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INTERNATIONAL

WHAT CHANGED IN HUNGARY'S ELECTION?

The story so far:

In Hungary's general elections held on April 12, Viktor Orban (63), the Christian nationalist Prime Minister who had been in power since 2010, slumped to a shock defeat. His party, Fidesz, won only 55 seats (37.8% vote share) in the 199-member National Assembly. The Opposition Tisza Party, led by Peter Magyar (45), a former Fidesz leader, secured a two-thirds majority with 138 seats (53.6% of the vote), while the far-right Mi Hazank (Our Homeland Movement) won six seats (5.8% vote share).

What is the significance of Orban's defeat?

Under Mr. Orban, Hungary had effectively become an electoral autocracy. In 2011, he used his two-thirds majority in the National Assembly to pass a new Constitution that centralised power and eroded democratic checks and balances. A new law forced hundreds of judges to retire, who were then replaced by Orban loyalists, weakening judicial independence. He secured near-complete control over the media by selectively channelling government advertising and ensuring that critical outlets were either shut down or taken over by his loyalists.

He also manipulated Hungary's electoral system to his advantage through various means that favoured large parties like Fidesz, including granting voting rights to non-resident ethnic Hungarians in Central Europe and gerrymandering (redrawing electoral constituency boundaries to suit his party). These changes helped him win consecutive elections. With pollsters predicting another term for Mr. Orban, his loss came as a shock to the world.

Given how he had altered Hungary's democratic landscape and foreign policy and sought to project Hungary as a model for 'illiberal democracy', his exit assumes historic significance.

What were the reasons for his defeat?

Political analysts have flagged four major reasons: a stagnant economy, high unemployment, a broken healthcare system, and a strong anti-corruption campaign led by Mr. Magyar. The rise of Gen Z voters also played a part. It was a key factor in the 76.5% voter turnout — the highest since Hungary's post-1990 democratic transition — indicating a widespread sentiment that this was a high-stakes election.

A growing public perception that Mr. Orban was running a 'kleptocracy', along with a stuttering economy, was a double blow that led to mass discontent and a yearning for change.

Who is Peter Magyar?

A former ally of Mr. Orban, Mr. Magyar broke away from the party and resigned from all government positions in 2024 following a political scandal in which the then-President had pardoned the head of a children's home who had been convicted of covering up child sexual abuse.

Mr. Magyar utilised the scandal to reposition himself from a system insider to an Opposition leader. He amplified it by releasing a politically damaging audio recording of his ex-wife, Judit

Varga, who was Justice Minister at the time and had countersigned the pardon. The recording was made secretly when they were still married.

Founding a new political party would have taken time and posed administrative hurdles, so Mr. Magyar joined the little-known Tisza party to contest the European Parliament elections. He won, becoming a Member of the European Parliament (MEP) in 2024. Soon after, he conducted a series of high-decibel media interviews and public rallies in which he accused the Orban regime of rampant corruption, repeatedly claiming that "a few families own half the country".

Ahead of the 2026 elections, he campaigned extensively across Hungary, advocating urgent change with the slogan, "Now or never". His mass mobilisation efforts paid off.

Does Magyar represent a clean break with the Orban era?

Yes and no. Mr. Magyar has the two-thirds 'supermajority' needed to roll back the anti-democratic constitutional changes made by Mr. Orban, and he has promised to do so. He has also called on all of Mr. Orban's 'puppets' in the government to resign. Hungary's institutions, especially the judiciary and academic institutions, could regain some of their lost autonomy.

On the foreign policy front, there will be a clear break from Mr. Orban's pro-Russia, anti-EU stance, with Mr. Magyar going the other way — pro-EU and anti-Russia. In fact, his election rallies were marked by chants of "Ruszkik, haza!" ("Russians, go home!") — a reference to the Hungarian revolution of 1956, when the country was under Soviet occupation, and an expression of resentment at Mr. Orban's close ties to Moscow. However, while he is likely to reduce Russian influence in government and support the EU's $103 billion loan package to Ukraine — which Mr. Orban had blocked — he is not in favour of accelerating Ukraine's EU membership and is wary of being seen as overly pro-Kyiv. At the same time, he aims to reduce Hungary's dependence on Russian energy.

On immigration, Mr. Magyar could end up being tougher in material terms. He wants to cut back on the guest worker programme to protect Hungarian wages.

Does Orban's defeat mark the limits of populism?

Mr. Orban's populism had served as an ideological inspiration for similar political formations across the world, including the MAGA movement. Vice President J.D. Vance even visited Hungary to lend his weight to Mr. Orban's election campaign.

The combination of a skewed electoral system, an unlimited campaign war chest, and a clueless Opposition had made Mr. Orban appear invincible for 16 years. But a new political party led by an energetic leader demonstrated that even in an electoral autocracy, if the Opposition hits the streets and successfully engages younger voters, it may not be impossible to defeat a dispensation that uses populist policies as a cloak for rampant cronyism and economic mismanagement.

WHAT IS 'ILLIBERAL' DEMOCRACY?

Liberal democracy

Liberal democracy is a system of government characterised by the rule of law, universal suffrage, and the protection of civil rights. Marc F. Plattner, the founding coeditor of the Journal of Democracy, notes that while democracy is an answer to the question of who rules, liberalism describes the limits to rulers' power once they are in office.

Since liberal democracy emphasises freedom and equality for all individuals, these limits, usually defined in a written constitution, seek to protect individuals' rights and demand the rule of law, says Plattner, adding that hence, "constitutional democracy" sometimes serves as an alternative term for liberal democracy.

However, it is interesting to note that democracy and liberalism are not inseparably linked. Larry Diamond, a leading scholar of democracy, underlines that "historically, liberty – secured through constitutional, limited government and a rule of law – came about before democracy."

While some liberal societies were not governed democratically, there were premodern democracies that were not necessarily liberal. The fact that electoral democracy and liberalism do not necessarily go together is central to debates on the idea of "illiberal" democracy, in which Viktor Orbán occupies centre stage.

Illiberal democracy

The term "illiberal democracy" was first introduced by Fareed Zakaria in an article titled "The Rise of Illiberal Democracy", published in Foreign Affairs in 1997. Zakaria used the term to describe the spread of democracy during the mid-1970s in countries that completely lacked a liberal tradition.

He argued that the mere introduction of elections does not qualify such countries to be called genuine liberal democracies. Rather, it undermined the possibility of these countries evolving into a liberal democracy. He argued that the path through "liberal autocracy" might be a surer route than the path through illiberal democracy for reaching the ultimate goal of liberal democracy.

Nevertheless, following the triumph of the Fidesz party in Hungary in 2010, Orbán expressed his unequivocal support for the idea of illiberal democracy by saying that "there is an alternative to liberal democracy: it is called Christian democracy"..., "which is, by definition, not liberal: it is, if you like, illiberal", noted Plattner.

Implications of Orban's defeat

Orban also drew distinctions between liberal democracy and Christian democracy by underlining that the former supports multiculturalism, immigration, and adaptable family law, while the latter prioritises Christian culture and family model, and does not support immigration.

Although Orbán's defeat in the recent elections ignited debates about its implications for the "illiberal" democracy in Hungary under the aegis of the centre-right Tisza party, the implications remain to be seen.

But Plattner's observation, he made years ago, appears relevant in this context, when he said that the threat to liberal democracy lies in the possibility that "mainstream center-right parties will be captured by tendencies that are indifferent or even hostile to liberal democracy."

NATIONAL

ON THE SABARIMALA TEMPLE ENTRY CASE

The story so far:

A nine-judge Constitution Bench of the Supreme Court (SC), led by Chief Justice of India Surya Kant, is currently hearing petitions relating to discrimination against women at religious places, examining the correctness and broader constitutional implications of its 2018 ruling in Indian Young Lawyers' Association vs. State of Kerala on women's entry into the Sabarimala Temple in Kerala.

On September 28, 2018, a five-judge Constitution Bench of the apex court, by a 4:1 majority, struck down the age-based restriction, declaring Rule 3(b) of the Kerala Hindu Places of Public Worship (Authorisation of Entry) Rules, 1965 – which permitted 'religious denominations' to exclude women from public places of worship on grounds of custom — as unconstitutional. The exclusion of women of "menstruating age" violated the guarantees of equality, non-discrimination and dignity, the apex court had held. It further ruled that devotees of Lord Ayyappa do not constitute a separate 'religious denomination', and that the said custom does not qualify as an "essential religious practice" (ERP).

Balancing religious freedom and equality

Articles 25-28 under Part III (Fundamental Rights) of the Constitution guarantee the right to freedom of religion, with the Sabarimala matter focused on the interplay between Articles 25 and 26. While Article 25 secures to "all persons" the freedom of conscience and the right to profess, practise, and propagate religion, Article 26 protects the autonomy of 'religious denominations' to manage their own affairs in matters of religion, establish institutions, and acquire and administer property. Both rights are subject to 'public order', 'morality', and 'health', with Article 25 additionally limited by 'other fundamental rights'. Framed against the backdrop of India's religious diversity, these provisions safeguard the beliefs and practices of all faiths.

The doctrinal foundation for interpreting these provisions lies in Sri Lakshmindra Thirtha Swamiar of Shirur Mutt (1954), where the Supreme Court held that religion also includes practices essential to the faith while distinguishing them from secular activities, particularly administration, property and finance, which remain amenable to state regulation. This sacred-secular distinction is decided through the ERP doctrine, which requires courts to assess, with reference to religious texts and tenets, whether a practice is integral to a faith, i.e., whether its absence would fundamentally alter the religion itself, as was clarified in Acharya Jagdishwarananda Avadhuta (2004). The doctrine seeks to balance 'religious autonomy' with 'constitutional accountability'.

Union government's contentions

The Union government, led by Solicitor General Tushar Mehta, had advanced three primary contentions: first, that "constitutional morality" is inherently subjective and not an independent ground of judicial review; second, that judges should not be social reformers, which must instead emanate from the legislature and society; and third, that the judiciary is ill-equipped to determine ERPs, as the Constitution leaves questions of religious essentiality to the faith itself. Building on this, the Union further argued that the 2018 ruling failed to account for the internal plurality of

Indian religions and the phrase "any section thereof" in Article 26, which, it contends, extends denominational protection to sub-groups within a faith.

Moreover, Mr. Mehta, citing the example of temples where men are excluded, and a Kerala temple where men enter dressed as women, argued that religions may impose male or female-centric restrictions, which have nothing to do with gender stereotypes or patriarchy. In a related vein, the application of Article 17 (abolition of untouchability) to the exclusion of women was contested on the ground that it is historically confined to caste-based practices and cannot be extended to biological conditions such as menstruation without distorting its constitutional purpose.

On conducting reforms in religion

At its core, the issue turns to how the Constitution distinguishes between protected religious practices and those amenable to reform. While Article 25(1) guarantees freedom of conscience and religion, Article 25(2) permits regulation of secular activities associated with religious practice. During the Constituent Assembly debates, Dr. B.R. Ambedkar pointed out the need to separate what is "essentially religious" from secular activities intertwined with religion, advocating limits on religious definitions to allow State intervention in non-essential practices. Yet, despite the Constitutional provision not clearly demarcating this boundary, the framers' intent was to protect all practices that are inherently and essentially religious under Article 25(1) - a position now narrowed by the evolving ERP doctrine, which shifts the inquiry from whether a practice is inherently religious to whether it is indispensable to a religion's core identity.

In doing so, the judicial position taken in earlier cases adjudicated by the top court between 1950 and 1980, including that in Mahant Sri Jagannath Ramanuj Das (1954) and Seshammal (1972), is undone. These verdicts recognised that Article 25(1) protects not only doctrine but also rituals, observances, ceremonies, and modes of worship, i.e., all practices that are essentially religious and not merely things that have scriptural backing to be "essential to the religion". This stands in contrast to later rulings such as Adi Saiva Sivachariyargal (2015) and Indian Young Lawyers' Association (2018), wherein the Supreme Court held that even if there is proof of a certain practice being followed since pre-constitutional times, it cannot be afforded protection under Article 25(1) if it is not essential to the core functions of the religion. This pattern points to a gradual narrowing of the religious protections afforded under Article 25(1), with the court allowing for practices and rituals falling at the periphery of religious practice to be reformed.

Importantly, Article 25(2)(a) allows the 'State' to make laws regulating secular functions associated with religion while also empowering it under Article 25(2)(b) to provide for social welfare or reforms. Article 25(2)(b) was originally designed to dismantle caste-based exclusion in Hindu religious institutions, not gender-based restrictions. As reflected in the Constituent Assembly debates, particularly the views of K.M. Munshi and Dr. B. R. Ambedkar, the phrase "all persons are equally entitled" emerged in the context of caste and communal inequities. Accordingly, gender equality claims are better grounded in Articles 14 and 15, rather than by expanding Article 25(2)(b).

Thus, the Constitutional text reflects the framers' intent to vest the power of reform in the State, which must calibrate such measures in a manner that is aligned with the needs of its constituents.

So, what role does the judiciary play? While Article 25(2) vests the power of reform in the State, courts retain the authority to intervene where religious practices (like witchcraft or human sacrifice) offend public order, morality or health. Therefore, a combined reading of Articles 25 (1) and (2) indicates that, while the State has the power to actively pursue social reforms in matters

of religion with a limited scope of application of "transformative constitutionalism" by the courts, the judiciary retains the power to strike down practices that may be completely abhorrent to the spirit of a democratic society.

The definition of religious denomination

Religious denominations or sects enjoy a special set of rights under Article 26, extending beyond the general protections under Article 25, including autonomy in managing religious affairs. Additionally, while the right under Article 25 is subject to all other fundamental rights, the same is not the case with the 'denominational rights' granted under Article 26, making the "denomination" status extremely covetable.

In Shirur Mutt (1954), the apex court adopted the Oxford Dictionary meaning of "denomination" and laid down a three-part test to be fulfilled by a group of individuals to qualify as a denomination - (1) common faith, (2) common organisation, and (3) designation by a distinct name. Applying this in the Indian Young Lawyers' Association (2018), the SC denied denominational status to Ayyappa devotees, holding that they were not distinct from the broader Hindu faith, particularly as the temple permitted entry to Hindus across sects rather than exclusively to Ayyappa followers.

However, critics often rely on an argument tracing the origins of Article 26 to propound for denominational rights to the devotees of Ayyappa Swami. Article 26 of the Indian Constitution is borrowed from Article 44 of the Irish Constitution from 1937, which at one point in time, specifically enumerated denominations like the Methodist Church of Ireland, the Presbyterian Church in Ireland, and so on. Therefore, the expression "religious denomination" is one that was originally used in the context of clearly defined and organised Christian sects. This definition, when juxtaposed in the context of Hinduism's open architectural background, often loses meaning, as sects often do not function independently of the primary Hindu tenets.

Presumably to account for this difference, the framers of the Constitution extended denominational rights to every religious denomination "or any section thereof" under Article 26(1). This allows for a scenario where sections of a larger faith, even if not completely distinct from the said faith, enjoy 'denominational rights' available under the provision.

WHY INDIA SHOULD ESTABLISH A VACCINE INJURY COMPENSATION MECHANISM

In the winter of 2021, millions of Indians lined up outside government health centres to receive COVID-19 vaccines. They were responding to public calls from official campaigns and, in many contexts, were effectively mandated by employers and institutions. With over 219.86 crore doses administered by late 2022, vaccination was not merely a personal choice but a social contract. What was never made equally clear was what would happen to those who, through no fault of their own, suffered serious harm because they answered that call.

India's silence on vaccine injuries is a governance deficit that cuts to the heart of constitutional accountability and the social compact between citizens and the state. Now, the Supreme Court has directed the Union government, in the Rachana Gangu v. Union of India (2026) case, to frame a no-fault compensation policy for serious adverse events following COVID-19 vaccination.

Rare but real

Vaccines are among the most consequential public health innovations in human history. Their role in eliminating smallpox, nearly eradicating polio, and dramatically reducing child mortality is

beyond dispute. Yet the medical literature is equally unambiguous that serious adverse events following immunisation, while rare, do occur. Anaphylaxis, thrombosis with thrombocytopenia syndrome (TTS) linked to certain adenoviral vector vaccines, vaccine-associated paralytic polio from oral polio formulations, and encephalopathy following some childhood vaccines are all documented.

The rarity of these events is not a reason to dismiss them. It is the very reason a compensation mechanism becomes ethically necessary. When a harm is rare and unpredictable, the individual who suffers it is just someone who took a risk on behalf of collective immunity and lost. The government's own affidavit recorded 92,114 Adverse Events Following Immunisation (AEFI) cases, including 89,332 minor, 2,782 serious or severe AEFIs, and 1,171 deaths.

Protecting public health

The Constitution does not merely permit the State to run vaccination programmes, but creates an affirmative obligation to protect public health as part of the right to life under Article 21, which includes the right to health. If the state derives legitimacy from promoting collective welfare through mandatory interventions, it must also bear the duty to remedy harm caused by those interventions. The "doctrine of legitimate expectation" supports this, as citizens who comply with state health directives may legitimately expect not to be abandoned if compliance causes injury. A wealthy individual can access specialists and courts; a daily-wage worker who suffers post-vaccination paralysis cannot, making the absence of a scheme not a neutral gap but a deeply unequal one.

