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Table of Contents

1. Purchasing Managers' Index
2. Import Restrictions
3. Offshore Areas Mineral Act
4. Rajmargyatra App
5. Agriculture Infrastructure Fund
6. Cabinet Secretary
7. Study in India Portal
8. Himalayan Vulture
9. Vulture Conversation
10. Voyager 2 Spacecraft

INDIAN EXPRESS

Page 18

PURCHASING MANAGERS' INDEX

(Syllabus: GS Paper 3 - Economy)

Services PMI at 13-year high; sales strong in India and abroad

ENS ECONOMIC BUREAU
NEW DELHI, JULY 25

INDIA'S SERVICES sector weathered the global headwinds to grow at the fastest pace in over 13 years in July, boosting hopes that the buoyant sector would give solid support to the economy in the current quarter.

The seasonally adjusted S&P Global India Services PMI Business Activity Index stood at 62.3 in July, compared with 58.5 in June, as a substantial improvement in demand conditions induced the strongest increases in new business and output in over 13 years.

The services PMI had stood at 62 in April, then the highest point in 13 years, and was only marginally lower at 61.2 in May. With this, the index remained above the 50-mark that separates growth from contraction for two years.

The latest PMI print is encouraging as it comes close on the heels of a moderation in the growth of services exports witnessed in Q1FY24, after the surge witnessed in FY23.

"The resilience of the service sector underscores its vital role in fuelling India's economy, with the PMI results for July so far pointing to a notable contribution from the sector to overall GDP for the second fiscal quarter," Pollyanna De Lima, Economics Associate Director at S&P Global Market Intelligence, said.

"The broad increases in sales across the domestic and international markets are particularly welcoming news. Firms noted a widespread upturn in services exports to several nations including Bangladesh, Nepal, Sri Lanka and the UAE." FE

Context: India's services sector output, as measured by the S&P Global India Services **Purchasing Managers' Index (PMI),** rebounded from a three-month low in June to record a 13-year high of 62.3 in July.

- A reading of over 50 on the **index indicates an expansion** in activity levels.
- Output levels improved at the sharpest pace since June 2010 as per the **survey-based index,** with firms attributing this upturn to strong demand and new business gains.

PMI or a Purchasing Managers' Index (PMI)

- It is an **indicator of business activity** - both in the manufacturing and services sectors.
- It is a **survey-based measures** that asks the respondents about changes in their perception of some key business variables from the month before.
- It is **calculated separately for the manufacturing and services sectors** and then a composite index is constructed.
- A **figure above 50 denotes** expansion in business activity.
- **Anything below 50 denotes** contraction.
- **Higher the difference** from this mid-point greater the expansion or contraction.
- The **rate of expansion** can also be judged by comparing the PMI with that of the previous month data.
- If the figure is **higher** than the previous month's then th**e economy is expanding at a faster rate.**
- If it is **lower** than the previous month then it is growing at a lower rate.

FINANCIAL EXPRESS

Page 1

IMPORT RESTRICTIONS

(Syllabus: GS Paper 3 - Economy)

Import curbs imposed on PCs, laptops

To boost local manufacturing

HUKESH JAGOTA
New Delhi, August 3

THE GOVERNMENT ON Thursday imposed licensing requirements for imports of laptops, tablets, personal computers and servers with immediate effect, as it sought to curb rising inbound shipments from countries like China and boost local manufacturing.

While the move may make it compelling for the likes of Apple, Dell and Samsung to access the fast-growing Indian market for these items by manufacturing them locally, the tech hardware industry called the move ill-advised and premature, and felt that the government should have waited at least till a local production ecosystem was in place. Currently, about 90% of the domestic demand for these products are met through imports.

The government resorted to quantitative curbs, as it would have been difficult for it to raise tariffs on import of these products given the country's zero-tariff commitment under the multilateral information and communication technology (ICT) agreement. The European Union (EU) had dragged India to the World Trade Organization's dispute settlement body against the tariff increases earlier on mobile phones and certain electronic components.

