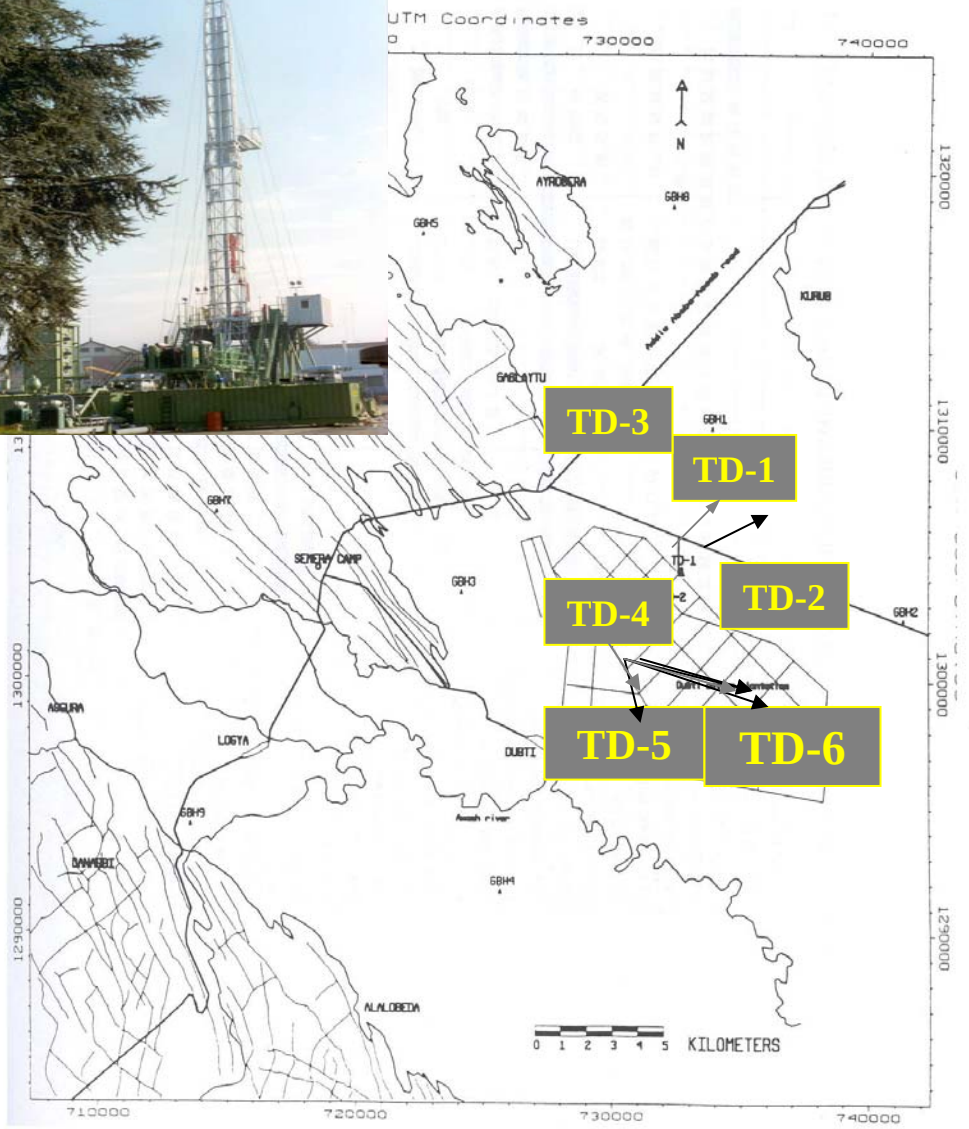
Fig.1 Location Map of the Geothermal Prospect Areas with in the Ethiopian Rift Valley



TENDAHO GEOTHERMAL FIELD EXPLORATION HISTORY

- ✓ RECONAAISSANCE SURVEY (1969/70)
- ✓ PRE-FEASIBILITY STUDY (1979/1980)
- ✓ TECHNO ECONOMIC STUDY (1982)
- ✓ DRILLING OF 3 DEEP & 3 SHALLOW WELLS (1993-1998) FINANCED BY ITALIAN AND ETHIOPIAN GOVT.
- ✓ WELL TESTING & GEOSCIENTIFIC STUDIES (1998-TO DATE)
- ✓ MT survey was carried out by BGR (2006-7)

TENDAHO

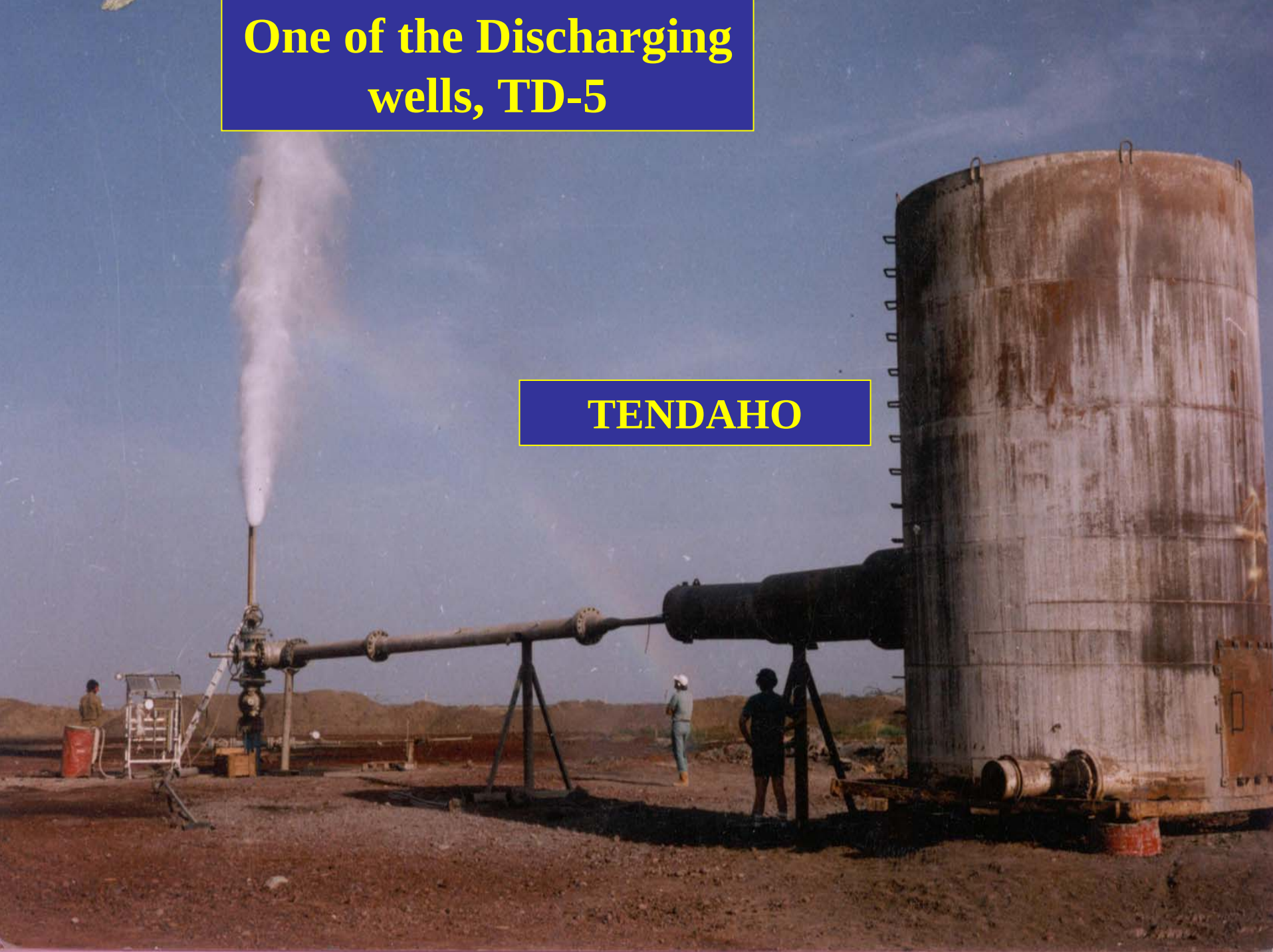


- 3 DEEP (2100 m) & 3 SHALLOW WELLS (500m) WERE DRILLED

- FINANCED BY ITALIAN AND ETHIOPIAN GOVERNMENT

- MAXIMUM TEMP = 260ºC AT A DEPTH OF 500M

LOCATION OF WELLS IN THE TENDAHO GEOTHERMAL FIELD


One of the Discharging wells, TD-5
TENDAHO

SUMMARY OF EXPLORATION RESULTS

- **EXISTNENCE OF SHALLOW RESERVOIR (220-250°C) PROVEN**

- **POTENTIAL OF SHALLOW RESERVOIR ESTIMATED AT 3-5MWe**

- **DEEP RESERVOIR INDICATED (>270°C)**

- **LOCATION OF DEEP DRILL WELL SITES TO BE IDENTIFIED**

The way forward for the Tendaho Geothermal Field

- Location and delineation of the deep reservoir
- Identification of Shallow reservoir volume
- Characterize the shallow reservoir by installing a small scale pilot power plant
- Further drilling to reach to the deep reservoir & develop the field