Existing legal remedies for vaccine injury are poorly suited to the problem. Tort law requires proof of fault that the manufacturer or state acted below the required standard of care. Where a serious adverse event occurs because of individual immune response rather than any error, there is simply no fault to establish and no cause of action to bring. The Consumer Protection Act 2019, allows claims for deficiency in service. However, where vaccines are supplied free, the 'consumer' relationship is legally contested, and consumer forums are ill-equipped to assess pharmacovigilance evidence.

Even PILs are too blunt an instrument for individual compensation. A PIL can direct policy, as the Supreme Court has now done, but it cannot administer a claims process, leaving the legal ecosystem structurally incapable of uniform redress.

Practices abroad

India is not starting from scratch in a conceptual sense. The no-fault vaccine injury compensation model has been road-tested widely. In the U.S., the Vaccine Injury Compensation Programme operates through a dedicated federal 'vaccine court' where claimants bear a lower evidentiary standard and are compensated from a trust fund levied on manufacturers, saying that the burden of collective immunity shall not be privately borne.

The U.K.'s Vaccine Damage Payment Scheme provides a fixed lump-sum payment to those who suffer severe disablement from a covered vaccination, without requiring proof of negligence. Japan, Germany, New Zealand, and several Nordic countries maintain comparable no-fault frameworks. Taiwan processed thousands of COVID-19 compensation claims within months of rollout, offering a model that India should study.

A framework for India

India requires a Vaccine Injury Compensation Act, not a circular, which can be quietly withdrawn between elections, but a Parliamentary statute with defined rights and independent oversight. Second, a no-fault presumptive causation table is needed. The law should maintain a 'Vaccine Injury Table': conditions occurring within a specified time window following a specific vaccine are presumed to be caused by it, shifting the evidentiary default toward the injured while allowing the state to rebut in exceptional cases. Third, an independent administrative tribunal is required.

Claims should be decided by a dedicated quasi-judicial body with medical and legal expertise, accessible without mandatory legal representation. Fourth, a dedicated compensation fund must be set up. Funding should be shared between the Central government and vaccine manufacturers through a levy system, aligning manufacturers' interests with vigilant post-market surveillance rather than incentivising suppression. Fifth, transparent AEFI reporting must be prioritised. India must strengthen its surveillance system through mandatory disaggregated state-level reporting, independent audits and public dashboards, as a compensation framework is only as credible as the data behind it.

The trust dividend

Sceptics may argue that a compensation scheme emboldens anti-vaccination sentiment. The comparative evidence suggests the opposite: robust compensation systems consistently correlate with higher voluntary vaccination uptake. Trust is built not through silence about risk, but through transparency and accountability, and with India's recently launched massive HPV vaccination programme, it becomes urgent.

Vaccination is a social bargain. The individual accepts a small, quantifiable risk so that the community is protected from a larger, diffuse one. When the state manages, promotes, or mandates that bargain, it becomes a party to it. A party to a bargain that causes harm bears responsibility for that harm. What India's legislature, Health Ministry, and legal community must now ensure is that the policy that emerges is not a minimalist gesture of compliance but a genuine institutional commitment, one that honours, finally and formally, the price some citizens pay for the protection of all.

HC SEEKS REPLIES FROM 2 INDORE COUNCILLORS WHO REFUSED TO SING VANDE MATARAM AT CIVIC MEET

The Madhya Pradesh High Cour on Thursday sought replies from two Congress women councillors who refused to sing national song Vande Mataram at a meeting of the Indore Municipal Corporation (IMC).

The direction by the HC's Indore Bench came during hearing on a public interest litigation, which sought formulation of a clear legal framework to ensure dignified conduct by people present during the singing of Vande Mataram at government events or public platforms.

A Division Bench of Justices Vijay Kumar Shukla and Alok Awasthi issued show-cause notices to Congress councillors from Indore, Faujia Sheikh Aleem and Rubina Iqbal Khan, along with the State government.

The petition was filed by local lawyer Yogesh Hemnani, who argued his case in the court.

He submitted that the two councillors not only refused to sing Vande Mataram during an IMC event last week, but also showed disrespect towards the national song by making objectionable remarks.

The petitioner argued that such conduct by elected representatives violated constitutional provisions related to citizens' fundamental duties and was punishable under the Prevention of Insults to National Honour Act, 1971.

Cong. probe panel

Meanwhile, Congress's central leadership has constituted a committee to probe into the Vande Mataram row involving its two Indore councillors, who refused to sing the national song at an event, and issues arising out of media comments of local leaders, a party functionary said on Thursday.

He said All India Congress Committee in-charge for Madhya Pradesh Harish Chaudhary formed the two-member panel on Wednesday and asked it to submit a report within a week to enable organisational action.

RESERVATION RUSE

In a Parliament sitting convened from April 16, the Union government is seeking to advance women's empowerment, but as part of a wider legislative package: the Constitution (131st Amendment) Bill, 2026, and a companion Delimitation Bill. The stated rationale is the operationalisation of the Nari Shakti Vandan Adhiniyam (the 106th Amendment of 2023), which reserves one-third of Lok Sabha and Assembly seats for women but was tied to a post-Census delimitation. The government's insistence on bundling women's reservation with delimitation suggests that the former is being used as political cover for the latter: a sweeping reallocation of Lok Sabha seats that would reshape the federal composition of Parliament to the advantage of States where the Bharatiya Janata Party (BJP) enjoys electoral dominance, and at the expense of States where it has been historically weak.

When India's decennial Census was delayed for more than five years without a definitive or rational explanation from the BJP-led Union government, the political logic was not hard to discern. The 2021 Census was first postponed citing COVID-19, but no reason was offered for the successive deferrals that followed, until it was quietly announced that the exercise would be carried out in 2026-27. Under the Constitution, the freeze on inter-State distribution of Lok Sabha seats, pegged to the 1971 Census, was set to expire only after the first Census conducted after the year 2026 was published. This meant that in the normal course, delimitation would have been based on the 2031 Census. By delaying the Census to 2026-27, the government ensured that the delimitation exercise could be initiated on its preferred timeline, using the 2026-27 Census rather than one conducted in 2031.

Now, perhaps realising that any delimitation exercise would itself take years to conclude after the 2026-27 Census, and therefore not be ready even for the 2029 Lok Sabha elections, the government appears to be in a tearing hurry to proceed with delimitation on the basis of the last completed Census, that of 2011. The 131st Amendment Bill amends Articles 55, 81, 82, 170, 330, 332, and 334A of the Constitution. Its most consequential changes are the following. First, it raises the ceiling on Lok Sabha membership from 530 elected members from States and 20 from Union Territories to 815 and 35 respectively, to a potential House of 850. Second, it replaces the existing

constitutional definition of "population", which specifies the 1971 Census for seat allocation and the 2001 Census for boundary demarcation, with an open-ended formulation: population shall mean the Census "as Parliament may by law determine." The choice of which Census to use is no longer left to the Constitution but will depend on ordinary legislation, changeable by simple majority. Third, it deletes the third proviso to Articles 82 and 170 entirely. A freeze on seat allocation that has been in place since the 42nd Amendment of 1976, and extended by the 84th Amendment of 2001, guaranteed States that had stabilised their populations that they would not lose parliamentary seats as a consequence. This safeguard is now removed.

Members of the Union Cabinet, including Home Minister Amit Shah and Commerce Minister Piyush Goyal, had assured the country that the existing proportion of seats held by each State will be maintained through a uniform increase. But this assurance finds no place in the constitutional amendment. Article 81(2)(a), retained unchanged, mandates that the ratio between seats and population shall be the same for all States "so far as practicable" which is a population-proportionality requirement and does not preserve existing proportions.

Based on 2011 Census data, a purely population-proportional allocation to an 850-seat House would produce sharply unequal increases across regions. The Hindi-heartland States (Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Haryana, Chhattisgarh, Uttarakhand, and Delhi), which currently hold 207 of 543 seats, would secure 366 — a 77% increase, with their share rising from 38.1% to 43.1%. The southern States (Tamil Nadu, Karnataka, Andhra Pradesh, Telangana, Kerala, and Puducherry), with 132 seats now, would receive only 176, a 33% increase, while their share would drop from 24.3% to 20.7%. The eastern States would slip from 14.4% to 13.7%; the North-East from 4.4% to 3.8%. The west and the northern non-Hindi States would remain roughly unchanged. States that spent decades building their health infrastructure, educational access, and women's agency that brought fertility down now face a reduction in their share of democratic power, while States that lagged on these indicators stand to gain the most seats. The already weakened fiscal federalism would now be compounded by diminished political representation for socio-economically advanced States.

That this legislation is being rushed through, with barely any time for public debate, just days before voters in two crucial States go to the polls, makes the timing even more suspect. There is no reason why women's reservation cannot be implemented within the existing 543-seat Lok Sabha by designating constituencies for women on a rotational basis, an approach the Opposition had pressed for after the passage of the 106th Amendment. MPs from States that stand to lose proportional representation in the Lok Sabha must resist the bulldozing of legislation on an issue that strikes at the federal foundations of the Indian Union. The consequences of letting this amendment pass are too grave to contemplate.

POLL-BOUND T.N. AMONG TOP PERFORMERS IN MANY INDICATORS

Tamil Nadu is going to polls on April 23 and political parties have made a slew of promises, many of them having women and education at their centre. At this point, an indicator-based analysis shows that though the State remains a frontrunner on several economic, educational and women-related indicators, concerns remain.

Firstly, Tamil Nadu recorded a Human Development Index score of 0.787 in 2023, higher than the national average. This indicator, as defined by the United Nations Development Programme, is a summary measure of average achievement in key dimensions of human development such as life expectancy, education, and standard of living.

Data shows that Tamil Nadu is strong across various economic indicators. For select indicators such as the per capita net domestic product — the net average income earned by an individual in the State at a certain period — and average daily wage rates in rural areas, Tamil Nadu's figures remain much higher than India's average. In fact, with an average daily wage rate of ₹573.2 in rural areas, the State's wages are the highest among others with the exception of Kerala.

Tamil Nadu's debt-to-GSDP ratio in 2023-24, as per the latest Finance Commission report, stood at 29.9%. However, the State's GSDP growth rate of 11.9% during 2024-25, the highest among all States, is likely to improve its fiscal indicators.

While the State performed well across many health and women-related indicators, it lagged in areas such as sanitation and health scheme coverage. It is one of the five top performing States across several health indicators related to children and women. According to Niti Aayog, its maternal mortality ratio is 54 per lakh live births, far lower than the national average of 97.

A similar pattern can be seen for indicators related to children too. As of 2023, the State's infant mortality rate is 12 per thousand children, nearly half of India's average. It is also the fourth State to have the least share of children aged 0-5 with stunted growth. It ranks second when it comes to share of children with all basic vaccinations (%).

Though 66.5% of the surveyed households had at least one member covered by a health scheme, Tamil Nadu lags behind seven other States in this indicator. The share of population in the State remaining with unimproved sanitation facilities was also higher than the national average.

Tamil Nadu is also a frontrunner when it comes to education-related indicators. The State ranks among the top-performing States for Adjusted Net Enrolment Rate (ANER) in elementary education — the number of pupils of school-age group for primary education, enrolled either in primary or secondary education as a share of the total population in that age group.

Tamil Nadu also has the third lowest dropout rate among the States. Further, the State's Gross Enrolment Ratio in higher secondary education is much higher than the all India average. However, the State ranked 16 among 29 States when it came to the Gender Parity Index in higher education — the ratio of female to male students enrolled at a specific level of education.

However, the State lagged on select environment-related indicators. It was among the top seven States that generated high amounts of plastic waste per thousand population and consumed high levels of fossil fuels per capita.

DEVELOPMENT IN WEST BENGAL LEAVES MUCH TO BE DESIRED

An indicator-based analysis for the poll-bound West Bengal reveals that the State lags in several economic and social indicators. While it shows strength in select indicators such as immunisation and elementary enrolment, the State's performance across various indicators remained relatively poorer compared to national average.

West Bengal's Human Development Index (HDI) stood at 0.719 in 2023, below the national average of 0.732. Economic indicators show a similar trend. The State ranked 16th out of 23 in per capita net domestic product, with an average of ₹1.63 lakh, far lower than the national average of ₹2.05 lakh and substantially behind Delhi and Telangana, where per capita incomes are more than double that of West Bengal. Rural wage levels also lag, with an average daily wage of ₹347 compared to ₹398 nationally.

However, the State fares relatively better on some health measures. Infant mortality rate stands at 17, lower than India's 25, with the State ranking 14th out of 30. The share of households relying on unimproved sanitation facilities is smaller compared to the national average. While the proportion of stunted children (34%) is marginally lower than the national average, the State ranks 19th out of 29, indicating that undernutrition remains a concern. Immunisation coverage is among the strongest in the country, with 88% of children receiving all basic vaccinations, placing the State 4th.

However, these gains coexist with significant concerns. The share of women aged 15-19 who have begun childbearing is 16%, more than double the national average. Maternal mortality, at 103 per one lakh live births, is above the national average of 97. With 83.4% of women using hygienic menstrual protection, the State falls behind regions such as Delhi and Tamil Nadu. Only about a third of households have at least one member covered by a health scheme.

Education indicators too present a mixed picture. The State records a perfect adjusted net enrolment rate of 100% at the elementary level, along with many other States. However, retention remains a concern, with an average annual dropout rate of 18% at the secondary level. Gross enrolment ratio in higher secondary education is 62%, slightly above the national average. Gender parity in higher education remains relatively balanced.

The share of men who lack schooling is much higher than the national average while fewer women lack schooling, but the gap with top performing States remains wide. Total fertility rate is also below the national average.

With 13% of the surveyed men aged 15-49 doing no schooling in the State, it ranks 23rd among 29 States. This is higher than the national average of 10.7%. The same indicator for women, however, pushes the State's rank to 16. Also, the share of women in West Bengal who have done no schooling is 18.5%, much lower than the national average of 22.6%.

The State's performance is patchy in select infrastructure and environmental related indicators. Per capita fossil fuel consumption is lower than the national average, though this likely reflects differences in economic structure rather than greater efficiency. Plastic waste generation is higher than the national average, with the State ranking 8th out of 23. Rural internet penetration remains limited at just 35 per 100 people. At the same time, urban housing conditions are somewhat better, with only 0.8% of households living in kachha houses.

ED ARRESTS DIRECTOROF I-PAC IN BENGAL COAL 'SCAM' CASE

In a major action weeks ahead of the West Bengal Assembly election, the Enforcement Directorate (ED) on Monday arrested Vinesh Chandel, a director and co-founder of the political consultancy firm I-PAC, in a money-laundering case linked to an alleged coal scam in the poll-bound State.

An official said Mr. Chandel was taken into custody under the provisions of the Prevention of Money Laundering Act (PMLA) in Delhi late in the evening. He is expected to be produced before a special court later in the day. The ED will seek Mr. Chandel's custodial remand for questioning.

Mr. Chandel's premises in Delhi, apart from that of another I-PAC co-founder and director, Rishi Raj Singh, in Bengaluru and that of former Aam Aadmi Party (AAP) communications in-charge Vijay Nair in Mumbai, were searched by the ED on April 2 as part of this investigation.

The federal probe agency conducted searches in connection with the case on January 8 at the I-PAC office and the Kolkata residence of its founder and one of the directors, Pratik Jain, leading to a controversy after West Bengal Chief Minister Mamata Banerjee arrived at the said location along with State government officials and took away documents.

WHAT IS THE SIR CONTROVERSY IN WEST BENGAL?

The story so far:

What began as an exercise aimed at cleaning up electoral rolls, by removing duplicate, migrated, and deceased voters, and identifying "illegal immigrants", has turned into a major controversy in West Bengal.

The Election Commission of India (ECI)'s Special Intensive Revision (SIR) of electoral rolls has been conducted in 13 States and Union Territories so far. However, it is in West Bengal that terms such as 'adjudication', 'logical discrepancies' and 'voter tribunals' have cropped up. The SIR process has also led to a "trust deficit" between the ECI, a constitutional body, and the elected Trinamool Congress government, according to the Supreme Court.

How has the SIR impacted the electoral rolls of West Bengal?

The SIR began in West Bengal on November 4, 2025, with 7.66 crore voters on the list. The draft rolls published on December 16 showed that over 63 lakh names had been deleted, bringing down the number of voters to around 7 crore. The deleted names were marked under the ASDD (absent, shifted, dead, and duplicate) category. However, of the 7 crore in the draft list, 30 lakh names were categorised as "unmapped voters" (no link with the last SIR conducted in 2002) and 1.20 crore names with logical discrepancies.

What is the logical discrepancy category? What was the result of this exercise?

Voters under the logical discrepancy category were checked against a highly contentious five-point list even if they were mapped to the 2002 SIR list. Under a new AI algorithm, the ECI identified five types of discrepancies: (a) spelling differences in names between 2002 and 2025 rolls; (b) cases where more than six voters linked themselves to a single ancestor; (c) age gaps between a voter and their parent falling beyond the 15-45 year range; (d) cases where the differences between the grandparents' age and the voters' age was less than 40 years; and (e) instances where the voters' gender did not align with the name provided.

