

Tongonan geothermal reservoir, Philippines

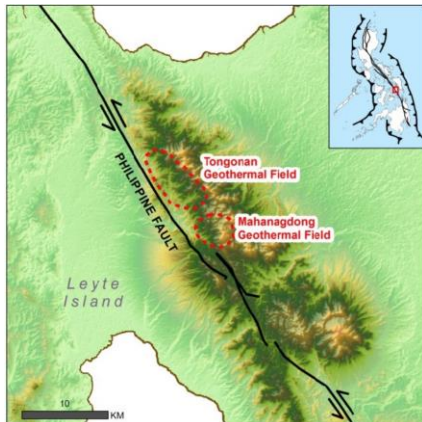
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Location:

- In central highlands of Leyte province/island (Eastern Visayas region)

Geological Setting:

- Within tectonically active Philippine Mobile Belt
 - Eastern bound: Philippine Trench
 - Western bound: Manila Trench, Negros Trench, Cotabato Trench
 - Philippine Fault Zone (NW-SE)
- Hosted by andesitic volcano-sedimentary units intruded by microdioritic dykes



Size:

- One of largest water-dominated systems in the world
- 2 hydrothermal systems in Leyte Geothermal Production Field: Tongonan, Mahanagdong
- Production sectors Tongonan (15 km²): Upper Mahiao, Tongonan-1, Malitbog, South Sambaloran

Reservoir characteristics:

- Stored heat capacity Tongonan: 590-740 MW
- Convective upflow centered in area of Upper Mahiao and Tongonan-1
- Lateral outflow toward Malitbog and UM
- Up to 300°C (relatively constant over time, mostly 280°C contour)
- Fluid enthalpy : 1500-2700 kJ/kg

Current exploitation and management strategies:

- Exploration since 1960's
- Commercial operation since 1983: Increased production over time led to changes in reservoir response
- Adaption strategies
- LGPF provides ~37 % installed geothermal capacity in Philippines
- 3 power plants – Total installed capacity: ~710 MW
- Total mass extraction rate: 5Mt/month - Total brine injection rate: 2 Mt/month (2000)

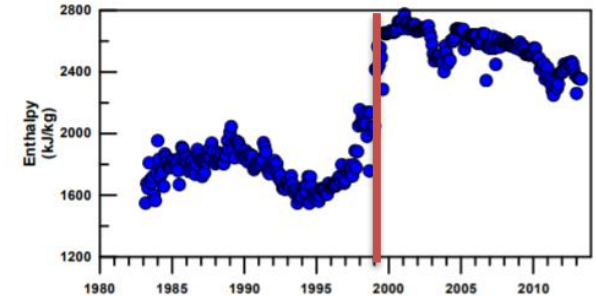


Figure 7: Tongonan-1 Field Enthalpy Trend

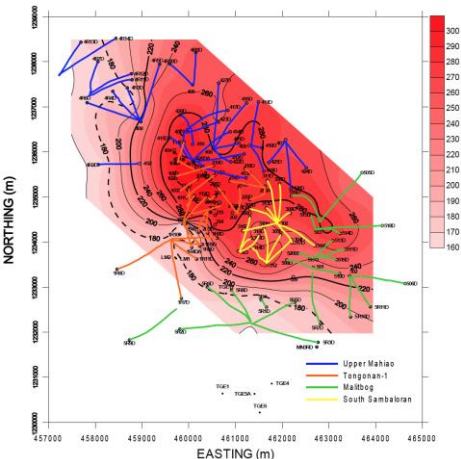


Figure 5: Tongonan Temperature Contour

References: Uribe et al., 2015; Dacillo et al., 2010; Ana et al., 1999; Austria et al., 2015; Mismanos and Vasquez, 2015.