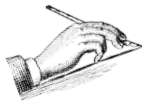




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GS 3: SPACE

THE HINDU PAGE: 3

Chandrayaan-2 identifies 'possible presence' of ice in lunar south pole

The Hindu Bureau

BENGALURU

Nearly six years after it was launched, India's second moon mission Chandrayaan-2 continues to provide valuable data on the satellite.

In a new finding, scientists have found the possible presence of sub-surface ice in the Lunar South Polar Region. These were the findings of scientists from the Physical Research Laboratory (PRL) who used observations from the Chandrayaan-2's Dual Frequency Synthetic Aperture Radar (DFSAR) payload.

In this study, the scientists focused on doubly



Lunar shades: In the study, the scientists focused on special craters located in permanently shadowed regions of the moon. PTI

shadowed craters, which are special craters located in permanently shadowed regions (PSRs) of the moon.

Due to continuous shielding from sunlight

and thermal radiation, these regions remain extremely cold (temperatures -25K) and are considered favourable locations for preserving water-ice over long geological times-

cales. Using advanced radar polarimetric analysis, the scientists identified radar signatures consistent with the possible presence of sub-surface ice beneath the floors of four doubly shadowed craters in the lunar South Polar Region.

"Among the investigated craters, one crater of 1.1 km diameter within the Faustini crater shows particularly strong evidence of sub-surface ice, supported by both radar observations and distinctive lobate-rim morphological characteristics," the ISRO added.

The findings are expected to have significant implications for future lunar exploration missions.

GS 2: HEALTH

THE HINDU PAGE: 6

National Health Accounts figures indicate high burden of health care costs on people

Ramya Kannan
CHENNAI

While India has improved public financing of health care, households and individuals still bear the heaviest burden. As per the latest figures from the National Health Accounts (NHA) Estimates for India 2022-23, out-of-pocket expenditure (OOPE) is nearly half of the current health expenditure, and financial protection for health emergencies remains incomplete, though government and insurance spending has increased.

The government's interpretation of the NHA measures and takes credit for infinitesimal growth of public spending. According to a press release, "The share of Government Health Expenditure (GHE) as a percentage of the GDP has risen from 1.15% in 2013-14 to 1.43% in 2022-23", and as per the new GDP series, it will be 1.48% in 2022-23. "Similarly, this share in General Government Expenditure has increased from 3.78% to 4.89% over the same period, underscoring the growing priori-



A big worry for a nation with a large non-communicable diseases burden is the relatively low spending on preventive care. ISTOCK

tisation of health in public spending. In per capita terms, GHE has increased nearly 2.7 times... The decadal trend of increased Government Health Expenditure has resulted in overall reduction in the Out-of-Pocket Expenditure (OOPE) as a share of the Total Health Expenditure," the release claims.

However, claims notwithstanding, these figures are still short of the WHO Global Recommendation to dedicate at least 5% of the GDP to public health towards meeting universal health coverage targets. It also falls short of National Health Policy recommen-

dation to have the combined Central and State government health spend at 2.5% of GDP.

Abhay Shukla, national co-convenor, Jan Swasthya Abhiyan, points out that the slight surge in public health spending seen in India during COVID has been pushed back to pre-COVID levels. "India's Government Health Expenditure (GHE) as a share of Current Health Expenditure (CHE) has dropped sharply from 41.1% in 2021-22, to 35.6% in 2022-23, in just one year." This indicates that even the temporary, small rise of public financing observed during COVID has not been

sustained, rather the latest levels are comparable to 35.3% recorded in 2019-20 in the pre-COVID period, he explains. CHE, which measures the final consumption of healthcare goods and services excluding cap-ex, is ₹7,66,814 crore.

The NHA also answers the question of who contributes to the health spend. GHE is the amount the government spends on health care, inclusive of capital expenditure, is ₹3,85,332 crore - less than half of the total health expenditure (THE). Of this, the Union government's share is about 36%, and the State governments fund over 63% of THE. With households forking out 56.44% of health spends on CHE, an extraordinary burden remains on the people. Of this, out of pocket expenditure, accounts for a whopping 49.90% of CHE.

