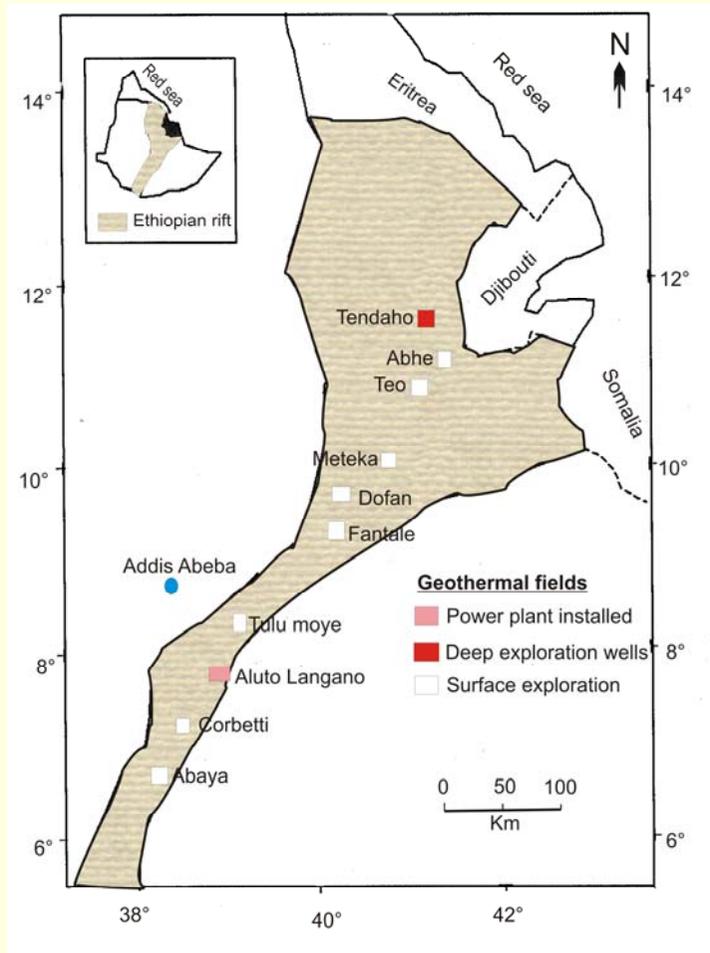

Environmental Impact Assessment for the Development of Tendaho Geothermal Field, Ethiopia



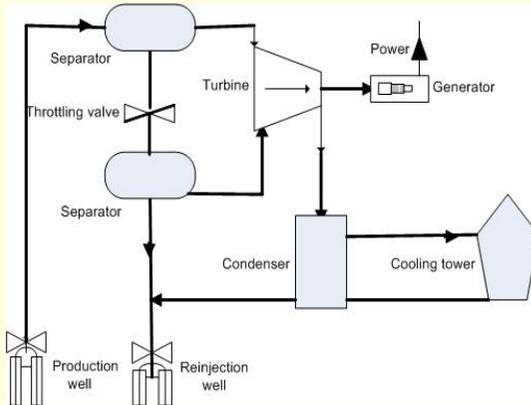
Solomon Kebede
Geological Survey of Ethiopia
solo450354@yahoo.com

Location of Tendaho

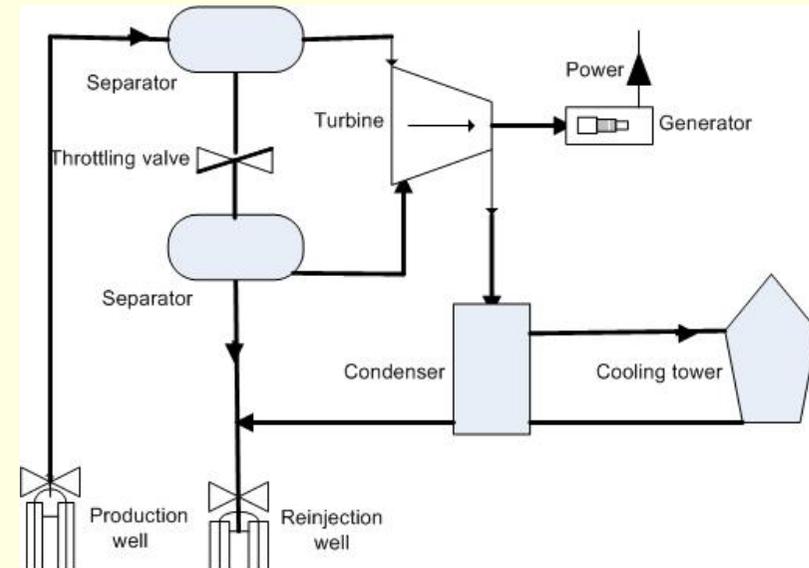


- NE of AA about 600km in northern Afar
- Six geothermal wells have been drilled so far
- Three (shallow) and one deep well are prouctive
- There is a plan to pogress the field to development