After the ECI hearings, about 60 lakh of the 1.5 crore cases remained disputed, with Electoral Registration Officers and micro-observers appointed by the Election Commission of India unable to agree on their eligibility. This process resulted in over 60 lakh names falling in the 'under adjudication' category. They were excluded from voting pending verification.

What happened to voters placed in the 'under adjudication' category?

The Supreme Court in March took the "extraordinary" decision to involve the judiciary in the SIR process saying the persistent "trust deficit" between the Mamata Banerjee government and the ECI had led to a "stalemate", with time running out.

A three-judge Bench headed by Chief Justice of India (CJI) Surya Kant requested the Chief Justice of the Calcutta High Court to deploy a force of serving and retired judicial officers to take over the quasi-judicial task of Electoral Registration Officers/Assistant Electoral Registration Officers

(EROs/AEROs). The CJI said the rolls published on February 28 would not be treated as the final one and those cleared in the adjudication would be added in subsequent supplementary lists. Thus, the over 60 lakh 'under adjudication' cases were heard by nearly 700 judicial officers from West Bengal and neighbouring Odisha and Jharkhand.

How many names were cleared by the judicial officers? What is the status of those whose names did not make it?

The judicial officers struck down 27 lakh of the 60 lakh names. Those whose names have not been cleared can now approach the 19 special tribunals set up by the ECI. However, with the ECI freezing electoral rolls for the upcoming elections, these people are unlikely to get to vote in the upcoming Assembly polls even if their names are cleared by the tribunals. A window of hope remains in the April 13 hearing in the Supreme Court, however.

So far, the total number of names deleted from the pre-SIR 2025 list is 90.8 lakh. The number of eligible voters in Bengal is 6.77 crore.

What has been the political fallout?

While the BJP, the main Opposition in the State, has strongly backed the process, the Trinamool has questioned the timing and scale of the process. Initially, the party had protested against the short timeline for the exercise, arguing it would lead to errors. However, since the process began, the SIR has become the main electoral plank in the Assembly polls, with the Trinamool accusing the ECI of playing the BJP's game and trying to disenfranchise people who are loyal voters of the BJP. The Trinamool has repeatedly approached the ECI as well as the Supreme Court with Ms. Banerjee herself appearing before the apex court to argue her case.

What are the other issues flagged by civil society and Opposition?

Civil society activists such as Yogendra Yadav and Prashant Bhushan have attacked the Bengal SIR accusing the ECI of "deliberately" targeting Muslim voters. At a press conference in Delhi, My. Yadav said, "It is not revision, it is rewriting." He gave the example of Nandigram, where he said 25% of the voters are Muslim. "95% of deletions here were Muslim voters," he noted. The maximum number of voters have been deleted from Murshidabad, Malda and Uttar Dinajpur districts, which are predominantly Muslim in composition. He also said women have been targeted, especially in Matua-dominated areas.

ELECTORATE FALLS BY 10.2% IN NINE STATES, THREE U.T.S AFTER REVISION OF POLL ROLLS

Among the nine States and three Union Territories (UTs) that undertook the special intensive revision (SIR) of electoral rolls in the second phase, Uttar Pradesh has recorded the highest net deletion of voters in absolute numbers at 2.04 crore, followed by West Bengal at 83.86 lakh.

In percentage terms, the Andaman and Nicobar Islands had the highest net deletion at 16.6%. Lakshadweep recorded the lowest deletion, both in absolute numbers (181) and percentage terms (0.3 %).

According to data shared by Election Commission (EC) sources, as many as 67 lakh deceased voters and 1.28 crore duplicate voters were removed in this phase, which was announced on

October 27 last year. It identified 1.34 crore non-existent voters and 3.15 crore voters who had migrated.

The consolidated electoral rolls of the nine States and three Union Territories saw a reduction of 10.2%, bringing the number of active voters down to 45.81 crore from over 50.99 crore before the revision exercise.

According to the EC data, 66.88 lakh deceased voters were removed, with the highest number from Uttar Pradesh (25.47 lakh) followed by West Bengal (24.16 lakh). 1.28 crore duplicate voters were deleted, with Uttar Pradesh at highest with 79.5 lakh.

A total of 63.16 lakh names were removed after objections and adjudication through Form 7, with West Bengal recording the highest at 33.15 lakh.

Phase 2 of the SIR was conducted in Uttar Pradesh, West Bengal, Tamil Nadu, Rajasthan, Chhattisgarh, Kerala, Puducherry, Andaman and Nicobar Islands, Lakshadweep, Gujarat, Madhya Pradesh, and Goa. In Assam, a "special revision", instead of the SIR, was conducted.

The next phase, covering 17 States and five UTs, is likely to begin after the Assembly polls. They are Andhra Pradesh, Arunachal Pradesh, Chandigarh, Dadra and Nagar Haveli & Daman and Diu, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Ladakh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Delhi, Odisha, Punjab, Sikkim, Tripura, Telangana, and Uttarakhand.

STATE CENSUS OFFICES TOLD TO MONITOR ONLINE NARRATIVES

The Registrar-General and Census Commissioner of India (RG&CCI) has directed the Census Directorates in the States to "monitor social media narratives round the clock" to flag propaganda and false narratives against the ongoing Census exercise.

In 2020, the Ministry of Home Affairs informed a parliamentary panel that the "right kind of messaging will be done to tackle the miscommunication and rumours around the National Population Register (NPR) and Census".

The Census, a decennial exercise, was last held in 2011. The NPR was also first compiled that year.

The first phase of Census and the NPR were initially to be rolled out in some States on April 1, 2020, but were postponed indefinitely due to the COVID-19 pandemic.

Following the protests related to the NPR and its link to the proposed National Register of Citizens (NRC) and the Citizenship Amendment Act (CAA), 2019, the government had decided not to update the NPR during the present Census.

DEPORTATION POLICY SEEKS DISTRICT-LEVEL TASK FORCE

The Union government has formulated a new deportation policy under which all States have been asked to set up a special task force in each district to "detect, identify and deport/send back illegal migrants from Bangladesh and Myanmar", and provide a monthly status report on foreigners who are missing or overstaying their visas.

The States have been asked to operationalise "holding centres/camps" with a 10-foot-high boundary ringed with barbed wires, to restrict the movement of such undocumented migrants till

they are deported or "sent back" to Bangladesh or Myanmar, says the policy framed by the Union Home Ministry.

An upper limit of 90 days has been fixed to verify the antecedents of suspected Bangladeshi or Myanmarese nationals, if they claim to be a resident of another State. Private buildings could also be hired to run as holding centres, if government land was not available, the Ministry said. The States have been asked to upload documents, including Aadhaar, driving licence, and PAN cards obtained by illegal migrants on a portal, so that they could be cancelled, and the person "blacklisted" in government records.

Many sent back

After the government change in Bangladesh in August 2024, the police across the country were asked by the Ministry to detect Bangladeshis who had illegally entered the country. The drive assumed momentum after the Pahalgam terror attack on April 22, 2025, and Operation Sindoor on May 7, 2025. In some cases, undocumented Bangladeshis were flown on Indian Air Force planes and sent to Bangladesh.

At least seven West Bengal residents who were pushed to Bangladesh by the Border Security Force (BSF) on suspicion of being Bangladeshis were brought back to India due to the intervention of the West Bengal government.

A major part of the policy that was shared with the States in February, a copy of which has been seen by The Hindu, reiterates and consolidates the existing guidelines with a separate chapter dedicated to "illegally staying Bangladeshis/Myanmar nationals in the country". The guidelines on "holding centres" will be applicable to other foreigners awaiting deportation, and those declared foreigners by Foreigners' Tribunals (FTs). FTs are unique to Assam.

Separate enclosures

The holding centre should have separate enclosures for men and women, and should be equipped with all amenities, including an LPG connection in the kitchen, fire safety system, strict access control measures and adequate security personnel, it said.

"There should be sufficient open space within the compound", the Ministry added, and it should be ensured that members of the same family were not separated, and all family members were housed in the same holding centre/camp.

"The persons housed should be permitted to meet/communicate with the family members and the Embassy/High Commission concerned," the MHA said.

States have been directed to immediately initiate nationality verification of arrested foreigners so that travel documents are ready upon the completion of judicial proceedings, enabling expeditious deportation. "After deportation, proposals for blacklisting of such foreign nationals to prevent their future entry into India may be sent to the Bureau of Immigration," the Ministry said.

In case of people who inadvertently cross the border, the designated force shall interrogate them, and "if found innocent, they may be handed over to the border guarding force of Bangladesh or Myanmar", or to the police, if found guilty, before capturing the biometrics, the Ministry said.

IS BSF'S IDEA TO HAVE REPTILES IN RIVERS ALONG BANGLADESH BORDER SOUND?

The Border Security Force (BSF) has come up with a curious idea to prevent infiltration from Bangladesh: releasing reptiles into the rivers that run along the border, The Hindu reported on April 6.

"Snakes or crocodiles" introduced in vulnerable riverine gaps should be explored for feasibility, per a directive to the BSF on March 26. The reptiles could deter infiltration and criminal activities in the riverine border, according to an internal communiqué seen by The Hindu.

What do conservationists and scientists make of this unprecedented proposal? And are there precedents anywhere in the world?

One conservationist told The Hindu that introducing reptiles could "cause serious conflict with the local communities that live there" because they are bound to disperse from their designated areas. "Technically, they should not be introducing any species into an ecosystem like the Sundarbans. There are already saltwater crocodiles and snake species such as cobras, Russell's vipers and kraits in that region."

The survival of the animals is also important, and introducing alien species is never a good idea: "The introduction of any new species or even a large number of existing species can create an imbalance in the ecosystem. In the long run, this may be counterproductive."

As for deterring 'infiltrators', the source said the presence of crocodiles and snakes is already known to people who cross the borders and that "they must be taking precautions to avoid both."

We must remember that the species will not stick to one part of the border, but will spread on both sides and in fact could be a "challenge for our border patrolling agencies to deal with", they added. "The only reference I can recall is that the invading army of Alexander was supposedly stopped by elephants and snakes, "which is not proven," said the source.

A third scientist said translocating wild animals is always "a tricky proposition". First, several animals, including crocodiles, are territorial. "Moving them to new locations means they are in unfamiliar territory, which reduces their chances of survival."

Even if they weren't territorial, new places come with "unfamiliar risks". "Often, such animals come into contact with humans, increasing conflict, as has been shown for many species including leopards."

Translocations could thus reduce their odds of survival, have unknown negative effects on the local ecosystem, and increase conflict with local, often marginalised, communities. If there are criminal elements, these translocations "could unwittingly provide them with an extra source of protein," the scientist said.

India shares a 4,096-km border with Bangladesh that passes through hills, rivers, and valleys. The BSF has been patrolling it to prevent illegal immigration and illicit activities. The barbed wire fences on several stretches have reportedly become obsolete.

WHAT ARE THE LEGAL CONSEQUENCES OF PIRACY?

The story so far:

In a blow to the movie's producers, Vijay-starrer Jana Nayagan, directed by H. Vinoth, was recently leaked online in its entirety in high quality while its theatrical release has been stuck in a limbo following issues with censor certificate.

The leak indicates that someone with legitimate access to the movie mishandled or intentionally spread it further. Six people have been held by authorities in connection with the leak. Film piracy through illegal downloads is rampant, but it is less common for content to become available in the first place in such high quality.

What are the laws on piracy? How well are they enforced?

The Copyright Act, 1957, deals extensively with infringement of intellectual property such as movies, TV shows, books, articles, and other creative work. Section 63 and Section 63A of the Copyright Act provide for fines of up to ₹2 lakh and three years of imprisonment. Repeat offenders can receive those same penalties again for each subsequent violation.

The Cinematograph Act, 1952, since its amendment in 2023, provides for a much larger fine: 5% of the audited gross budget of a film. While the minimum fine is decidedly smaller, judges may not look too kindly on the Jana Nayagan case in particular.

This is because unlike practically every other film, the Vijay starrer was leaked before it had a chance to release in theatres, denting both its theatrical value and home video rights valuation.

It is uncommon for film piracy cases to be investigated and pursued with vigour. India is consistently listed as a "notorious market" by U.S. authorities, for instance, for anemic responses to piracy.

However, considering the vast spectrum of voices within the film industry and political circles that has come out in support of KVN Productions, which bankrolled Jana Nayagan, this case may be the subject of a more serious investigation.

Judges have tended to focus more on distributors in piracy and intellectual rights cases than on individual infringers. But depending on an individual infringer's behaviour, punishments can end up hitting not just the original leaker of the film, but anyone who shares a link forward.

To boot, Tamil Nadu Police's State Cyber Crime Wing said in a press release that those among the six arrested were sharing cloud storage links to the film.

How did this movie get leaked? How do studios protect against leaks?

Ordinarily, movies are only leaked to pirates in high quality when they appear on OTT streaming platforms. This is because once this happens, in spite of copy-resistant technologies employed by these platforms, pirates have found ways to defeat Digital Rights Management (DRM) protections on such content, and extract a video file that is close to the original stream in quality and fidelity.

As such, withholding content access from audiences at large altogether is the current gold standard. If only theatre projectionists have the movie — and that too only in an encrypted hard drive — it is much harder to copy. Invisible and barely visible watermarking enables studios to

instantly identify the perpetrator if a copy is made from a legitimate theatrical print. That makes leaking an incredibly unattractive prospect to people with access to a movie.

It is common for full videos in a film's supply chain to be visibly watermarked for the intended recipient, or to indicate a versioning. There is such a watermark for Jana Nayagan, but it is not yet clear if the version circulating online has enough forensic clues for investigators to zero in on a specific individual. If carelessness was involved, the harshest punishments may go to the first few people who received and distributed the film.

What happens if a movie has already been leaked?

It is incredibly challenging for a leaked film to be completely wiped from the Internet. For one, there are several sites, constantly changing their domain names to evade judicial website blocking orders. For another, private groups on messaging apps like Telegram and protocols like torrents, make the distribution of pirated content harder to stem.

However, there still remains an industry of so-called "anti-piracy" firms like AiPlex who work with filmmakers, sports broadcasters, and so on, to quickly send copyright takedown notices to social media platforms (who generally act quickly on such alerts), and torrent sites (some of whom accept and act on it).

It is also common for filmmakers to approach courts for so-called "dynamic injunctions" that allow them to constantly provide High Courts with links to non-compliant sites' URLs, after which they are blocked online. Some "John Doe" orders can be passed even before a film is leaked, in anticipation of a film becoming available on such platforms were a leak to happen.

INSIDE THE WORLD OF SHADOW LIBRARIES: DIGITAL PIRACY, AI, AND THE FIGHT FOR ACCESS

In early 2026, users of Anna's Archive — one of the world's largest shadow libraries — woke up to find that the site's domain had vanished. Within weeks, its alternative address was also taken down. For many students, researchers, and casual readers, it was a familiar disruption. For the organisations behind such platforms, it was business as usual.

Shadow libraries, or vast and often anonymous databases offering free access to books and academic papers, have long existed in a legal grey zone. For years, they were framed as a quiet rebellion: readers bypassing paywalls, students downloading unaffordable textbooks, teachers sharing educational materials, and knowledge circulating beyond borders.

In 2026, they are something else entirely. What was once an underground movement for access is now entangled in a much larger fight involving publishers, governments, and increasingly, artificial intelligence (AI) companies.

Platforms such as Library Genesis (LibGen), Z-Library, Sci-Hub, and Anna's Archive collectively host or index tens of millions of books and research papers. Some operate as searchable indexes linking to files hosted elsewhere while others directly store massive collections.

The appeal of shadow libraries lies in access. In countries where books are expensive, libraries underfunded, or academic journals locked behind steep paywalls, shadow libraries fill a gap that formal systems have failed to address.

Messages left by users on these unauthorised platforms reflect this reality. A homemaker in Kenya described using Z-Library to build new skills while raising children. A reader in Lebanon said war and economic instability had made books unaffordable. A student in India credited the platform with making essential course material accessible.

While publishers and international authorities continue to fight back, digital piracy has proven far harder to contain than its physical counterpart. Websites go offline and reappear under new domains. Mirrors proliferate. Communities migrate across platforms. The infrastructure is decentralised, resilient, and often anonymous. Takedowns, while disruptive, rarely deliver lasting results.

The stakes change

In late 2025, Anna's Archive drew global headlines after claiming it had scraped Spotify, collecting hundreds of terabytes of music and metadata. The move pushed shadow libraries beyond books and research into the realm of multimedia aggregation.

The legal response was swift. In January, a U.S. court ordered service providers linked to Anna's Archive to disable access. Soon after, major publishers filed a lawsuit accusing the platform of operating as a commercial piracy hub.

Another case added a new dimension. A group of authors alleged that Nvidia had used shadow library sources, including Anna's Archive, to obtain copyrighted works for training artificial intelligence models. Nvidia denied the claim.

