



## SCIENCE AND TECHNOLOGY

## OBSERVING GRAVITATIONAL WAVES CRITICAL TO STUDY OF THE COSMOS

**Context:** Last week, scientists reported evidence that the universe is constantly flooded with low frequency gravitational waves.

India's Giant Metre wave Radio Telescope was one of six large telescopes worldwide involved in collecting data that led to the recent discovery.

**What are Gravitational Waves?**

- Gravitational waves are 'ripples' in space-time caused by some of the most violent and energetic processes in the Universe.
- The gravitational waves themselves are invisible. Gravitational waves travel at the speed of light.
- These waves squeeze and stretch anything in their path as they pass by.
- Albert Einstein predicted the existence of gravitational waves in 1916 in his general theory of relativity. Einstein predicted that something special happens when two bodies—such as planets or stars—orbit each other.
- He believed that this kind of movement could cause ripples in space. These ripples would spread out like the ripples in a pond when a stone is tossed in.
- Scientists call these ripples of space gravitational waves.

**What causes gravitational waves?**

- The most powerful gravitational waves are created when objects move at very high speeds. The strongest gravitational waves are produced by cataclysmic events such as colliding black holes, supernovae (massive stars exploding at the end of their lifetimes), and colliding neutron stars.
- Other gravitational waves are predicted to be caused by the rotation of neutron stars that are not perfect spheres, and possibly even the remnants of gravitational radiation created by the Big Bang.
- But these types of objects that create gravitational waves are far away. And sometimes, these events only cause small, weak gravitational waves. The waves are then very weak by the time they reach Earth. This makes gravitational waves hard to detect.

**How do we know that gravitational waves exist?**

- In 2015, scientists detected gravitational waves for the very first time. They used a very sensitive instrument called LIGO (Laser Interferometer Gravitational-Wave Observatory).
- These first gravitational waves happened when two black holes crashed into one another. The collision happened 1.3 billion years ago. But, the ripples didn't make it to Earth until 2015!

**Significance of Gravitational Waves**

Historically, scientists have used electromagnetic (EM) radiation (in the form of visible light, X-rays, microwaves, ultraviolet light, etc.) to study the universe. Gravitational waves are however, a much better way to study the space and universe.

- Intense cosmic events like the collisions of black holes or neutron stars

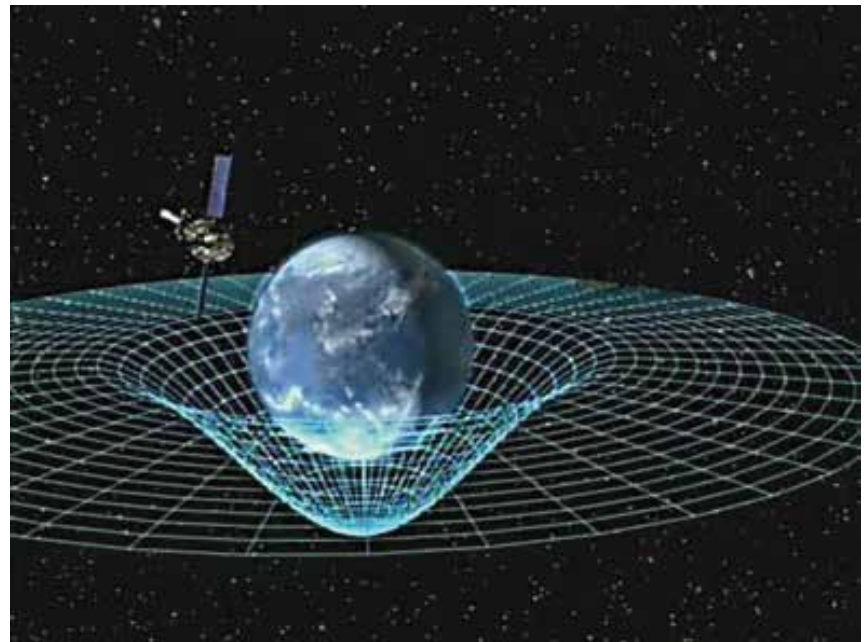


Figure 1: Two-dimensional illustration of how mass in the Universe distorts space-time.

release large amounts of energy as well as gravitational waves. Such events are hard to see in certain wavelengths, but they can be well studied by analysing the gravitational waves.

