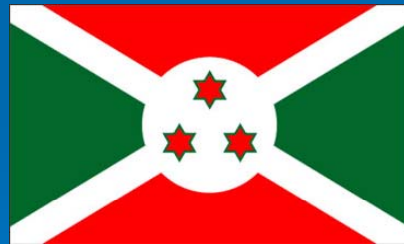


# GEOHERMAL EXPLORATION IN BURUNDI



# Country's location



Burundi is a landlocked country in Central Africa,  
Its area is 27834 km<sup>2</sup>,  
It is bordered with RDC in the West,  
Rwanda in the North and Tanzania in the East and South,  
Population is about 8 millions  
The Capital City is Bujumbura.

# Economy

- More than 90% of the population is rural and occupied on agriculture and breeding.
- Main agricultural products for exportation are cotton, tea and coffee.
- The underground is full of different mines which are not efficiently exploited.
- In the northwest, Cibitoke province, there is essentially gold;
- In the north, Kayanza and Musinga provinces, there are cassiterite, Colombo-tantalite;
- In the east, Ruyigi province, there is a huge mine of Nickel.

# Energy sector

- Biomass: 94%
- Electricity: 3.5%
- Oil: 2.5%

## Electricity

- Hydro: 80%
- Thermal: 20%
- Hydro exploitable potential: 300 MW
- Hydro install capacity: 32 MW
- Thermal install capacity: 12.2 MW
- Consumption capacity: 52 MW
- Importation capacity: 15 MW from RDC and SINELAC
- Demand capacity: 72 MW
- Deficit capacity: 20 MW

# HYDRO POWER POTENTIAL PROJECTS IN BURUNDI

Burundi has now three hydro power projects as shown below:

- **Hydro power project of MPANDA.**  
Installed capacity: 10.4MW
- **Hydro power project of KABURANTWA (KABU 16).**  
Installed capacity: 20MW
- **Hydro power project of JIJI and MUREMBWE.**  
Installed capacity: 15.2MW

# HYDRO POWER POTENTIAL PROJECTS IN BURUNDI (cont...)

These three projects are on standby and in search of their implementation. The government of Burundi is seeking for financials.

- A regional hydro-power station project called RUSUMO FALLS with an installed capacity of 60 MW is now in beginning phase and the electric energy produced will be shared between Rwanda, Burundi and Tanzania .
- Exploitation of solar energy is now in beginning phase.