Dr. Shukla says, the total expenditure under government-financed health insurance schemes combined was ₹26,266 crore, representing a meagre 3% of India's THE. In contrast, now private health insurance

expenditures (9.2% of THE), most of which are paid for directly by households, are three times higher than all spending through government-financed health insurance schemes. He charges that Pradhan Mantri Jan Arogya Yojana (PMJAY) and associated government health insurance schemes are failing to provide substantial protection to people from high healthcare spending.

The NHA has also revealed that private hospitals take the largest share of all CHE at 30.83%, followed by government hospitals at 16.73%. This makes it clear that India's health system remains deeply privatised, despite claims of increased public spending, Dr. Shukla says. "This continued high level of unregulated privatisation is deepening major inequities in access to healthcare, linked with rising costs and frequent irrational treatment practices."

Another worrisome aspect is the relatively low spending on preventive care. As per the NHA, preventive care forms only 8.88% of the CHE spending.

GS 2: HEALTH

THE HINDU PAGE: 7

Colour blindness: a hidden vision condition many don't realise they have

Lakshmi S.

Despite being prevalent among Indians, knowledge and understanding of colour blindness in India is extremely poor. Most of the general population believes that colour blindness is when one sees the world only in shades of black and white. But this is not the case: most people with colour blindness cannot discriminate only between certain colours, namely red-green or blue-yellow combinations. The disorder is congenital and thus, many people may be unaware of their condition all their lives.

Indian scenario

According to various studies in India, around 8% of men and 0.5% of women suffer from colour blindness, which means almost 70 million Indians are potentially colour blind. Red-green type of this vision

problem is the most common type of colour blindness, caused by a gene mutation located on the X chromosome. Thus, since men have just one X chromosome, they are much more susceptible to inheriting this condition from their parents compared to women.

A serious problem with colour-blindness is that this condition influences one's life unnoticed. Common problems that people with this condition might face on daily basis range from the serious to the minor: misinterpreting traffic lights, a negative impact on academic performance of students, an inability to match clothes, problems working with colour-coded charts or maps, issues with choosing ripe fruit, and problems with interpreting colour signals. Many of these issues can go unnoticed until the person gets diagnosed with the problem.

It should be noted that there are



Colour clarity: According to various studies in India, around 8% of men and 0.5% of women suffer from colour blindness. GETTY IMAGES

multiple types of colour blindness. For example, red-green is the most common type, while blue-yellow type and complete colour blindness

are rather uncommon. Besides, while this problem is usually genetic, it can also develop due to diabetes mellitus, glaucoma, cataracts, retinal

diseases, optic nerve disease, brain injury, with ageing and certain medicines.

Any changes in colour vision should be checked by an ophthalmologist, as it can mean an underlying serious eye or neurological condition.

Testing of colour vision is necessary for children and adults who have diabetes or any chronic eye diseases. Unfortunately, colour blindness awareness is not high enough in India to allow for testing in schools for every child.

Addressing myths

There are also certain myths that should be addressed. First of all, it is a misconception that colour blindness leads to total blindness. It also has no connection to intelligence. Despite the fact that there are no ways to treat genetically-determined colour blindness permanently, some

individuals can be helped by colour-filter glasses, which allow for discriminating between different colours. However, there is no permanent cure for colour blindness.

More awareness

Schools, workplaces, and other areas use colour codes extensively, making the creation of colourblind-friendly environments necessary. Teachers and other educators need to be aware that students should not be punished for colour blindness.

Accommodating this need in individuals may involve the use of labels instead of colours, adding patterns or symbols, improving lighting, and using certain apps that can help identify colours.