PROSPECTS

AT

ADVANCED EXPLORATION STAGE

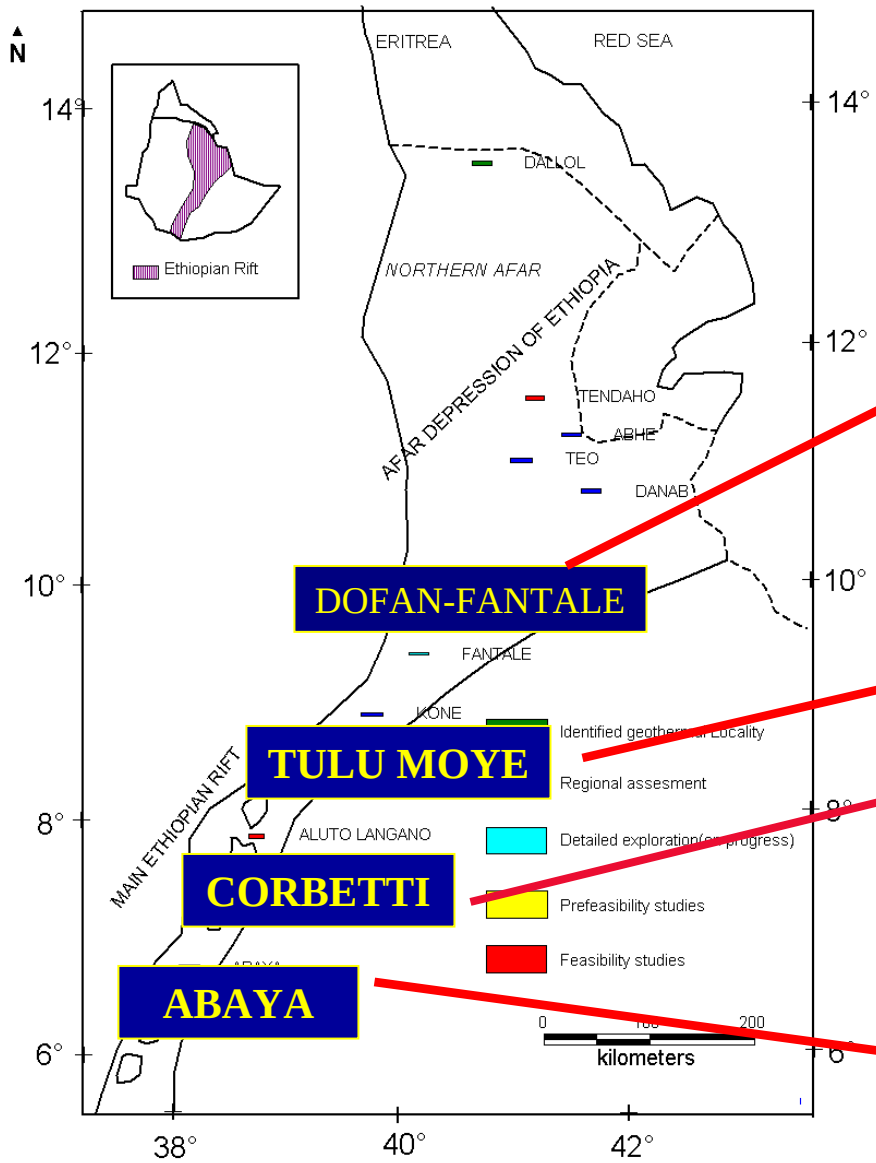
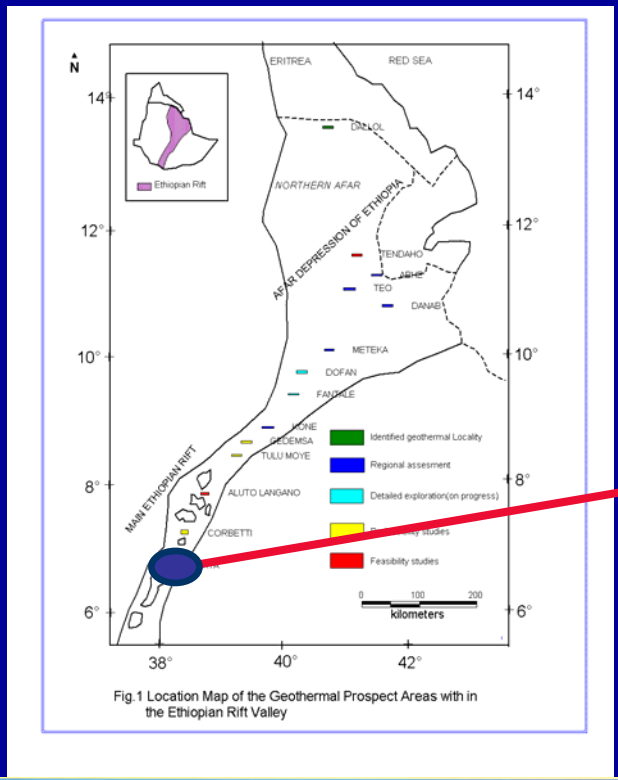


Fig.1 Location Map of the Geothermal Prospect Areas with in the Ethiopian Rift Valley

ABAYA GEOTHERMAL PROSPECT AREA



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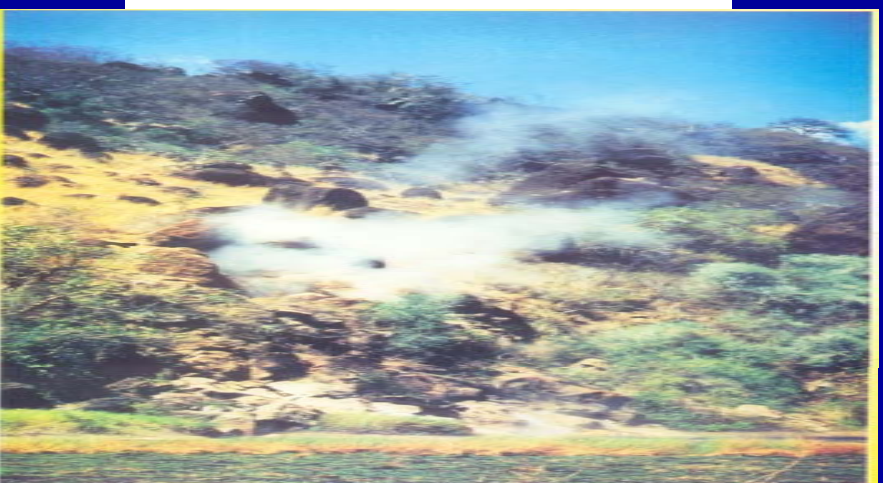
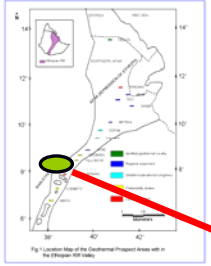
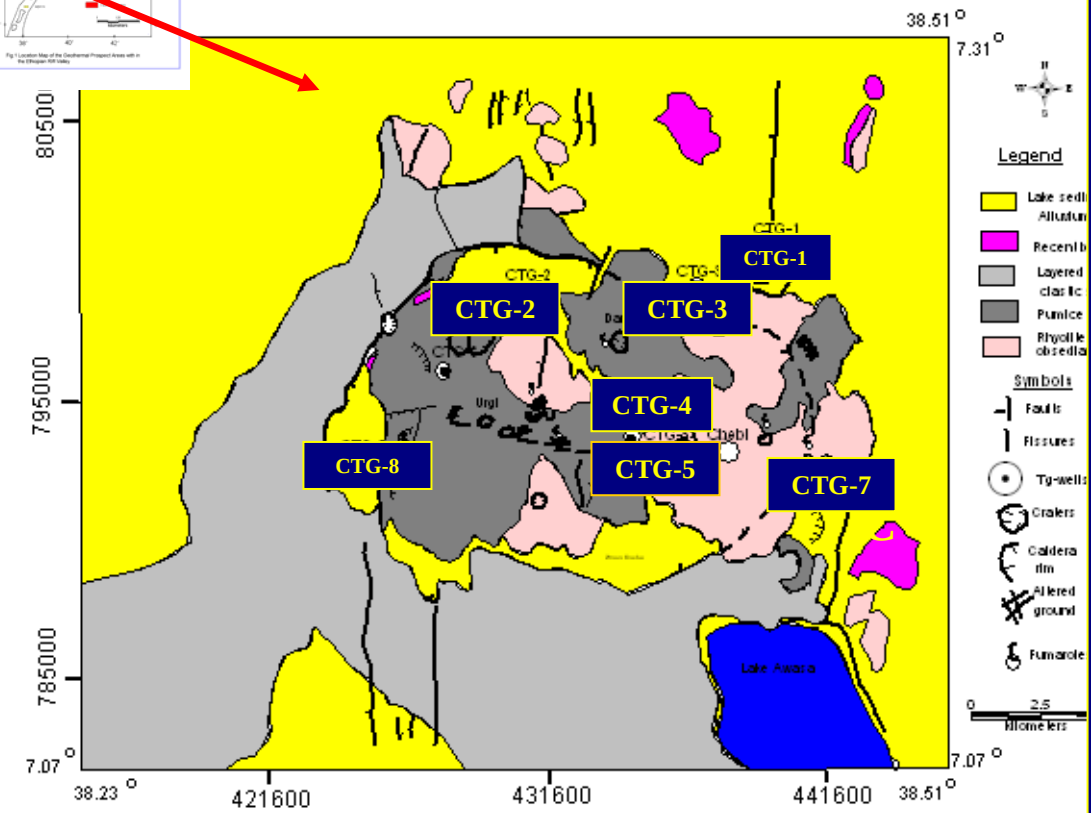


- 400 KM SOUTH OF A.A
- DETAILED GEOSCIENTIFIC STUDIES INCLUDING MT SURVEY HAVE IDENTIFIED A TEMPERATURE IN EXCESS OF 260 °C.
- FURTHER GEOPHYSICAL SURVEY (MT+TEM) ARE RECOMMENDED.
- 132 KV TL WITHIN 45 KM OF THE PROSPECT AREA

CORBETTI



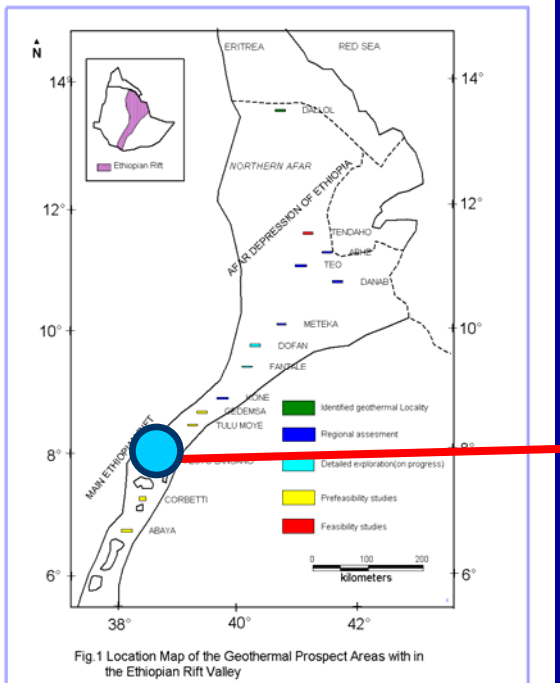


Figu

Geological Map of Corbetti Geothermal Prospect Area.