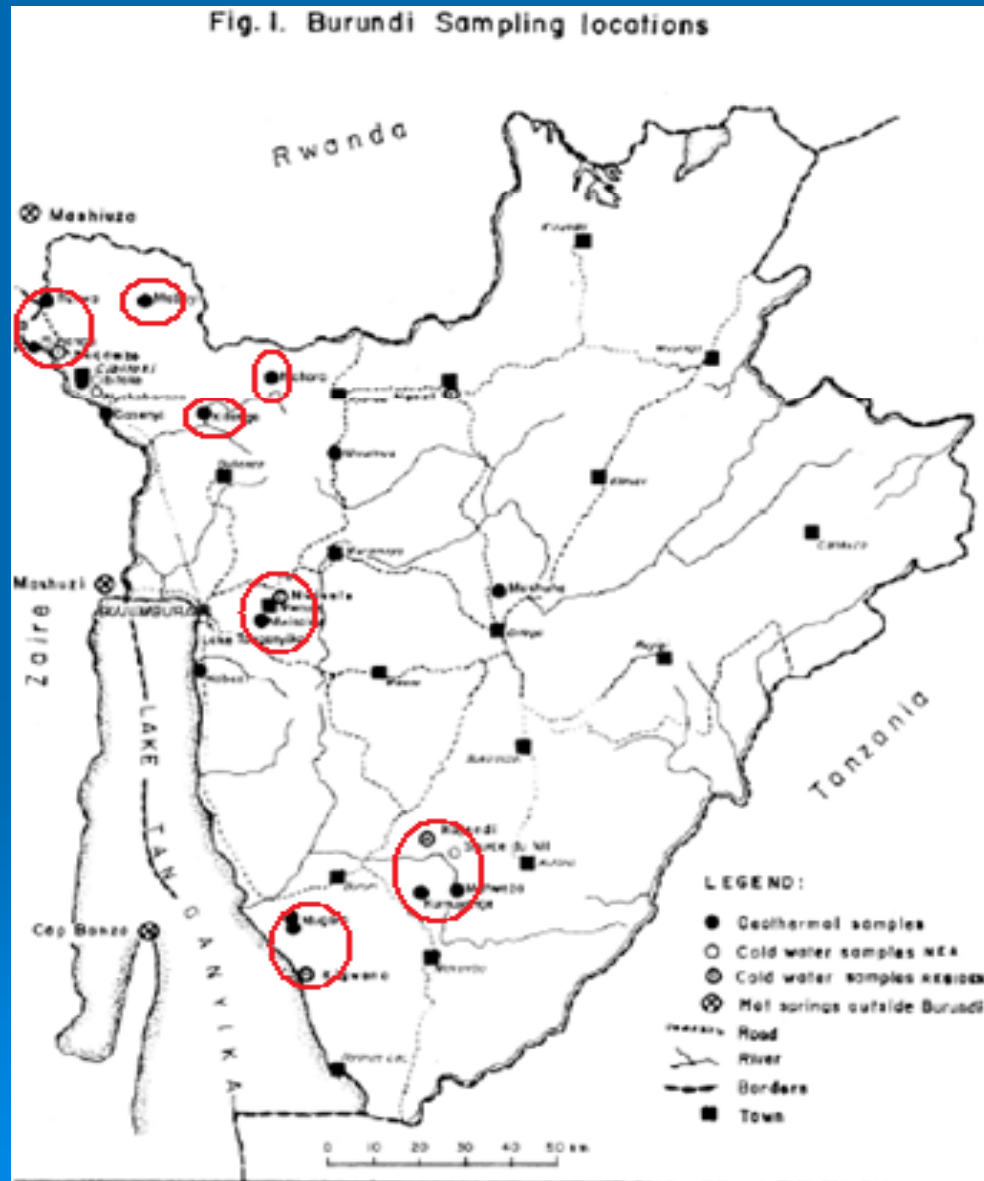
# GEOHERMAL RESEARCH IN BURUNDI

- The first description of geothermal manifestations in Burundi was given by Stanley (1878)
- The first specific investigation of activity in the country was carried out in 1968 by the UNDP (United Nations Development Program) following a request from the Burundian Government (1969)
- This study covered eight geothermal locations

# PREVIOUS GEOTHERMAL RESEARCH IN BURUNDI (cont..)

- The geology of the surroundings was described and a geochemical examination of the discharges recommended.
- In 1972, 15 hot springs have been described in Burundi, 1 in Rwanda and 3 in RDC
- In 1981, 14 geothermal locations have been described and reported chemical analysis from 13 of them.

# Location of the resources



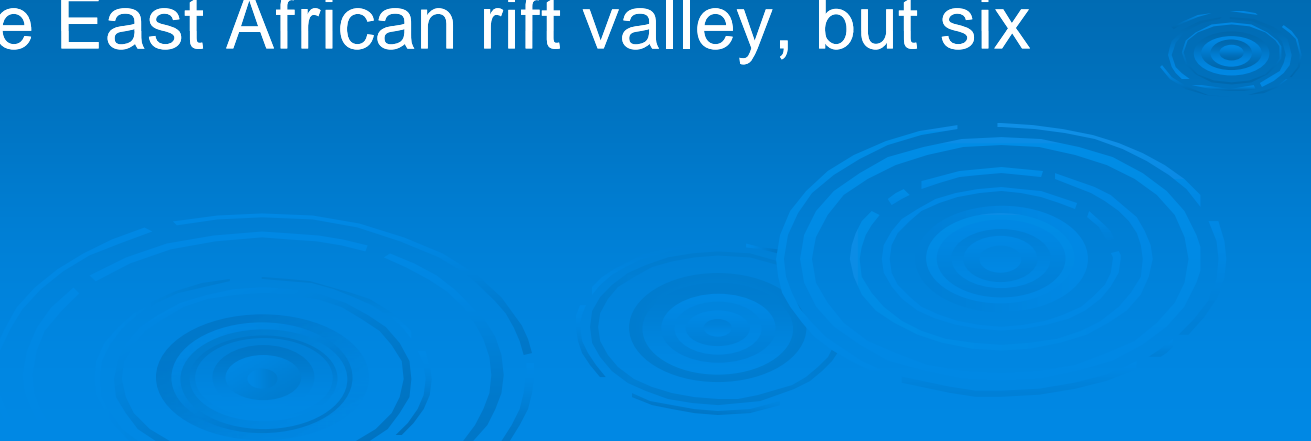
## Survey reports

- Little attempt has been made to relate the existence of geothermal heat to the general geology of the country
- It is however, clear that all the sources are situated in the Western or Central parts of the country and none in the Eastern part which lies farthest away from the active rift zone.