- Gravitational waves can be used to "listen" to the universe – in effect giving us an 'ear' on the universe's happenings – in addition to the 'eyes' we have had on it, the telescopes that tracked electromagnetic radiation.
- More importantly, since gravitational waves interact very weakly with matter (unlike EM radiation, which can be absorbed, reflected, refracted, or bent by gravity itself), they travel through the Universe virtually unimpeded, carrying information about their origins that is free of distortion.
- Black holes are objects in space with a gravitational pull so strong that even light can't get away from them. As a result, observatories that see electromagnetic radiation alone can't see black holes or study them very well.
- Scientists think that black holes probably began to form shortly after the universe was born. So studying them could reveal important information about their effects on the universe, especially when it was very young.

## CHANDRAYAAN-3

Chandrayaan-3 is a follow-on mission to Chandrayaan-2 to demonstrate end-to-end capability in safe landing and roving on the lunar surface.

It consists of Lander and Rover configuration. It will be launched by LVM3 from SDSC SHAR, Sriharikota.

The propulsion module will carry the lander and rover configuration till 100 km lunar orbit. The propulsion module has Spectro-polarimetry of Habitable Planet Earth (SHAPE) payload to study the spectral and Polari metric measurements of Earth from the lunar orbit.

**Lander payloads:**

Chandra's Surface Thermophysical Experiment (ChaSTE) to measure the thermal conductivity and temperature; Instrument for Lunar Seismic Activity

(ILSA) for measuring the seismicity around the landing site; Langmuir Probe (LP) to estimate the plasma density and its variations. A passive Laser Retroreflector Array from NASA is accommodated for lunar laser ranging studies.

**Rover payloads:**

Alpha Particle X-ray Spectrometer (APXS) and Laser Induced Breakdown Spectroscopy (LIBS) for deriving the elemental composition in the vicinity of landing site.

- Chandrayaan-3 consists of an indigenous Lander module (LM), Propulsion module (PM) and a Rover with an objective of developing and demonstrating new technologies required for Inter planetary missions.
- The Lander will have the capability to soft land at a specified lunar site and

- deploy the Rover which will carry out in-situ chemical analysis of the lunar surface during the course of its mobility.
- The Lander and the Rover have scientific payloads to carry out experiments on the lunar surface.
- The main function of PM is to carry the LM from launch vehicle injection till final lunar 100 km circular polar orbit and separate the LM from PM. Apart from this, the Propulsion Module also has one scientific payload as a value addition which will be operated post separation of Lander Module.

- The launcher identified for Chandrayaan-3 is GSLV-Mk3 which will place the integrated module in an Elliptic Parking Orbit (EPO) of size ~170 x 36500 km.

#### The mission objectives

- To demonstrate Safe and Soft Landing on Lunar Surface
- To demonstrate Rover roving on the moon and
- To conduct in-situ scientific experiments.

## AGRICULTURE/ ECONOMICS

# REPORT OF THE EXPERT COMMITTEE ON MARKET YARD OF NATIONAL IMPORTANCE PLATFORM

**Background :** Concept of e-NAM (National Agriculture Market) has come a long way since its launched in April 2016. So far, 1361 Mandis of 23 States and 04 UTs have been integrated to e-NAM platform. As on 03rd July 2023, more than 1.75 Crore Farmers & 2.45 Lakh traders have been registered on e-NAM portal.

- Achievement of e-NAM has been path breaking in Agri-marketing sector. Though 1361 regulated markets have become a part of the e-NAM platform, a need has been felt that for obtaining a competitive price especially for surplus farmer produce inter-mandi and more importantly, inter-State trade is crucial and it is essential that a more concerted intervention is needed for creating a larger reach for the farmer's surplus produce through an efficient and seamless marketing system across India by promoting quality based trading with a transparent price discovery mechanism for inter-mandi and inter-State trade.
- Taking a stride of policy reforms to the next level and with a vision to enhance the share of the producers in the end consumer price,

- Government of India had constituted a high-level Expert Committee on 21st April, 2023, to promote inter-mandi & inter-State trade through conceptualization and implementation of Market Yard of National Importance (MNI).
- The said expert committee was chaired by Dr. Manoj Rajan, On 4th July, 2023, Chairperson of the Expert Committee has submitted a report of the Expert Committee on MNI platform.
- The committee has recommended the implementation framework of MNI-P platform, legal framework & inter-state reciprocity of license and movement, dispute resolution mechanism, rollout strategy etc.
- This platform will provide an opportunity to farmers of the participating states to sell their surplus produce beyond its state boundaries. This platform would enable to create digital ecosystems that leverage the expertise of various segments of agriculture value chain.