- About 250 Km S of AA
- Detailed Geoscientific including 8 TG wells
- Max. Temp = 250 °C
- Drilling is justified to define the extension of reservoir
- Surface and near surface exploration are recommended before drilling
- 132 KV TL passes within 15 Km of the Prospect

TULU MOYE GEOTHERMAL PROSPECT AREA



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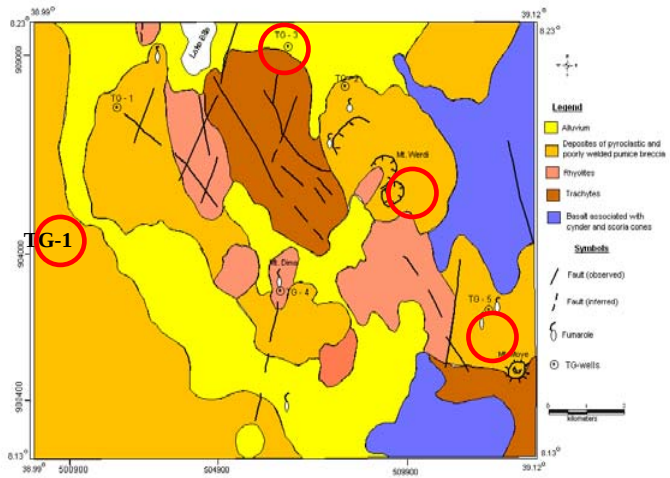


Figure 13, Geological map of Tulu Moye geothermal prospect (GSE, 2002

- **DETAILED GEOSCIENTIFIC STUDIES INCLUDING 5 TG WELLS**
- **HIGH TEMP > 200 ºC & GOOD PERMEABILITY**
- **TARGET AREAS FOR DEEP WELLS ARE SELECTED**
- **Lateral extent/depth of geothermal reservoir unknown**
- **LOCATED CLOSE TO AWASH I AND II POWER STATIONS**

THE DOFAN & FANTALE GEOTHERMAL PROSPECT AREA

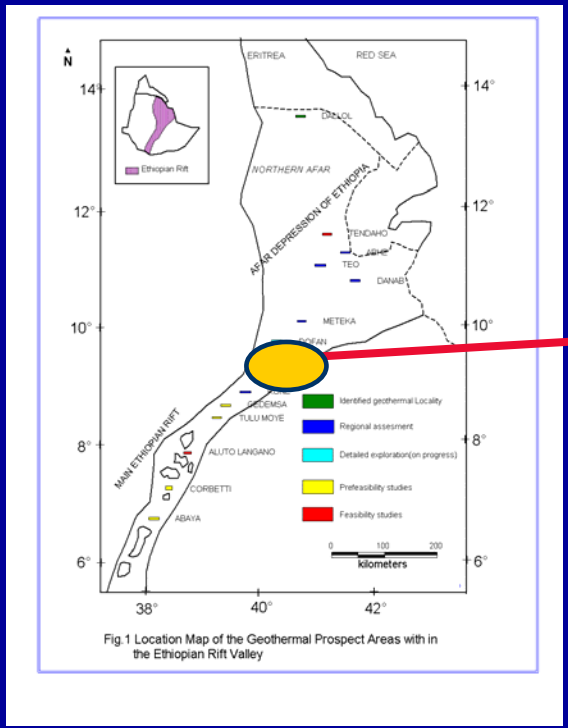


Fig.1 Location Map of the Geothermal Prospect Areas with in the Ethiopian Rift Valley

- LOCATED ABOUT 250 KM NE OF AA
- DETAIL GEOSCIENTIFIC STUDIES ARE COMPLETED IN 2004-06
- SEVERAL HYDROTHERMAL MANIFESTATIONS WITHIN THE VICINITY
- LATERAL EXTENT/DEPTH OF GEOTHERMAL RESERVOIR UNKNOWN

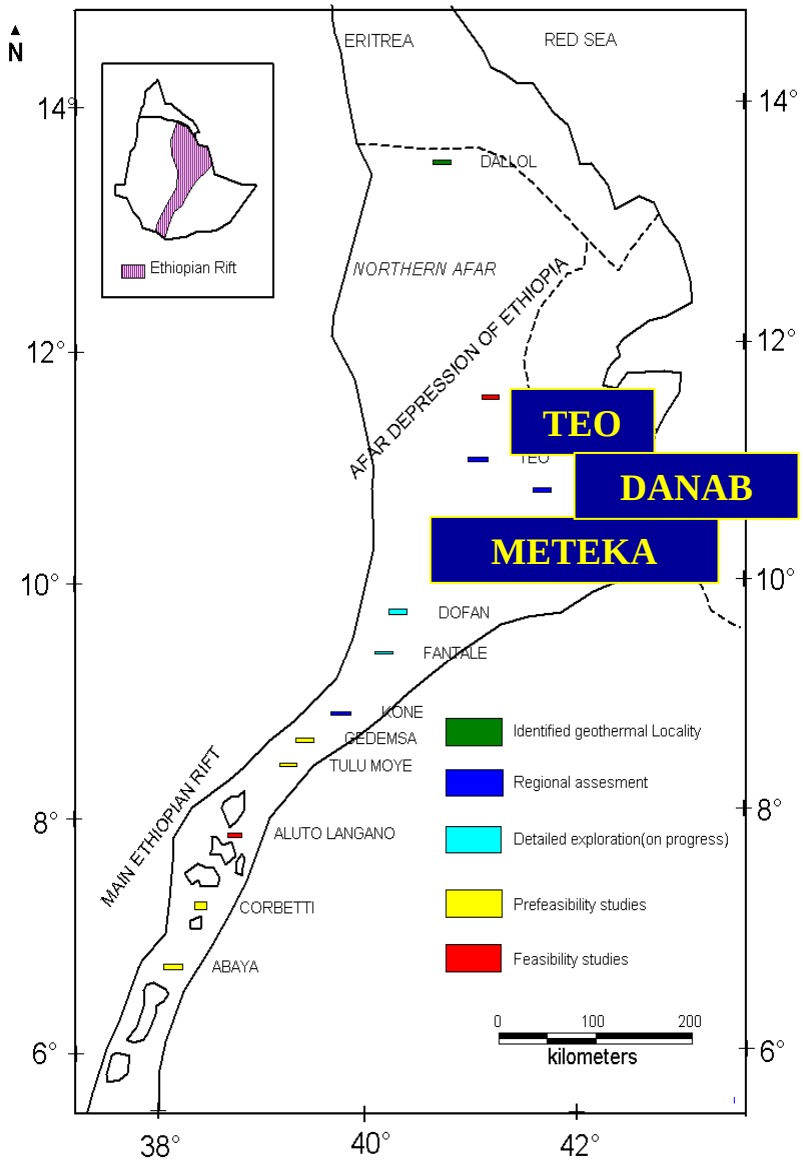


Fig.1 Location Map of the Geothermal Prospect Areas with in the Ethiopian Rift Valley

RECONNAISSANCE

DURING THE FOUR DECADES THAT GEOTHERMAL RESOURCE EXPLORATION WAS CARRIED OUT

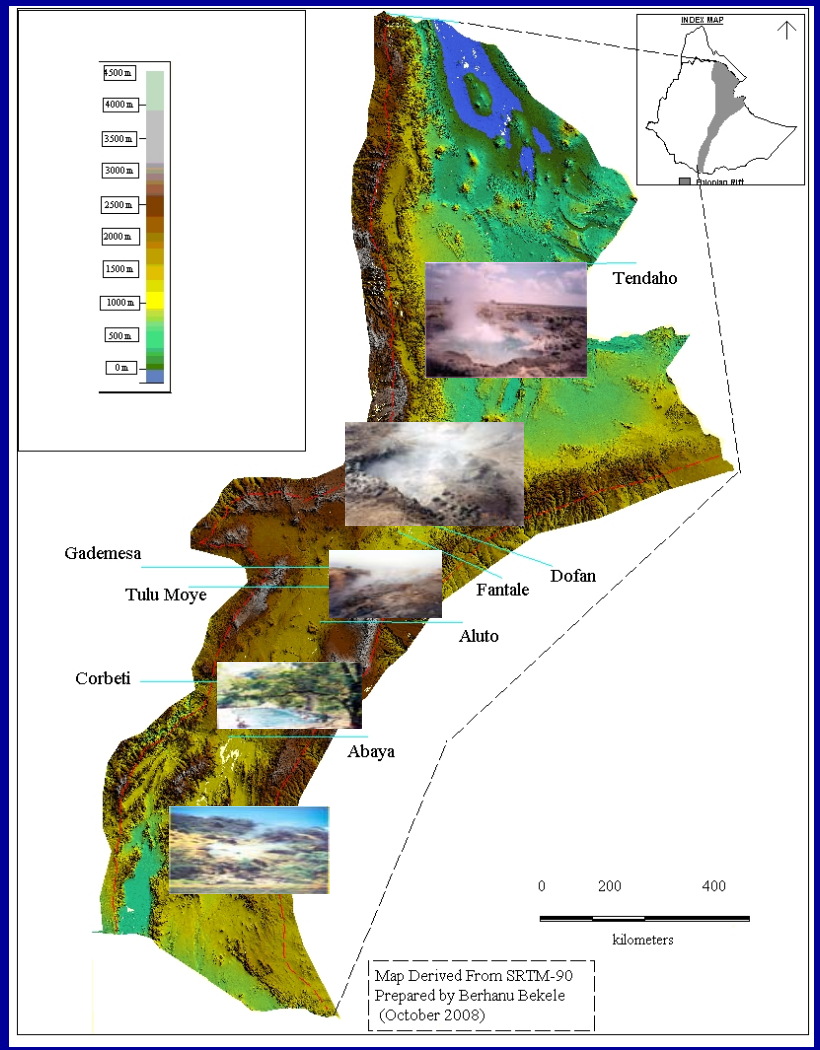
- GOOD INFORMATION BASE

- GOOD DEGREE OF EXPLORATION AND HUMAN CAPACITY

- BASIC INSTITUTIONAL AND INFRASTRUCTURE HAVE DEVELOPED.