## Survey reports (cont..)

- All reported geothermal sources in Burundi are water springs
- There is no record of surface steam (fumaroles) or mud pools
- Therefore it seems unlikely that high temperature geothermal areas will be found there
- The highest temperature is 68°C at RUHWA and underground source temperatures as high as 110-120°C in at least two places in RUSIZI valley.

## RECENT SURVEYS (1982)

- The recent reconnaissance mission of geothermal resources in Burundi was done in 1982 by two scientists from National Energy Authority, Iceland.
  - During the mission, fifteen samples of geothermal water, three of cold ground water and one of gas were collected
  - Eight of the locations are outside the Western branch of the East African rift valley, but six inside it.
- 

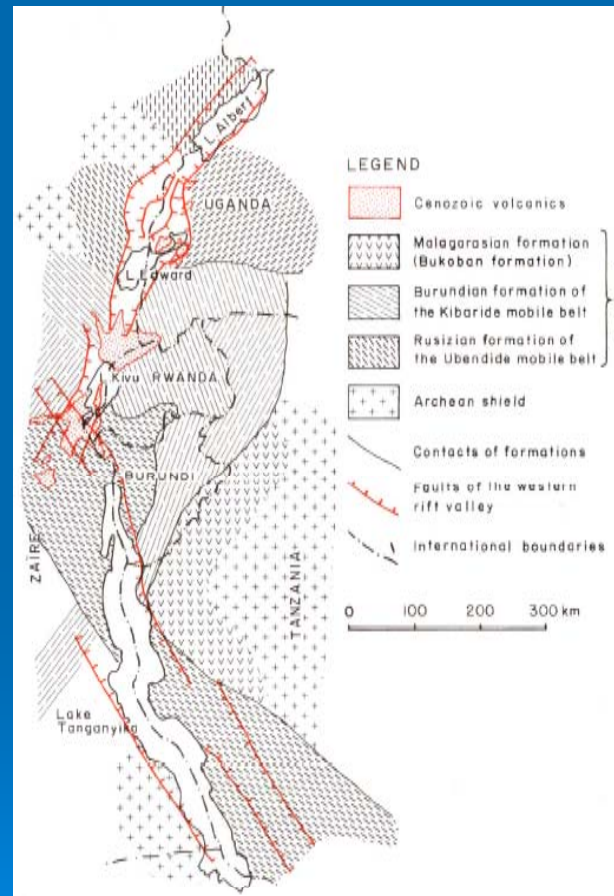
# RECENT SURVEY CONCLUSIONS: GEOLOGY

- There is considerable volcanism around Lake Kivu in whose vicinity geothermal heat has been reported
- The chemical composition of the Lake water is affected by geothermal heat
- The Northwestern part of Burundi is on the edge of the Thibinde volcanic region of Lake Kivu.
- Thus from a geological point of view this is the most promising of the geothermal areas in Burundi which were investigated.