"Import of laptops, tablets, all-in-one personal computers, and ultra small form factor computers, servers... is 'restricted' with immediate effect," according to a notification issued by the Director General of Foreign Trade (DGFT).

The share prices of Dixon Technologies and Optiemus Infracom, contract manufacturers for electronic goods, rose by 7.62% and 8.76%, respectively, on the NSE on Thursday.



The IT hardware industry was taken by surprise by the government's decision, which amounted to a throwback to the long-dismantled License Raj. Industry executives said the move would lead to a disruption of business and also impact consumers, a large segment of which might find these products out of bounds for a while.

Continued on Page 16

Context: The government **imposed import restrictions on laptops, tablets, and certain types of computers** with immediate effect for security reasons and the need to promote domestic manufacturing.

Key Points

- The move will **curtail inbound shipments** of these goods from countries like China and Korea.
- **Importers of these items** would now need permission or license from the government for their inbound shipments.
- Since imports will **now be allowed only against valid import licences,** the government can keep a strict watch on imports, especially from China, and check inflows whenever it feels the need.
- The notification also specifies various cases of exemptions from **licencing requirements.**
- The restrictions are not applicable to imports under **baggage rules,** under which one old and a new laptop is allowed in a baggage.
- Although the **import restrictions on laptops**, tablets and computers imposed are not country specific, it would affect imports from China as the country accounts for a substantial portion of the $7 billion of annual imports of the items.
- While the notification comes into force with immediate effect, under the **transition provisions of the foreign trade policy** if the bill of lading and letter of credit have been issued or opened before August 3, those import consignments can be imported without licence till August 31. After that, importers will need licences.

TIMES OF INDIA

Page 9

OFFSHORE AREAS MINERAL ACT

(Syllabus: GS Paper 3 - Infrastructure)

House clears tweaked law to set off undersea mineral hunt

To End Scope For Bias In Allocation Of Offshore Mining Rights

Sanjay Dutta@timesgroup.com

New Delhi: India's mining sector is in for a sea change, literally, with Parliament on Thursday passing the Offshore Areas Mineral (Development and Regulation) Amendment Bill 2023 to begin a serious hunt for mineral treasures buried under water.

The Bill, steered through Rajya Sabha by coal and mines minister Pralhad Joshi, introduces auction to end scope for discrimination in allocation of offshore mineral exploration and mining rights to companies, including from the private sector.

▸ Parliament reports, P10

The transparent auction regime with well-defined norms for concession holders and operators is expected to attract investors and mark the country's foray into offshore mining in the true sense. "Offshore mining has remained neglected for long. While our neighbours in the Indian Ocean region have been doing it since long, nothing has happened here due to scope for discretion in the existing law — framed in 2002 and implemented in 2010. The amendment will give confidence to investors by bringing in transparency and fair play," a top mines ministry official told **TOI**.

Offshore mining is of strategic importance to India, which has an exclusive economic zone (EEZ) of the size of 2 million sq km. Firstly, the country needs to harness its maritime resources to fuel a high growth trajectory. Secondly, offshore mining operations — just like oil and gas exploration — strengthens and safeguards territorial claims.

The Bill envisages granting two types of operating rights through auction to the private sector — production lease and composite licence. Composite licence envisages two stages for exploration and starting production.

Operating rights in areas reserved for the central government and exploration & production of atomic minerals will be only for public sector entities. Provision for renewal of production leases has been scrapped with a 50-year lease period to remove uncertainty for operators. Limits have been introduced on the total offshore area each entity can acquire.