- HOSTED 1ST ARGEO CONFERENCE IN ADDIS ABABA, ETHIOPIA NOVEMBER 2006

POSSIBLE STRAEGY FOR EXPLORATION AND DEVELOPMENT IN ETHIOPIA



Geothermal Strategy 500 MWe for the coming 15 years.

STRAEGY FOR EXPLORATION AND DEVELOPMENT IN ETHIOPIA

PROSPECT 1: ALUTO LANGANO

PROSPECT 2: TENDAHO

PROSPECT 3 : CORBETTI

PROSPECT 4: ABAYA

PROJECT 5: TULU MOYE

PROSPECT 6: FANTALE

GOVT. OF ETHIOPIA IS COMMITTED TO DIVERSIFY AER. & call for GIC in Dec 2, 2008, AA, Ethiopia

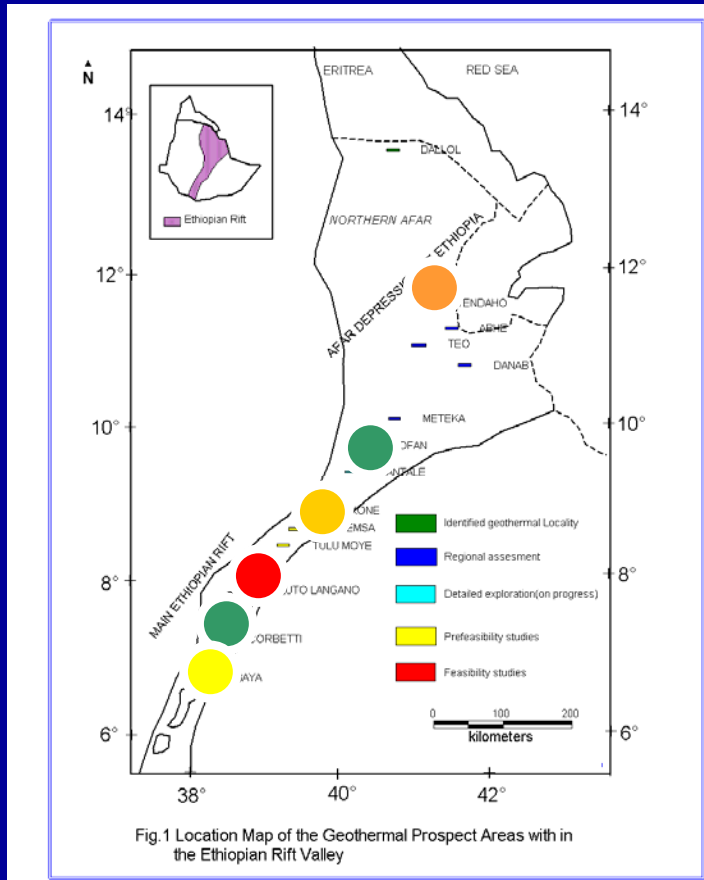


Fig.1 Location Map of the Geothermal Prospect Areas with in the Ethiopian Rift Valley

KENYA

TIC= 1052 MWe

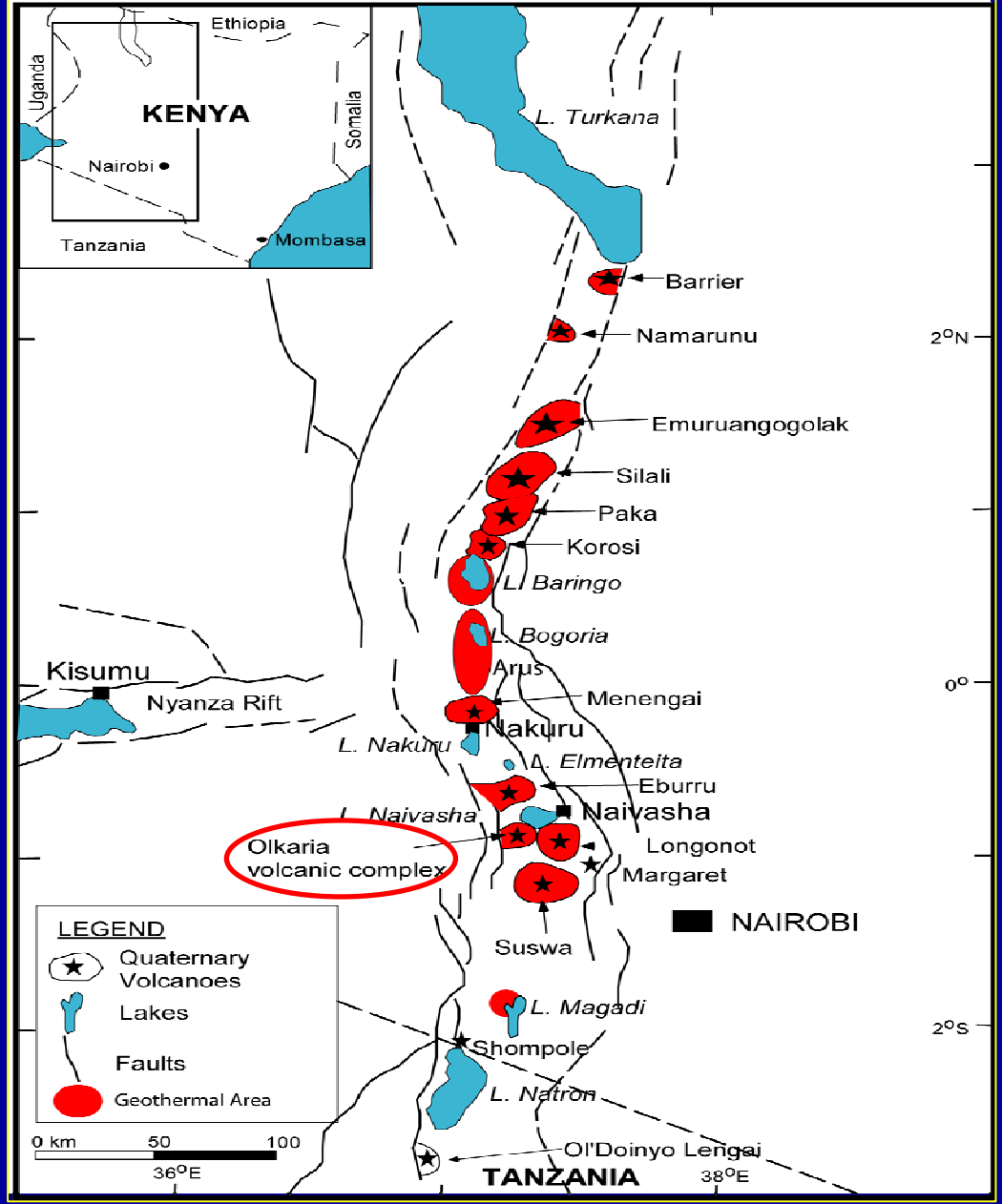
Hydro

Thermal

Geothermal

Wind

Gas turbine



LOCATION OF GEOTHERMAL PROSPECTS
THE KENYAN RIFT

E. R. Potential : > 4000 MWe

Main Areas of Focus:
Olkaria fields

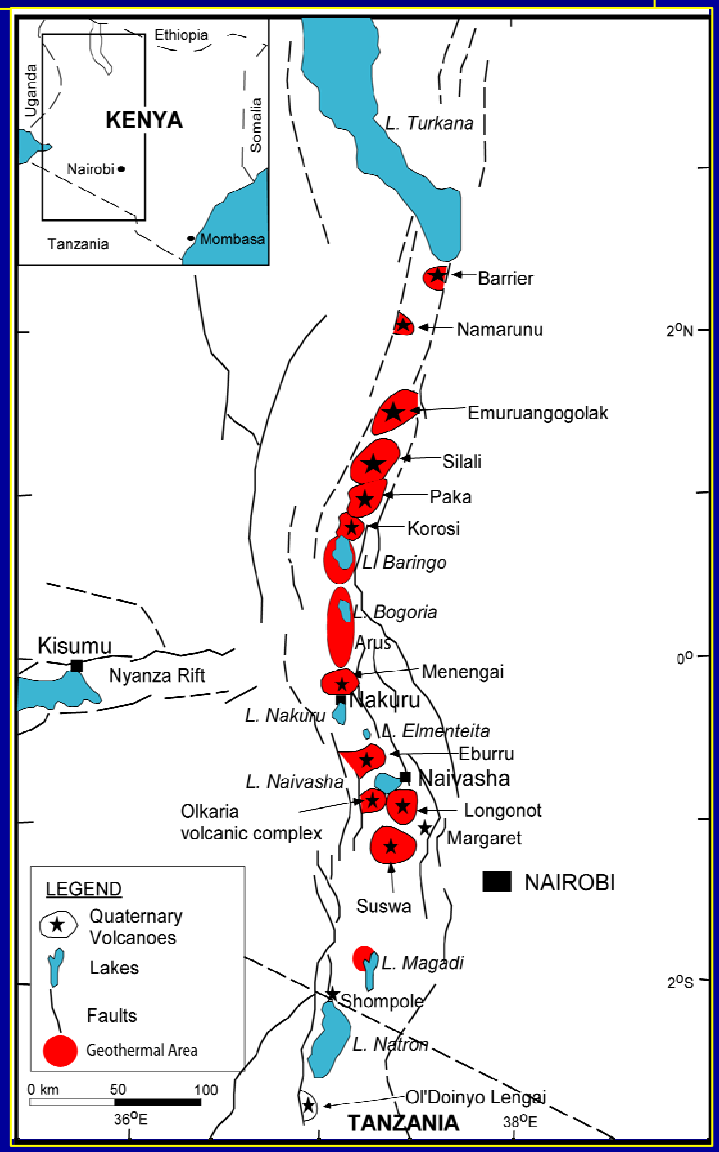
Menengai
Eburu
Longonant
Suswa
Paka

GEOTHERMAL PROSPECTS OF KENYA

	Geothermal Area	Detail Survey	Drilling	Max. Temp °C
1	L. Magadi	No	No	140+
2	Suswa	Yes	No	250+
3	Longonot	Yes	No	>250+
4	Olkaria	Yes	Yes	340
5	Eburru	Yes	Yes	279
6	Menengai	Yes	No	>250+
7	Arus/Bogoria	Yes	No	115-190+
8	Baringo	Yes	No	>170-210+
9	Korosi/Chepchuk	Yes	No	>220-250
10	Paka	Yes	No	>250-300+
11	Silali	No	No	250-300+
12	Emurangogolak	No	No	210-290+
13	Namarunu	No	No	
14	Barrier volcano	No	No	220-296
	Note: + Geothermometer			