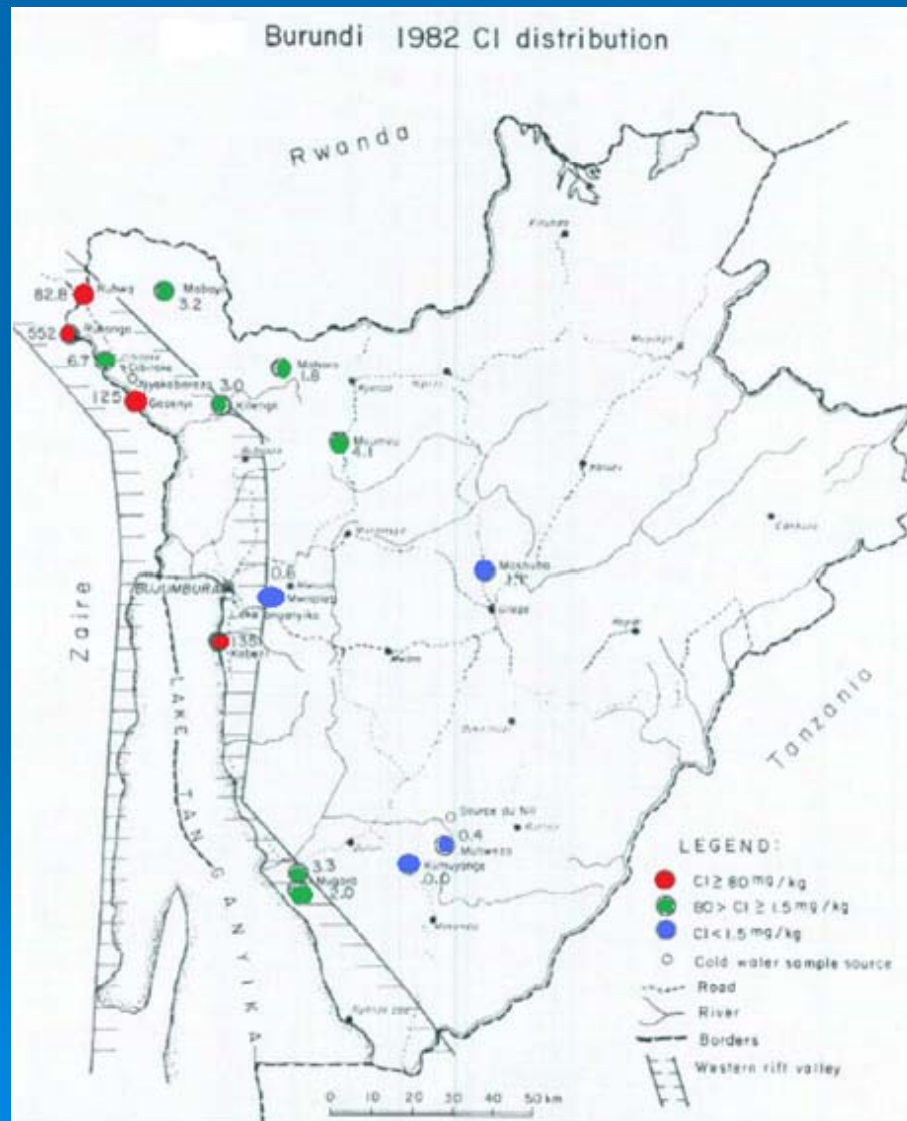
## RECENT SURVEY CONCLUSIONS: GEOLOGY

- Six geothermal locations in the rift valley were visited, four in the Rusizi valley, one on the East coast of Lake Tanganyika (Kabezi), and one further south at some distance from the lake (the Mugara springs).
- In the Rusizi valley and at Kabezi the hot water rises from sediments, but at Mugara from precambrian rock.
- Thus the former sources are likely to originate from larger and more open aquifers than the latter.