BURIED TREASURES

- Resources delineated by the Geological Survey of India
- 1,53,996 MT (million tonne) of lime mud within the exclusive economic zone off Gujarat and Maharashtra coasts
- 745 MT of construction-grade sand off Kerala coast
- 79 MT of heavy mineral placers in the inner-shelf and mid-shelf off Odisha, Andhra Pradesh, Kerala, Tamil Nadu and Maharashtra
- Phosphorite in the eastern and western continental margins
- Polymetallic ferromanganese (Fe-Mn) nodules and crusts in Andaman and Lakshadweep seas

Context: India's mining sector is in for a sea change with Parliament passing the **Offshore Areas Mineral (Development and Regulation) Amendment Bill 2023** to begin a serious hunt for mineral treasures buried under water.

- The Bill amends the **Offshore Areas Mineral (Development and Regulation) Act, 2002.** The Act regulates mining in maritime zones of India.

Highlights of the bill

- The Act **categorises offshore mining-related activities** into: (i) reconnaissance, which involves a preliminary survey to locate mineral resources, (ii) exploration, which includes exploring, proving, or locating mineral deposits, and (iii) production, the commercial activity of the extraction of minerals.
- The **Act provides for the following types of concessions**: (i) a reconnaissance permit for reconnaissance, (ii) an exploration licence for exploration, and (iii) a production lease for undertaking mining.
- Under the Act, a production lease is **granted for a period of up to 30 years**. It may be further renewed for up to 20 years.
    - The Bill instead provides that a production lease, as well as a production lease under a composite licence, will be valid for 50 years.
- The Act provides for the grant of concessions through **administrative allocation.**
    - The Bill mandates competitive bidding for a production lease and a composite license to private entities.
- The Act allows the government to **reserve offshore areas** that are not held under any operating right.
    - The Bill allows the administering authority to grant a composite licence or production lease to the government or a government company.
- The Bill adds that in **case of atomic minerals, exploration, production, and composite licenses** will be granted only to the government or government companies.
- Under the Act, the size of one block for offshore mining is five minutes latitude by five minutes longitude.
    - The Bill **reduces this to one minute latitude** by one minute longitude.
- The Bill sets up the **Offshore Areas Mineral Trust.**
    - The funds will be used for specified purposes including: (i) exploration in offshore areas, (ii) research and studies about the mitigation of adverse effects of offshore mining on the ecology, and (iii) relief upon the occurrence of a disaster.
- The Bill **increases fines for various offences.**
    - For instance, under the Act, conducting any activity without a permit or licence is punishable with imprisonment of up to five years, a fine of up to Rs 50,000, or both. As per the Bill, the fine for this offence will be between five lakh rupees and Rs 10 lakh.

PIB

August 4

RAJMARGYATRA APP

(Syllabus: GS Paper 3 - Infrastructure)

NHAI Launches 'Rajmargyatra' a Unified Mobile Application for National Highway Users

Context: The National Highways Authority of India (NHAI) takes a significant stride towards improving the highway user experience with the launch of **'Rajmargyatra,' a citizen-centric unified mobile application.**

- This **user-friendly app** is now available for download on both Google Play Store and iOS App Store, empowering travelers with comprehensive information on Indian National Highways while also offering an efficient complaint redressal system.
- The app is currently **available in Hindi and English**.

Key Features of 'Rajmargyatra' App:

- **Comprehensive Highway Information:** 'Rajmargyatra' serves as a one-stop repository of essential **information for National Highway users.**
  - Get real-time weather conditions, timely broadcast notifications, and access to details about nearby toll plazas, petrol pumps, hospitals, hotels, and other essential services that ensure a seamless and safe journey on National Highways.
- **Hassle-Free Complaint Redressal:** The app comes equipped with **an inbuilt complaint redressal and escalation mechanism**. Users can easily report highway-related issues, attaching geo-tagged videos or photos for better clarity.
  - The registered complaints will be handled in a time-bound manner, with system-generated escalations to higher authorities in case of any delays. Users can also track the status of their grievances for complete transparency.
- **Seamless FASTag Services:** 'Rajmargyatra' integrates its s**ervices with various bank portals**, making it convenient for users to recharge their FASTags, avail monthly passes, and access other FASTag-related banking services – all within a single platform.
- **Over-speeding notifications and voice-assistance** to encourage responsible and safe driving behavior.