STATUS OF GEOTHERMAL EXPLORATION

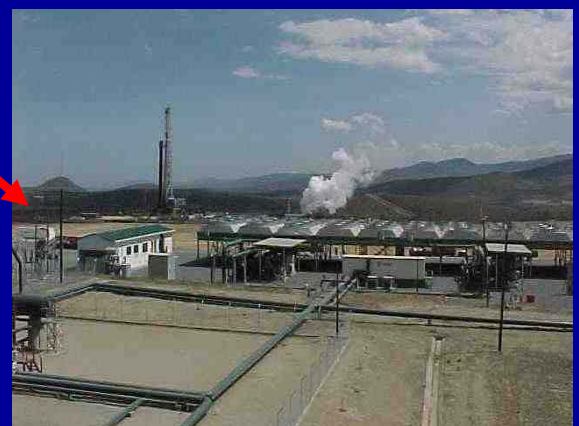
- **Exploration started in Olkaria region in 1950's**
- **In 1970's More exp. Wells were drilled funded by UNDP and Kenya govt.**
- **Todate, more than 100 wells were drilled in Kenya to depths ranging from 503m-2800m.**
- **Further Exploration ongoing at Lake Magadi, Longonat, Eburu, Menengai, Suswa, Paka Sites.**



LOCATION OF GEOTHERMAL PROSPECTS THE KENYAN RIFT

Kenya's use of Geothermal Energy

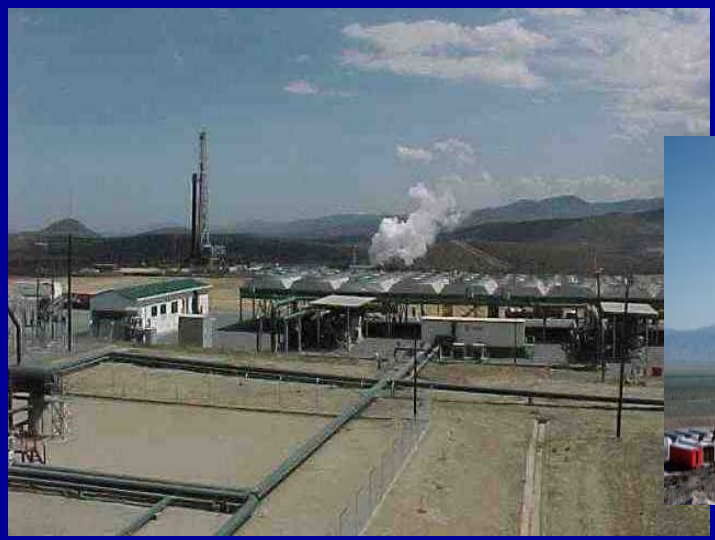
- 1ST African country to use Geothermal energy for E. power generation
- 45 MW (Olkaria I plant) Operating in Hells Gate National Park since Early '80's > 98% Availability
- 70 MW Power station (OLkaria II) owned by KENGEN was commissioned in 2003
- In 1997, Ormat International received a license to generate 64-100 MW in BOO agreement, 12 MW commissioned so far (Olkaria III); 36 MWe is being completed.
- Olkaria IV (DOMES)- Exploration with three Exploartion wells drilled. Further appraisal drilling of six wells is completed.
- Total installed capacity is about 130 MW



TIC= 130 to 166 MWe

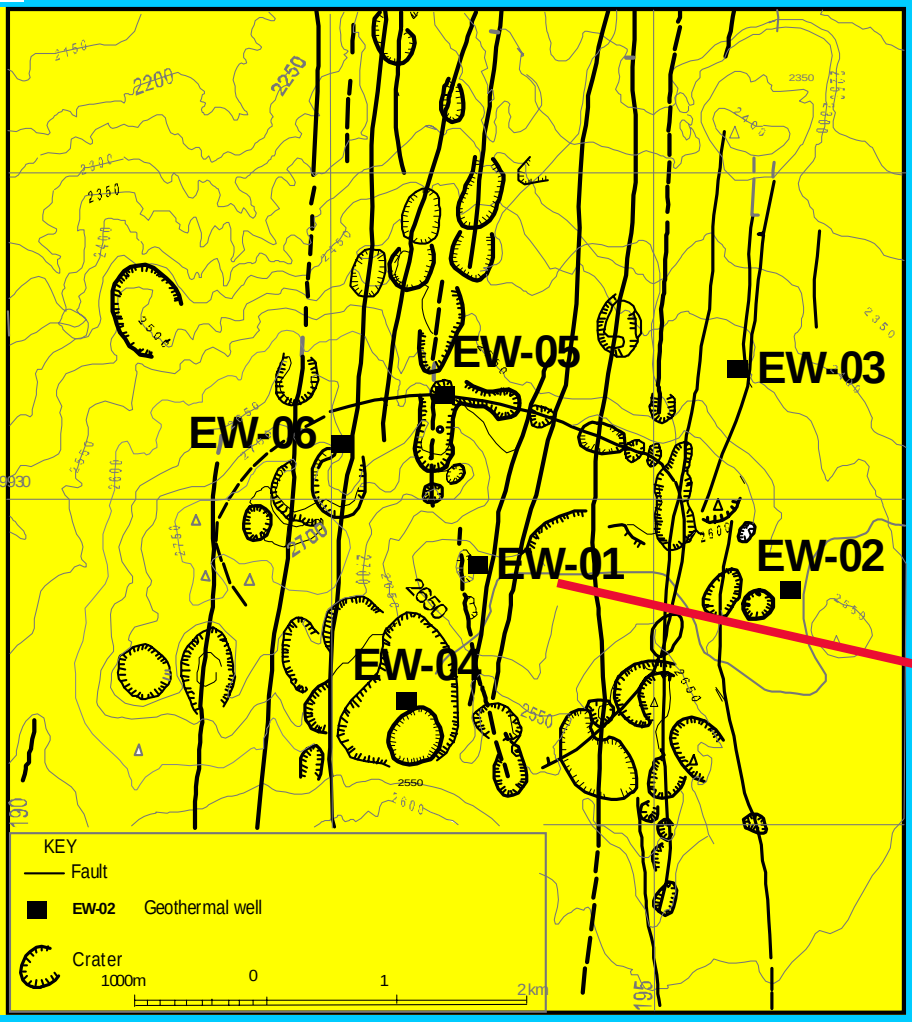
Olkaria I Power Plant 45MW

Olkaria II Power Plant 70MW / 35 MWe under construction



Olkaria III power Plant 13MW (IPP) 36 MWe is being completed.

Oserian Power Plant 3MW



Location of Geothermal Wells in the Eburru Geothermal Field, Kenya (5 MWe)

PROPOSED GEOTHERMAL PROGRAM

- **Production Drilling and Development of 140 MWe by 2012 in Olkaria Domes (Olkaria IV)**
- **Expansion of Olkaria III by 36 MWe (2008/9)**
- **Building of a Geothermal Pilot plant at Eburru (5 MWe)**
- **Plans to further explore at Menengai for 700 MWe**
- **Plans for additional 1260 MW by 2018**
- **GoK is planning to further explore and develop other geothermal prospects (Longonat etc..)**

KENYA:

- HAS ACQUIRED CONSIDERABLE EXPERTISE IN GEOTHERMAL RELATED EARTH SCIENCES AND ENGINEERING

- HAS LED TO A DEVELOPMENT OF THE INSTITUTIONAL STRUCTURE NECESSARY FOR GEOTHERMAL RESOURCE E,D & U.

