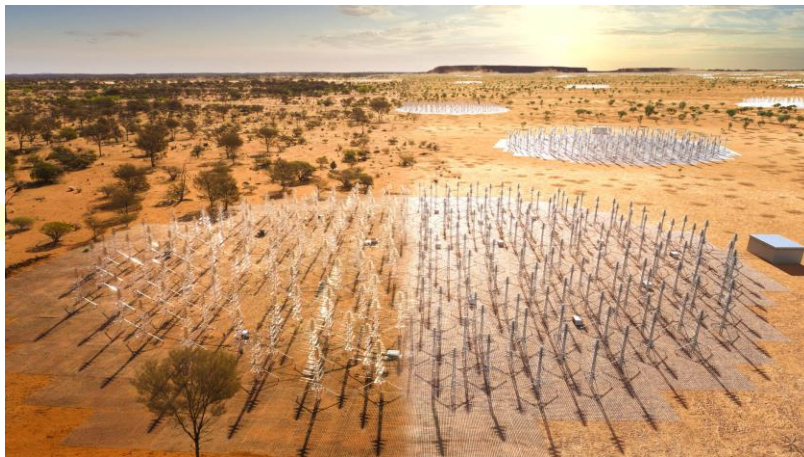


Square Kilometer Array Project

Why In News

- **India had decided** to formally join the **Square Kilometer Array (SKA)** project, an international scientific collaboration working to build the world's largest radio telescope.
- India had already been contributing to the project for the past several years, but the **full member status**, which offers greater scientific opportunities to use the upcoming facility, requires countries to sign and ratify an international treaty, and also make a financial commitment.
- **India has approved Rs 1,250 crore for the project**, which includes its funding contribution for the construction phase.



- The decision to join SKA as a full member ensures India's participation in yet another international mega science project in the most advanced areas of scientific research.
- India has already decided to build a gravitational wave detector to join the international **LIGO (Laser Interferometer Gravitational Wave Observatory)** network, and is a full member of the ITER project, which is working to harness energy from nuclear fusion reactions.
- India also has a strong participation in the **Large Hadron Collider (LHC)**, the world's largest and most powerful particle accelerator that is running some of the most exciting experiments in particle physics.

Square Kilometer Array

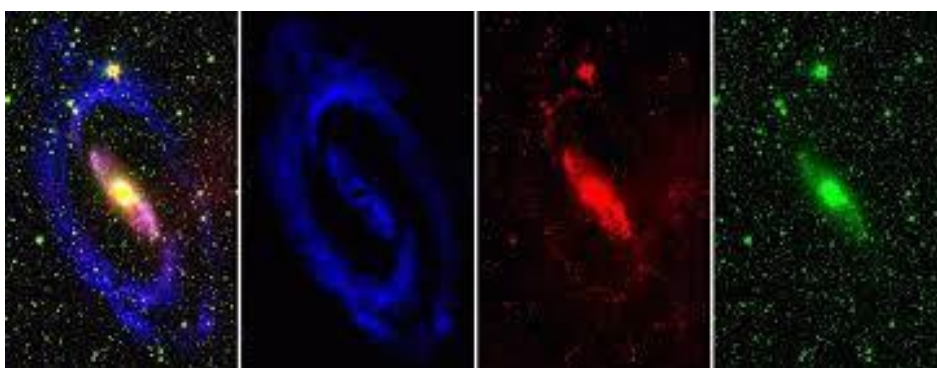
- **Square Kilometre Array Observatory (SKAO)** was founded in 2019 and has **16 consortium members**: Australia, South Africa, Canada, China, India, Japan, South Korea, the UK, Spain, Portugal, Switzerland, France, Germany, the Netherlands, Sweden, and Italy.
- The SKA Observatory aims to build the **world's largest and most sensitive radio telescope**, combining cutting-edge technology with a vast collecting area to address a wide range of scientific questions in astronomy, astrophysics, and cosmology.



- The Square Kilometer Array will not be a **single large telescope**, but a collection of thousands of dish antennas operating as a single unit.
- The name, Square Kilometer Array, comes from the original intention **to create one square kilometre (one million square metre) of effective area** for collecting radio waves.
- This was meant to be achieved by installing thousands of smaller antennas in a specific array design that would make them function like a single radio telescope.



- As of now, it appears that the **USD 2.4-billion project** (2021 prices) would eventually have a lesser collecting area than one square kilometre, but the original name has been retained.
- The antennas, about **200 of them in South Africa** and more than **130,000 in Australia**, are being installed in sparsely populated locations, chosen to ensure they are as far away from human activities as possible.



- This has been done in order to minimise signal interference from undesirable Earth-based sources. Construction at both the sites began in December 2022, and the first phase of the project is expected to be completed by next year.
- Once operational, **SKA would be between 5 to 60 times more powerful** than the most advanced existing radio telescopes functioning in comparable frequency ranges.

What's In It For India

- Though **none of the SKA facilities** would be **located in India**, there are immense science and technology gains for the country by participating in the project as a full member.
- In this regard, SKA offers **opportunities similar to the LHC** or the ITER, which too are located on foreign soil but have brought rich dividends to the Indian scientific community.
- Radio astronomy is something in which India already has highly developed capabilities.
- The **Giant Meterwave Radio Telescope (GMRT)** near Pune is one of the most advanced — and sought-after — facilities in the world, which has been producing remarkable scientific results.
- There are other similar facilities in Ooty, Nainital and Bengaluru. The SKA, which will become the most promising tool for research in the most pressing scientific

questions in astronomy, offers the next logical step forward for Indian scientists working in this area.



- A **full member status** would provide **India preferential access** to the SKA facilities. Most existing telescopes **operate under an open-use policy** which allows research groups from any country to get time on the facility through competitive bidding by making a scientific case.
- This is how the GMRT also works. But there is a growing argument that countries that contribute to **building any large international project** should have priority access to that facility.



- There are **technology benefits** as well. The SKA would work on highest-end technologies, including electronics, software, materials science and computing. The intellectual properties generated by the project, though owned by the SKA Observatory, would be **accessible to all the member countries**.

- This can offer huge learning opportunities for scientists, academics and even private industry.
- Participating in the project is also expected to result in expanding the **science and technology base in this area**, along with capacity building and training opportunities.



- The Indian participation in the project is being led by **Pune-based National Centre for Radio Astrophysics (NCRA)**, but 22 institutions are collaborating on SKA-related activities in the country. These include not just leading research institutions and some IITs and IISERs, but also a couple of universities and colleges. A few private companies are also involved.

