

Environmental aspects of geothermal utilisation

Presented by Dr. Ólafur G. Flóvenz, general director of
ISOR – Iceland GeoSurvey
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geothermal energy

Environmental concerns

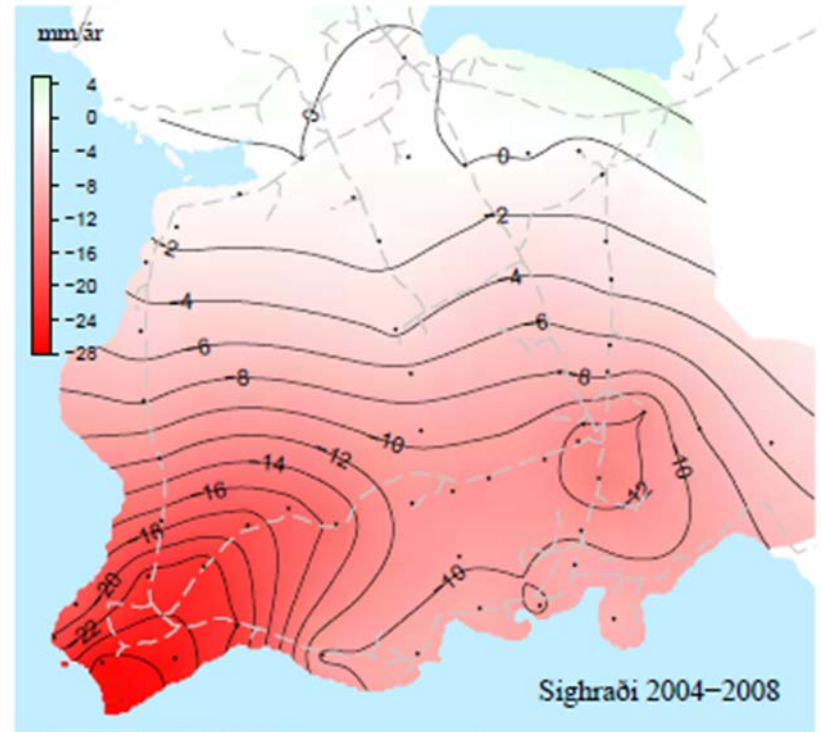
- Surface disturbances
- Physical effects - fluid withdrawal
- Noise
- Thermal pollution
- Chemical pollution
- Protection
- Social and economic effects

Surface disturbances

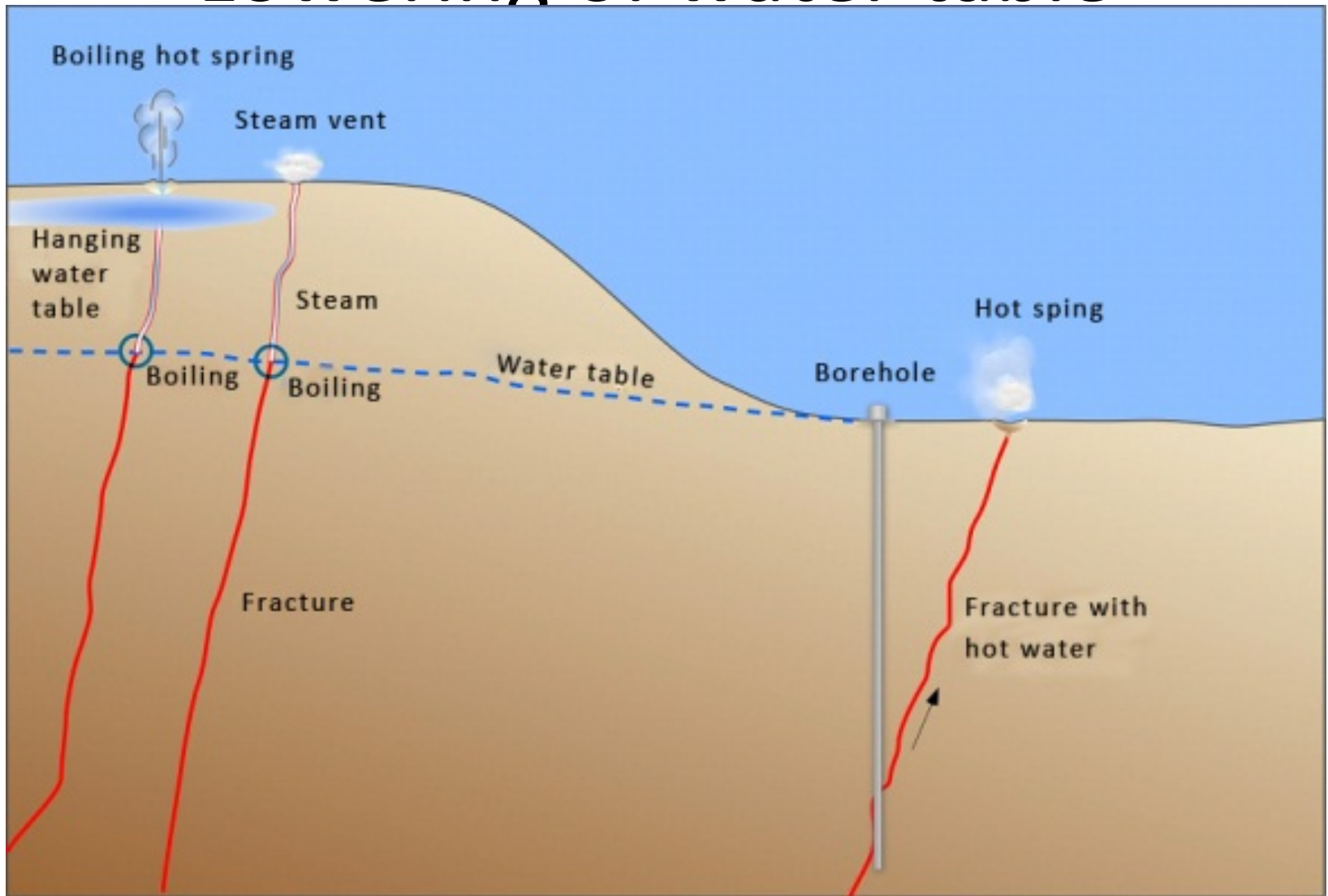
- Excavation
- Construction
- Roads
- Landslides
- Scenery
- Changes in surface geothermal activity
- Untidiness