TANZANIA

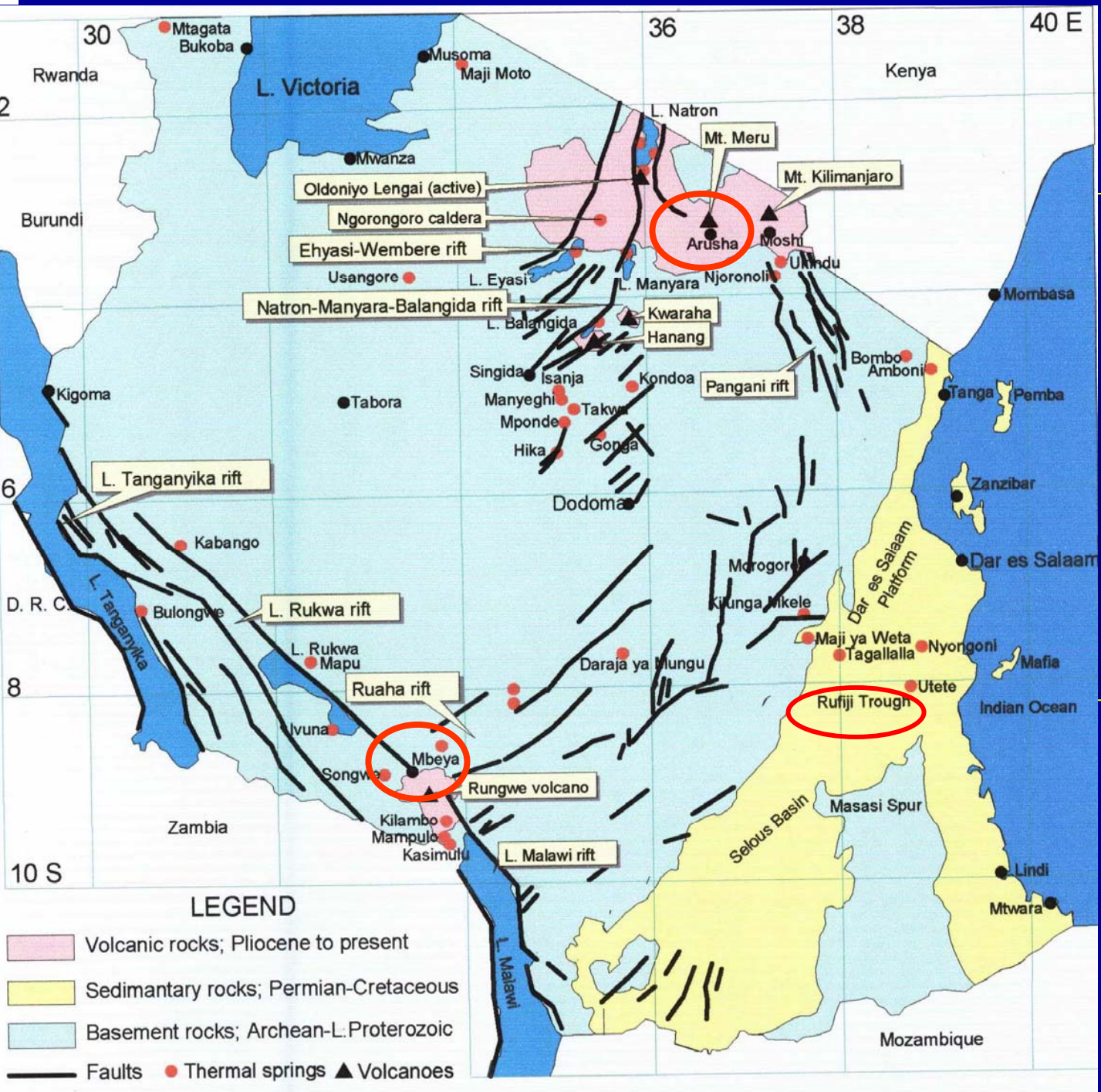
Generation Capacity = 1018 MWe

Hydro= 561 MWe (70%)

Natural gas = 182 MW

Thermal= 100 MWe

Access to Electricity = 11.5%



LOCATION OF POTENTIAL GEOTHERMAL PROJECT SITES IN TANZANIA

E. G.R Potential

230-460 MWe

STATUS OF GEOTHERMAL EXPLORATION

- Geothermal Resource Exploration started between 1976-79 by Swedish Consult. Group in Collaboration with Virkir-Orkint of Iceland

- Two potential targets, Arusha & Mbeya region ,were Singled out for further Geothermal Exploration

- Detail Exploration in Mbeya region funded by UNDP in 1983

- FEC ,T. company, did exploration studies and research on the economic feasibility in Rufiji (Luhoi) region (1997-2004)

- Results indicate:

  Existence of geothermal resources for power generation in Arusha, Mbeya and Luhoi area (T= 220-270ºC).

- BGR did geoscientific studies in Songwe-Mbeya G. Prospect area.

PROPOSED GEOTHERMAL PROGRAM

- **Further Exploration and Detail Analysis of selected geothermal Prospects (Arusha & Mbeya)**
- **Create awareness on Geothermal**
- **Training in Geothermal Disciplines to build capacity**
- **Govt. is committed to participate in a private sector led initiative**

UGANDA

- Located in the western branch of the EAS
- TIC= 300 MWe (hydro) reduced to 135 MWe
- E.R. Potential : 450 MWe
- Main Areas of Focus:

Western Part of Uganda

GEOTHERMAL PROSPECT AREAS (UGANDA)

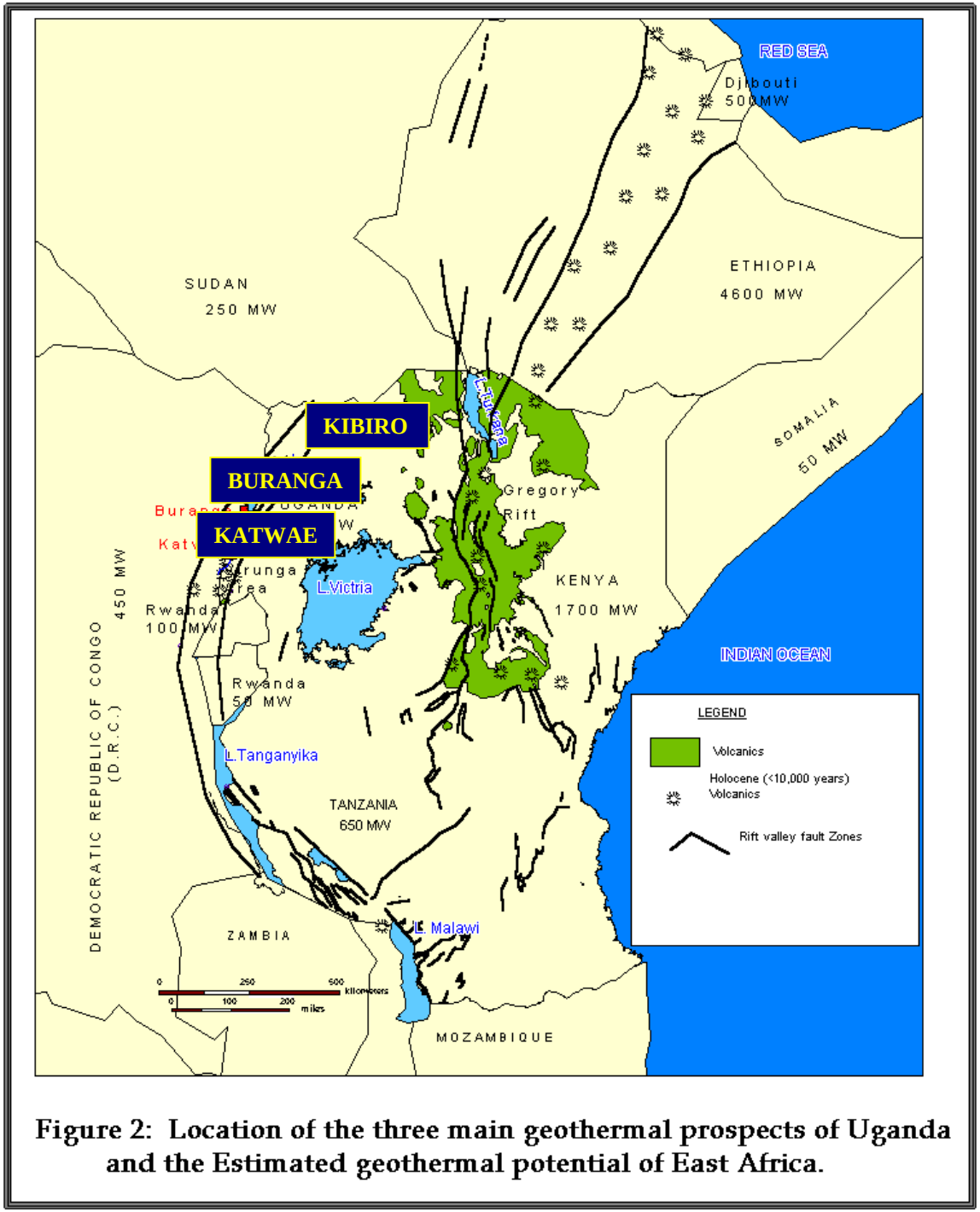


Figure 2: Location of the three main geothermal prospects of Uganda and the Estimated geothermal potential of East Africa.

STATUS OF GEOTHERMAL EXPLORATION

1993–1994: Geochemical and geological investigation on Katwe, Buranga and Kibiro - 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 & geophysical surveys in Katwe - GoU & AfDB.

2004: Geological and geophysical surveys in Kibiro - GoU & Iceland (ICEIDA).

2005-2007: Detailed geological, geochemical & geophysical survey of Buranga - GoU & BGR.

CONT..

STATUS OF GEOTHERMAL EXPLORATION

2005-2007: Further detailed geological, geophysical surveys and temperature gradient measurement in Katwe and Kibiro - GoU, WB & ICEIDA

October 2008- Technical Review meeting with ICEIDA and BGR to evaluate results of their work.

November 2008: Host ARGeo-C2 Conference.

PROPOSED GEOTHERMAL PROGRAM

- **Deep exploratory drillng at Kibiro & Katwe (is located 35 Km from the Terminus of a 132 KV transmission line).**

- **Feasibility study , if successful, development of 30MW geothermal power plant by an IPP.**

- **Govt's policy framework is strongly private sector oriented for power generation**

ZAMBIA

ABOUT 99 % OF POWER IN ZAMBIA IS HYDRO GENERATED

TOTAL INSTALLED CAPACITY IS 1640 MW

HYDRO - 1632 MW
THERMAL - 8 MW

STATUS OF GEOTHERMAL EXPLORATION

- Since 1950, ZGS examined various springs during routine R. mapping exercises
- In 1986, the ZGS together with I. company studied various HS and todate, development has been considered on two prospects (i) Kapsiya and (ii) Chinyunyu HS projects.
- Pilot Plant (nominal capacity of 200 kW) located in Kapsiya (Sumbu) was built with funding from the Ital. govt.
- The plant never became operational
- KENGEN- Refurbishing of the plant is in progress