# Principal geological structures of central Africa

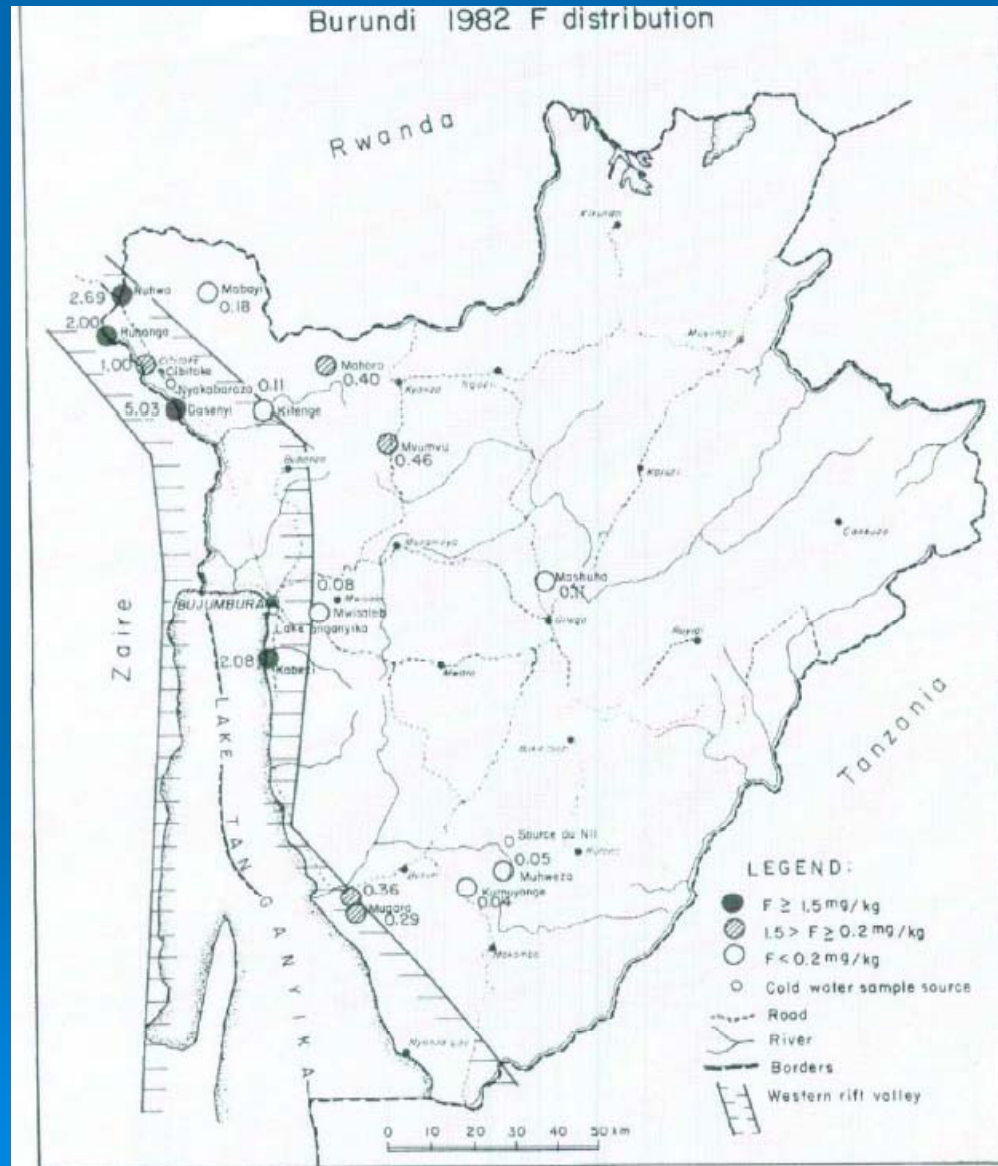


# CI distribution

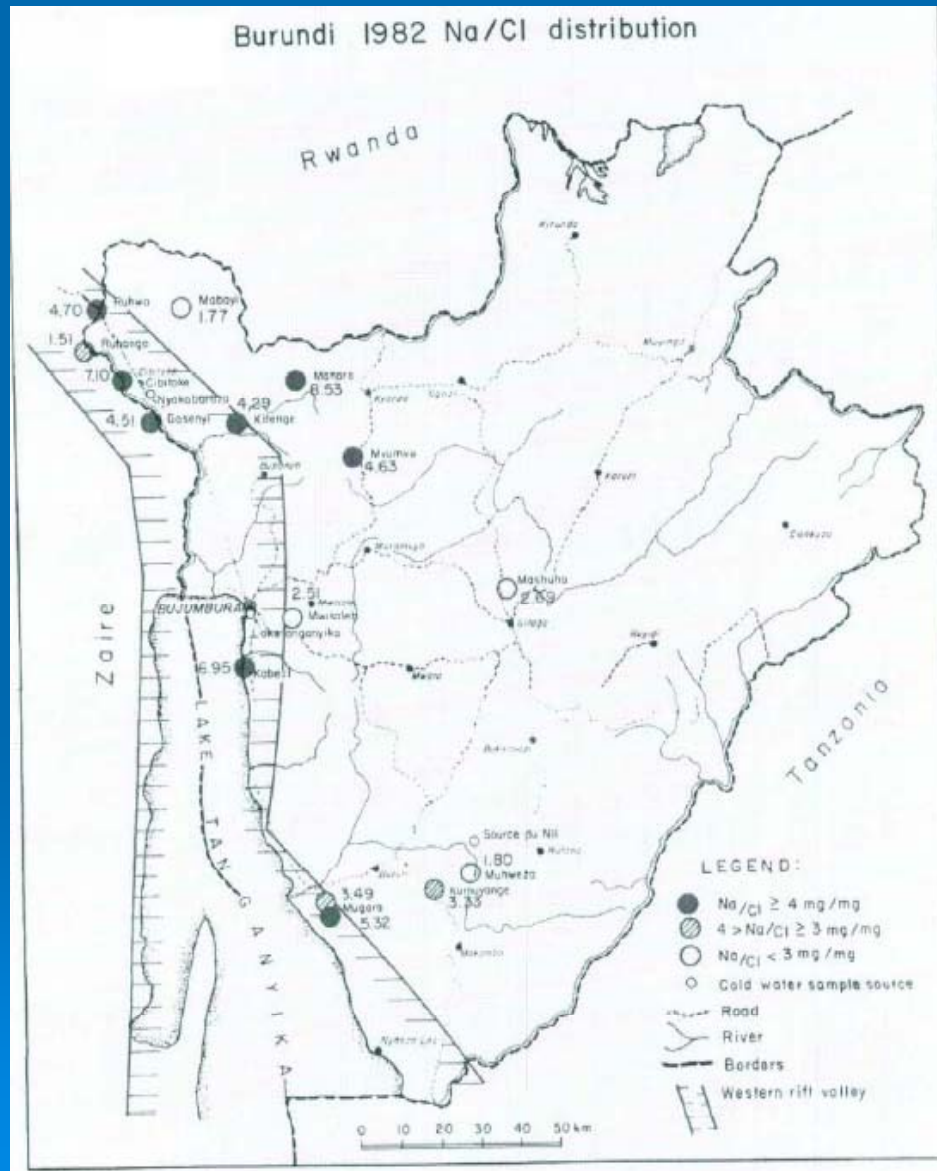




# F distribution



# Na/Cl distribution



### MEASURED T°, CHEMICAL GEOTHERMOMETER T° & PROBABLE SOURCE T°

Location	Measured temperature °C	Chalcedony temperature °C	Quartz temperature °C	Na-K-Ca-Mg temperature °C	Probable source temperature °C
Kabezi	38.0	49	79	50	65
Mwisale	37.0	34	64	34	45
Mashuha	37.7	41	71	32	55
Mvumvu	28.5	67	97	45	60
Mahoro	45.0	54	84	54	70
Kitenge	47.1	47	77	43	65
Mabayi	37.7	31	60	4	45
Ruhwa	63.1	80	109	34	100
Ruhanga	48.3	90	120	37	105
Gasenyi	59.5	93	123	93	110
Cibitoke	30.6	48	78	45	60
Nyakabaraza	22.7	54	84	23	23
Mugara I	46.8	60	90	73	85
Mugara III	46.0	65	95	68	85
Kumuyange	40.1	42	72	35	60
Muhweza	37.3	39	69	22	55
Source du Nil	16.8	0	29	11	17
Lac Tanganyika	28.0	-8	20	28	28

### EXPECTED RESERVOIRS TEMPERATURES

Location	Underground source temperature assuming no boiling, °C	Underground source temperature assuming maximum steam loss, °C
Gasenyi	240	160
Ruhanga	220	150
Ruhwa	140	130

# GEOCHEMISTRY

## RECENT SURVEY CONCLUSIONS

- Chemical geothermometers suggest highest source temperatures in the rift valley and the three highest temperatures were estimated at locations in the Rusizi valley.
- All discharges rising from sediments were carbon dioxide rich
- This could indicate the presence of a powerful heat source.
- The high carbon dioxide concentrations lead to supersaturation with respect to calcium carbonate in some cases, so that care would have to be exercised in avoiding calcium carbonate deposition in the event exploitation CI distribution.