## 'A GLOBAL RUPEE MAY RAISE VOLATILITY'

**News in Gist:** *Asserts that the benefits of internationalisation far outweigh the various concerns*

The Inter-Departmental Group (IDG) of officials of the Reserve Bank of India (RBI) report cautioned internationalisation of Indian Rupee may result in increased volatility in the rupee's exchange rate in the initial stages.

#### Concerns posed by the Inter-Departmental Group (IDG)

- Triffin dilemma - Obligation upon RBI to supply Indian Rupee to meet the global demand may conflict with its domestic monetary policies.
- Capital outflow - Accentuate an external shock, given the need to adopt the
- Full Convertibility to facilitate the flow of funds into and out of the country and from one currency to another.

#### Benefits of internationalisation

- Limited exchange rate risk
- Lower cost of capital due to better access to international financial markets
- High seigniorage benefits
- Reduced requirement of foreign exchange reserves

#### Recommendations

Design a template and adopt a standardised approach for examining the proposals on bilateral and multilateral trade arrangements for invoicing, settlement and payment in INR and local currencies.

Enable INR as an additional settlement currency in existing multilateral mechanisms such as the Asian Clearing Union.

## DEFENCE

# JIMEX 23- JAPAN INDIA MARITIME EXERCISE 2023

- The seventh edition of the bilateral Japan-India Maritime Exercise 2023 (JIMEX 23) hosted by the Indian Navy, is being conducted at/ off Visakhapatnam from 05 -10 July 2023.
- This edition marks the 11th anniversary of JIMEX, since its inception in 2012. JIMEX 23 will witness the participation of INS Delhi, India's first indigenously built Guided Missile Destroyer, INS Kamorta, an indigenously designed and built Anti-Submarine Warfare Corvette, fleet tanker INS Shakti, a submarine, maritime patrol aircraft P8I and Dornier, ship-borne helicopters and fighter aircraft. JMSDF will be represented by the guided missile destroyer JS Samidare and its integral helicopters.

- The exercise will be conducted over six days in two phases - a Harbour Phase at Visakhapatnam comprising professional, sports and social interactions, after which, the two navies will jointly hone their warfighting skills at sea and enhance their interoperability through complex multi-discipline operations in the surface, sub-surface and air domains. Having grown in scope and complexity over the years, JIMEX 23 provides an opportunity to learn from each other's best practices and facilitates operational interactions between IN and JMSDF to foster mutual cooperation and reaffirm their shared commitment towards maritime security in the region.

## ENVIRONMENT/ GEOGRAPHY

# 3-DAY INTERNATIONAL CONFERENCE ON GREEN HYDROGEN (ICGH-2023) BEGINS

**Context:** The ICGH-2023 is being organized during 5th – 7th July 2023 at Vigyan Bhawan, New Delhi.

**Organizers of the ICGH:** The conference is being organized by the Ministry of New and Renewable Energy, in partnership with the Ministry of Petroleum and Natural Gas, Council of Scientific and Industrial Research, Office of Principal

Scientific Advisor to Government of India and the Confederation of Indian Industry.

#### Objective of Event

- Positioning India as a Global Green Hydrogen hub
- To bring together international scientific and industrial community under one

roof

- Learning from international best practices
- Bringing together Industry and academia
- Understanding the recent advances and upcoming technologies in the entire value chain of Green Hydrogen
- Domain specific research interactions on hydrogen production, storage, distribution & downstream applications
- Discussion on green financing, human resource upskilling and startup initiatives in this area

#### Significance of the ICGH – 2023

- The conference brings together global scientific, policy, academic and industrial leaders to discuss recent advances and emerging technologies in the entire green hydrogen value chain.
- The conference will enable the sector stakeholders to explore the evolving green hydrogen landscape and innovation-driven solutions in the sector, thus strengthening the sustainability ecosystem of the sector.
- The fundamental aim of the Conference is to explore how we can establish a Green Hydrogen ecosystem and foster a systemic approach for meeting the global goals for decarbonization through Green Hydrogen. It will also give a boost to the India's National Green Hydrogen Mission

#### What is Green Hydrogen?

Depending on the nature of the method of its extraction, hydrogen is categorised into multiple categories, such as, Grey, Blue and Green etc.

- Grey Hydrogen: It is produced via coal or lignite gasification (black or brown), or via a process called steam methane reformation (SMR) of natural gas or methane (grey). These tend to be mostly carbon-intensive processes.
- Blue Hydrogen: It is produced via natural gas or coal gasification combined with carbon capture storage (CCS) or carbon capture use (CCU) technologies to reduce carbon emissions.
- Green Hydrogen: It is produced using electrolysis of water with electricity generated by renewable energy. The carbon intensity ultimately depends on the carbon neutrality of the source of electricity (i.e., the more renewable energy there is in the electricity fuel mix, the "greener" the hydrogen produced).