LOCATION MAP OF GEOHERMAL PROSPECT AREAS IN ZAMBIA

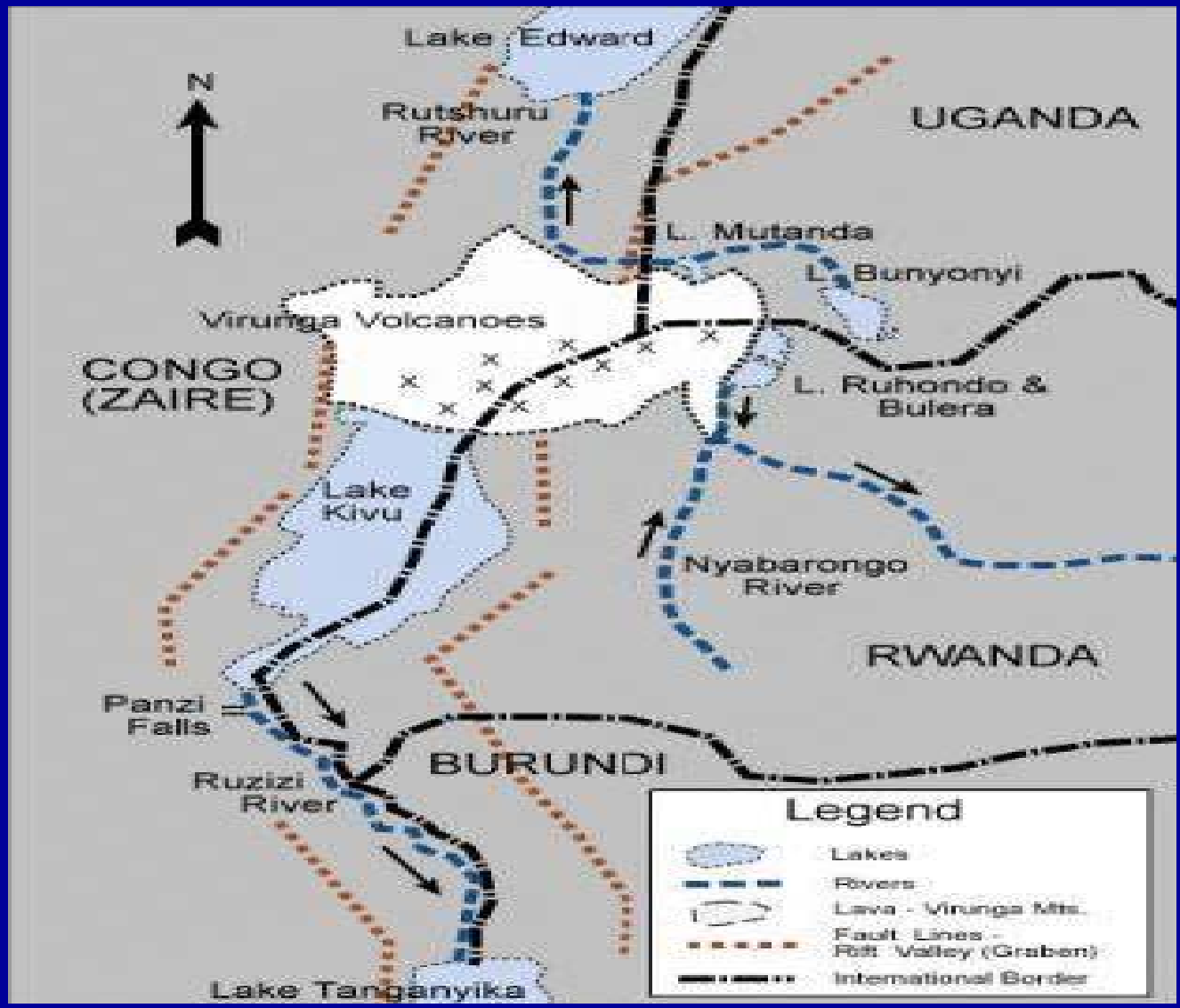
PROPOSED GEOTHERMAL PROGRAM

- **Govt. of Zambia is exploring options for expansion of the Kapsiya geothermal field.**

- **Train local personnel in the maintenance & operation of the plant**

- **PUT IN PLACE Regulations And Standards Frame Work To Govern Geothermal Resources Development.**

RWANDA



Bounded by

Uganda

D. Congo

Burundi

Main Source of power
Hydroelectricity 40%

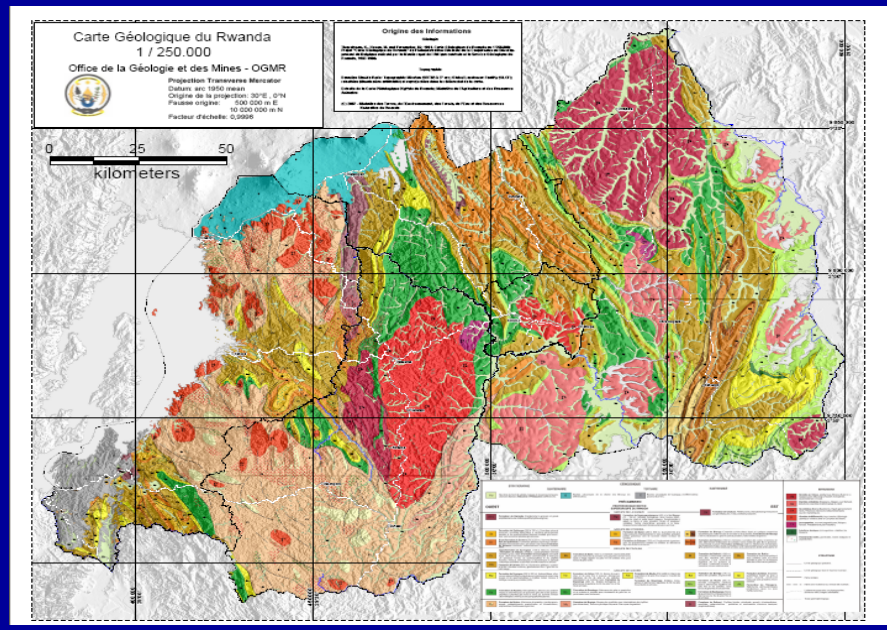
Thermal energy 60%

STATUS OF GEOTHERMAL EXPLORATION IN RWANDA

- In the 80's geothermal fields were investigated for GRE by BRGM.

- A second preliminary assessment of two geothermal prospects (Gisenyi and Mashyuza) was carried out by Chevron (2006).

- Most favourable conditions appeared to exist in the NW of the country

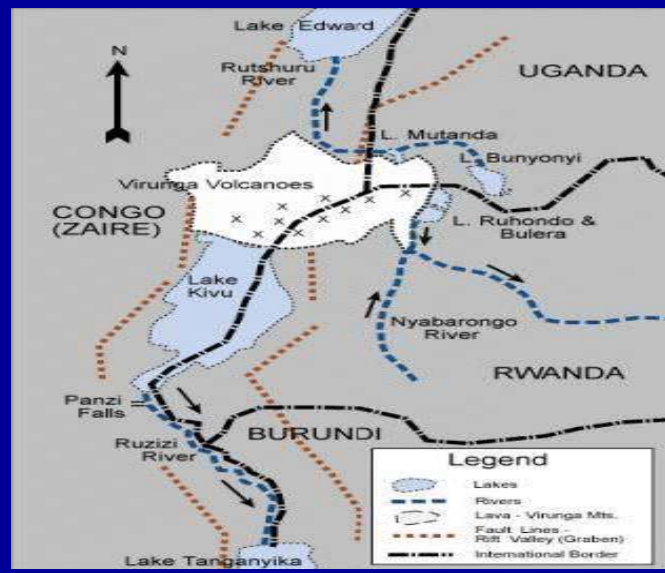


RWANDA

BGR is currently carrying out MT + TEM with KENGEN (2007-08)

PROPOSED GEOTHERMAL PROGRAMME

- **Extension Of Geophysical Measurements both MT And TEM**
- **Further investigations in other prospect areas**
- **Capacity Building in terms of HR**



DRCONGO

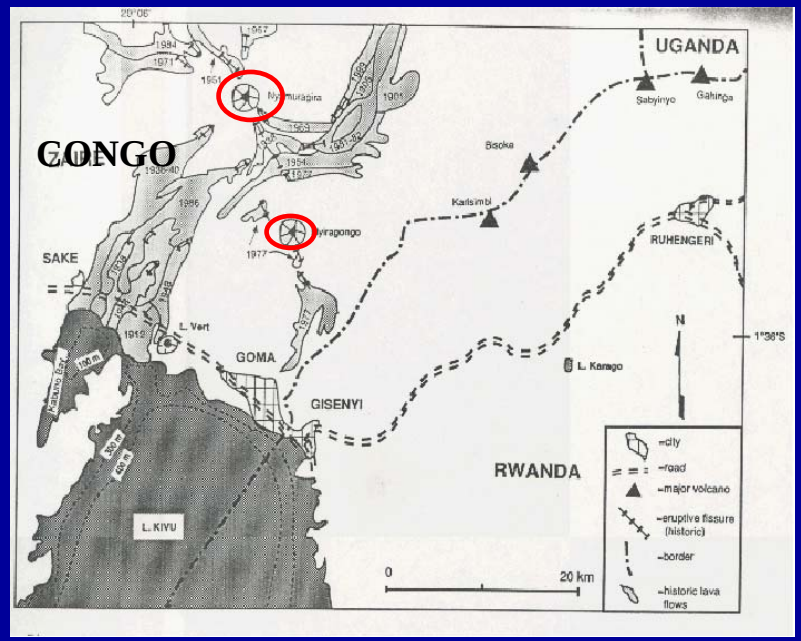
- **Eastern Part of D.R. Congo lies in the Western branch of EARS**