DTE

August 4

AGRICULTURE INFRASTRUCTURE FUND

(Syllabus: GS Paper 3 - Agriculture)



Three years on, only 15% of Rs 1 lakh crore agri infrastructure fund disbursed

The scheme was launched in 2020 for the development of post-harvest infrastructure

NEXT NEWS >

By Shagun
Published: Thursday 03 August 2023



Context: Only 15 percent of the Rs 1 lakh crore **Agriculture Infrastructure Fund (AIF)**, launched in 2020 for the development of post-harvest infrastructure, has been disbursed in the first three years.

- According to the information shared by Union agriculture minister in Parliament, **Rs 15,448 crore has been disbursed for 27,748 projects** until now. And out of this, a total of 19,650 projects worth Rs 9,660 crore (9.66 percent of the total allocation) have been completed.
- Among the 27 states and Union Territories, Madhya Pradesh (MP) utilised the maximum funding of Rs 2,707 crore for 3,909 completed projects.
- **MP was followed by Maharashtra and Uttar Pradesh** as distant second and third at Rs 901 crore with 2,424 completed projects and Rs 691 crore for 1,175 projects respectively.

Agriculture Infrastructure Fund (AIF)

- **About**: It is a **central sector scheme** that will enable a financing facility of Rs.1 lakh crore for funding agriculture infrastructure projects at farm-gate and aggregation points such as farmers producers organisations, primary agricultural cooperatives, startups and entrepreneurs in the agriculture sector.
- **Origin**: It was **announced in May 2020 under the ambitious Atma Nirbhar Bharat Package** as a dedicated Central Government scheme that provides medium-long term credit facility for investment in creation of post-harvest management infrastructure and community farming assets.
- **Nodal Ministry:** Ministry of Agriculture and Farmers Welfare.
- **Benefits**:
  - **Interest subvention**: All loans under this financing facility will have an **interest subvention of 3% per annum** up to a limit of Rs. 2 crore. This subvention will be available for a maximum period of seven years.
  - **Credit guarantee:** Credit guarantee coverage will be available for eligible borrowers under **Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) scheme** for a loan up to Rs. 2 crore. The fee for this coverage will be paid by the Government.
  - **Moratorium for repayment**: Moratorium for **repayment under this financing facility** may vary subject to a minimum of 6 months and a maximum of 2 years.
- **Scheme beneficiaries**: **Primary Agricultural Credit Society (PACS)**, FPOs, Marketing Cooperative Societies, Joint Liability Groups (JLG), Self-Help Groups, Multipurpose Cooperative Societies, Startups, agri entrepreneurs, Central/State agency or Local Body sponsored Public-Private Partnership Projects.

THE HINDU

Page 15

CABINET SECRETARY

(Syllabus: GS Paper 2 - Polity & Governance

Cabinet Secretary gets third service extension

The Hindu Bureau
NEW DELHI

The Appointments Committee of the Cabinet (ACC) has given another one-year extension in service to Cabinet Secretary Rajiv Gauba. He will remain in office till August 30, 2024.

This is the third time his service has been extended by an year. Mr. Gauba was appointed Cabinet Secretary in 2019 for a fixed term of two years.

Before his appointment to the top bureaucratic post, he served as the Union Home Secretary for two years.

Context: Cabinet Secretary got an extension in service for another year.

- He will remain in office till August 30, 2024.
- This is the third time his service has been extended for another year.
- He was in 2019 appointed to the country's top bureaucratic post for two years.
- He was given one-year extension in 2021 and then in August last year.