(Dr. Lakshmi S. is head, clinical services, Dr. Agarwal's Eye Hospital, Chennai. omprakash.lakshmi@yahoo.com)

GS 2: POLITY

THE HINDU PAGE: 10

What did the court rule on Bihar's SIR of electoral rolls?

What were the four main issues raised by the petitioners against the SIR exercise?

Rangarajan R.

The story so far:

The Supreme Court recently upheld the powers of the Election Commission (EC) to conduct special intensive revision (SIR) of the electoral rolls in Bihar. It also upheld the procedure followed by the EC.

What was SIR?

Article 324 of the Constitution provides that the superintendence, direction and control of the preparation of electoral rolls for the conduct of elections shall vest with the EC. Section 21 of the Representation of the People Act, 1950 (RP Act), deals with the preparation and revision of electoral rolls. It authorises the EC to carry out a special revision of the electoral roll, for any constituency at any

time, for reasons to be recorded.

In its June 2025 order to carry out the SIR of Bihar electoral rolls, the EC noted that there had been large-scale additions and deletions to the electoral rolls over the last 20 years due to rapid urbanisation and migration. This has increased the possibility of duplicate entries in the electoral roll. The EC stated that it is also constitutionally obligated to ensure that only citizens are enrolled in the electoral rolls. Accordingly, the EC decided to undertake an SIR exercise for the entire country, starting with Bihar.

What issues were raised?

The Association for Democratic Reforms and various other petitioners had challenged the SIR exercise in the Supreme Court. The key issues for consideration in these petitions are summarised below.

First, whether the EC is empowered to carry out the SIR exercise. Section 21(3) of the RP Act authorises the EC to carry out a special revision of the electoral roll for 'any' constituency or part of a constituency in such manner as it may think fit. The petitioners argued that this provision is for special revision of only a particular constituency and not for a State as a whole, as envisaged in the SIR process.

Second, if the SIR is founded on a legitimate purpose, whether the measures adopted by the EC are proportionate to the object being sought to be achieved. Third, whether the procedure is violative of provisions of the RP Act and Registration of Electors Rules, 1960 (RER). The petitioners argued that enrolment in the electoral roll carries a presumption of citizenship and eligibility. Rule 21A of the RER mandates that no

name already entered in the electoral roll can be deleted without prior notice to the elector concerned and an opportunity of hearing. The petitioners argued that requiring all electors to fill out the enumeration forms again and deleting the names of those who fail to submit them violates these provisions. Fourth, whether the EC is empowered to scrutinise the citizenship status of persons seeking inclusion or continuation in the electoral roll.

What did the court rule?

The court, after hearing the petitioners and EC, upheld the SIR exercise and procedure followed. The conclusion of the court for the four main issues raised can be summarised as follows. First, the interpretation of the word 'any' in Section 21(3) of the RP Act as 'only' for a particular constituency would be narrow and restrictive. The EC is well within its constitutional mandate to carry out SIR for 'many' or 'all' constituencies in a State. It is an exercise traceable to Section 21(3) read with Article 324 of the Constitution to fulfil the constitutional requirement of free and fair elections.

Second, the SIR exercise satisfies the proportionality requirement. The measures adopted bear a rational nexus to the objective sought to be achieved, are not manifestly excessive, and are accompanied by sufficient procedural

safeguards to prevent arbitrary exclusion.

Third, while inclusion in the electoral roll gives rise to a presumption of validity, it does not impose a blanket prohibition on the powers of the EC to undertake an SIR. The safeguards of notice and hearing under RER are preserved in substance, and the process adopted by the EC is within the statutory requirements. The documentation prescribed by the EC, to which the Aadhaar card was subsequently added as per the court's direction, is based on intelligible criteria having a direct nexus with the objective of ensuring the integrity of the electoral roll.

Fourth, the EC is empowered, in the exercise of its constitutional mandate, to undertake a limited enquiry into citizenship for eligibility for inclusion in the electoral roll. It does not amount to a determination of citizenship in the strict sense and is confined to electoral consequences alone.