Regardless of the outcome, the implication is significant as shadow libraries are becoming potential data pipelines for AI systems.

This shift has unsettled even some supporters of the Open Access movement. While many users justify piracy as a response to high prices and restricted access, the idea of large technology companies benefiting from the same datasets introduces a new ethical concern.

Such concerns are enabling new open access systems that expand access to knowledge through legal channels.

"What distinguishes India is the continued and significant role of public-sector-led Diamond Open Access, where neither authors nor readers pay, supported by publicly funded research organisations," said Sridhar Gutam, the convenor of Open Access India.

Platforms such as preprint repositories and community-led journals aim to make research widely available without violating copyright laws.

"Open Access India has also been instrumental in launching and supporting no-fee scholarly infrastructures… These initiatives reflect a long-standing commitment to non-commercial, community-governed publishing models," he added.

Mr. Gutam argued that shadow libraries are not a solution, but a symptom.

"The widespread use of shadow libraries reflects persistent access barriers, particularly in low- and middle-income contexts. While such platforms raise clear legal and ethical concerns and cannot be endorsed, focusing solely on enforcement without addressing the underlying access crisis would be insufficient," he said.

Even within the shadow library ecosystem, there is no unified philosophy.

Anna's Archive has positioned itself as a preservation-focused project, aiming to index and safeguard existing collections. It has previously criticised platforms like Z-Library for restricting access to newly uploaded content, arguing that true openness requires easier sharing and mirroring.

At the same time, Anna's Archive has faced criticism of its own, particularly for offering high-level data access in exchange for large donations or contributions. The possibility of providing datasets to corporations, including AI developers, has divided its user base.

Sci-Hub, one of the most well-known platforms focused on academic papers, has also distanced itself from newer entrants. Its founder, Alexandra Elbakyan, has argued that no other piracy platform matches its impact on access to scientific knowledge.

These disagreements highlight a key point: shadow libraries are not a single movement, but a loose network of projects with overlapping goals and conflicting values.

A widening conflict

The debate over shadow libraries is often framed as a clash between readers and publishers. That framing no longer captures the full picture.

Today, the conflict spans industries and borders. Courts in multiple countries are becoming arenas where these battles play out.

For publishers, the stakes include revenue, intellectual property, brand reputation, and the sustainability of creative industries. For technology companies, the issue is access to vast datasets that can power increasingly sophisticated AI systems. For users, the concerns remain more immediate: affordability, availability, and the freedom to read. These interests do not align neatly.

As legal battles intensify and new actors enter the space, the future of the shadow libraries remains uncertain.

CREEPING RISK

An engineering reality underlying the recent spate of boiler explosions is that boilers almost never fail this way suddenly. They are usually due to overpressure, scaling, mismanaged water level, and/or revival stress, the risk of each of which builds over time. The boiler explosion in Sakti, Chhattisgarh, that killed 20 people also shares a few similarities with the Visakhapatnam gas leak in 2020 and the blast at a thermal power station in Neyveli in 2020. In the former, safety systems at a unit had been inactive or uncalibrated following a post-lockdown restart while a plant restart process triggered the explosion at the latter. The Sakti plant had likewise been recently acquired, recently commissioned, and was operating at under its full capacity at the time of the blast. In these unstable operating regimes, failures often result due to transient thermal and pressure imbalances. However, in practice, neither the national boiler inspection regime nor the regulatory framework heighten oversight in these phases. Certification is valid for up to a year even though boiler conditions vary on a daily basis. The current structure also penalises downtime instead of unsafe operations and rewarding maintenance shutdowns. Events such as those at Sakti are also evidence that the framework's focus on fabrication standards rather than continuous instrumentation and auditing is not working. The Centre's focus on 'ease of doing business' has

favoured self-certification and scheduled third-party audits in place of surprise government inspections. The Boiler Accident Inquiry Rules were notified in 2025; whether they will address these structural gaps remains to be seen.

The expansion of India's industrial capacity is pushing ageing infrastructure harder, more plants are operating closer to their limits, and flaws in their management are being exposed to more media coverage and political attention. It is possible that these facilities have long been exposing their workers to hazardous working conditions, and the ensuing crises are not altogether accidental. Contract labour is the most exposed. A growing share of workers are migrants hired via subcontractors, who trade blame with the operator after a disaster. The safety signage and manuals are often unavailable in workers' native languages. Investigators have reported workers in the Pune industrial belt since 2021 and following explosions in Sangareddy in 2024 and 2025 being unaware of the names and properties of the chemicals in their workplace. The new OSHW Code 2020 also does not clearly hold the principal employer criminally liable for safety lapses in contractors' operations but qualifies it on the employer's negligence. These are old complaints about how India treats its labour. Until this culture is dismantled, firms' and regulators' incentives, labour arrangements, and factory-floor practices will keep absorbing 'accidents' as the cost of doing business.

DRY DAYS

After the crest, the trough is inevitable. Following two years of surplus rainfall, India is likely staring at a significant shortfall in the coming monsoon. The India Meteorological Department (IMD) in its April forecast has predicted an 8% deficit, or "below normal" rainfall, coming June-September. There is a five percent margin of error in this estimate but going by IMD's track record, there are many more times it has expected a 'normal' monsoon only for India to end up with a drought than it has forecast a drought and been proved wrong. In fact, when IMD warns of a deficit in April, history shows that India often experiences a drought. The agency, in its official lexicon, never uses the term 'drought' and only refers to a deficit below 90% as "deficient." In the April of 2015, IMD issued a "below normal monsoon" forecast for the 2015 southwest monsoon season, predicting seasonal rainfall at 93% of the long-term average, again, 'below normal.' India ended up much worse at 86% Long Period Average (LPA). IMD expects a depressed monsoon this time in the second crucial half of the monsoon (August and September) on the back of weather models indicating an El Nino, the cyclical phenomenon where a heating of the central equatorial Pacific Ocean beyond 1 degree Celsius has corresponded nine out 16 times since 1950 to a deficient monsoon.

The timing of an El Nino matters. If the temperature rise happens outside of the monsoon months, its impact on the monsoon is not as threatening. In 2019, for instance, the IMD expected less than normal rainfall in April because El Nino-like conditions were on the horizon. Paradoxically, India ended up with above normal rainfall because that heating was not as strong as expected. This year too, the IMD expects the Indian Ocean Diapole would counter the desiccating impact of the El Nino. In a year where the most concerning clouds as of now are the war-like ones over West Asia, shortage of gas and fertilizer could worsen farmer sentiment on top of the weak rains. The government should immediately begin preparations to shore up fertilizer stocks, equitable water distribution, particularly in reservoirs that are likely to be stressed, and provide timely advisories to farmers on optimal sowing practices.

BELOW NORMAL MONSOON, BUT NO CAUSE FOR ALARM

After seven consecutive years of fairly good rainfall in the monsoon season, India seems to be finally running out of luck. This year's monsoon is expected to be relatively dry, according to the forecast by the India Meteorological Department (IMD).

Key Takeaways:

• In its first forecast for the coming rainy season, IMD on Tuesday said the country as a whole was likely to get only 92% of normal rainfall this time. It is the lowest forecast for all India monsoon rainfall that IMD has put out in the last 20 years.

• The monsoon forecast is one of the most keenly tracked announcements in the month of April. It is not merely an exercise in weather prediction. The four-month monsoon, from June to September, brings over 70% of India's annual rainfall. Besides offering respite from the summer heat to large parts of the country, rainfall during this season has a big impact on the economy.

• Nearly half of India's cropland is still dependent on rainwater for irrigation. Timely and adequate rainfall is critical for good agricultural yields which in turn drives up farm incomes and rural demand.

• The monsoon rainfall also feeds India's reservoirs, which are used to meet the needs of drinking water, hydroelectricity, and industry for the rest of the year. Maintaining the flow of rivers, inland water transportation, and groundwater recharge are some of the other things affected by monsoon rainfall.

• An early monsoon forecast — the first one comes in April, which is updated with a more detailed one in May, and then daily updates after that — is used by policy planners for water management decisions for the year. A forecast for low rainfall, like this year, is a sort of notice to governments and policymakers to begin preparing for all kinds of contingencies to absorb the impacts of a dry monsoon season.

Do You Know:

• That IMD's own forecasts have improved significantly over the last one decade has helped immensely. Forecasts have not just become more accurate and timely, but also more detailed, granular, and actionable. This has brought about greater efficiency and certainty in the policy planning exercise.

• The improvement in forecast accuracy has come at a time when weather patterns are becoming increasingly unpredictable under the influence of climate change. Rainfall events have become particularly erratic.

• The number of very heavy and highly localised rainfall events have increased significantly over the last few years, and so have extended dry spells. The challenge ahead of IMD is to further improve the forecasts of these events because of their potential to cause large-scale disasters and destruction.

• There are many other reasons why the prospects of a bad monsoon is not seen as a major cause of worry. Better water management practices, efforts to improve groundwater conservation, river and lake cleaning exercises have all contributed to ensuring that India is much better prepared to deal with rainfall shortages during the monsoon.

ARE BIOMASS STOVES A CLEANER, CHEAPER ALTERNATIVE TO LPG?

The story so far:

Owing to the LPG crisis, many areas—especially rural regions—have reported going back to firewood that are generally seen as increasing drudgery for women, while also causing pollution and health hazards.

Are today's firewood-based stoves less polluting and benign to human use?

Modern biomass stoves, often called improved cookstoves (ICS), represent a major step up from traditional cooking methods. Unlike old-fashioned mud stoves, they can cut fuel use by up to two-thirds while dramatically reducing smoke.

Traditional "chulhas" waste most of their heat through poor airflow and have an efficiency of barely 10%. By contrast, modern stoves reach thermal efficiency levels of 38% to 45%. Technologies such as secondary aeration help to catch soot and harmful gases before they turn into smoke.

How can mass firewood-based cooking be made sustainable?

Cooking with firewood can be sustainable, provided the wood is harvested and used responsibly. Firewood is a renewable resource as long as the rate of extraction does not exceed the rate of regrowth. Since improved cookstoves burn fuel more efficiently, they can reduce the amount of wood needed for a meal.

Modern cookstoves can also run on alternative biomass fuels, including pellets and briquettes made from sawdust or agricultural waste. This widens the fuel base and takes some pressure off raw firewood.

Financing is key to achieving deployment at scale. Emissions savings enabled by improved cookstoves can be tracked and turned into carbon credits, creating a funding stream that makes stoves more affordable for lower-income families.

What about the cost of equipment and fuel expenses?

Upfront costs vary significantly. Household models start below ₹2,000, while commercial systems can exceed ₹20,000, depending on the manufacturer and purchase channel (whether direct, through e-commerce, or via distributors). For low- and middle-income households, managing upfront costs can be made easier through financing partnerships involving microfinance, CSR programs, and carbon finance.

The principal operating cost is fuel, and modern cookstoves' high thermal efficiency can significantly reduce fuel requirements. Today's stoves have cut firewood consumption by more than 50%.

Firewood is highly cost-effective compared with LPG, especially during the ongoing supply crunch when commercial LPG rates in major cities have exceeded ₹100/kg. From the wide range of prices available for different firewood types, it is possible to assume a rough average cost of around ₹10/kg (if firewood is being bought instead of being simply scavenged). Considering that 4 kilos of firewood deliver the same cooking energy output as 1 kg of commercial LPG (in an improved cookstove), firewood could potentially offer cost savings of well over 60%.

What supply chain would be needed for mass adoption? Will this be a massive investment?

Adopting biomass cookstoves on a large scale absolutely does not require a massive investment in fuel supply chains. Since the primary fuels – like firewood, crop waste, and dung cakes – are already widely available in rural and semi-urban areas, there is less need for expensive, centralised infrastructure.

Scaling up is therefore more about strengthening distribution networks. Success depends on improving logistics, last-mile delivery, and local partnerships. Just as importantly, building user awareness and providing reliable after-sales support are essential to making sure these stoves remain a permanent part of daily life.

BALANCING FAITH AND ECOLOGY: ARE RIVERS TAKING THE BRUNT?

Story so far:

A 21-day religious ceremony at the Pataleshwar Mahadev Temple in Madhya Pradesh's Sehore district, guided by Sant Shivanand Maharaj, culminated in a controversial ritual where 11,000 litres of milk were poured into the Narmada River in what devotees described as a "sacred offering" on April 8.

Organisers aimed at purifying the river and bless Narmada Parikrama pilgrims. The incident, where a tanker was seen pouring milk, sparked a debate between religious faith and environmental concerns regarding pollution.

No official action has been taken yet by the Madhya Pradesh pollution control board or National Green Tribunal. Malnutrition in Madhya Pradesh has prompted the ₹700-crore Yashoda Milk Supply Scheme (2026–27), targeting 1.3 crore children through schools and Anganwadis.

Experts and activists argue that the 11,000 litres poured into Narmada could provide 44,000 glasses (250ml each), feeding 2,200 kids daily for 20 days or supplementing 10,000+ for a week at school programmes.

What are the impacts of ritual offerings on aquatic ecosystems?

Though culturally viewed as pure, environmental studies show dairy effluents can have biochemical oxygen demand (BOD) levels far exceeding domestic sewage, leading to rapid depletion of dissolved oxygen and ecological stress in aquatic environments.

It is observed by experts that ritual offerings further accelerate microbial activity, adding to cumulative pollution loads. This reduces dissolved oxygen, suffocating aquatic life, while nutrient enrichment can trigger algal blooms, further degrading water quality and disrupting biodiversity.

The Central Pollution Control Board (CPCB)'s 2025 assessment identified 296 polluted river stretches across 271 rivers, with water quality at over 800 locations exceeding safe limits for bathing (BOD > 3 mg/l). The CPCB also observed that the Yamuna in Delhi records BOD levels as high as 83 mg/l, nearly 27 times the safe limit, effectively rendering stretches ecologically "dead."

A monitoring committee appointed by the National Green Tribunal (NGT) in 2018 observed an "unacceptable rise" in pollution levels in the Yamuna after idol immersion, noting sharp increases in heavy metals from paints and synthetic materials.

Empirical evidence from CPCB monitoring and peer-reviewed studies shows that events like Kumbh Mela, Chhath Puja, Durga Puja, and Ganesh Utsav raise BOD and solid waste levels. Rapid population growth has pushed river degradation to the forefront of public concern, intensifying pressures on already fragile ecosystems.

Traditions that evolved in an era of sparse populations are now practiced at a vastly larger scale, amplifying their ecological impact. In the context, it is worth asking if age-old practises need to be revisited and reimagined to ensure that devotion does not come at the cost of the very rivers it seeks to honour?

What does India's environmental laws entail?

At the apex level, the Supreme Court of India has reviewed cases involving the weakening of environmental safeguards for religious practices. Petitions rely on three legal foundations: The precautionary principle, the Water Act (Prevention and Control of Pollution), 1974, and Article 21 of the Constitution, which guarantees a clean environment.

Together, these establish that environmental protection is a binding legal obligation, even when balanced against religious freedoms. The NGT has enforced the CPCB's 2020 idol immersion guidelines, mandating artificial tanks or regulated zones for immersions. However, experts observe that no single law explicitly regulates offerings such as milk, flowers, oil, or mass bathing as a distinct category. Indian constitutional jurisprudence is clear that religious freedom under Article 25 is not absolute and can be restricted on grounds of public health. Yet, enforcement remains uneven due to political sensitivities and lack of uniform guidelines on everyday ritual practices. The NGT has applied principles such as "polluter pays" and precaution, reinforcing that faith cannot override ecological limits.

Is a per capita limit on offerings plausible and effective ?

Even minimal practices create a significant, continuous pollution load, say experts.

An analyses of offerings at Varanasi ghats with an average daily footfall of 2.5 lakh, shows minimal offerings of 5 ml milk, 5 ml oil(for lamps), and one flower per person, translating into 1,250 litres each of milk and oil, and 5 tonnes of flowers daily, excluding ashes, public offerings, and other waste. On peak days, this rises to 3,500 litres and 14 tonnes of waste.' It is argued that per capita limits alone are insufficient. Effective regulation must combine site-specific caps, waste collection, and diversion to ensure sustainable river management.

The debate is not about curbing faith, but about recognising ecological limits.

KASHMIR SCIENTISTS CRACK CULTIVATION OF RARE MOREL MUSHROOMS

Key Takeaways:

• Morels or Morchella, locally known as Kangaech, that grows naturally in specific high elevation forest ecosystems during a narrow rainy season costs anything between Rs 15,000 to Rs 40,000 per kilogram.

• "This is a game changing breakthrough," said Vice Chancellor SKUAST-K Prof Nazir Ahmad Ganai. "This innovation marks a paradigm shift — from dependence on uncertain wild collection to a controlled, scalable production system. It opens new opportunities for farmers, youth and entrepreneurs and contributes to ecological conservation."

• The cultivation of wild Morels in controlled conditions has been achieved independently by three people in SKUAST — Prof Tariq Ahmad Sofi, his student Kamran Muneer from the Faculty of Horticulture, and Prof Vikas Gupta from the faculty of agriculture.