Cabinet Secretary

- The Cabinet Secretary is the **top-most executive official** and senior-most civil servant of the Government of India.
- She/he is the **ex-officio head of the Civil Services Board,** the Cabinet Secretariat, the IAS, and all civil services under the rules of business of the government.
- She/he ranks eleventh on the **Indian order of precedence.**
- She/he is under the direct charge of the PM and is appointed for a **fixed tenure of two years.**
- The Cabinet Secretariat is responsible for the administration of the **Transaction of Business and the Allocation of Business Rules 1961.**
- She/he **facilitates smooth transaction of business** in Ministries/ Departments of the Government.
- Secretarial assistance to the Cabinet and its Committees
- Assists in decision-making in Government by ensuring Inter-Ministerial coordination ,
- Ironing out differences amongst Ministries/ Departments
- Evolving consensus through the instrumentality of the standing/ adhoc Committees of Secretaries
- In **2019, All India Services (Death-Cum-Retirement-Benefits) Rules, 1958,** was amended by Government to provide extension.
- According to **All India Services (Death-Cum-Retirement-Benefits) Rules, 1958**, the government can give extension in service to a cabinet secretary provided the total tenure does not exceed four years.
- As per the modified rules, the central government **may give an extension in service** for a further period not exceeding three months, beyond the period of four years to a cabinet secretary.

PIB

August 4

STUDY IN INDIA PORTAL

(Syllabus: GS Paper 2 - Education)

Shri Dharmendra Pradhan and Shri S. Jaishankar jointly launch Study in India (SII) Portal in New Delhi

Context: Union Education and Skill Development & Entrepreneurship Minister and Union External Affairs Minister jointly launched **Study in India Portal.**

Key Points

- **Study in India Portal** is a dedicated website that will provide comprehensive information about the Indian Higher Education Institutions (HEIs).
- The website will illustrate academic programs covering but not limited to **undergraduate (UG), postgraduate (PG), Doctoral level programs** as well as courses in Indian Knowledge System like **Yoga, Ayurveda, classical arts etc.**
- The **website-portal** will present information about the academic facilities, research support, and related information.
- The new website will now have the provision for students to **apply in more than one institute/course of their choice.**
- The new portal will provide an integrated **one-stop solution for student registration** and visa application process.

Study in India program

- **Study in India is a flagship program** of the Government of India, under the aegis of the Ministry of Education (MoE).
- The Study in India programme aims to **increase the number of international students in India.**
- The **Study in India programme** involves partnership with educational institutes fulfilling one of the following criteria:
    - National Institutional Ranking Framework (NIRF)ranking (<=100)
    - National Assessment and Accreditation Council (NAAC) accreditation score (>=3.01)
    - Institutes of National Importance (INI)
- This ensures premier institutions being the partner to **enrolling international students coming to study in India.**
- The Study in India programme **offers a streamlined and well-organized application process** for international students seeking higher education opportunities in Indian Higher Education Institutes.
- From registration to visa approval, the **online platform simplifies the entire journey**, enabling students to choose their desired courses, receive institute offer letters, and successfully pursue their academic dreams in India.
- By providing a seamless experience, the **SII programme continues to attract talented and ambitious students** from around the world to study in India's vibrant and culturally diverse academic environment.

THE HINDU Page 17

HIMALAYAN VULTURE

(Syllabus: GS Paper 3 - Env & Eco)

Endangered Himalayan vulture, bred in captivity for the first time in India

Shiv Sahay Singh
KOLKATA



New records: The vulture nestling at the Assam State zoo in Guwahati. SACHIN RANADE

Researchers have recorded the first instance of captive breeding of the Himalayan vulture (*Gyps himalayensis*) in India at the Assam State Zoo, Guwahati.

Categorised as 'near threatened' on the International Union for Conservation of Nature (IUCN) Red List of threatened species, the Himalayan vulture is a common winter migrant to the Indian plains, and a resident of the high Himalayas.

Details of the successful breeding were recently published in a paper titled "Breeding of Himalayan Vulture *Gyps himalayensis* Hume, 1869 (Aves: Accipitriformes: Accipitridae) in the Assam State Zoo, Guwahati, Assam, India" in the *Journal of Threatened Taxa*.