Any deletion of names on account of the opinion of the EC that they are not citizens should be referred by the commission to the competent authority under the Citizenship Act, 1955, for adjudication of their citizenship. If the authority holds that such deleted individuals are citizens, they shall be included in the electoral roll. (Rangarajan R is a former IAS officer and author of 'Courseware on Polity Simplified'. Views expressed are personal.)

GS 2: INTERNATIONAL RELATIONS INDIAN EXPRESS PAGE: 8

India's West Asia challenge: Stay agile, stay connected



SYED
AKBARUDDIN

RARELY IN recent years has West Asia occupied so much space in India's foreign-policy conversation. Attention, however, has not always produced understanding. By breakfast, newspaper columns have sorted the heroes and villains. By prime time, TV hosts have turned the crisis into loyalty tests.

For India, West Asia is not a straight line. It is a Rubik's Cube. Every move shifts another face. There is no single West Asia for New Delhi to align with. Israel, the Gulf and Iran are three principal faces of the same puzzle. A posture that protects defence ties with Israel may complicate Gulf sensitivities. A channel that preserves access to Iran may unsettle partners elsewhere.

The first is a security and technology-oriented West Asia. Here, Israel matters. The relationship is embedded in defence procurement, intelligence-sharing and counter-terrorism capabilities. In a crisis, these are operational assets. Any serious Indian policy must account for this layer, however uncomfortable that may be for those who prefer a purely moral frame.

The second is an economic and human West Asia, the Gulf. For India, it means remittances, oil, gas, investment flows, food security and the safety of its workers abroad. Saudi Arabia and the UAE are both indispensable, but they are not interchangeable. Riyadh carries the weight of oil markets, Islamic legitimacy and bargaining in any future regional settlement. Abu Dhabi's break with OPEC discipline underlines how differently it moves. It is faster, more commercially wired, less bound by old Gulf caution, more open with Israel and more wary of Tehran. For India, there is no single Gulf consensus waiting to be read from one capital. The Gulf has become a cube within the cube.

The third sits on the map itself. For India, Iran is not just a difficult sanctions problem. It is Chabahar, access to Afghanistan and Central Asia, and a reminder that geography keeps its own counsel. A closed channel with Tehran would make India less agile.

These three West Asias do not fit to-

gether easily. Each twists differently, creating pressure elsewhere. Today's crisis has fused Gaza, the US confrontation with Iran, militia activity in Lebanon and pressure on maritime routes into a layered conflict. Even within individual theatres, alignments are not straightforward. In Lebanon, the state's interest in preventing escalation can overlap more with Israel's preference for stability than with Hezbollah's confrontation-driven posture, without making them allies.

This is where the punditry fractures. One camp reads every Indian statement or silence as proof of a tilt towards Israel and the US. Another wants New Delhi to speak in a louder moral register. A third mistakes low visibility for irrelevance. The shallow-west version treats foreign policy as optics.

The claim that India has "chosen" one side ignores India's different interests. The argument that India should have spoken more forcefully assumes that voice alone alters outcomes in a conflict where some actors can change facts on the ground. Moral clarity matters. States, however, inherit consequences that commentators do not. The charge of absence is misleading too. Visibility and access are not the same. India has tried to preserve access rather than spend it on a louder line.

None of this means India has mastered the moment. The risks are now closer to home. West Asia enters India through oil and fertiliser prices, pressure on foreign exchange reserves, a weaker rupee and anxious families. Recent appeals for restraint in fuel use, gold purchases and foreign travel attest to that.

India has recognised that West Asia is not a single contest but a tangle of rivalries, bargains and anxieties. That means policy, even when purposeful, will sometimes appear uneven. Debate and commentary will continue, as they should. India's success in West Asia, however, will be judged by whether it can protect its interests, keep channels open and keep turning the cube without losing sight of the whole.