• Having a high-export value, the cultivation of Morchella under controlled conditions is likely to open new frontiers in high value bioeconomy of Jammu and Kashmir

Do You Know:

• Morchella is a highly valued gourmet mushroom known for its intense and distinct flavour, superior nutritional profile and medicinal properties. The harvesting of the wild Morchella is a laborious and time-consuming process as gatherers carefully scour dense forests in harsh weather conditions. Sometimes, they return empty handed even after several days of foraging.

• The cultivation of Morchella has been a major scientific challenge especially as the species is known for a complex life cycle, symbiotic ecological behaviour and highly specific environmental requirements that makes the artificial cultivation extremely difficult.

THE ALARMING RISE OF MEDICALISATION IN INDIA

The recent announcement by Air India, hinting at possible pay cuts or even de-rostering for crew members with a higher Body Mass Index (BMI), may, at first glance, appear to be a prudent and well-intentioned step toward ensuring fitness and operational safety. Aviation, after all, is a profession where physical readiness is essential. Yet, the timing of this decision —coinciding with the week an anti-obesity drug, semaglutide, went off patent and nearly 40 products entered the Indian market— signals something deeper.

India today faces a mounting burden of obesity and associated metabolic conditions such as diabetes, hypertension, fatty liver disease, and dyslipidaemia. Nearly a quarter of Indians are overweight or obese. One in 10 adults live with diabetes, one in three with hypertension, and a substantial proportion has fatty liver disease. Even more concerning is the rapid rise of obesity among children. The causes, which are neither obscure nor debated, include the proliferation of ultra-processed or high fat, salt and sugar-content foods, and increasingly sedentary lifestyles shaped by urban work patterns, shrinking open spaces, chronic stress, alcohol consumption, and inadequate sleep. Compounding this is a genetic predisposition among Indians and South Asians toward excess body fat despite a seemingly lean appearance — the so-called "thin-fat" phenotype.

Historically, in a society long shaped by undernutrition and micronutrient deficiencies, excess weight was once perceived as a marker of prosperity. Consequently, as overweight and obesity began rising over the past two decades, public discourse remained muted, almost reluctant to confront this emerging reality.

Then came the pharmaceutical response. Around this time last year, another anti-obesity drug, tirzepatide, entered the Indian market and rapidly became one of its highest-selling medications. Its commercial success revealed not just clinical demand but also the emergence of a vast and lucrative therapeutic marketplace. With semaglutide now available at a remarkably lower cost, the market potential has expanded further.

Sustained marketing campaign

Over the past year, however, a more troubling pattern has emerged. Prescription medicines cannot be directly advertised to the public, yet pharmaceutical companies have grown adept at navigating these constraints. Surrogate advertising — often framed as public awareness campaigns — has become increasingly sophisticated. In the past year, the country witnessed full page newspaper campaigns, and billboards at major urban areas regarding obesity; influencer endorsements for medical products; and sponsored features that resemble independent journalism, subtly shape public perception without explicitly naming the drugs.

Regulatory responses lagged behind. The restrain from the government on newspaper ads and billboards came only a year later.

The messaging on drugs from pharmaceuticals is rarely overt; instead, it is nuanced, persistent, and highly effective, gradually reshaping both public expectations and clinical practice. In such an environment, the boundary between genuine scientific advancement and commercial enthusiasm begins to blur. New drugs are presented as transformative breakthroughs, while their uncertainties receive far less attention.

The less talked about side effects

Anti-obesity medications, particularly those acting on GLP-1 pathways, are associated not only with fat loss but also with a reduction in lean muscle mass — a condition known as sarcopenia. As there is loss of fat from the body, nearly 25% to 40% is contributed by the loss of muscle mass — an unintended but serious consequence. By suppressing appetite and reducing caloric intake, these drugs can inadvertently lead to muscle loss unless accompanied by adequate protein intake and structured physical activity, especially resistance training. Sarcopenia in this context is no longer a theoretical concern. It has been documented in clinical trials and is supported by emerging real-world evidence. Yet, amid the celebration of weight loss outcomes, such risks are often understated. Individuals may achieve a lower BMI while compromising strength, metabolic resilience, and long-term health.

The trajectory does not end there. Sarcopenia itself is now emerging as a new therapeutic target. Pharmaceutical pipelines already include drugs aimed at preventing or reversing muscle loss, many in advanced stages of development. It requires little imagination to foresee the next phase — a population using anti-obesity medicines, along with additional therapies to manage the very consequences these drugs produce. What we are witnessing here is a cascading logic: one intervention begets another, each addressing the unintended consequences of the previous one. It is a self-reinforcing cycle sustained by scientific innovation, commercial incentives, and a growing societal preference for quick pharmacological solutions over sustained behavioural change.

Perhaps what is most disquieting is the evolving role of professional medical bodies within this ecosystem both globally, and increasingly in India. Clinical guidelines are being updated with growing frequency, sometimes annually, often generating anticipation around new therapies. The interval between a drug's introduction and its inclusion in standard treatment protocols appears to be shrinking. Inclusion in such guidelines almost guarantees widespread adoption and commercial success. While scientific progress must be embraced, the pace of endorsement raises important questions: are these recommendations grounded in robust, long-term evidence, or are they shaped by the forces influencing markets and public discourse?

Meanwhile, one of the most fundamental drivers of the obesity epidemic — the rapid expansion of ultra-processed foods —receives comparatively limited attention. In India, this sector has grown at an annual rate of around 13% between 2011 and 2021. These products, aggressively marketed and widely accessible, shape dietary habits from an early age, fuelling the very conditions the pharmaceutical industry seeks to treat. Yet policy responses remain hesitant. Front-of-package warning labels, for instance, continue to face delays.

Thus, we inhabit a deeply paradoxical ecosystem. One industry promotes consumption patterns that drive metabolic disease. Another offers pharmaceutical remedies. A third emerges to treat the side effects of those remedies. From a market perspective, this system is efficient, profitable, and self-sustaining. From a public health perspective, it is profoundly misaligned with the goal of durable well-being.

Shift in perspective

Reclaiming the narrative of health demands a shift in perspective. Medicines must be recognised as adjuncts, and not substitutes, for foundational interventions such as a nourishing diet, increased physical activity, sufficient and restorative sleep, and stress management. Greater transparency about the risks of newer therapies is not just desirable but absolutely essential. At the same time, there must be stronger, evidence-based advocacy to restore lifestyle modification to the centre of clinical care. The medical profession must, above all, reaffirm its ethical compass.

Encouraging fitness among airline crew is not misguided. But if such measures become yet another entry point into a cycle of measurement, medication, and market-driven dependence, we risk losing sight of what health truly means. Anti-obesity drugs are not the destination; they are a signal revealing how deeply medicalisation is embedding itself into everyday life. This is a moment to pause, recalibrate, and reclaim health before medicine begins to define it.

THE ATHLETIC GENE: SPORTING HUB GUJARAT LAUNCHES PROJECT TO UNLOCK 'MARKERS'

As Gujarat counts down to 2030, when it will be hosting the Commonwealth Games for the first time, the state government is planning to conduct whole genome sequencing of talented athletes in the state to identify and record genetic markers associated with endurance and power sports.

Key Takeaways:

• In a first, the project aims to identify talent early, create an athlete genome database, and develop personalised training programmes in the state, where cricket has been the most popular sport.

• The 'Sports Genomics Programme' is being undertaken by the Gujarat Biotechnology Research Centre (GBRC), under the Department of Science and Technology of the state, in coordination with the Sports Authority of Gujarat.

• Noting that genetic factors contribute as much as 66% to athletic performance, GBRC Director Dr Snehal Bagatharia says: "In a key study published in 2023, 128 genetic markers (DNA polymorphisms) showed a positive association with athlete status. A total of 41 markers were related to endurance, 45 to power, and 42 to strength."

• Led by Dr Ildus Ahmetov of Liverpool John Moores University in the United Kingdom, the study 'Genes and Athletic Performance: The 2023 Update' was published in the journal Genes. It identified 251 genetic markers linked to sports-related traits, across 34 countries, including India.

• Under the programme, for which Rs 26.05 crore has been allocated for five years, the GBRC will collect at least 2,000 genetic samples per year over five years, with the 10,000 samples covering 10 sports – five endurance and power sports each. These sports will be identified in collaboration with the Sports Authority of Gujarat, from all the districts of the state.

• The goal is to create a Gujarat Athlete Genome Database, integrating genotype, physiological and performance data which, apart from identifying genes influencing athletic performance, would also help zero in on genetic risk factors for injuries, and help design rehabilitation protocols. Officials said the project would also help understand sex- and age-related genomic differences influencing athletic adaptation.

• Gujarat has seen a rise in sports stars from remote parts, like 21-year-old Rohit Majgul belonging to the Siddi community who recently qualified as a judoka for the Commonwealth and Asian Games. Majgul belongs to Jambur village in the Gir region that is often referred to as 'Mini Africa' as the Siddi community that is based here draws its origins from Africa.

Do You Know:

• A genome, simply put, is all the genetic matter in an organism. It is defined as "an organism's complete set of DNA, including all of its genes. Each genome contains all of the information needed to build and maintain that organism. In humans, a copy of the entire genome — more than 3 billion DNA base pairs — is contained in all cells that have a nucleus".

• The full genome of an individual means getting the exact order in which four nucleotide molecules in the human DNA are arranged in an approximately three-billion-long sequence. These four nucleotide molecules — adenine, thymine, cytosine, and guanine, or simply A, T, C and G — along with a phosphate molecule and a sugar molecule, form the long double-helix DNA strands which is essentially the genetic blueprint of the individual.

• More than 99.9% of the nucleotide sequence is the same in all human beings. It is the 0.1% difference that makes a person unique, not just in outer appearance — height, or facial features — but also in behavioural tendencies. This means that in every individual, about three to four million nucleotide molecules are uniquely placed in the sequence, and this is what gives rise to the diversity.

• People within a closed and isolated population group are likely to have fewer variations in their nucleotide sequences. Whereas, a heterogeneous population will show greater genetic diversity.

OAK TREES FELLING CASE: THEIR ECOLOGICAL IMPORTANCE FOR HIMALAYAS

On April 1, the Uttarakhand High Court stayed the felling of oak trees in Mussoorie for construction by the Municipal Council.

Key Takeaways:

• In a PIL petition, the petitioner had cited a Right to Information application filed with the Divisional Forest Officer of Mussoorie to seek confirmation on whether the forest department had

provided a no-objection certificate (NOC) to the Municipal Council to fell the trees. The department had replied that no NOC was sought.

• The petition claimed that the construction appears to be undertaken for extraneous considerations, including facilitating adjoining private establishments such as hotels.

• Bird data from the Cornell Lab of Ornithology's eBird platform shows high species richness across Himalayan districts with oak cover: about 440 species in Tehri Garhwal, 391 in Rudraprayag, 491 in Almora, 311 in Bageshwar, 383 in Chamoli, and 366 in Champawat. Insects are equally present: a 2022 study from Ranichauri (Tehri Garhwal) recorded 24 butterfly species in Banj oak forests alone.

• A December 2025 paper titled "Degradation of Oak Forests in the Himalaya: Impacts on Diversity Carbon Stock, and Regeneration", published in the Trees, Forests, and People journal, pegged the degradation of forests in the Indian Himalayan regions at a rate of 0.36 sq km per year due to both natural calamities as well as anthropogenic disturbances, including developmental activities.

Do You Know:

• Oak belongs to the genus Quercus in the Fagaceae family and holds immense social and ecological importance in the Indian Himalayan regions.

• In these regions, 35 species of oaks have been reported between 800 and 3,000 metres above sea level. In the western Himalaya, five oaks have been reported, and the species are providers of numerous ecosystem services such as conservation of soil, water, native flora and fauna, and serve as a lifeline for the local communities.

• Oaks found in Uttarakhand are Banj oak, Moru oak, Kharsu oak, Rianj oak, and Phaliath oak. Oak forests assist watershed protection by promoting the recharge of springs.

• Oak forests support a remarkably diverse web of life. Their trees host lichens, bryophytes, pteridophytes (all three being moss-like plants), orchids, and other flowering plants, creating layered microhabitats.

• These ecosystems also sustain a wide range of animals. Birds and mammals such as jays, Himalayan langurs, red giant flying squirrels, and Asiatic black bears feed on oak leaves and acorns, often caching them for leaner periods.

FIRST-EVER ASSESSMENT OF BAT CONSERVATION FLAGS THREAT TO SPECIES AND DATA DARK SPOTS

The bat species in India, around 135, are facing neglect due to lack of research and are also under threat from urbanisation, deforestation, land-use changes and climate impacts, the first-ever national assessment (State of India's Bats, 2024-25) has reported.

Key Takeaways:

• Pieced together by a team of 36 bat experts from 27 institutions over two years, and based on review of existing scientific literature, the report has painted a sobering status of the flying mammals, calling for urgent research on their habitats, hotspots, ecology, diet, and the disease risk they pose.

• The researchers, led by Nature Conservation Foundation (NCF) and Bat Conservation International, underlined that the data deficit and neglect of bats is of concern as they play a crucial role in pollinating plants, disperse fruit seeds, control pests that damage crops, and provide soil nutrition through their droppings. In fact, despite the heightened attention during the Covid-19 pandemic, research permits are slow to come by due to bureaucratic hurdles, the report noted.

• The Covid-19 pandemic increased the stigma around bats, casting them as disease carriers, the report noted, while ignoring their benefits to nature and society. The WHO had said in June 2025 that the "weight of available evidence suggests zoonotic spillover … either directly from bats or through and intermediate host".

Do You Know:

• Out of 135 bat species, 16 are endemic or only found in India and seven of them are listed under the threatened category by the International Union for Conservation of Nature. However, this does not mean the rest are in the pink of health as 35 species have either not been assessed or data is deficient on them, the report found.

• For instance, the Khasian Leaf-nosed bat which is under threat due to persecution-fuelled hunting, mining in Meghalaya, is not classified as per IUCN, which prepares the conservation status list.

• Rohit Chakravarty, an expert on bats from NCF and Bat Conservation International and one of the lead authors of the report said that research on bats needs to be stepped up urgently, and a lot many agencies other than the Forest department needs to work on bat conservation. "They are facing severe threats from urbanisation, even renewable energy infrastructure. The perception around the creatures needs to change to understand their ecosystem services," he told The Indian Express.

• The report has also recommended stepping up surveillance of pathogens in Northeast India and Western Ghats to prevent zoonotic disease outbreaks, and called for more studies on the impacts of environmental pollution on bats.

• The report documented significant inter-variability in the distribution of bat species. West Bengal leads with 68 bat species, followed by 66 in Meghalaya, 52 in Uttarakhand 41 each in Kerala and Karnataka and 43 in Sikkim, denoting diversity. Among cities, Delhi had 15 bat species, despite pressures of urbanisation. Haryana, Punjab had only five recorded species with limited forest cover and farm expansion.

• Most studies on the ecology and biology of bats was concentrated in southern states, including Western Ghats biodiversity hotspot. Other hotspots like the Himalayas, Northeast India, Andaman and Nicobar Islands were relatively understudied while states within the Eastern Ghats and Terai lowland regions were under sampled.

• The assessment found bats roosting across natural habitats and man-made structures. Caves and trees were two of the most common roosting sites. The winged mammals roost in caves due to their stable microclimate and as they provide them protection from environmental fluctuations and predators. Robber's cave in Mahabaleshwar, Maharashtra, houses perhaps the largest known roost of Phillip's long-fingered bat with an estimated 1 lakh individuals during breeding season.

• Among man-made structures, bats have been found to roost in crevices of dilapidated buildings, wooden beams to even government-protected monument. In fact, the report has highlighted the

presence of large bat colonies in monuments across Delhi, Hyderabad and Maharashtra. "Large bat colonies may cause structural damage to monuments and deter tourists from visiting. ASI (Archaeological Survey of India) can work with bat researchers and conservationists to use these sites as an opportunity for bat-related education, development of ethical guidelines for tourism around bat colonies, and finding ways to prevent bat-related damage to monuments," the report stated.

TOURISM AND TRADE

The Union government's ₹92,000 crore mega-infrastructure project for the holistic development of the Great Nicobar Island (GNI) by building it up as a port and tourism-led economy has gathered speed in the last six months, even as concerns remain about its impact on the Island's ecology and the rights of local populations, the Nicobarese and the Shompen — two indigenous tribal groups. The Andaman and Nicobar Islands administration has notified a draft master plan for the project. Apart from the International Container Transhipment Port (ICTP), the airport, and power plants, the draft master plan envisions developing the GNI as a "seaside destination in a pristine, unspoilt, protected environment", outlining plans for business, adventure, biodiversity tourism, family entertainment, amusement parks, etc., along with adequate social infrastructure for healthcare, education, and livelihood. The draft is planned for a projected population of over 3.36 lakh by 2055, by which time the expected tourist inflow will be a million a year. Over 70% of the direct employment the government hopes to create will be in tourism and allied sectors. The current population of the GNI is a little less than 10,000. This transformation of the GNI, aided by the ICTP, is crucial to leverage the "strategic importance" of the Island's location at the western entrance to the Malacca Strait. The draft plan has said the port will help India achieve its "aims to capture a significant share in global sea trade".

