



Indian Neutrino Observatory

For Prelims: Indian Neutrino Observatory (INO), Neutrinos, Western Ghats, sensitive ecological zone, Periyar Tiger Reserve, Shola National Park, global biodiversity hotspot, supernovae

For Mains: Achievements of Indians in Science & Technology, Scientific Innovations & Discoveries, Indian Neutrino Observatory (INO), Neutrinos, arguments against INO, Future Applications of Neutrinos

Why in News

Recently, the Tamil Nadu Government has made clear to the [Supreme Court](#) that it does not want the [Indian Neutrino Observatory \(INO\)](#) to be set up in [Eco-Sensitive Zones](#) in the [Western Ghats](#).

- INO will incur great cost to **wildlife, biodiversity and ignores the local opposition.**
- Eco-Sensitive Zones are areas within 10 kms around [Protected Areas, National Parks and Wildlife Sanctuaries](#).

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What are the arguments of the Tamil Nadu Government?

- The Government asserted that the **project falls exactly on the hill slopes of this part of the Western Ghats**, which align within it a significant tiger corridor, namely the **Mathikettan-Periyar tiger corridor**.
 - This corridor links the [Periyar Tiger Reserve](#) along the Kerala and Tamil Nadu borders and the Mathikettan [Shola National Park](#).
 - **Quarrying and construction activities** will upset wild animals which use the corridor for seasonal migrations.
- The area is a **significant watershed and catchment zone** for the rivers **Sambhal and Kottakudi**.
- Though the experiments in the observatory would be conducted a kilometre underground, massive blasting, activities like transportation, excavations and tunnelling among others, would **jeopardise the ecological sustainability of the zone, deep in the Western Ghats**.
- The protection of the Western Ghats was supreme as they are a [global biodiversity hotspot](#) and a treasure trove of biological diversity.
 - The specific region harbours many endemic species of flowering plants, fish, amphibians, reptiles, birds, mammals and invertebrates other than large numbers of [elephants](#) and [tigers](#).

What is the Indian Neutrino Observatory (INO)?

- It is a proposed **particle physics research mega project**.
- The objective of the project was to study neutrinos in a **1,200-metre deep cave**.
- The project is proposed to be set up at Pottipuram village in **Theni district in Tamil Nadu**.
- The project was initially mooted by the **Institute of Mathematical Sciences** and then by

Digging deep for knowledge

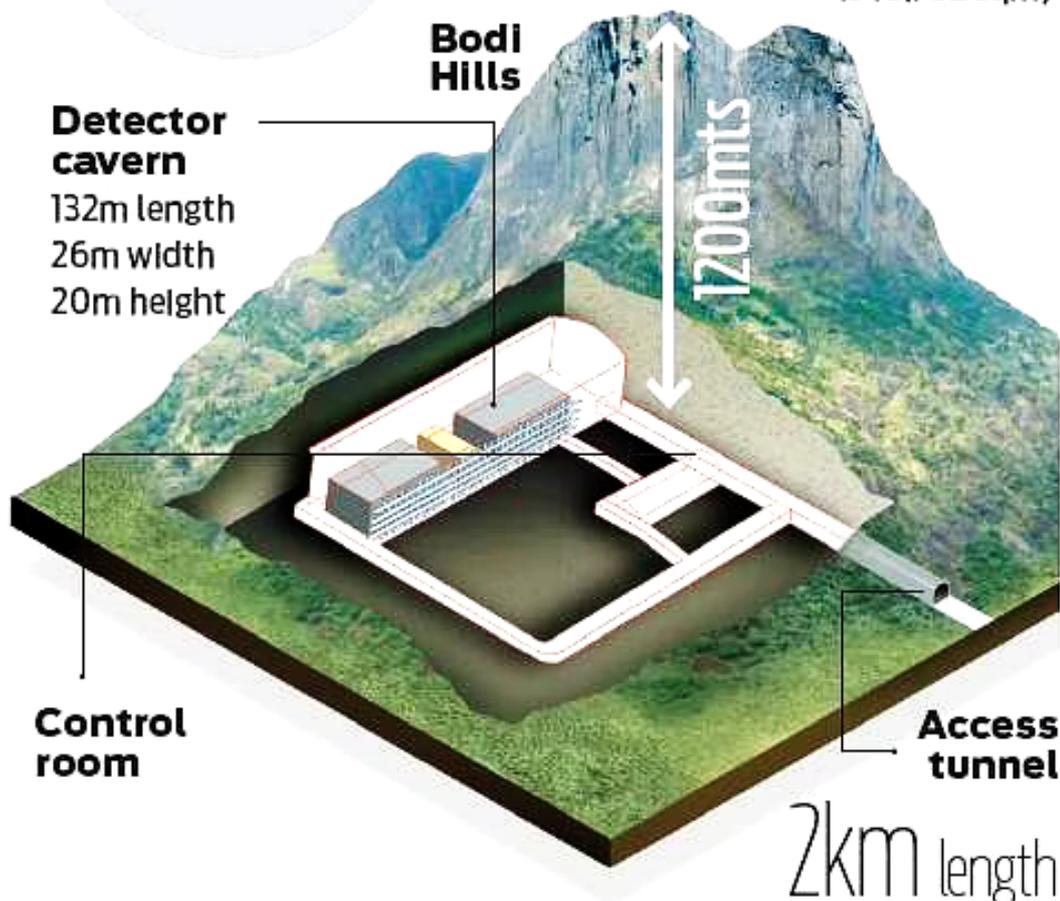
The proposed INO under Bodi hills is India's most ambitious basic science project

