Union Cabinet approves LIGO-India

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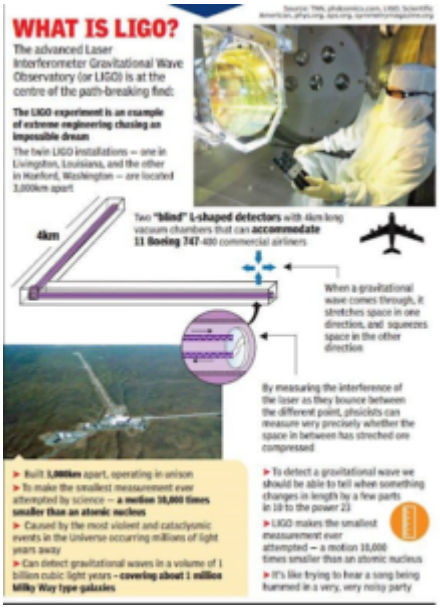
In news– Recently, the Union government has given the final go-ahead to India's Laser Interferometer Gravitational-Wave Observatory, or LIGO, project.

About the Project-

- The Union Cabinet's approval to set up a **gravitational-wave detection facility in Maharashtra,** a ₹2,600 crore project.
- It is one that will **consist of a detector called the Laser Interferometer Gravitational-wave Observatory (LIGO)**, to be built in the image of the twin LIGO instruments already operational in the U.S.
- The facility's construction is expected to be completed by 2030.
- The observatory will be the third of its kind, made to the exact specifications of the twin Laser Interferometer Gravitational-wave Observatories (LIGO), in Louisiana and Washington in the U.S. LIGO-India will work in tandem with them.
- US l**A third detector is being built in India as part of the LIGO-India collaboration** in order to improve the detectors' collective ability to pinpoint sources of gravitational waves in the sky.
- **The Cabinet's approval throws up two opportunities:** first, **India could become a global site of gravitational physics research,** aiding training and the handling of precision technologies and sophisticated control systems, ultimately, cementing a reputation for successfully running an experimental Big Science project.
- **Second, LIGO-India can demonstrate an ability to reckon**

intelligently with Indian society's relationship with science, using the opportunities that Big Science affords.

- India has had a contested relationship with such projects, including, recently, **the Challakere Science City and the stalled India-based Neutrino Observatory (INO).**
- The project is jointly funded by the department of science and technology and the department of atomic energy.
- The mega-science project in astronomy promises breakthrough research, development of cutting-edge technology and opportunities for students and researchers.
- LIGO-India will be built by the Department of Atomic Energy and the Department of Science and Technology, with a memorandum of understanding with the U.S. National Science Foundation and several national and international research institutions.
- The U.S. will provide key components for the lab worth around Rs 560 crore.



LIGO &Gravitational waves-

- The LIGO is a giant L-shaped instrument. Each arm of the

‘L’ is 4 km long.

- Two laser pulses are shot through each arm at the same time, and they bounce off a mirror at the end to return to the vertex. A detector checks whether the pulses return at the same time.
- When a gravitational wave passes through the detector, the pulses are slightly out of time.
- Researchers use this and other signals to detect, record, and study gravitational waves
- **Gravitational waves are emitted by very massive objects in the universe** in extreme environments, such as when black holes collide.
- Just as light emitted by an object can be used to probe its electromagnetic properties, **gravitational waves can be used to probe the gravitational features of the source.**
- **While two LIGOs can study gravitational waves,** a third observatory is required to better triangulate the location of a source in the sky.
- A more ideal setup requires four observatories to record the same wave. **To this end, researchers are setting up and upgrading detectors in Italy and Japan.**