#### Importance of Green Hydrogen

- India has set its sight on becoming energy independent by 2047 and



achieving Net Zero by 2070. To achieve this target, increasing renewable energy use across all economic spheres is central to India's Energy Transition.

- Green Hydrogen is considered a promising alternative for enabling this transition. Hydrogen can be utilized for long-duration storage of renewable energy, replacement of fossil fuels in industry, clean transportation, and potentially also for decentralized power generation, aviation, and marine transport.
- To achieve its clean energy transition goals, Government brought the National Green Hydrogen Mission.

#### National Green Hydrogen Mission

- The Union Cabinet has approved National Green Hydrogen Mission in January 2023. The Prime Minister launched the National Hydrogen Mission on India's 75th Independence Day (i.e., 15th August, 2021).
- The Ministry of New & Renewable Energy will be responsible for overall coordination and implementation of the Mission.
- The overarching objective of the Mission is to make India the Global Hub for production, usage and export of Green Hydrogen and its derivatives. This will contribute to India's aim to become Aatmanirbhar (self-reliant) through clean energy and serve as an inspiration for the global Clean Energy Transition.
- Following are the intended outcomes of the National Green Hydrogen Mission.

## INTERNATIONAL RELATION

# AS GRAIN DEAL NEARS DEADLINE ON JULY 17, U.S. URGES INDIA TO USE 'UNIQUE VOICE' WITH RUSSIA

**Context:** The Black Sea Grain Initiative deal is set to expire on July 17. The deal was already extended in May 2023. Now Russia warned that it has "no grounds" for a further extension after it agreed to one extension for two months in May 2023.

#### What is Black Sea Grain Initiative deal?

- The Black Sea Grain Initiative was signed in Istanbul on 22 July 2022 to allow for the safe navigation for the exports of grain and related foodstuffs and fertilizers, including ammonia, from designated Ukrainian seaports in the Black Sea – Odesa, Chornomorsk, Yuzhny/Pivdennyi.



- The deal was brokered by Turkey (Turkey) and facilitated by the United Nations (UN) Secretary-General Antonio Guterres.
- The Joint Coordination Centre (JCC) was established to monitor the implementation of the Initiative. The Joint Coordination Centre is hosted in Istanbul and includes representatives from Russia, Türkiye, Ukraine and the United Nations. The UN acts also as the Secretariat for the Centre.

supplies were particularly threatened in Middle Eastern and African countries, which rely heavily on Ukrainian grain.

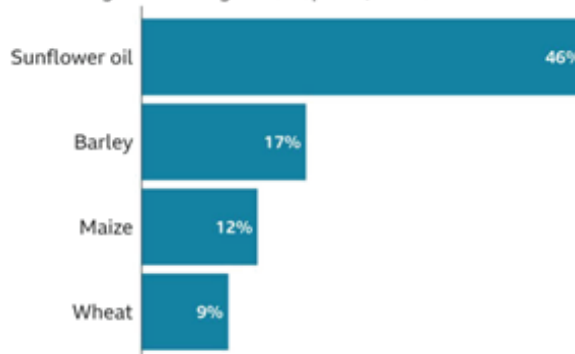
- Thanks to the agreement, more than 30 million tonnes of grain and other foodstuffs have been shipped out of the Black Sea through a safe corridor.

#### What US says now?

- The U.S. Ambassador to Ukraine Ms. Bridget Brink made an appeal to India to use its influence with Russia to ensure that grain exported from Ukraine is not blocked.
- Ms. Brink said that India and the U.S. shared belief in principles of "sovereignty and territorial integrity", and that the U.S. "hoped" to find commonality on their policies towards the war in Ukraine.
- She also remarked that India's leaders have a unique voice to stand up for developing countries and encourage the continuation and the expansion of the Black Sea Grain Initiative to ensure people around the world can access food they desperately need.

#### Ukraine is a major supplier of key crops

Percentage share of global exports, 2021 to 2022



Source: US Department of Agriculture Foreign Agricultural Service

BBC



## POLITY AND GOVERNANCE

## CABINET GIVES NOD TO DATA PROTECTION BILL

**News :** *The Bill outlines practices for entities on how personal data should be stored and processed to ensure there is no breach.*

Legislation will be introduced in Parliament in the Monsoon Session; it specifies norms on management of personal data of Indian residents; activists have raised concerns on an amendment to the RTI Act, 2005 that would prohibit government departments from sharing personal information. The official said that over 20,000 comments were received on the draft Bill though these would not be put out in the public domain.

