Significance of Atmospheric Research Testbed (ART)

Why in news?

Recently the 1st phase of India's Atmospheric Research Testbed in Central India (ART-CI) was inaugurated at Bhopal in Madhya Pradesh.

What is Atmospheric Research Testbed?

- **Fund-** Ministry of Earth Sciences (MoES).
- **Implementation by** - Indian Institute of Tropical Metrology, Pune.
- **ACROSS scheme**- ART-CI is the component under ***Atmosphere & Climate Research-Modelling Observing Systems & Services*** (ACROSS), central sector scheme, pertains to the atmospheric science programs of MoES.
- **About-**It is an open-field observational and analytical research program aimed at studying vital cloud processes associated with the Indian monsoon, particularly focusing on the ***Monsoon Core Zone (MCZ)*** in central India.

  The core monsoon zone is a region in India that stretches from Gujarat in the west to West Bengal in the east

- **Need-** To conduct comprehensive observations of weather and cloud parameters, crucial for understanding monsoon patterns.
- **Location significance-** The selection of Silkheda in Madhya Pradesh as the site for ART is strategic as it is positioned directly in the path of major rain-bearing synoptic systems, it facilitates direct monitoring and tracking of these systems.
- **High quality data-** The pristine environment, devoid of anthropogenic pollutants, makes it an ideal location for deploying sensitive meteorological instruments, ensuring high-quality data collection.
- **First phase-** It will have remote sensing-based and in-situ measurements using 25 meteorological instruments have commenced.
- **Second phase**- ART will deploy instruments such as a radar wind profiler and balloon-bound radiosonde, and soil moisture and temperature measuring equipment.

  At 72 metres, ART will house India's tallest meteorological tower.

What are the objectives of ART-CI?

- **Understand monsoon dynamics**-To better understand on processes governing monsoon convection and land atmospheric interactions over the monsoon core region.
- **Measure parameters**- To measure relevant meteorological parameters using the

state-of-the-art observational systems.

- **Observational campaigns**- To organize intense observational campaigns along with weather prediction model runs for testing hypotheses and to improve physical parameterizations in the models related to convection and land surface processes.
- **Address research needs**- There is an urgent need to understand more on monsoon convection, its diurnal variation and land-atmospheric interactions.
- **Outreach and training**- The testbed will be made into an international facility for intense observational campaigns and testing physical parameterization schemes including sensitivity runs.
- **Improve weather predictions**- To use ART-CI data to test, validate, and constrain numerical models for improving predictions of *intense convective storms and high-impact mesoscale weather events* observed predominantly over the Central India region.
- **Data dissemination-** The data collected at this facility will be shared for research to national and international scientific community within the data policy of the Ministry of Earth Sciences.

How ART-CI is significant to India?

- **Agricultural dependence**- About 45% of India's labour force is employed in agriculture, which relies heavily on rain, especially in the Monsoon Core Zone (MCZ) spanning central India2.
- **Monsoon significance**- The southwest monsoon brings 70% of India's annual rainfall, critical for Kharif crops cultivated during July and August.
- **Study rainfall patterns**: ART helps study the synoptic systems like low pressures or depressions originating in the Bay of Bengal, which significantly influence the monsoon rainfall in the MCZ.
- **Weather forecasting**- The long term data from ART will improve weather models, leading to more *accurate rainfall predictions*, benefiting the agricultural sector.
- **Rainfall correlation**- The rainfall in central India is closely linked to the *overall monsoon performance* across the country, making it a key area for study.
- **Climate change**-With changing climate patterns, understanding monsoon behaviour in this region helps in adapting to erratic rainfall strengthened low pressure systems.
- **Research advancements**- The Atmospheric Research Testbed (ART) enables scientists to gather *long-term data*, improving weather models and rainfall predictions.

Quick facts

ACROSS scheme

• It is central sector scheme that pertains to the atmospheric science programs of the ***Ministry of Earth Sciences*** (MoES).
• The sub-schemes under the ACROSS scheme are multi-disciplinary in nature and will be implemented in an integrated manner through 4 institutes.
• **Institutes** – The four institutes are:
  - India Meteorological Department (IMD)
  - Indian Institute of Tropical Meteorology (IITM)
  - National Centre for Medium Range Weather Forecasting (NCMRWF)
  - Indian National Center for Ocean Information Services (INCOIS)
• They will cover all the aspects of the weather and climate.
• **Sub-Schemes**- Each institute has designated role for accomplishing the tasks through the following schemes:
  - Upgradation of Forecast System
  - Weather & Climate Services
  - Atmospheric Observations Network
  - Numerical Modelling of Weather and Climate
  - Monsoon Mission III
  - Monsoon Convection Clouds and Climate Change (MC4)
  - High Performance Computing System (HPCS)

References

1. The Hindu-Why Atmospheric research bed in Bhopal?
2. Tropmet- About Atmospheric Research Testbed in Central India