The writer is former permanent representative of India to the United Nations, and dean, Kautilya School of Public Policy, Hyderabad

For India, West Asia is not a straight line. It is a Rubik's Cube. Every move shifts another face. There is no single West Asia for New Delhi to align with

GS 3: SCIENCE AND TECHNOLOGY

INDIAN EXPRESS PAGE: 18

Why RG staff are turning to salt to save the clay

Express News Service
Mumbai, May 28

FOR DECADES, clay courts have been associated with long rallies, high bounces and physically-draining tennis. But at this year's French Open, players have often said Roland Garros is playing faster than usual.

The reason is not a change in balls or court construction alone — it is the weather.

Paris is currently experiencing an unusually intense early-summer heatwave, with temperatures crossing 35°C during the opening week of the tournament. Groundskeepers say the conditions are unlike anything they have dealt with in late May.

"What we're experiencing is unprecedented," Philippe Vaillant, head of court maintenance at Roland Garros, told the Associated Press. "Even the weather services say it themselves: it's unprecedented to have temperatures this high for such a long period at this time of year." The heat is fundamentally altering how the clay behaves.

Weather's impact

Clay courts are moisture-dependent surfaces. Unlike hard courts, their playing characteristics are directly tied to how much water is retained beneath the top layer of crushed brick. When temperatures rise sharply, moisture evaporates faster. The surface becomes drier and harder, which changes the speed and bounce of the ball. Players at Roland

Garros have already noticed the difference.

World No.1 Aryna Sabalenka said the conditions were "boiling hot" and that "balls are flying, everything is much faster."

Traditionally, clay slows the ball down because moisture creates more friction between the surface and the ball. But dry clay reduces that resistance.

The bounce becomes quicker and lower, favouring aggressive baseline hitting over attritional rallying. The shift is significant because Roland Garros has historically had the slowest Grand Slam surface. This year, players are increasingly comparing conditions to hard courts during afternoon sessions.



Jannik Sinner struggling during his match on Thursday. AP

Red clay's science

What appears to spectators as a simple layer of red dirt is actually a complex five-layer structure nearly 80 centimetres deep. At Roland Garros, the courts are built using large foundation stones, gravel, volcanic rock residue, compacted limestone, and finally a thin layer of crushed red brick.

According to Vaillant, the limestone layer is the most critical component because it retains moisture and provides structural stability. The red brick layer is mainly cosmetic

and helps players slide. If the limestone dries out excessively, the court can crack. More importantly, the surface becomes dangerously slippery. Vaillant compared overly dry courts to an ice rink, warning that players could lose their footing while sliding into shots.

"The crushed brick layer is 3 to 5 millimetres thick," Vaillant explained. "The most important part is the limestone layer underneath. That's the actual playing foundation. This limestone layer must remain moist at all times. It's compacted crushed stone maintained through water supply. If we let it dry out too much, the courts could crack."

The red brick layer, meanwhile, serves a different purpose. "The crushed brick is mainly there for colour and as a material that provides some sliding ability and an important visual contrast, since the limestone is almost white," Vaillant said.

Keeping courts alive

To combat the heat, tournament staff have dramatically altered maintenance routines. "We're forced to water the courts a little more, of course,"

Vaillant said.

Normally, clay courts are watered at fixed intervals. This year, groundskeepers are soaking the courts every evening to replenish moisture deep beneath the surface. During matches, courts are also being lightly watered between sets — something rarely required under standard French Open conditions.

Another key tool is calcium chloride, a salt compound spread across the courts in flake form each morning. "This is basically just salt," Vaillant said. "We spread it over the courts in flake form in the morning. It melts on contact with water and helps retain surface moisture."

The compound slows evaporation and helps the courts retain consistency through long matches played in direct sun. Groundskeepers say the substance effectively "reactivates" moisture in the crushed brick layer during the day.

The maintenance operation is massive. Around 200 groundskeepers are working across 18 competition courts and 15 practice courts during the tournament.