Dallol Geothermal Field

January 17, 2020
***Source**: The Hindu*

Manifest pedagogy: Dallol represents the region which is completely devoid of life. The physio-chemical conditions of such regions could be asked at preliminary stage. Brief preparation of the above helps in answering Science & Tech questions.

In news: Scientists recently discovered a place on earth which is devoid of any form of life.

Placing it in syllabus: Geothermal energy

Dimensions:

- Dallol Geothermal Field
- Geographical location
- Its physio-chemical properties

Content: Geothermal energy is the heat derived within the sub-surface of the earth. Water and/or steam carry the geothermal energy to the Earth's surface.

Dallol Geothermal Field:

- Scientists have discovered that **hot, hyperacid ponds of Dallol Geothermal Field in Ethiopia** and the nearby **magnesium-filled salt pools have no life.**
- The conditions here are so extreme that even **microbes cannot adapt to survive.**
- The **importance of this finding** is that it could help us understand the limits of habitability of life on Earth despite the presence of liquid water.
- This place has **extreme conditions of heat (daily temperatures soar over 45 degrees Celsius even in winters) and dryness t**hat the study experts have

proposed it as a terrestrial analogue of early Mars.
- It is also one of the **lowest land points on Earth** which lies 410 feet below the mean sea level.

Its geographical location:

- Dallol lies in the evaporitic plain of the **Danakil depression at the Afar Triangle.**
- It lies in the prolongation of the **Erta Ale basaltic volcanic range.**
- The intrusion of basaltic magma in the marine sedimentary sequence of Danakil resulted in the formation of a **salt dome structure,** where the hydrothermal system is hosted.

- The wider area of Dallol is known as one of the driest and hottest places on the planet.
- **Other known hydrothermal features** nearby Dallol are Yellow and Black Lakes.
- Earlier findings had shown that **microorganisms cannot survive in the magnesium-rich Black and Yellow lakes.**

Physio-chemical properties of Dallol field:

- The hydrothermal springs of Dallol discharge **anoxic, hyper-acidic, hyper-saline (almost 10 times more saline than seawater), high temperature brines** that contain more than 26 g/L of iron.
- The pH scale measurements even reach negative readings at times.
- The **main gas phases** emitted from the springs are CO_2, H_2S, N_2, SO_2 and traces of H_2, Ar, and O_2.
- The coexistence of such extreme physicochemical characteristics has left Dallol to be one of the very few **'poly-extreme' sites** on Earth.
- **Parts of the region are nearly sterile,** except for a diverse array of "ultrasmall" archaea.

- In contrast to other hydrothermal systems known for their colorful pools (e.g. Yellowstone), where the colors are generated by biological activity, **the color palette of Dallol is produced by the inorganic oxidation of the abundant iron phases.**
- It has a **wide array of unusual mineral pattern**s like salt-pillars, miniature geysers, water-lilies, flower-like crystals, egg-shaped crusts, and pearl-like spheres.