The paper states that the successful hatching was noted on March 14, 2022 and the nestling was shifted to the artificial brooding facility on March 15.

"During first month, the nestling was kept in the brooder made up of a plastic box (1 x 1 x ½ f) with a mat for the grip. The temperature was maintained around 30-35 C with a lamp, a water bowl and it was monitored with a thermo-hygrometer. The nestling was provided with sufficient space to move towards and away from the heat source," the publication said.

Along with the housing for nestling, the paper says, the food, frequency of feed, and the growth and colouration of the nestling were observed.

Sachin Ranade, lead author of the publication, said: "Breeding the species in Guwahati was a daunting task as, in nature, this species breeds in snow-clad mountains. But as these birds were kept in zoo for a long time, they acclimatised to the tropical environment, and we helped them rear the young ones, which led the whole process to this unique success," Mr. Ranade said.

The two co-authors of the paper are Jay Gore, and Ashwini Kumar, Director of the Guwahati Zoo.

Mr. Ranade, who is also in charge of the Vulture Conservation Breeding Centre (VCBC) at Rani in Assam, said that the conservation breeding of the Himalayan vulture at the Guwahati Zoo is the second such instance in the world, after France, where the species has been bred in captivity.

Four VCBCs established by Bombay Natural History Society (BNHS) at Pinjore in Haryana, Bhopal in Madhya Pradesh, Rani in Assam, and Rajabhatkhawa in West Bengal are involved in conservation breeding of the white-rumped vulture (*Gyps bengalensis*), slender-billed vulture (*Gyps tenuirostris*), and the Indian vulture (*Gyps indicus*). The unprecedented scale and speed of declines in vulture populations has left all the three resident *Gyps* vulture species categorised 'Critically Endangered'.

Context: Researchers have recorded the first instance of captive breeding of the Himalayan vulture (Gyps himalayensis) in India at the Assam State Zoo, Guwahati.

- Categorised as **'Near Threatened' on the International Union for Conservation of Nature (IUCN) Red List** of threatened species, the Himalayan vulture is a common winter migrant to the Indian plains, and a resident of the high Himalayas.

Himalayan vulture

- **Scientific Name**: Gyps himalayensis
  - It is a rare and largest bird native to the Himalayas
- **Habitat**: It lives mainly in the higher regions of the Himalayas and the Tibetan Plateau at the elevation of above 1500 metres.
  - This species is distributed from **western China, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Afghanistan and Pakistan, east through the Himalayan mountain range in India, Nepal and Bhutan, to central China and Mongolia.**
- **Conservation status**: The vulture is listed as "**Near Threatened"** by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species.
  - The species is covered by a **Multi-species Action Plan (MsAP)** for the conservation of African-Eurasian vultures and by national Action Plans in India , Bangladesh, Nepal and Cambodia.
- **Threats**: The most serious potential threat to this species is thought to be mortality caused through ingestion of **diclofenac and other vulture-toxic non-steroidal anti-inflammatory drugs (NSAIDs)** widely used in livestock, particularly in South Asia.

DTE

August 4

VULTURE CONSERVATION

(Syllabus: GS Paper 3 - Env & Eco)

