

## ● POLITY

## ● ECONOMICS

## ● TECHNOLOGY

## ● ECOLOGY

# Know your rover PRAGYAN

Meet the Chandrayaan-3 rover on the moon. Weighing 26 kg and with a speed of 1 cm per second, it is a diminutive yet important component of the mission's distinction: as the first to conduct *in situ* studies of the lunar soil in the moon's south polar region

## What will the rover do on the moon?

- First, it will move around on the moon's surface in low gravity and a thin atmosphere in a semi-autonomous way and avoiding hazards
- Second, its instruments will study what the materials on the moon's surface near the landing site are made of

## Where is the rover on the moon?

- On August 23, the Chandrayaan-3 lander descended at a site between the craters Manzinus C and Simpelius N. The lander has a moving speed of 1 cm per second, so it is also close to the lander
- It can't move more than 500 m from the lander anyway, to ensure that they are able to send signals between each other. The rover can communicate only with the lander

## PRAGYAN THE LAB

### Laser-Induced Breakdown Spectroscopy (LIBS)



A powerful laser is shined on a target sample...



...until it blows off a few atoms and causes the sample to emit some radiation



Detectors study this radiation to understand what the sample is made of



Weights 1.5 kg, consumes 5 W

### Alpha Particle X-Ray Spectrometer (APXS)



Blasts a target sample with X-rays emitted by radioactive material (curium-244)



Atoms in the sample absorb the X-rays and then release them at a different frequency



Based on this frequency, scientists can say which elements the sample contains



Weights 0.7 kg, consumes 4 W



LIBS



APXS



This power feeds a 6Ah rechargeable battery

Lifespan: One lunar day  
**14** earth days



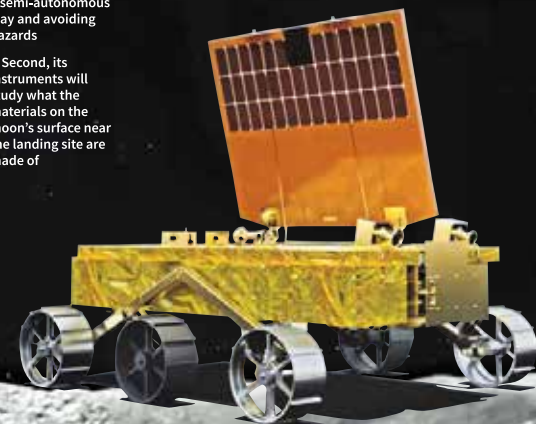
Local data storage:  
**2 Gb**



Warm Electronics Box has a volume of around  
**38** litres



Cameras to navigate the terrain



Avoids shadowed areas on the moon, like some sides of craters

Rover speed is  
**1** cm per second

Weights **26** kg



Its solar panels produce  
**50** W of power

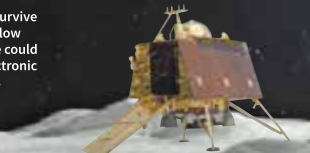
Unlikely to survive lunar night: low temperature could damage electronic components

Has rocker-bogie suspension



## Why does it have a short lifespan?

- When the sun sets on the moon, an area will become dark and very cold. This can damage the battery and other electronic components
- When the sun rises again, after 14 days, the rover can 'return' to life if the components have survived. This is unlikely



The rover has six wheels. The wheel treads will imprint ISRO logo and Ashoka lions emblem on the ground

## SCIENCE AND TECHNOLOGY

### ROVER PARAGYAAN

Chandrayaan-3's lander module Vikram successfully touched down on the moon and the rover Pragyan rolling out from it. The Lander Horizontal Velocity Camera (LHVC) aboard Vikram initially developed for the Chandrayaan-2 mission has already clicked the first image of the moon during its descent on the lunar surface. The LHVC with its complex algorithm played an important role in measuring horizontal velocity during the lander descent phase. The second camera is a set of 2 navigation cameras (NAVCAM) mounted in the front of the rover for path planning and obstacle avoidance, serving as its eyes.

### UPCOMING MOON MISSIONS

part from India's successful Chandrayaan-3 and failed mission of Russia's Luna-25 and Japan's Hakuto-R lander, poised to be the world's first commercial soft landing on the lunar surface failed to make a moon landing in April, 2023, a number of lunar missions are lined up for the coming months.

Commercial Lunar Payload Services (CLPS) and Lunar Trailblazer from the U.S.: The CLPS initiative of the National Aeronautics and Space Administration, according to the U.S. space agency, allows rapid acquisition of lunar delivery services from American companies for payloads that advance capabilities for science, exploration or commercial development of the moon. The Lunar Trailblazer on the other hand is an orbiter.

China would launch Lunar Communication and Navigation Satellite Constellation and Japan would launch Smart Lander for Investigating Moon (SLIM), an orbiter/lander mission.