But while the administration has sought public suggestions and objections for 30 days, it remains unclear till when this window will remain open, given that the draft does not mention when it was notified. This draft plan follows another draft plan to relocate local Nicobarese communities to make way for the project. The two plans seemingly contradict each other with regard to where existing populations may be relocated, which has renewed fears among these groups. These communities have been opposing the project's clearance since 2022, alleging that their forest rights had not been settled. While the National Green Tribunal has set aside concerns about the project's impact on the GNI's biodiversity by citing its "strategic importance", a challenge to the project's clearances remains in the Calcutta High Court. Some have also questioned the project's commercial and naval merits. Considering that the project aims to irreversibly alter the demography, and ecology of the GNI, the most prudent path for the government is to take the time needed to build a more holistic consensus over it.

ASHA BHOSLE, LEGENDARY PLAYBACK SINGER, DIES IN MUMBAI AT THE AGE OF 92

Legendary playback singer Asha Bhosle died in Mumbai on Sunday. She was 92.

The singer had been admitted to the Breach Candy Hospital on Saturday evening with exhaustion and a chest infection. Hospital officials said the cause of death was multi-organ failure following a cardiac arrest.

Her son, Anand Bhosle, confirmed the news outside the hospital. He said that those who wish to pay their last respects may visit her residence on Monday at 11 a.m., and that the last rites will be performed at Shivaji Park, Dadar, at 4 p.m, with full state honours.

Ms. Bhosle, who recorded nearly 12,000 songs in over 20 Indian and foreign languages, is considered one of the most versatile voices in Indian music.

Born in a musical family, she began singing at the age of 10. Her first song was Chala Chala Nav Bala for the 1943 Marathi film Majha Bal. She entered Hindi cinema five years later with Saawan Aaya in Chunariya (1948). Her work in Naya Daur (1957) brought her wider recognition.

Over the decades, she recorded more songs than any other female playback singer of her time. The Guinness World Records recognised her for the most studio recordings.

She was honoured with the Dadasaheb Phalke Award, Padma Vibhushan, and Maharashtra Bhushan. Some of her famous songs are Chura Liya Hai Tumne Jo Dil Ko, Dum Maro Dum, Piya Tu Ab To Aaja and In Aankhon Ki Masti.

QUEEN ON THE BOARD

The significance of R. Vaishali winning the Women's Candidates cannot be overstated. The winner of the gruelling 14-round tournament, featuring the world's top chess players, gets the right to challenge the World champion; now the 24-year-old, who was not among the favourites in Cyprus, will take on China's Ju Wenjun in the World championship later this year. Vaishali is the first Indian to win the Women's Candidates, which dates back to 1952, and now only the second Indian to contest the Women's World (classical) chess championship match. She must be aiming to become the first Indian to capture the crown that matters most in women's chess. Besides Vaishali, Divya Deshmukh also played at the Candidates, though she had a forgettable tournament, finishing seventh in a field of eight. Divya had made history herself last July when she won the World Cup: she was the first Indian woman to win that prestigious event. It is remarkable that two young Indian women have won two of the biggest events in world chess within a space of nine months. And Koneru Humpy had clinched her second World rapid championship in December 2024.

Notwithstanding their successes, and the fact that Indian women, like the men, are the reigning World team champions (by winning the Chess Olympiad), the country cannot boast of great depth in women's chess. While there is no shortage of fresh talent among boys on the Indian chessboard, the story is different when it comes to girls. Women like Vaishali and Divya are not products of the system; they have succeeded because of their parents, and in the case of the former, generous corporate sponsorship has also played a role. Corporates have also contributed to the staggering growth of Indian chess. The WestBridge Anand Chess Academy (WACA), founded by Sandeep Singhal and five-time World champion Viswanathan Anand, ensured that money was no constraint for Gukesh's challenge for the World title against Ding Liren in 2024. Indian chess can get only better if more corporates step forward. To ensure that women's chess keeps its momentum, the chess federation should focus on girls, get them trained by Grandmasters, and organise more tournaments for them.

SHORT NEWS

9TH INDIAN OCEAN CONFERENCE

— India Foundation, in association with the Government of Mauritius, organised the 9th Indian Ocean Conference—IOC 2026—in Mauritius from April 10 to 12, 2026.

— The theme of the conference was "Collective Stewardship for Indian Ocean Governance."

— The conference brings together leaders, policymakers, and experts from across the Indian Ocean Region to deliberate on shared responsibilities, cooperative frameworks, and the future of regional governance.

ANTICIPATORY BAIL

— The Supreme Court has refused to extend the transit anticipatory bail earlier granted to Congress leader Pawan Khera by the Telangana High Court.

— The FIR against Pawan Khera was filed by Riniki Bhuyan Sharma, following a press conference where Khera levelled serious allegations of financial and legal misconduct.

— Black's Law Dictionary (4th edition) describes 'bail' as procuring "the release of a person from legal custody, by undertaking that he shall appear at the time and place designated and submit himself to the jurisdiction and judgement of the court."

— As opposed to ordinary bail, which is granted to a person who is under arrest, in anticipatory bail, a person is directed to be released on bail even before arrest made.

— The Bharatiya Nagarik Suraksha Sanhita, 2023 (BNSS) contains provisions for anticipatory bail in Section 482 (earlier Section 438 of the Code of Criminal Procedure). The provision empowers only the Sessions Court and High Court to grant anticipatory bail.

— Sub-section (1) of the provision reads: "When any person has reason to believe that he may be arrested on an accusation of having committed a non-bailable offence, he may apply to the High Court or the Court of Session for a direction under this section; and that Court may, if it thinks fit, direct that in the event of such arrest, he shall be released on bail."

— In the 1980 Gurbaksh Singh Sibbia vs State of Punjab case, a five-judge Supreme Court bench led by then Chief Justice Y V Chandrachud ruled that S. 438 (1) is to be interpreted in the light of Article 21 of the Constitution (protection of life and personal liberty).

DEPUTY CHAIRMAN OF RAJYA SABHA

— Rajya Sabha Deputy Chairman Harivansh is set to be elected unopposed for a third term on 17th April, 2026, with the Opposition deciding to boycott the elections.

— The Deputy Chairman is a constitutional position created under Article 89 of the Constitution, which specifies that the Rajya Sabha shall choose one of its MPs to be the Deputy Chairman as often as the position becomes vacant.

— The Deputy Chair is the one position that is elected solely by members of Rajya Sabha. It is a critical position not just because s/he steps in when there is a vacancy in the office of Chairperson/Vice President but also because s/he plays a critical role in ensuring the smooth running of the House.

MULTI-LANE FREE FLOW (MLFF) TOLLING SYSTEM

— The National Highway Authority of India (NHAI) has issued directions to all FASTag-issuing banks to immediately validate Vehicle Registration Numbers (VRNs) or license plate numbers

linked to the FASTags they have issued. It also comes in the backdrop of a push for a Multi-Lane Free Flow (MLFF) tolling system.

— The MLFF is an advanced facility that allows vehicles to pass through toll gates at high speeds, without stopping or slowing at toll plazas. Accurate VRN mapping with FASTag is critical for MLFF tolling.

— The MLFF or barrier-less tolling system does not have boom barriers. The toll is collected after high-performance Radio Frequency Identification readers and Automatic Number Plate Recognition cameras read the FASTag and VRN. In the absence of human intervention in this process, a mismatch in the VRN linked to the FASTag could see commuters pass without paying the fee.

— FASTag is an electronic toll collection system managed by the National Payments Corporation of India (NPCI) and the NHAI. FASTag sticker is usually pasted on the windscreen of a car. It was launched in 2014 as a pilot project and made mandatory at every toll plaza in the country in 2021.

— It uses Radio Frequency Identification (RFID) technology to communicate with scanners installed at toll plazas. Once the car crosses a toll plaza, the requisite toll amount is automatically deducted from a bank account or a prepaid wallet linked to the FASTag.

INDIAN ECONOMY 6TH LARGEST IN THE WORLD

— According to the latest World Economic Outlook (WEO) released by the International Monetary Fund (IMF), India is now the 6th largest economy in the world, slipping from the 4th position.

— According to the latest WEO, in 2026 India's gross domestic product — the total value of all goods and services produced inside the country — will be around $4.15 trillion (up from $3.92 trillion in 2025) while the UK's GDP will be $4.27 trillion (up from $4 trillion in 2025) and Japan's GDP would actually fall from $4.48 trillion in 2025 to $4.38 trillion in 2026.

DELHI DEHRADUN ECONOMIC CORRIDOR

— The Delhi-Dehradun Expressway corridor was inaugurated by Prime Minister Narendra Modi on April 14, 2026

— The corridor is built at a cost of Rs 11,868 crore, the 210-km highway is expected to cut down travel time to 2.5 hours.

— Apart from connectivity to Dehradun, the highway is designed with a spur to Haridwar to facilitate connection with the Char Dham highway.

MAN-MADE FIBRE (MMF)

— The Textiles Ministry is pushing for another round of customs duty cuts on several input items related to man-made fibre (MMF) to cushion war impact, The Indian Express has learned.

— The Indian Express had reported that the biggest impact of the war has been on the prices and availability of poly-ethylene terephthalate (PET).

— PET is used in polyester fibre that goes into the production of roughly 40% of India's apparel production, as 60% is still cotton-based.

— Man-made fibres (MMF) are mainly of two types: synthetic and cellulosic. Synthetic fibres are produced from crude oil, and cellulosic fibres are from wood pulp. The main varieties of synthetic staple fibres are polyester, acrylic and polypropylene. Cellulosic fibre is viscose fibre, modal, etc.

OFFICIAL LANGUAGE OF MEGHALAYA

— The Meghalaya cabinet on 16th April, 2026 announced the indigenous Khasi and Garo languages as the official languages of the state, in addition to English.

— The move comes amid a long-standing demand for the inclusion of Khasi and Garo – the languages of the state's two largest tribes – in the Eight Schedule of the Constitution. Currently, all official business in the state is carried out in English.

INDIA'S FIRST INDIGENOUS QUANTUM COMPUTING TESTING FACILITY IN AMARAVATI

— Andhra Pradesh Chief Minister N Chandrababu Naidu formally launched India's first indigenous quantum computing testing facility at SRM University in Amaravati.

— The Amaravati Quantum Reference Facility (AQRA) facility at Amravati was inaugurated on World Quantum Day (14th April), and with this, India now has open sovereign quantum infrastructure.

According to the World Quantum Day, "the World Quantum Day is celebrated on April 14, a reference to 4.14, the rounded first digits of Planck's constant: 4.1356677×10−15 eV·s = 0.000 000 000 000 004 1356677 electron volt second, a product of energy and time that is the fundamental constant governing quantum physics."

— The initiative features two distinct platforms: the 1Q testbed at Medha Towers and the 1S testbed at SRM University, Amaravati. It was launched under the Andhra Pradesh government's flagship quantum technology hub which is under India's National Quantum Mission.

— National Quantum Mission (NQM) was launched at a total cost of Rs. 6003.65 crore from 2023-24 to 2030-31, to seed, nurture, and scale up scientific and industrial R&D and create a vibrant & innovative ecosystem in Quantum Technology (QT).

DESIGNER RICE

— Scientists at CSIR – National Institute for Interdisciplinary Science and Technology in Thiruvananthapuram, Kerala, have developed a "designer rice" that packs three times the protein of normal grains while maintaining a low glycemic index (below 55) to help manage diabetes.

— Instead of genetic modification, the scientists have used food-processing technology.

— They took broken rice, the bits usually sold at a discount—ground them into flour, and blended them with protein and micronutrients like iron, folic acid, and Vitamin B12. They then "reformed" this mixture into grains that look, feel, and taste exactly like the rice we know.

— Protein powerhouse: While normal rice has about 6–8 per cent protein, this version boasts over 20 per cent.

— Fortified defense: It bridges the gap for anaemia by embedding iron, folic acid, and Vitamin B12 directly into the grain's structure.

SAMRAT CHOUDHARY

— BJP leader Samrat Choudhary was sworn in as the Chief Minister of Bihar, marking the first time the party will lead a government in the state.

— Nitish Kumar, who is now a Rajya Sabha MP, relinquished the chief minister's post on April 14, 2026, dissolving his Cabinet in which Choudhary was a deputy chief minister and held the crucial Home portfolio.

ANITA CHAUDHARY

— Anita Chaudhary, a 30-year-old forest guard at Rajasthan's Shergarh Wildlife Sanctuary, won the prestigious Machhli National Award from the World Wildlife Fund for Nature (WWF).

— The WWF's 'Machchli National Award', named after the famous Ranthambhore tigress and including a cash component of Rs 50,000, was the fourth recognition of her work.

SADHVI SATISH SAIL

— Sadhvi Satish Sail was crowned Miss India World 2026 at the grand finale of the 61st Femina Miss India pagenat held in Bhubaneswar.

— Crowned by her predecessor Nikita Porwal, Sail is all set to represent India at the Miss World 2027 pageant.

OPERATION UPSTREAM

— The World Anti-Doping Agency (WADA) has decided to collaborate with the Central Bureau of Investigation (CBI) to take a 'top to down' approach to curb anti-doping activities in the nation as the Sports Ministry pushes for criminalization of suppliers of prohibited substances to athletes.

— Operation Upstream, a joint CBI-WADA action plan, will target supply chains that move prohibited performance-enhancing drugs, and punish coaches, physios of doping athletes.

— Currently, India is the country with the most number of dope offenders in the WADA list of suspended athletes from 2024. The nation has been a regular feature in the top three list pointing at a deep-rooted problem related to usage of prohibited substances and performance enhancing drugs.

— Other hurdles that India faces in curbing doping activities are the lack of personnel at the National Anti-Doping Agency and lapse in procedures at the National Dope Testing Laboratory (NDTL). One of the 29 WADA accredited labs in the world, NDTL was suspended in 2019 due to non-conformities with international standards.

BUSINESS AND ECONOMY

WAR TO CAST SHADOW OVER IMF, WORLD BANK MEETS

Top finance officials from around the world will convene in Washington this week under the shadow of the war in the Middle East, which has delivered a third major shock to the global economy after the COVID pandemic and Russia's full-scale invasion of Ukraine in 2022. Top International Monetary Fund and World Bank officials last week said they would downgrade forecasts for global growth and raise their inflation predictions as a result of the war, warning that emerging markets and developing countries will be hit hardest by higher energy prices and supply disruptions.

Before the Iran war broke out on February 28, both institutions had expected to lift growth forecasts given the resilience of the global economy - even in the wake of major tariffs imposed by U.S. President Donald Trump beginning last year. But the war has delivered a series of shocks that will slow progress on recovering growth and beating back inflation. The World Bank's baseline estimate now projects growth in emerging markets and developing economies of 3.65% in 2026, down from 4% in October, but sees that number dropping as low as 2.6% if the war lasts longer. Inflation in those countries was now forecast to hit 4.9% in 2026, up from the previous estimate of 3%, and could spike as high as 6.7% in the worst case. The IMF warned last week about 45 million additional people could also face acute food insecurity if the war persists and continues to disrupt fertilizer shipments needed now.

Racing to respond

The IMF and World Bank are racing to respond to the latest crisis and support vulnerable countries at a time when public debt levels reached record levels and budgets are tight. The IMF said it expects demand for $20 billion to $50 billion in near-term emergency support to low-income and energy-importing countries. The World Bank has said it could mobilise some $25 billion through crisis response instruments in the near-term, and up to $70 billion in six months, as needed. But economists are urging governments to use only targeted and temporary steps to ease the pain of higher prices for their citizens, since broader measures could fuel inflation. "Leadership matters, and we've come through crises in the past," World Bank President Ajay Banga told Reuters, lauding work on fiscal and monetary controls that had helped economies weather previous storms. "But this is a shock to the system."

Inflation, growth

Countries now face a tough balancing act managing inflation while keeping an eye on growth and the longer-term challenge of creating enough jobs for the 1.2 billion people who will reach working age in developing countries by 2035.

U.S., China tensions

IMF and World Bank also face a far different global landscape with tensions running high between the United States and China, the world's largest economies, and the Group of 20 major economies hobbled in its ability to coordinate a response.

The United States currently holds the rotating presidency of the G20, which also includes Russia and China, but it has excluded another member - South Africa - from participation, complicating the group's ability to coordinate on this crisis.

HOW INDIA MANAGED OIL EMBARGO AND ENERGY CRISES OF 1973 AND 1979

The largest-ever disruption of energy supplies caused by the US-Israel war against Iran has left major global economies struggling with energy shortages. Amid the possibility of a new round of negotiations between Iran and the US, concerns over supply disruptions appear to cool down with oil prices dropping in early trade on Thursday.

However, the Iran war has damaged as much as $58 billion worth of energy infrastructure, according to an estimate by Rystad Energy. This does not bode well for economies like India, as its dependence on imported crude oil grew to over 88.5 per cent in the first 10 months of the current financial year FY26.