Proposed development



Small scale plant on shallow resource



Medium scale plant on deep resource

*Deep
drilling*



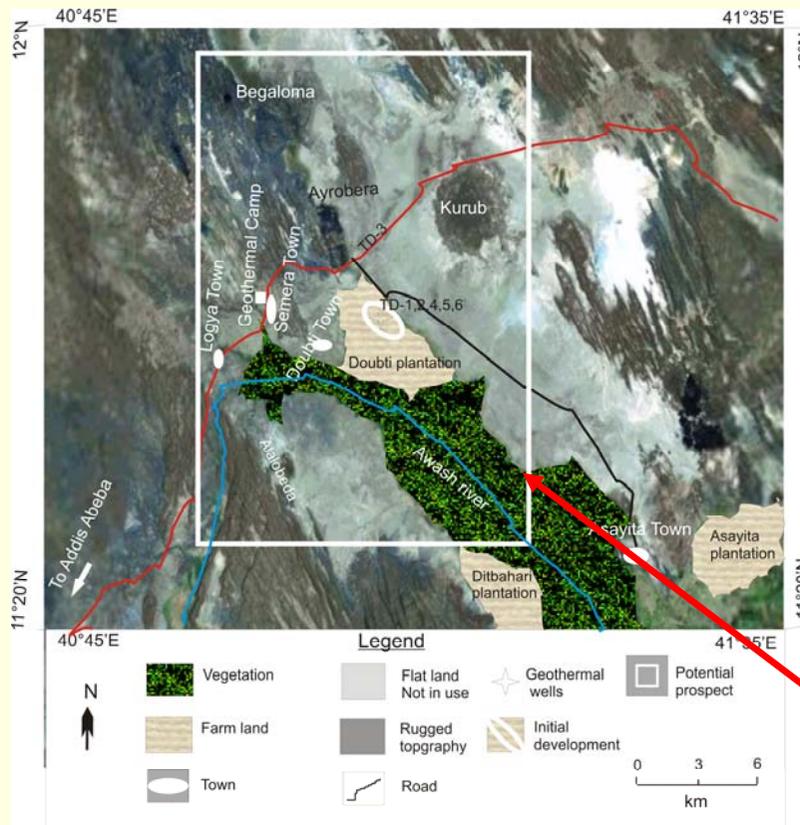
Methodology of Assessment

- Field observation and data collection
- Interpretation of collected data
- National and international standards
- Stakeholders opinion

Baseline environment

- **Air Quality and Climate:** The state of the atmosphere at Tendaho and its surrounding is generally good.
- **Wild life:** There is no noticeable wild life.
- **Water resources:** The majority gets from unprotected water sources, such as rivers, ponds and springs
- **Social services:** inadequate.
- **Energy resources:** Thermal electricity at high cost 48.13% use kerosene, 26.53% use electricity and 25.09% use fire wood.

Baseline environment contd.



- **Land use:** 1.2% irrigated cultivation, 15% grassland, 24% shrub land, 2% woodland, 1% water, 2% wetland and 55% soil, sands rock (bare land).

Tendao Geoth. Field

Baseline environment contd



- Dominant wind direction towards NW
- Windy with speeds 10-20m/sec



- Extensive hot spring geysers at SW part

Characteristics of the geothermal resource

NCG values range 0.1-1 % wt/%

Geoth. field	As	B	H₂S	NH₃	Li	
Tendaho(separated water)	0.4	4.6	0.1	1.49	1.06	
Wairaki(deep water)	4.7	30	1.7	0.2	14	
Salton sea (deep water)	12	390	16	386	215	
Nesjavellir(separated water)	0.05	2.1				
Threshold value	0.3	0.5	0.05	1.5		

Results of Assessment

■ Negative impacts

Physical impacts

- *Exploitation from the shallow resource induces land subsidence and hydrothermal eruption*

Chemical and thermal impacts

- *Impact on surrounding farmland due to waste water disposal at surface and air emissions*

Impact on occupational and public safety

- *Potential damage to life and property due to hydrothermal eruption*

Results of Assessment

Impact on Cultural Heritages and scene

- Fluid withdrawal in SW of Tendaho impact hot springs

Positive Impacts

- On the socio economy

Assessment of impact significance

Criteria of assessment

Criteria	High	Medium	Low
Extent	National/international	Regional	local
Intensity	Affects protected areas	Affects areas of potential conservation	areas of little potential conservation
Duration	> 15 years	5-15 years	0-5 years
Mitigation potential	No mechanism	Partly	Fully
Acceptability	Unacceptable	Manageable	No risk

Results of assessment of impact significance

- The shallow resource development may have medium rated negative impact on soil, life and property.
- Surface disposal of waste water may have medium rated negative thermal/chemical impact on veget.
- Impacts due to air emissions are low rated.
- withdrawal of fluids may have medium rated negative impact on cultural heritages (natural manifestations)
- High rated positive impact on the socio economy.

Mitigation and environmental measures



- Power plant shall be NW of productive wells
- Caution and very close monitoring of thermal activity on developing the shallow resource
- Balance withdrawal of fluids with recharge
- Reinjection of waste water
- Long term geochemical monitoring

COCLUSIONS AND RECOMMENDATIONS

- Assessment of impacts showed medium rated –ve impacts on vegetation, safety and cultural heritages
- Impact on the socio economy is +ve
- All impacts are mitigable with appropriate measures
- The proposed Tendaho geothermal development could proceed with implementation of the recommended environmental management measures