As of July, there are six active lunar orbiters and currently, the only operating rover is China's Yutu-2 rover released by Chang'e 4, which operates on the far side.

Next year, Beresheet 2 from Israel, U.S.'s Volatiles Investigating Polar Exploration Rover (VIPER), China's Lunar Exploration Programme (CLEP) Chang'e 6 and Hakuto-II are expected to be launched.

## ECONOMICS AND DEVELOPMENT

## TRADE CURBS ON FARM PRODUCTS

**CONTEXT:** The consumer food prices rose 11.5% in July, the third highest since the current retail inflation data series began in 2014.

The Centre has imposed stock limits on pulses and wheat imposed in June, curbs on non-basmati rice shipments outside India in July and most recently a 40 % export levy on onion exports with immediate effect till at least December 31. The government also announced a hike in buffer stocks of the curry essential by two lakh metric tonnes. Onion exports grew 65 % last year, accounted for 8 % of total domestic production. Maharashtra and Madhya Pradesh account for almost 60% of India's onion supplies, and the deficient rainfall this month in parts of these States after excess rains in July had put a question mark on the moisture-sensitive tuber's prospects this kharif season. The onion prices increased from around ₹23 a kilo in June to over ₹31 in August with some analysts projecting prices per kilo to touch ₹60-₹70 by September. The Centre promised to purchase onions at a "historical high" price of ₹2,410 per quintal, and buffer stock procurements will be ramped up further if needed.

## INTERNATIONAL RELATIONS

## MODI, XI CALL FOR SPEEDY DISENGAGEMENT ALONG LAC

- It's significant that Prime Minister Narendra Modi and Chinese President Xi Jinping had a conversation on the sidelines of the BRICS summit, especially considering the ongoing stand-off and tensions along the Line of Actual Control (LAC) between India and China. This marks their first such conversation on this particular issue.
- During their conversation, PM Modi emphasized the importance of respecting the LAC as a crucial step for the normalization of relations between India and China. He highlighted India's concerns about the unresolved issues along the LAC in the western sector of the border areas shared between the two countries.
- Foreign Secretary Vinay Kwatra announced that both India and China have agreed to intensify their efforts for the disengagement of troops and de-escalation of tensions along the LAC. This suggests that both countries are acknowledging the necessity of reducing the military presence and defusing the situation in the disputed border region.
- The fact that this conversation was kept under wraps until after the PM's departure for Greece indicates that the involved parties were working on a joint approach and wanted to announce the progress when it was appropriate.
- It's important to note that the situation along the India-China border has been a point of concern for both countries and the international community. The tensions have led to skirmishes and military build-up in the region.
- Both India and China have expressed a desire to find a peaceful resolution to the border issue, and this conversation between the leaders on the sidelines of the BRICS summit seems to be a step in that direction. The commitment to disengagement and de-escalation is a positive sign for reducing tensions and promoting stability in the region.

## SCIENCE AND TECHNOLOGY

## GOVERNMENT TO BUY WEAPONS LOCALLY

**CONTEXT:** The Defence Acquisition Council (DAC) under the chairmanship of Defence Minister Rajnath Singh, accorded Acceptance of Necessity (AoN) for capital acquisition proposals estimated at about ₹ 7,800 crore.

The DAC has accorded Acceptance of Necessity (AoN) for procurement and installation of an electronic warfare (EW) suite on Mi-17 V5 Helicopters, a ground-based autonomous system for mechanised infantry and armoured regiments, light machine guns (LMG) and bridge-laying tanks (BLT).

The ground-based autonomous systems for mechanised infantry and armoured regiments will enable various operations such as unmanned surveillance, logistic delivery of ammunition, fuel and spares and casualty evacuation on the battlefield, it said. The induction of LMG will enhance the fighting capabilities of infantry forces, the induction of the BLT will result in faster movement of mechanised forces.

The AoN for procurement of rugged laptops and tablets for the Army under Project Shakti has been approved. All these procurements will be sourced indigenously.

The DAC has accorded AoN for procurement of weapons to enhance the operational capability of the MH-60R helicopters of the Navy. The Navy is currently inducting the MH-60R helicopters, 24 of which were contracted from Lockheed Martin under a \$2.2-billion deal.

## ECONOMICS AND DEVELOPMENT

## MODI SEEKS LEVEL PLAYING FIELD FOR SMALLER E-COM COMPANIES



**CONTEXT:** Prime Minister Narendra Modi made a strong pitch to ensure "equitable" competition between large and small vendors in the e-commerce space and to empower small enterprises to integrate with global supply chains.

The Micro, Small and Medium Enterprises (MSMEs) accounted for 60 % to 70 % of employment and 50 % of the global gross domestic product (GDP). Empowering smaller firms translates to societal empowerment.