As the crisis in West Asia continues to shape global energy security, what lessons do past oil shocks offer for navigating the current situation? Let's examine. But first, a brief overview of India's energy mix and import dependence.

India's energy basket

The unfolding crisis in West Asia has a profound impact on India's energy market, as the country is heavily dependent on West Asia for its energy imports.

Crucially, a huge chunk of those imports passes through the Strait of Hormuz – a waterway between the Persian Gulf and the Gulf of Oman. Around 2.5–2.7 million bpd of India's crude imports – accounting for almost half of the country's total oil imports – have transited the strait in recent months; the longer-term average is around 40 per cent.

With a population of 1.46 billion and a fast growing economy, India has seen a steady growth in its energy demand. This demand is met through various energy sources, with coal remaining the largest source of energy supply.

According to the International Energy Agency (IEA), around 48.4 per cent of India's total energy demand is met through coal and coal products as of 2023. Crude oil constitutes the second largest source, accounting for 24.7 per cent of total energy supply.

As coal is the mainstay of India's energy basket, its domestic production has registered a considerable growth, with 1047.5 million tonnes produced in 2024-2025 compared to 997.8 million tonnes in 2023-2024.

On the other hand, domestic oil production meets only about 13 per cent of total demand. In 2023, domestic oil production averaged around 700 thousand barrels per day. As a result, India remains heavily dependent on crude oil imports.

India's strategic petroleum reserves (SPRs), which have a capacity to store 5.33 million tonnes of crude oil, are currently holding 3.37 million tonnes of oil, or just about two-thirds of their total storage capacity, according to the Ministry of Petroleum and Natural Gas (MoPNG).

Energy import profile

India is the second largest importer of crude oil, with total crude oil imports standing at 244.5 million metric tonnes in 2024-2025. This means that nearly 90 per cent of India's energy demand is met through imports.

West Asia has traditionally been India's primary source of crude oil imports, with over 70 per cent of its crude oil coming from Saudi Arabia, Iran, Iraq, Kuwait and the United Arab Emirates.

Although India has sought to diversify its sources of oil supply since 2005 and included supplies from African countries like Nigeria and Angola as well as Venezuela, West Asia still constitutes about 60 per cent of the country's energy import basket.

Currently, Russia, Iraq, Saudi Arabia, the UAE and the US are the top five crude oil suppliers. The total share of imports from these countries increased from 75.23 per cent in 2022-23 to 82.7 per cent in 2024-25.

Oil shocks: What history tells us

But the ongoing crisis in West Asia once again highlights the vulnerability of energy supplies to geopolitical tensions. At the same time, global oil shocks are not a new phenomenon. Let's see how India navigated some of the major shocks in the past.

The 1973 oil crisis

During the 1973 Arab-Israeli war, Arab members of the Organization of Petroleum Exporting Countries (OAPEC) imposed an embargo on the US and other countries that were supporting Israel. The embargo reduced about 7 percent of the global supply, while embargoed countries faced a combined shortage of 4.5 million barrels of oil per day.

This was one of the first crises, when global economies were jolted by the strategic power of oil. As part of a coordinated move by Arab countries to cut production, oil prices surged by 70 per cent to $5.11 per barrel. The impact was severe, pushing major economies like the US into recession that lasted until 1975. In the UK, this led to the fall of the Conservative government led by Ted Heath.

For India, the oil shock had a significant economic impact. Its import bill rose sharply from about $500 million in 1973 to $1.3 billion dollars in 1974. Rising petroleum prices and shortages of petroleum-based fertilisers even affected India's agricultural output.

The Five-Year Plan, launched in 1974, had estimated oil import expenditure at $3.8 billion by 1978. However, the sharp increase in oil prices – reaching around $8 per barrel – proved the estimate inadequate. Inflation surged by 20 per cent, while the demand for petroleum stagnated and imports declined.

The 1979 oil crisis

The next major shock followed in 1979 after the Iranian Revolution. Political instability led to a decline in Iran's oil production – around 7 per cent of world production at the time. This resulted in a rise of oil prices from $13 per barrel in mid-1979 to $34 per barrel in mid-1980. The crisis hit the global economy still recovering from the first oil shock just a few years earlier.

Amid these conditions, India was compelled to approach the International Monetary Fund (IMF) for assistance to address its balance of payment issue. This engagement is often seen as laying the foundation for the process of economic liberalisation, as the IMF support came in exchange for structural adjustments.

The 1990 Gulf crisis

Another major oil crisis occurred in 1990 with the onset of the Gulf war. Following the Iraqi invasion of Kuwait in 1990, a US-led coalition of over 30 countries launched 'Operation Desert Storm'.

Even before the war, tensions between Iraq and Kuwait had strained oil supplies, and the outbreak of the war further aggravated the situation. Oil prices doubled, while India faced one of its most severe balance of payments crises since independence.

By 1991, Indian foreign exchange reserves had fallen to $1-1.2 billion, which was not enough to cover the costs of oil imports. Repeated oil shocks, alongside domestic factors, further complicated the situation for India.

The uptick in oil prices inflated India's import bill. Due to the disruption in trade routes, India had to rely on costlier alternative routes. Additionally, the return of Indian expatriate workers from the Gulf reduced remittance inflows, further straining the economy.

India pledged approximately 67 tonnes of gold to raise emergency funds to keep the economy afloat, according to official RBI records. Of this, about 47 tonnes were airlifted to the Bank of England and 20 tonnes to the Union Bank of Switzerland, raising about $600 million in foreign currency.

The 2008 financial crisis

The 2008 financial crisis was primarily triggered by the collapse of the housing bubble in the US, which led to the worst global economic downturn since the Great Depression. As a complex chain reaction unfolded, the oil market crashed with oil prices fluctuating from $100 in January 2008 to $147 by July 2008, and then falling close to $30 by the end of 2008.

While oil-exporting countries in West Asia and elsewhere saw windfall gains, the oil-importing countries like India faced severe trade deficits. The sudden spike in oil prices in mid 2008 pushed inflation in India to 12.9 per cent in August 2008. At the same time, GDP growth fell from 9.4 per cent to 6.7 per cent in 2008-09, while the fiscal deficit reached 6.2 per cent of GDP.

To manage this shock, the government increased the prices of petrol by 5 rupees per litre, diesel by 3 rupees per litre, and LPG by 50 rupees per cylinder. At the same time, customs duties on oil were cut down to zero, and oil bonds worth 94,600 crore were issued to oil marketing companies to compensate for under recoveries.

The Russia-Ukraine war

More recently, India's energy import profile was affected by the Russia-Ukraine war that has been going on since 2022. India's economic ties and energy imports from Russia date back to the Soviet era. But following the collapse of the Soviet Union in 1991, India increasingly turned to Gulf countries.

But the outbreak of the Russia-Ukraine war largely reshaped this trajectory. In response to the Western sanctions, including a $60 per barrel cap on Russian seaborne crude, Russian oil was offered at discounted rates. India capitalised on this opportunity by increasing imports of Russian crude.

However, in February this year, US President Donald Trump claimed that India had agreed to stop buying crude from Russia, while announcing the reduction of tariffs on the country to 18 per cent from 50 per cent.

Following the outbreak of the US-Israel war against Iran, Washington issued a one-month sanctions waiver for Russian crude specifically for India in early March. The waiver, which expired on April 11, has now been extended till May 16. This extension is expected to help India continue buying Russian crude in large quantities amid the squeeze on supplies from West Asia.

The Strait of Hormuz crisis

The US-Israel war against Iran that began on February 28 has resulted in one of the worst global oil shocks. As tensions in the Strait of Hormuz continue to evolve, oil markets remain highly volatile to geopolitical developments.

On Wednesday (April 15), the White House sounded hopeful about reaching an agreement to end the war with Iran, while also warning of increasing economic pressure against Tehran if it remains defiant. Amid hopes of de-escalation in US-Iran tensions, oil prices dropped in early trade Thursday (April 16).

The Iran war has affected India's overall energy imports, be it crude oil, liquefied natural gas (LNG), or liquefied petroleum gas (LPG). India's real economic growth rate is also expected to dip below the crucial 7 per cent mark in the current financial year due to the war, according to a new assessment by the World Bank.

India's response

These oil shocks have caused significant losses to economies around the world. In response, countries have sought to strategise to minimise the impact of "weaponisation" of oil. For example, the 2008 financial crisis and the resulting oil crisis became one of the primary drivers of the shale oil revolution in the US.

Similarly, India has taken a series of policy measures to better absorb energy market volatility. For example, following the 1973 oil crisis, India increased its investment in its domestic coal production, tapping into its abundant reserves.

The 1979 oil shock also prompted policy rethinking that gradually culminated in the 1991 economic liberalisation. In addition, India has also sought to diversify its energy imports to reduce excessive dependence on a single source. It has developed SPRs to provide a buffer during periods of supply disruptions.

India's experience with past oil shocks highlights a pattern in which global energy volatility manifests as domestic economic strain through higher inflation, trade imbalances, and slower growth. As geopolitical tensions in the Strait of Hormuz continue to evolve, this historical susceptibility remains increasingly salient.

While policy interventions, ranging from the diversification of import sources to the establishment of strategic reserves, have undoubtedly enhanced resilience, exposure to external shocks cannot be overlooked.

HOW POLITICAL GOALS, TUSSLES LED TO 1969 BANK NATIONALISATION

The nationalisation of banks in India is widely regarded as the single most consequential economic decision taken by any government since Independence in 1947. Its impact —political, social and economic — was so far-reaching that even the sweeping economic reforms of 1991 are often considered less transformative in comparison.

Key Takeaways:

— This landmark decision was spearheaded by Indira Gandhi, who, while serving as both Prime Minister and Finance Minister, nationalised 14 of the country's largest private banks on July 19, 1969.

— The decision was rooted in the government's commitment to a socialist framework, aiming to align the financial system with broader developmental and social goals. Notably, the process of state intervention in banking had begun earlier, with the nationalisation of the State Bank of India in 1955.

— Until the 1960s, the expansion of branches was largely limited to urban areas, and rural and semi-urban areas continued to go unserved, the History of the RBI notes. As a result, several economic activities in agriculture, as well as small-scale industrial units and the self-employed, did not have proper access to banking facilities.

— This led to the widespread political perception that, left to itself, the private sector was not sufficiently aware of its larger responsibilities towards society. The political class became convinced that privately owned banks needed to be made aware of the credit needs of society.

— Private banks were seen as being excessively concerned with profit alone, making them unwilling to diversify their loan portfolios across different scales of economic operation, as this would raise transaction costs and reduce profits, the volume says.

— The idea of 'social control' of banks, as it first emerged in 1967, was the result of a compromise between two extreme viewpoints on banking held by the political class, then mainly represented by the Congress party.

— At the Congress Working Committee meetings in May 1967, economic policy — especially the meaning of "democratic socialism" — was intensely debated. Bank nationalisation emerged as the central issue. The Committee ultimately endorsed increased state participation in banking, insurance, foreign trade, and food distribution.

— According to the History of the RBI, a day before the announcement on July 19, she informed IG Patel, Secretary for Economic Affairs, that she had taken the decision to nationalise banks on "political" considerations and that he should prepare a speech within the next 72 hours. Patel is said to have offered two suggestions to Gandhi: first, that foreign banks should not be nationalised; and second, that there was no need to nationalise all banks, and it would be better if only the major banks, which accounted for 85–90 per cent of the total banking business, were nationalised, the RBI history says.

— Initially, banks with deposits of Rs 100 crore were listed for nationalisation. It then emerged that some important banks, like Dena Bank, with deposits of Rs 98 crore, would be left out. The limit was thus lowered to Rs 50 crore.

— On July 19, 1969, an Ordinance was promulgated to nationalise 14 major banks with deposits exceeding Rs 50 crore with immediate effect. The Ordinance was signed by the Vice President, VV Giri, who was then also the acting President, with President Zakir Hussain having died a few months earlier.

— On July 27, the Sarvodaya Leader Jayaprakash Narayan described the takeover of banks as "wrong and unwarranted", while addressing a public meeting in Rajkot. He said the step would not solve the economic ills of the country but would only enhance the power of those in power and the bureaucracy, the book says.

Do You Know:

— The RBI was set up on the basis of the recommendations of the Royal Commission on Indian Currency (Hilton Young Commission) which was set up in 1926. It recommended establishing a central bank to be called the 'Reserve Bank of India'.

— RBI is tasked with regulating the issue of banknotes, maintaining reserves with a view to securing monetary stability and to operate the credit and currency system of the country to its advantage.

— The first Governor of the RBI was the Australian Sir Osborne Arkell Smith, one of the two managing governors of the Imperial Bank of India. Sir C D Deshmukh was the first Indian to become Governor.

— The Central Office of the Reserve Bank was initially established in Kolkata but was permanently moved to Mumbai in 1937. The Central Office is where the Governor sits and where policies are formulated.

— RBI was nationalised from 1st January, 1949 on the basis of the Reserve Bank of India (Transfer to Public Ownership) Act, 1948. All shares in the capital of the Bank were deemed transferred to the Central Government on payment of a suitable compensation.

— The affairs of the RBI is governed by the Central Board of Directors consisting of the Governor and not more than four Deputy Governors. Non-official directors nominated by the government consist of ten Directors from various fields and two government officials along with four Directors – one each from four local boards.

— RBI performs several functions from maintaining price stability, issuing currency to banker to the government and banks. One of the significant functions which becomes important in the current times is the management of the forex reserve. It manages the Foreign Exchange Management Act, 1999 to facilitate external trade and payment and promote orderly development and maintenance of the foreign exchange market in India.

DEVIOUS MENACE

In the case of Nithin Raj, the first-year dental student in Kannur who died last week after falling from atop a five-storey building, the police have identified harassment over a loan that he secured via an app as a contributing factor. His death is the third high-profile suicide linked to loan apps in Kerala within four months. Since January, over 35 complaints related to these apps have been registered in Thiruvananthapuram Rural alone. In Raj's case, parallel investigations are also probing allegations of caste-based discrimination at his college and the National Commission for

Scheduled Castes has sought a report from the State police in under a week. Once installed, these apps extract contact lists, photo galleries, and GPS data from the user's device and export them to servers often located in North India or overseas. If repayment is delayed, recovery agents steadily ramp up harassment, including repeated abusive calls to the borrower, harassing persons listed as references on the loan application, and inflicting reputational damage. Kerala in particular has high smartphone penetration and digital literacy, but not necessarily financial literacy, and a large student population with urgent small-credit needs. Despite the RBI's Digital Lending Guidelines, predatory apps lend without regulated status, fabricate Non-Banking Financial Company (NBFC) partnerships, route funds through opaque gateways, conceal fees and disbursal deductions, and provide no grievance mechanism.

The apps are able to operate because while the RBI regulates financial entities, the harmful entity operates in the app and data layers. As a first step, smartphone makers must consider an OS-level sandbox in which any app categorised as "financial" is technically barred from accessing contacts, photos, etc., even if the user grants permission. The apps' call centres are also often traced to other States or countries, beyond the reach of local police. Second, India needs to enact legislation with prison sentences and heavy fines for illegal digital lending. When an app is removed from a store or directory, its developers relaunch immediately under new names. Third, the government can mandate all financial apps to have a cryptographically signed certificate of association from a regulated bank or NBFC and app stores to check listings against a Reserve Bank of India whitelist. This is also why the Kerala government is mulling new legislation to regulate digital lending platforms and empower local police to act against apps operating from outside the State. Fourth, the country needs rigorous disclosure standards on effective interest rates and fees, strict rules on recovery conduct, stricter KYC (Know your Customer) obligations on payment aggregators, and risk flags on UPI IDs associated with lending operations associated with a high complaint rate.

BAGESHWAR DHAM GETS GOVT. NOD TO RECEIVE FOREIGN FUNDS

The Union Home Ministry has granted registration under the Foreign Contribution (Regulation) Act (FCRA) to Baba Bageshwar Dham, a religious body led by Dhirendra Krishna Shastri, a Madhya Pradesh-based godman who seeks to establish 'Hindu Rashtra'.

Mr. Shastri, 29, is often courted by politicians and is known for his provocative statements on religious matters. His website has a separate section to collect donations from within India.

Despite repeated attempts, the religious body could not be reached for comments.

Mandatory registration

Registration under the FCRA is mandatory if a non-government organisation (NGO) or an association wants to receive foreign donations.

NGOs can receive foreign contributions for social, educational, religious, economic, and cultural programmes and can be registered for at least one or multiple categories.

The Shri Bageshwar Jan Seva Samiti Gadha at Chhatarpur in Madhya Pradesh has been registered under the 'Religious (Hindu)' programme, other than cultural, economic, educational and social categories.

Till April 15, 38 NGOs have been granted FCRA registration, out of which six have stated 'Religious (Hindu)' as one of the programmes for which foreign funds are required. Other than Bageshwar

Dham, those registered under the category are Ramakrisha Missions at Bolpur in West Bengal and Purnea in Bihar, Divya Jyoti Jagriti Sansthan in Delhi, The Institution at Dharmasthala in Karnataka, and Radha Soami Satsang at Agra, Uttar Pradesh.