The government has refused to provide copies of comments from industry, civil society, and government bodies on the Bills in response to Right to Information (RTI) queries.

The Bill essentially allows laypersons to complain to a Data Protection Board, consisting of technical experts, constituted by the government, if they have reason to believe that their personal data has been used without their consent (for example, mobile phone numbers or Aadhaar details). The Board will institute an investigation into the breach.

It is not clear what changes, if any, have been made to the DPDP and telecom Bills following the consultation processes.

The DPDP Bill also outlines practices for entities that collect personal data on how that data should be stored and processed to ensure there is no breach, as well as rights of persons whose data is being used.

#### EU law

The Bill draws from an EU law — The General Data Protection Regulation — and benchmarks 23 instances in which taking consent for recording data is not possible. "These are special circumstances like golden hour during an accident or natural disasters and so on," the official said.

The official said that the Bill has a clause for offering voluntary undertaking in case an entity wants to admit that a breach has occurred and pay penalty as mitigation measure to avoid court litigation. "Penalties can even reach up to ₹250 crore for each instance of breach ranging up to ₹250 crores and an upward revision of ₹500 crore can be made," the official said.

As per the draft, the Data Protection Board of India could fine firms which do not protect user data with fines for individual offences ranging from ₹10,000 to ₹500 crore, which may apply in case of data breaches.

#### Global experience

In global experience, about 90% to 95% cases were settled at the grievance redressal stage. "In the EU, this law took 10 to 12 years to evolve, we believe evolution in India will also take time.

However, if the aggrieved party (individual whose data is breached) wants to seek compensation they will have to move the courts and resort to the judicial process.

In an eco-system where artificial intelligence is rapidly evolving and applications such as ChatGPT is scraping data from social media platforms to test its models, the upcoming Bill was "tech agnostic", and "would cater

to the world we are in today".

#### Not applicable in certain cases

As per the latest draft, courts and law enforcement agencies enjoy wide exemptions from key requirements, as the Bill's requirements do not apply when

Personal data is processed in the interest of prevention, detection, investigation or prosecution of any offence or contravention of any law

Any court or tribunal or any other body in India is necessary for the performance of any judicial or quasi-judicial function".

#### RTI Act

Right to Information activists have raised concerns on an amendment to the RTI Act, 2005 in the DPDP Bill that would prohibit government departments from sharing personal information, arguing government departments may refuse to share information that could hold public officeholders accountable. "Any personal data will not be shared with a third party, however a person whose data has been breached can ask for their own information through RTI," said the official.

#### Puttaswamy Case

The Bill comes after multiple versions floated by the Union government, a process that was started way back in 2017 with the K.S. Puttaswamy v Union of India judgment, where privacy was declared as key to the fundamental right to life and personal liberty under Article 21 of the Constitution.

#### Observation by Justice B. N. Srikrishna

The Committee of Experts on a Data Protection Framework for India led Justice B. N. Srikrishna submitted its report and draft Bill in 2018. The following are the observation of the committee

Regulatory framework has to balance the interests of the individual with regard to his personal data and the interests of the entity such as a service provider who has access to this data.

To prevent abuse of power by service providers, the law should establish basic obligations on all stakeholders

It is important to define what constitutes personal information.

Consent must be treated as a pre-condition for processing personal data. Such consent should be informed or meaningful.

- It is not possible to obtain consent of the individual in all circumstances.
- The rights of the individual are based on the principles of autonomy, self-determination, transparency and accountability to give individuals control over their data.
- Recommended setting up a regulator to enforce the regulatory framework.
- Various allied laws are relevant in the context of data protection because they either require or authorise the processing of personal data

## TELE-MANAS CHATBOT - INDIA'S FIRST CHATBOT FOR PEOPLE IN DISTRESS

India's first Tele-MANAS chatbot, which will start an instant conversation with people in distress, was launched in J&K.

This year Kashmir saw amongst the highest number of distress calls to the Tele-Manas centre.

The initiative will ensure the availability of health counsellors, clinical psychologists and consultants round-the-clock.

#### What is a chatbot?

- A chatbot is a computer program that uses artificial intelligence (AI) and

natural language processing (NLP) to understand customer questions and automate responses to them, simulating human conversation.

- Chatbots can make it easy for users to find the information they need by responding to their questions and requests—through text input, audio input, or both—without the need for human intervention.



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