## INTERNATIONAL RELATIONS

## INDIA'S G-20 OPPORTUNITY FOR AN AFRICAN RENAISSANCE

The article discusses how Africa is raising its voice in global forums like BRICS, G-20, and the UN, despite facing significant challenges. These challenges include governance issues, tribal conflicts, terrorism, and economic difficulties. The recent BRICS summit focused on Africa, and the upcoming G-20 Summit in India is seen as an opportunity to address African issues.

Africa's international support is weakening due to economic changes and geopolitical shifts. China's reduced trade and investment in Africa, Russia's uncertain role, and limitations in support from colonial powers are noted. Despite these concerns, Africa's problems remain a global concern.

India has strong connections with Africa, spanning from Mahatma Gandhi's efforts against apartheid to trade and investment collaborations. India's ties with Africa include sectors like education, healthcare, technology, and agriculture. India's hosting of the G-20 Summit is seen as a chance to step up and help Africa through bilateral and multilateral efforts.

India could collaborate with like-minded G-20 partners and international institutions to create a platform for resolving African challenges. This platform would combine peacekeeping with socio-economic development strategies. India can offer innovative solutions like the JAM trinity, DBT, and UPI, and contribute to building an equitable partnership with Africa for the 21st century.



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## INTERNATIONAL RELATIONS

## BRICS TO ADD SIX NEW MEMBER COUNTRIES

BRICS, a group of major economies (Brazil, Russia, India, China, and South Africa), is expanding by adding six new member countries. South African President Cyril Ramaphosa, the current chair of BRICS, mentioned the pursuit of peaceful conflict resolution in the Johannesburg Declaration, indirectly referring to the Ukraine conflict.

Indian Prime Minister Narendra Modi announced the expansion and welcomed Argentina, Egypt, Iran, Saudi Arabia, Ethiopia, and the United Arab Emirates into BRICS. This move is notable as it brings in countries from both sides of the energy-rich Gulf and marks a unique diplomatic decision by Iran and Saudi Arabia, who recently normalized relations.

The expansion of the group is part of its plan to build dominance and reshape global governance into "multipolar" world order that puts voices of the Global South at the centre of the world agenda.



This expansion decision comes after 13 years since South Africa joined in 2010. Initially, BRICS formed with Brazil, Russia, India, and China to enhance the influence of important economies in the evolving global order.

During the BRICS summit, PM Modi engaged in bilateral meetings with leaders from Senegal, Mozambique, Ethiopia, and Iran. He also spoke at sessions encouraging collaboration, inviting nations to participate in various initiatives like the International Solar Alliance and Coalition for Disaster Resilient Infrastructure.

The leaders emphasized a commitment to inclusive multilateralism and upholding international law. They expressed concerns about conflicts globally and stressed peaceful conflict resolution through dialogue and inclusive consultation.

## INTERNATIONAL RELATIONS

## INDIA AND THE NORTHERN SEA ROUTE

## CONTEXT:

India's role in Murmansk's cargo traffic surged to 35% in 2023. The Arctic's climate change vulnerability could affect India's security, water, and sustainability. India's Arctic involvement traces back to the 1920 Svalbard Treaty and includes research. India prioritizes the Northern Sea Route for its strategic shipping advantage between Europe and Asia-Pacific.

### Arctic region is significant to India

The Arctic's climate change poses risks for India's economy, water security, and sustainability. It holds substantial untapped hydrocarbon resources, potentially 40% of global reserves. India's Arctic Policy emphasizes aligning with UN Sustainable Development Goals for responsible economic development.

### Northern Sea Route

The Northern Sea Route (NSR), the shortest shipping route for freight transportation between Europe and countries of the Asia-Pacific region,

straddles four seas of the Arctic Ocean. Running to 5,600 km, the route begins at the boundary between the Barents and the Kara seas (Kara Strait) and ends in the Bering Strait (Provideniya Bay).

### What are the driving factors for India to participate in the NSR development ?

- The Northern Sea Route (NSR) has seen a 73% growth in cargo traffic from 2018 to 2022, with 34.117 million tonnes in the previous year. India's increased imports of oil and coal from Russia benefit from the reliable and secure NSR transport.
- NSR is crucial for India due to its geographic position and heavy reliance on maritime trade. The Chennai-Vladivostok Maritime Corridor (CVMC) project, a 10,500 km route, is being explored to link with the NSR for quicker and more efficient container transit. This could significantly reduce transportation time and costs for various goods.
- CVMC is anticipated to handle cargo like coking coal, crude oil,

LNG, and fertilizers. Moreover, discussions are ongoing about potential joint influence from China and Russia over the NSR's operations.

#### What Next ?

The Russian government's NSR development plan targets 80 million tonnes and 150 million tonnes of cargo traffic by 2024 and 2030,

respectively. Despite Western sanctions, the plan was approved. A Russian delegation engaged with the Indian business community to ensure year-round NSR operation components. Rosatom aims for Indian company participation in NSR projects. Regarding the CVMC project, a workshop involving stakeholders from both nations is anticipated in October.

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