Project area

The total area required is 31.445 ha (over ground 26.825 ha and underground 4.62 ha) and total construction (built-up) area of 31,314 sqm (underground facility is 20,552 sqm & over ground facility is 10,762 sqm)

₹1,500 cr

Investment/cost of the project



What is the Importance of Proposed Site Location?

- The proposed site in Theni district was **identified because the rock burden of over 1 km in all directions** shields the detector from other cosmic rays.
 - Since neutrinos can easily pass through anything, they will reach the detector while the **other particles will be filtered out by the rock in the mountain.**
- The geographical location is also peculiar as all the existing neutrino detectors (in other countries) are at latitudes larger than **35 degrees North or South.**
 - There is **none close to the equator as yet.**

What are Neutrinos?

- A neutrino is a **fundamental elementary particle**, and atmospheric neutrinos can be studied

when solar radiation hits the earth's atmosphere.

- They are **very hard to detect** as they **hardly interact with other forms of matter** due to their **lack of electrical charge**.
 - However, they seem to play an important role in the universe of elementary physics, which physicists have been trying to understand for a few decades now.
- They are produced in **high-energy processes** such as within stars and in supernovae.
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- So far, neutrino physics has been **mostly limited to outer space sources**, observing neutrinos from farther-away stars and galaxies.

What can be the Future Applications of Neutrinos?

- **Properties of the Sun:** The visible light is emitted from the surface of the sun and neutrinos, which travel close to the speed of light, are produced in the core of the sun.
 - Studying these neutrinos can help us **understand what goes on in the interior of the sun**.
- **Constituents of the Universe:** Light coming from distant stars can be studied by astronomers, for example, to detect new planets.
 - Likewise, if the properties of neutrinos are understood better, **they can be used in astronomy to discover what the universe is made up of**.
- **Probing Early Universe:** Neutrinos interact very little with the matter around them, so they travel long distances uninterrupted. The extragalactic (originating outside the Milky Way galaxy) neutrinos we observe may be coming from the distant past.
 - These undamaged messengers can give us a clue about the **origin of the universe and the early stages of the infant universe, soon after the Big Bang**.
- **Medical Imaging:** Apart from direct future uses of neutrinos, there are technological applications of the detectors that will be used to study them.
 - For instance, X-ray machines, MRI scans, etc., all came **out of research into particle detectors**.
 - Hence the INO detectors **may have applications in medical imaging**.

What are Eco- Sensitive Zones?

- Eco-Sensitive Zones or **Ecologically Fragile Areas** are **areas within 10 kms around Protected Areas**, National Parks and Wildlife Sanctuaries.
 - In case of places with sensitive corridors, connectivity and ecologically important patches, crucial for landscape linkage, even areas beyond 10 km width can be included in the eco-sensitive zone.
- ESZs are **notified by the Ministry of Environment, Forest, and Climate Change (MoEFCC)**, under [Environment Protection Act, 1986](#).
- The basic aim is **to regulate certain activities around National Parks and Wildlife Sanctuaries** so as to minimise the negative impacts of such activities on the fragile ecosystem encompassing the protected areas.

[Source: TH](#)