



Hunga Tonga-Hunga Ha'apai Volcano

For Prelims: [Hunga Tonga-Hunga Ha'apai](#) , Pinatubo , Krakatoa, Tambora, Samalás, Greenhouse Gases , [El - Nino](#) , [Paris Agreement](#) , IPCC, Cooling credits , Sun dimming.

For Mains: [Effect Of Volcano On Global Warming](#) , Types of volcano

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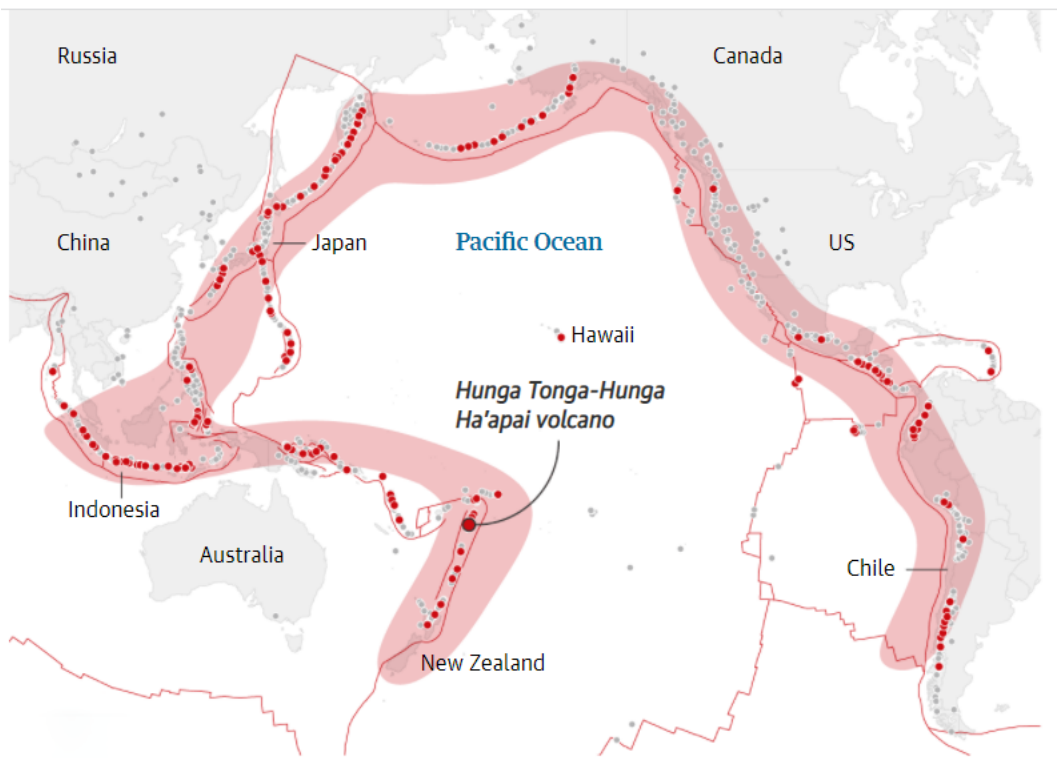
Why in News?

The Year 2023 has recorded unprecedented temperatures. Scientists believe one of the reasons for this may be an underwater volcanic eruption of **Hunga Tonga-Hunga Ha'apai in the South Pacific in 2022.**

What are the Key Points About Hunga Tonga-Hunga Ha'apai Volcano ?

- The Hunga Tonga-Hunga Ha'apai volcano is in the **western South Pacific Ocean**, west of the main inhabited islands in the Kingdom of Tonga.
- It is one of 12 confirmed **submarine volcanoes along the Tofua Arc**, a segment of the larger Tonga-Kermadec volcanic arc.
 - The Tonga-Kermadec arc formed as a **result of subduction of the Pacific Plate beneath the Indo-Australian Plate.**
- It is an **undersea Volcano** consisting of two small uninhabited islands, Hunga-Ha'apai and Hunga-Tonga.

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How will the Earth's Temperature be Affected by the Hunga Tonga Volcano?

- Generally, massive volcanic eruptions usually **reduce temperatures** because they spit out vast amounts of **sulfur dioxide**, which form **sulfate aerosols** that can reflect sunlight back into space and **cool Earth's surface** temporarily, generally referred as **Sun dimming**.
- However, the Tonga eruption had another effect because it occurred **underwater**. The eruption of Hunga Tonga-Hunga Ha'apai in 2022 **produced a plume 58 km high, and produced the biggest atmospheric explosion ever recorded**.
- The Hunga Tonga-Hunga Ha'apai eruption is peculiar because, in addition to causing the largest increase in **stratospheric aerosol** in decades, it also injected vast amounts of **water vapor** into the stratosphere.
- Water vapor is a **natural greenhouse gas** that absorbs solar radiation and **traps heat in the atmosphere**.
 - The aerosol and water vapor impact the climate system in opposing ways, but several studies have proposed that, **due to its larger and more persistent water vapor plume**, the eruption could have a **temporary net surface warming effect**.

How have Previous Volcanic Eruptions Impacted the Climate Globally?

- In the past 2,500 years, there have been about eight even bigger eruptions, according to the [Intergovernmental Panel on Climate Change \(IPCC\)](#).
- Among them, **Tambora in Indonesia** in 1815 led to a "year without a summer" - with failed harvests from France to the United States.
- Even worse, the eruption of **Samalas in Indonesia** around 1257 led to famines and may have kicked off the **Little Ice Age**, an unusually cool period that lasted until the 19th century.

What are the Types of Volcanoes ?

- In general, Volcanoes can be divided on the basis of **Type of Eruption & Periodicity of Eruption**.
 - **Based on Type of Eruption:** The nature of the eruption mainly depends on the viscosity of the magma and are of two types:
 - **Basic:** The basic magma are dark coloured like basalt, rich in iron and magnesium but poor in silica. They travel far and generate broad shield volcanoes.

- **Acidic:** These are light-coloured, of low density, and have a high percentage of silica and therefore it makes a familiar cone volcano shape.
- **Based on frequency of Eruption:**
 - **Active volcanoes:** They erupt frequently and are mostly located around the Ring of Fire.
 - E.g.: **Mount Stromboli** is an active volcano and it produces so many gas clouds that it is called the Lighthouse of the Mediterranean.
 - **Dormant Volcano:** These are not extinct but have not erupted in recent history. The dormant volcanoes may erupt in future.
 - E.g: **Mount Kilimanjaro**, located in **Tanzania**, **also** the highest mountain in **Africa, is known** to be a dormant Volcano.
 - **Extinct or inactive volcanoes** have not worked in the distant geological past.
 - In most cases the crater of the Volcano is filled with water making it a lake. E.g.: **Deccan Traps**, India.

Conclusion

- Any number of phenomena can sway global temperatures, from **El Niño** conditions in the Pacific Ocean to wildfires in Siberia.
- The Hunga Tonga-Hunga Ha'apai eruption may nudge the temperature past 1.5°C of warming, but that doesn't mean the **Paris Agreement** has failed yet; the event demonstrated how close the world is to its agreed-upon tipping point.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. Mention the global occurrence of volcanic eruptions in 2021 and their impact on regional environment. **(2021)**

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