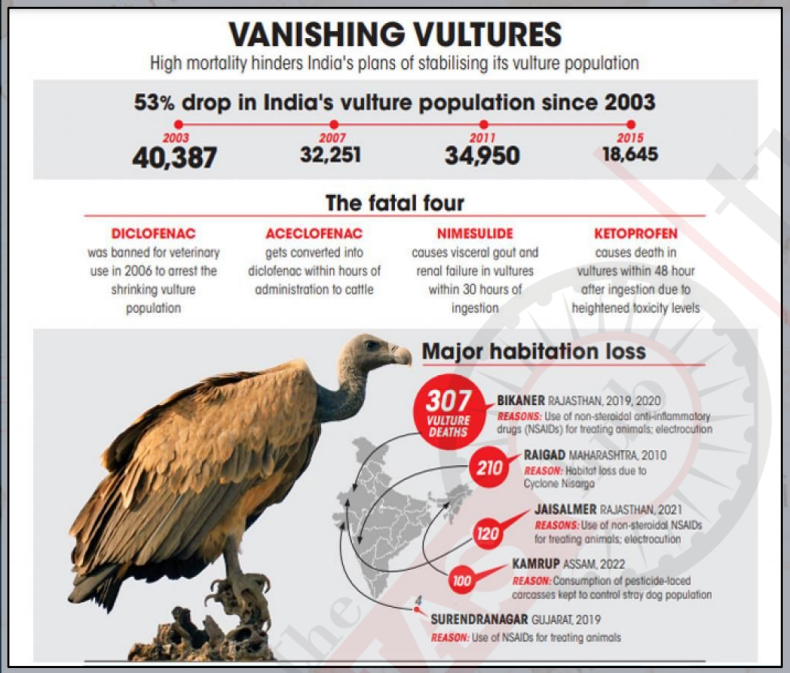
Gamechanger for India's vultures: Experts laud Centre's move to ban aceclofenac, ketoprofen

They also observed that the implementation of the ban would be the real test and that other raptors should also be provided similar safety from killer drugs

NEXT NEWS >

By Himanshu Nitnaware, Rajat Ghai
Published: Thursday 03 August 2023





Context: Experts who work on vultures have welcomed the Centre's decision to **prohibit the manufacture, sale and distribution of ketoprofen and aceclofenac.**

- The Union Ministry of Health and Family Welfare banned the manufacture, sale and distribution of ketoprofen and aceclofenac and their formulations for animal use under **section 26A of the Drugs and Cosmetics Act, 1940 (23 of 40).**

Key Points

- There are in total **six non-steroidal anti-inflammatory drugs toxic to vultures.**
- The ban on usage of diclofenac in 2006, then in 2013 and now this one has a huge gap.
- **India's vulture populations** crashed in the 1990s due to the use of diclofenac, a pain reliever administered to cattle.
- Vultures feeding on cattle carcasses used to die extremely painful deaths as the drug entered their system.
- In 2004, it was found that diclofenac was the cause of vulture deaths and that 97 percent of the population had been lost till then.
- The main species affected were **oriental white-backed vultures**, long-billed vultures and slender-billed vultures.
- That same year, the Indian government along with other agencies came up with a **Vulture Recovery Plan** which recommended banning the veterinary use of diclofenac, finding its substitute and set up conservation breeding centres for vultures.
- The **Vulture Recovery Plan** was incorporated into the Action Plan for Vulture Conservation 2006.
- The use of diclofenac as a veterinary drug was banned in 2006 and gazetted in 2008. It was also recommended in the same notification that another drug, meloxicam should be used.
- The Centre **also restricted the vial size of diclofenac** for human use to just three millilitres after it was found that people were using diclofenac meant for humans in cattle.

VOYAGER 2 SPACECRAFT

(Syllabus: GS Paper 3 - Sci & Tech)

THE STORY OF VOYAGER: HUMANITY'S FARTHEST FORAY INTO SPACE

ALIND CHAUHAN
NEW DELHI, AUGUST 3

NASA MANAGED to re-establish communication with Voyager 2 on August 1, more than a week after a faulty command mistakenly cut contact.

Launched in 1977, the Voyager mission — Voyager 1 and Voyager 2 — sent the first two human-made objects to interstellar space, outside the impact of our Sun's constant flow of material and magnetic field. Currently, Voyager 1 is roughly 24 billion km away from Earth, and Voyager 2 is 19.9 billion km away.

The mission

In 1972, NASA proposed to send the Voyager probes to explore the planets of Jupiter and Saturn. By 1974, Uranus and Neptune were added to the mission's ambit.