Fluid withdrawal effects

- Subsidence
 - Most prominent in sedimentary systems
- Lowering of groundwater table
 - Changes in surface manifestations
 - Steam pillows
 - Inflow of cold or corrosive water

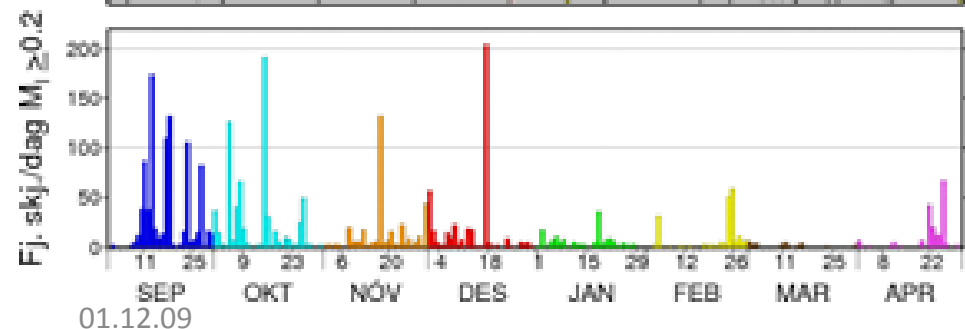
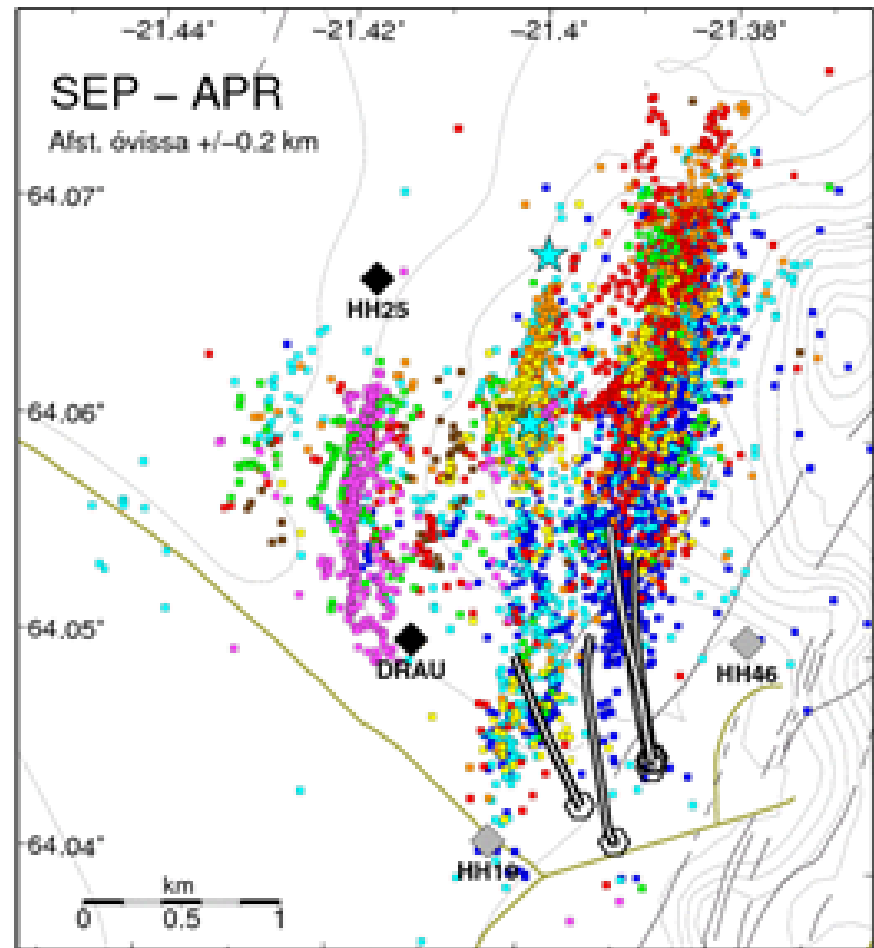


Lowering of water table



Induce

- Fluid withdrawal do not cause considerable induced seismicity.
- Fluid injection can.
 - Soultz
 - Basel
 - Geiser
 - Hellisheiði



Air pollution

- **Major offenders: CO₂, H₂S**
- Minor offenders: CH₄, Hg, Rn, NH₃, B
- CO₂, CH₄: Greenhouse gases
- H₂S: Toxic if conc. Smell chief concern. Can be removed
- Hg, Rn, NH₃, B: Minor toxic gases, B especially to plants

Chemicals in liquid fraction

- H₂S, As, B, Hg and more heavy metals
- Means of disposal
 - Direct. May be hazardous to life. Possible accumulation as well as quantity need watching
 - Ponds. Become sealed by silica and increase in area to unacceptable size
 - Treatment. Processes designed have not yet been found economic
 - Reinjection. Effective

Social and economic effects

- Temporary rise in employment. May harm traditional industries.
- Temporary rise in population.
- Increase in service industries to cater for temporary residents.
- Opening up of area for tourism. Better roads and service facilities. May be permanent.
- Discuss with locals and deal with in EIA. Stress benefits to locals.