- **It is known to be endowed with natural resources**

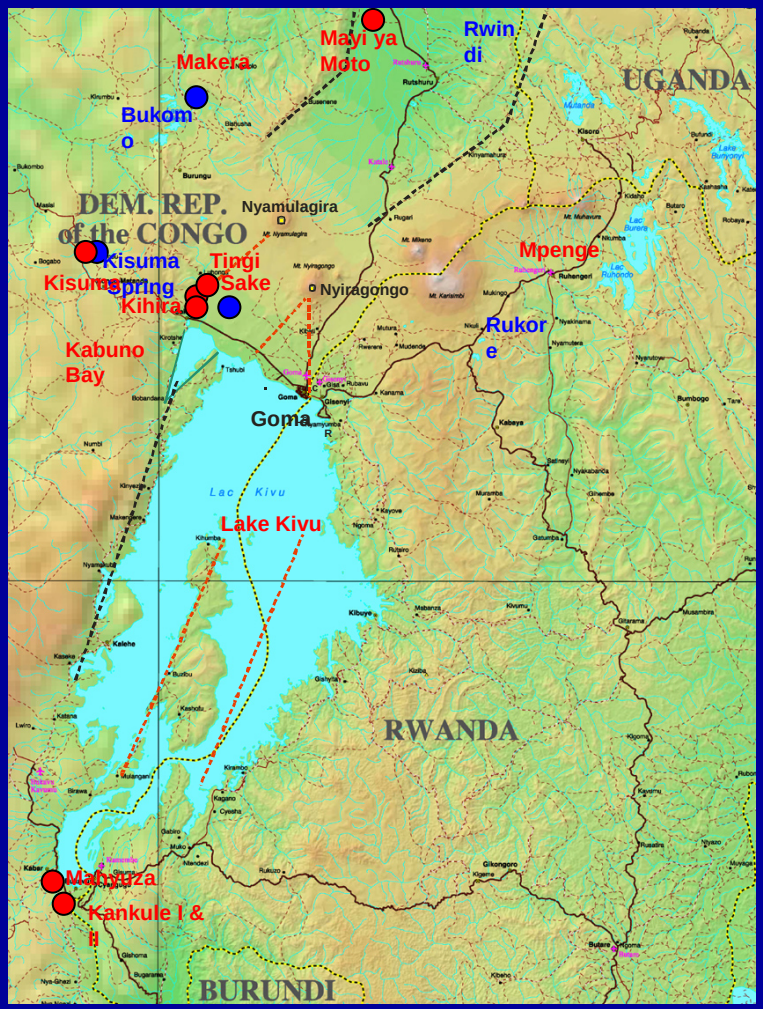
  - **Electric power is therefore mainly Hydropower.**

  - **Has enormous untapped resources.**

  - **In spite of large resources, only 10% of population use electricity**



DRCONGO



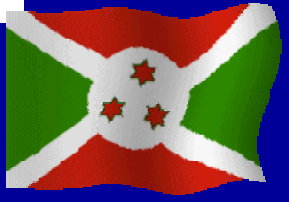
Hot spring = 90°c

Cold spring

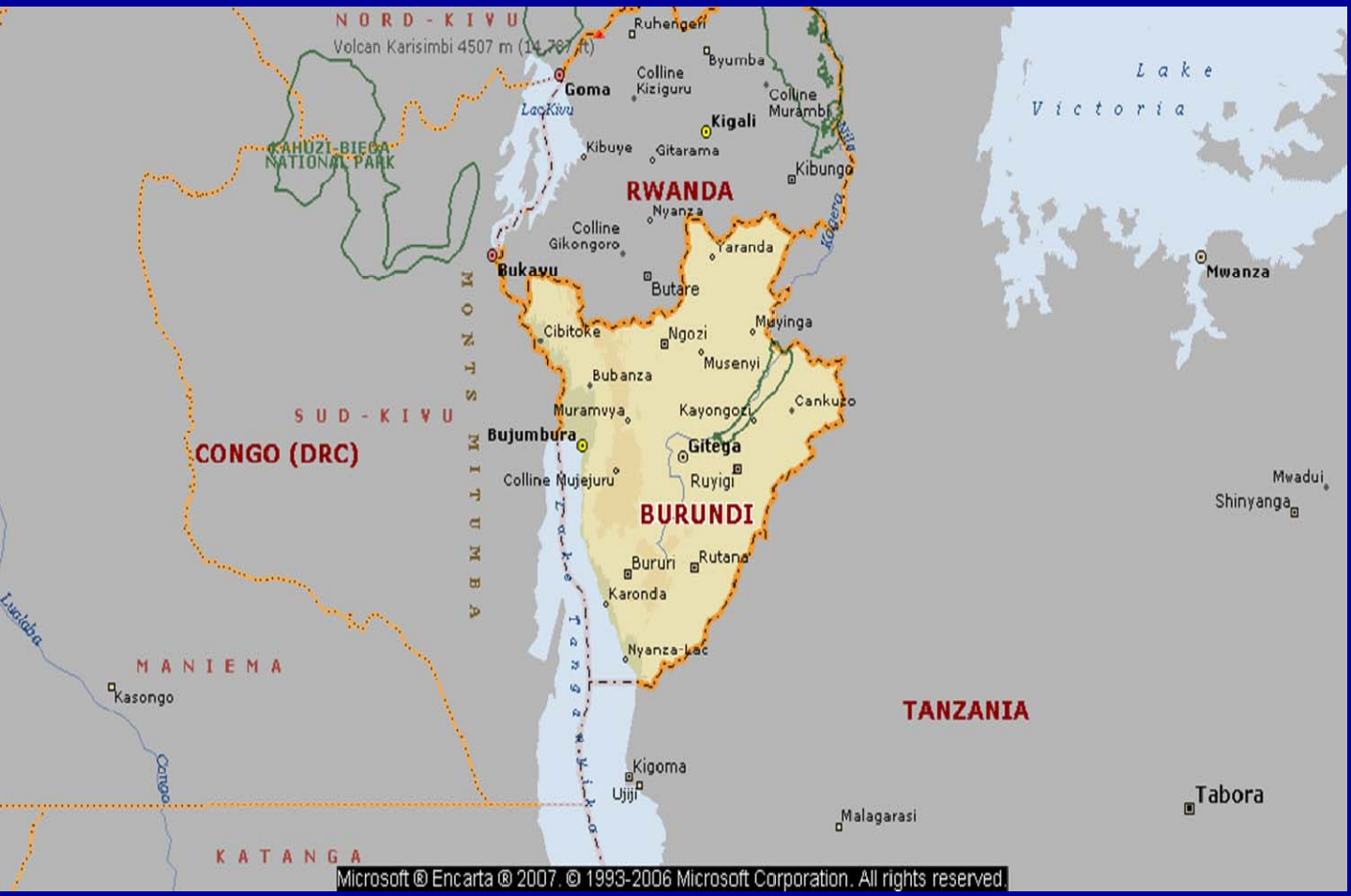
Rift limit

Major regional faults

Active Volcanic Centres



BURUNDI



Electricity

Hydro:95%
Thermal:5%

Hydro 32.46 MWe

Thermal 5.5

STATUS OF GEOTHERMAL EXPLORATION

- ✓ **The first description of geothermal manifestations in Burundi was given by Stanley (1878)**
- ✓ **But, specific investigation of activity in the country was carried out in 1968 by the UNDP**
- ✓ **This study covered eight geothermal locations with various hot springs of maximum temp. 68C.**
- ✓ **No record of fumaroles and mud pools**
- ✓ **Geothermometers indicate low to moderate tempertature.**
- ✓ **Further detail investigation is recommended**

THE COMOROS ISLANDS

Karthala volcano

KENGEN DID INVESTIGATIONS

MAIN OBSERVATIONS

- **A substantial Potential of G. E. Resource exist within the African Continent (EARS)**

- **Geothermal resources are indigenous, reliable, environmental friendly & cost effective alternative energy resource.**

- **Devt. of Geothermal Resources are constrained by**
  - **Risks associated with resource E&D**
  - **Financial risks associated with investment in PD projects**
  - **Lack of appropriate investment and institutional settings in many EA countries**

- **Diversified use of energy augments energy supply from HP plants and improve the Generation Mix (Avoid vulnerability to drought and oil P. fluctuations)**

STRATEGIES FOR DEVELOPMENT

- Establish long term conducive policies and incentives that attract private investment

- A Regional Network of Geothermal agencies should be set-up to ensure the promotion and use of geothermal expertise in the region

- Establish a Risk Guarantee fund for exploratory and appraisal drilling of projects in the region

- look for loans and grants from IO to finance the projects for further EX. & Development.

- Alternative is look for PS participation and financing from developers , investors, equipment suppliers and development banks.

UPCOMING PROJECT
Multi and Bi-lateral Agreements
ARGEO

- Eastern African Regional Geothermal Programme

- P. Objective –Techn. Ass & RMF for exploration

- Kenya, Ethiopia, Djibouti, Eritrea, Uganda and Tanzania Rwanda
- The project approved by the GEF Council in June, 2006.

- Executive and Implementing agents are: World bank and UNEP.

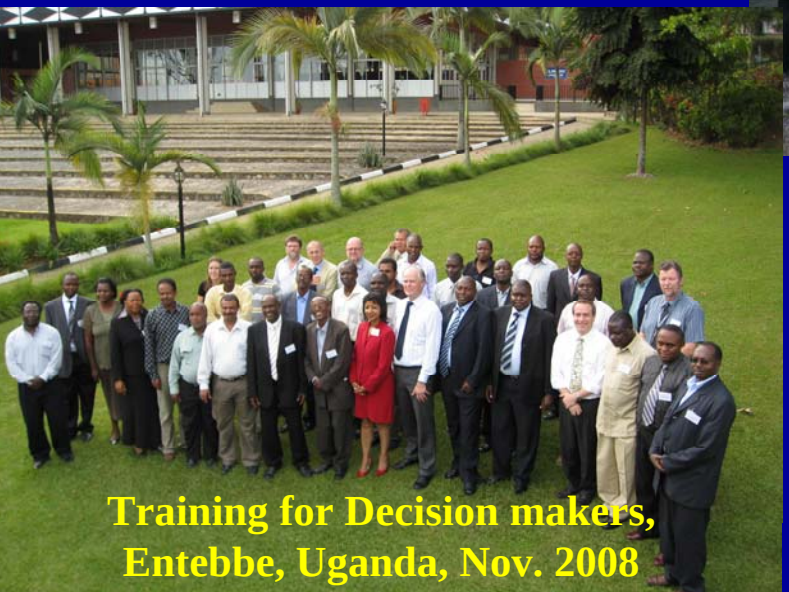
- Three projects from Djibouti, Kenya and Ethiopia are selected for RMF.

ACTIVITIES UNDER THE UMBRELLA OF ARGEO

ARGeo-C1

SC-III NAIVASHA, KENYA, Nov, 2008

SCI-Eburu



Training for Decision makers, Entebbe, Uganda, Nov. 2008

KENGEN working in Zambia


THANK YOU