The spacecraft were scheduled for take-off towards the end of the 1970s to take advantage of a rare alignment of Jupiter, Saturn, Uranus and Neptune that occurs once every 175 years. This allowed the spacecraft to harness the gravity of each planet to cover great distances while using small amounts of fuel.

The spacecraft

Voyager 1 and Voyager 2 are identical spacecraft — equipped with instruments to carry out 10 different experiments. These include television cameras, infrared and ultraviolet sensors, magnetometers, plasma detectors, and cosmic-ray and charged-particle sensors. They also have a 3.7 m wide antenna to communicate with Earth. The spacecraft are powered by small nuclear reactors that draw energy from plutonium pellets.

Notably, both spacecraft carry a golden phonograph record — a 12-inch disc, intended to be a "time capsule" from Earth to any extraterrestrial life that might intercept the probes in the distant future. The records contain a map of our solar system's location and a number of encoded images and sounds from Earth, including spoken greetings in 55 languages.



A recreation of the Voyager spacecraft travelling in space. NASA

...and beyond

The Voyager mission has provided us with a wealth of information about the solar system and beyond.

Both spacecraft reached Jupiter in 1979. Voyager 1 found that Io, one of Jupiter's moons, was geologically active, and the two spacecraft discovered three new moons of Jupiter: Thebe, Metis and Adrastea.

After that, both spacecraft moved to Saturn, reaching the ringed giant in 1980 and 1981 respectively. Among other findings, Voyager 1 noted that Titan was not the biggest moon of our solar system — contrary to what was believed at the time — and that it was smaller than Jupiter's Ganymede.

After Saturn, Voyager 1 headed towards interstellar space while Voyager 2 was redirected towards Uranus. It became the first human-made object to fly past the aquamarine planet in 1986, taking stunning photographs, and discovering multiple moons and rings.

Then, the probe progressed towards Neptune, flying by the planet in 1989. Apart from finding new moons and rings, it observed the Great Dark Spot — a huge spinning storm in the planet's atmosphere, about the size of Earth. Subsequently, Voyager 2 too headed out into interstellar space.

Voyager 1 officially entered interstellar space in 2012. Voyager 2 made its entry in 2018. Most of their instruments are not operational today, but the probes still transmit invaluable data to Earth.

LONGER VERSION ON
indianexpress.com/explained

Exploring our solar system...

Context: More than a week after the National Aeronautics and Space Administration (NASA) lost communication with Earth's longest-running space probe, **Voyager 2,** the space agency detected a "heartbeat" signal from the spacecraft.

- Although too faint for extraction of data, the detected signal confirms that **Voyager 2, which is about 19.9 billion kilometres away from Earth,** is still operating.
- On July 21, a faulty command sent to the probe caused its antenna to point 2 degrees away from Earth.
- As a result, **Voyager 2** is currently unable to receive commands or transmit data back to Earth.

Voyager 2 Spacecraft

- It is a space probe **launched by NASA** on August 20, 1977.
- It is part of the **Voyager program**, which also includes Voyager 1.
- **Primary mission:** To study the outer planets of our solar system and their moons, and then continue on an interstellar mission.
- It is the **second spacecraft to enter interstellar space.** On Dec. 10, 2018, the spacecraft joined its twin—Voyager 1—as the only human-made objects to enter the space between the stars.
- It carries a **Golden Record, a phonograph record containing sounds and images from Earth**, intended to be a message to any potential extraterrestrial civilizations it might encounter in the future.:
- It is the only spacecraft to **study all four of the solar system's giant planets** at close range.
- It discovered a **14th moon at Jupiter.**
- It was the **first human-made object** to fly past Uranus.
- At **Uranus**, Voyager 2 discovered 10 new moons and two new rings.
- It was the first **human-made object** to fly by Neptune.
- At **Neptune**, Voyager 2 discovered five moons, four rings, and a "Great Dark Spot."

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