# RECENT SURVEY CONCLUSIONS: GEOCHEMISTRY

- In summary, an exploitable geothermal source which has temperature in 100°-160°C range, may exist in the Rusizi valley and probably extends well into RDC and Rwanda.
- This source is thought to be connected to the Thibinde volcanic area south of Lake Kivu.
- Therefore, an anomalous geothermal gradient may be expected in this region.
- The temperature in Burundi is unlikely to be high

# GEOCHEMISTRY

## RECENT SURVEY CONCLUSIONS

- Base enough for conventional electricity production, but is suitable for many industrial and domestic uses.
- Of the existing industries in Burundi, the sugar factory, the tea factories, the brewery factory could benefit from such use, and any new industries especially those in which heating and drying are involved could use such an energy source.
- The geothermal water in Rusizi valley is carbon dioxide rich and a minor exploitation might involve its cooling and bottling as mineral water.

# GEOCHEMISTRY

## RECENT SURVEY CONCLUSIONS

- The most chloride rich sources would, however, be unsuitable in this respect
- The water rising from Precambrian rock is unlikely to be exploitable for other than direct uses such as bathing.



## Conclusion

- There is no surveys on going in the country for now, political commitment is still needed.
- Specific surveys must be carried out in order to develop the geothermal energy.
- Investors are invited to participate in the development of the Burundi's energy sector.

# MURAKOZE



THANK YOU FOR  
YOUR ATTENTION