Five-year validity

A FCRA registration is valid for five years, after which the NGO has to apply for a renewal. Since 2015, the FCRA registrations of more than 18,000 NGOs have been cancelled. As on April 15, there are 14,538 FCRA-registered NGOs active in the country.

During the Budget session of Parliament, which concluded on April 2, the Union government proposed to introduce the Foreign Contribution (Regulation) Amendment Bill, 2026 to amend the 2010 Act. However, following an uproar by Opposition parties, its discussion and passage were deferred.

The Chief Ministers of poll-bound Tamil Nadu and Kerala, and Christian groups opposed the Bill as it empowers the Ministry to take over the property and assets of an NGO if its FCRA registration is cancelled or suspended.

WHY JAN VISHWAS ACT MARKS A MAJOR REFORM FOR THE CRIMINAL JUSTICE SYSTEM

Last week, the Parliament passed the Jan Vishwas (Amendment to Provisions) Bill, 2026. The Bill proposes to amend 784 provisions across 79 Central laws. Earlier, the Jan Vishwas (Amendment of Provisions) Act, 2023, had amended 183 provisions across 42 laws to improve ease of doing business.

• Across the 79 laws, the Bill proposes four broad sets of changes:

—Decriminalisation: The Bill decriminalises a total of 805 offences, removing criminal sanctions such as imprisonment or fines and replacing them with civil mechanisms such as warnings and monetary penalties. These offences are removed from the ambit of the criminal justice system and will no longer attract police action and criminal court proceedings. They will however, in most cases continue to be regulated.

—Omission: The Bill proposes to omit 125 offences. Redundant or outdated offences have been omitted and effectively decriminalised. Offences that continue to pose public harm but are already covered under the Bharatiya Nyaya Sanhita, 2023, (BNS) have also been omitted from the specific laws, yet retain criminal liability under the general law.

—Compounding: Thirty-five offences have been proposed to be made compoundable, allowing violators to settle the case by paying a prescribed sum, avoiding prolonged litigation. While this brings some procedural flexibility, the violations continue to be criminalised.

—Rationalisation of punishments: For 53 offences, the Bill reduces imprisonment terms, removes disproportionately harsh punishments such as life imprisonment or death, and revises fines to contemporary standards.

• Underlying these amendments is a conscious attempt at rationalising the way in which the state responds to violations of the law.

Do You Know:

• In an attempt to rationalise the penal framework, the Bill amends laws across a broad range of sectors. These amendments collectively decriminalise or rationalise 1,018 individual actions and omissions treated as offences under the law.

• In the realm of business and industry, the Bill amends laws like the Tea Act, the Coir Industry Act, and the Legal Metrology Act, 2009. For municipal governance, the Bill proposes changes to laws like Delhi Development Act, the Delhi Municipal Corporation Act, and the Cantonments Act, 2006.

• In transportation and infrastructure, the Bill touches upon the Motor Vehicles Act, the Coastal Shipping Act, and the Petroleum and Minerals Pipelines (Acquisition of Right of User in Land) Act, 1962.

• The Bill also amends colonial-era legislations such as the Cattle Trespass Act, the Live Stock Importation Act, and the Indian Succession Act, which continued to rely on criminal law to enforce routine compliances.

• The Bill clarifies the distinction between fines and penalties. Fines remain court-imposed and often require the full criminal justice process, even for nominal fine amounts. Penalties, by contrast, are civil in nature and imposed by designated adjudicatory officers, enabling quicker and more efficient enforcement.

SHRINKFLATION

Apart from the fuel supply and price shock, the West Asia war has impacted a wide range of items from popular fast-moving consumer items such as instant noodles, juice, milk packs, beverages to automotive components for the country's largest carmaker. As companies attempt to recalibrate pricing of their products, many FMCG makers are also opting for reduction in grammage of their products, which leads to 'shrinkflation'.

Core Concept:

— Consumer products getting smaller in size but not changing price is a practice that is known as "shrinkflation"—a combination of the words 'shrink' and 'inflation'. It is closely related to "skimpflation", a practice that sees companies reduce the quality of their product or service while keeping the price the same. It primarily affects FMCGs, particularly in the food and beverage sector.

— Companies face higher prices for their supplies and may try to pass that onto the consumer. Downsizing a product reduces costs for manufacturers.

— Consumers tend to be price-sensitive but they may not notice subtle changes in packaging, or read the fine print on the size or weight of a product. The result is that consumers are less likely to notice getting less if the price is the same. Thus, we see that shrinkflation is basically a form of hidden inflation.

— Stagflation is described as an economic situation characterised by economic stagnation, meaning slow economic growth typically accompanied by an increase in unemployment, and inflation, meaning a persistent rise in the general price level.

— Typically, inflation occurs during periods of rapid economic growth, with the demand for goods outpacing their availability, increasing their prices. Similarly, during a period of economic decline, inflation falls as there is less money chasing the same goods.

— Stagflation presents a precarious situation for policymakers as policies that address either of these issues can end up worsening the other. An increase in unemployment amid a decline in economic growth is accompanied by a sluggish rise in incomes, while making sense of rising inflation. This puts dual pressures on the people, even as their purchasing power is reduced.

THE 'SURVIVOR SYNDROME' IN THOSE LEFT BEHIND AFTER A LAYOFF

On the morning of March 31, IT firm Oracle eliminated up to 30,000 jobs — roughly 18% of its global workforce — in a single automated email with no prior conversation with HR or warning from line managers. Access to company systems was revoked the same day. In India, about 12,000 employees were let go.

The layoffs come right after Oracle closed a profitable quarter with a $6 billion bottom line — revenue of $17.2 billion, up 22% year-on-year. The company's future looked secure with contracted future revenue at $553 billion, up 325%, almost entirely driven by AI deals.

With that kind of order book and profits, a layoff signals a strategic shift as the company liquidates its workforce to fund AI data centre infrastructure. Analysts have predicted cutting 20,000 to 30,000 employees could generate $8 to $10 billion in additional annual free cash flow. This will allow the company to reallocate payroll cost to AI infrastructure buildout. That in turn will allow Oracle to fulfil its remaining performance obligations.

While those who were let go will undoubtedly feel resentful, employees who are still on the company's payroll may feel something different.

Organisational psychologists have a name for it: survivor syndrome. Research pioneered by Joel Brockner at Columbia Business School shows that layoff survivors consistently develop negative reactions like reduced productivity and creativity, erosion of trust in management, and significantly higher intentions to leave.

Mr. Brockner's research identified a mechanism that most organisations consistently underestimate: survivors do not evaluate what happened to their colleagues in isolation. They use it as a signal of how they themselves will be treated. Surviving employees want to feel the process was handled in a just and fair manner. They use the fairness displayed in the dismissal of others as an indicator of how management will treat them in future.

Oracle's pre-dawn automated email, same-day system revocation, and no manager conversation give an unambiguous answer to that question. Based on these perceptions of fairness, employees decide to what extent they will commit to the organisation and whether they will put in their best effort or withdraw to the minimum acceptable level and potentially leave for another job.

Mr. Brockner's research further notes that when individuals are faced with bad outcomes, they want procedures to be fairly applied and be treated well during the process. Outcomes like losing colleagues, absorbing their workload, and working in a diminished team might seem like an accepted reality. But the way in which this decision was communicated creates a trust deficit as the layoff message was legally sufficient, not humanly adequate.

The behavioural consequences are immense as survivors can stop sharing concerns, becoming risk-averse and disengaged. This in turn will curtail creativity in the organisation. The human capital is now least likely to perform at the level Oracle needs.

There is also the problem of workload redistribution. While employees routinely assume duties of absent peers, layoffs create an entirely new scenario. As headcount shrinks by nearly a fifth, survivors will be made to absorb responsibilities disproportionately. Also, both formal and informal social networks within organisations will be rewired as roles and routines will be remapped in the new context.

This compounds the stress of survivors, reducing their commitment and motivation and increasing their intention to leave. Critically, the employees most likely to act on that intention are those with the most market value — precisely the ones Oracle needs to fulfil its $553 billion in contracted obligations.

Organisations that get this right — supporting survivors as well as those departing, with transparent and fair processes — are likely to differentiate themselves from competitors following large-scale change. Failure to do so leads, ironically, to the demotivation and organisational exit of the very people the company chose to keep.

BEHIND WORKERS' PROTESTS: HIGH COSTS, STAGNANT WAGES

The protests by thousands of factory workers in Noida spiralled into violence on Monday, but their agitation seeking a minimum wage hike, better working conditions and overtime payments had begun on April 8 itself.

Key Takeaways:

• The immediate fuse was the notification of a 35% minimum wage hike in neighbouring Haryana on April 9 following a similar protest in the industrial hub of Manesar.

• At the core of both protests, and others, is the spike in living expenses amid the West Asia war. This has been compounded by states' delays in revising the base minimum wage — one of two components that make up overall monthly minimum wage.

• The revision of the base minimum wage is supposed to take place every five years. But Haryana revised it only after 10 years. Uttar Pradesh, which has now stepped in with an interim hike, had last revised it in 2012.

• Before the revision, the overall monthly minimum wage of an unskilled worker in Haryana was Rs 11,274.60. It is now Rs 15,220.71, effective April 1.

• The same for an unskilled worker in Uttar Pradesh was Rs 11,313. It is now Rs 13,690 in Noida (Gautam Buddha Nagar) and Ghaziabad, Rs 13,006 for unskilled workers in municipalities, and Rs 12,356 for other regions, in the interim.

• This brings us to the second component of the overall monthly minimum wage — cost of living. This variable component is supposed to be revised twice a year, in line with the inflation rate for industrial workers — measured by the Consumer Price Index-Industrial Workers (CPI-IW).

• While most states carried out these half-yearly revisions, they have missed out on the base minimum wage revisions, especially in the years after Covid-19.

Do You Know:

• According to CPI-IW data, with the latest updated base year of 2016, the all-India inflation rate for industrial workers was 24.8% between February 2021 and February 2026. In Haryana, the inflation rate during this period was 27.9% in Gurugram and 27.2%% in Faridabad. In Uttar Pradesh, this figure was 27.4% in Ghaziabad and Noida. And Delhi saw the inflation rate for industrial workers rise by 27.4% between February 2021 and February 2026.

• In comparison, the overall minimum wage rate in Haryana increased by just 15% from Rs 9,803.24 in July 2021 to Rs 11,274.60 in July 2025 (before the April 2026 revision). Similarly, for Uttar Pradesh, the minimum wage for unskilled workers increased by 24.6% from Rs 9,078 in April 2021 to Rs 11,313 in April 2026 (before the interim revision announced on Tuesday). For Delhi, the minimum wage rate increased by 20.6% from Rs 15,310 in April 2020 to Rs 18,456 in April 2025.

• A common thread in the concerns raised by the workers during the protests in Noida and Manesar was that there was a certain expectation of the wages going up after the notification of the four Labour Codes in November 2025, which did not happen. In a statement Tuesday, the Uttar Pradesh government clarified that claims about a uniform minimum wage of Rs 20,000 per month are incorrect.

• The Factories Act capped the spread-over hours at 10.5 hours a day, extendable to 12 hours with written permission from Chief Inspector, and the daily working hours at nine hours a day. During the pandemic, many states including Rajasthan, Punjab, Himachal Pradesh and Uttar Pradesh increased the working time to 10-12 hours.

As per the draft rules of the new Labour Codes, "no worker shall be required or allowed to work in an establishment for more than 48 hours in any week. The period of work in each day… with intervals and spread overs, shall be as notified by the Central Government."

LIFE AND SCIENCES

SPLASHDOWN: ARTEMIS II RETURNS

The Artemis II capsule and its four-member crew streaked through Earth's atmosphere and safely splashed down in the Pacific Ocean on Friday after nearly 10 days in space, capping the first voyage by humans to the vicinity of the moon in over half a century.

Key Takeaways:

— NASA's gumdrop-shaped Orion capsule, dubbed Integrity, parachuted gently into calm seas off the Southern California coast shortly after 5:07 p.m. Pacific Time, concluding a mission that four days prior took the astronauts 252,756 miles away from Earth, deeper into space than anyone had flown before.

— The Artemis II flight, traveling a total of 694,392 miles (1,117,515 km) in two Earth orbits and a climactic lunar flyby some 4,000 miles from its surface, was the debut crewed test flight in a series of Artemis missions that aim to return astronauts to the lunar surface starting in 2028.

— The Chinese have been planning a human landing on the Moon by 2030, whereas India's plans are for 2040. India is a signatory to the Artemis Accords, a set of non-binding, bilateral principles that guides sustainable, peaceful civil space exploration led by NASA, particularly for the Moon and Mars. This signalled India's strategic alignment with the US space programme and possible opportunities for ISRO to collaborate closely with NASA on lunar exploration.

— The two agencies already have a deep engagement, with the recent NISAR earth-observation joint mission underlining that relationship. NASA's announcement said its lunar plans would have important contributions from private industry, academic institutions, and international partners. ISRO could have first-hand experience from these missions as it prepares to fulfil its own dreams over the next two decades.

— The mission was the key test of Orion's heat shield and a major milestone for NASA's Artemis program, which aims to return astronauts to the lunar surface in 2028 and build toward a longer-term presence on the moon and, eventually, Mars for the agency's future.

— The first mission of the Artemis programme, in 2022, was an uncrewed spacecraft that went around the Moon and came back.

Do You Know:

— When the first human landing on the Moon (Apollo 11) happened in 1969, the Indian Space Research Organisation (ISRO) did not even exist. It was set up within a month of that epoch-making event. Now, when NASA is working to take humans again to the Moon, ISRO is not just a collaborator but also a competitor, with its own plans of landing humans on the Moon.

MEASURING THE UNIVERSE

Q: What is the Hubble tension?

A: There is a major disagreement among physicists about how fast the universe is expanding. Astronomers use a value called the Hubble constant to measure it. However, the two main ways to calculate this number have produced different results.

In the first method, astronomers use the cosmic distance ladder. They observe nearby objects like pulsating stars and exploding supernovae to calculate how fast they are moving away from the earth. These measurements are said to be local, and they point to an expansion rate of around 73 km/s per second per megaparsec.

For the other method, scientists study the cosmic microwave background, which is the light left over from the Big Bang. Using mathematical models to project that ancient data into the present day, they have predicted a slower expansion rate of about 67 km/s per megaparsec.

The gap between these numbers is the tension. Both methods are highly precise yet their results don't match. The discrepancy suggests that physicists' current understanding of the universe might be incomplete.

On April 10, astronomers narrowed down the local expansion of the universe to be 73.5 km/s per megaparsec. They also confirmed that the value was correct using multiple methods. This new work doesn't settle the debate — in fact, it goes to show how robust the data on both sides is.

Physicists are now investigating whether they have made a measurement error or if 'new physics', like a new property of dark energy, is driving the expansion.

WHAT IS ANTHROPIC'S CLAUDE MYTHOS MODEL?

The story so far:

On April 7, Anthropic, the AI company behind the coding- and productivity-focused Large Language Model (LLM) family Claude, announced Mythos. This is its most powerful model yet, capable of finding bugs in old software that have not been flagged by humans so far. Anthropic said that it would not release the LLM widely, but only to a consortium of over 40 companies, which will use it to scan decades-old code to find software vulnerabilities not detected by humans yet.

What is Claude and why is it a notable product in AI circles?

Claude is an LLM developed by San Francisco-based Anthropic, like OpenAI's ChatGPT and Google's Gemini. However, its reputation for quality outputs in fields such as coding have lent it a reputation unlike any other LLM on the market. Claude runs through a command-line interface as well as a suite of apps for different platforms, published by Anthropic.

In increasing order of sophistication, Anthropic's other LLMs are Haiku, Sonnet, and Opus. All three have been noted for their performance and reasoning capabilities, which are critical to composing code and performing tasks agentically. AI firms often don't open-source their models, restricting access by rationing access to use and employing subscription- or usage-based pricing for users.

In spite of generally significant pricing for both usage-based pricing and subscriptions, most AI companies are not profitable, and are staking huge amounts of operational expenditure in the hopes of coming out on top in the AI race. Anthropic is not an outlier, since it does not make profits, but its usage limits and pricing are the subject of frequent complaints among users.

How is Mythos different from Claude's other models?

Cybersecurity has been an unintended side effect of these models' coding prowess. Opus was able to find multiple bugs in highly scrutinised pieces of open-source software, which are used in both private and public IT systems heavily. Human reviewers frequently find bugs, or security vulnerabilities, and they are "patched" so that attackers cannot exploit them to remotely shut down or gain access to computer systems.

Opus found bugs that humans missed, one Anthropic executive said at a talk in March, leading to worries within the company that its technology could be used by hackers to exploit, rather than find and patch, vulnerabilities.

Mythos has already been able to find "hundreds" of "severe" security vulnerabilities. Anthropic announced Project Glasswing, a defensive cybersecurity initiative, in partnership with Microsoft, Apple, Cisco, and other companies whose products and services form the backbone of several other companies and products across cyberspace.

Is Mythos really that capable? What is the problem if everyone has access?

It is not possible to know exactly how capable Mythos is since only a select group has access to it. But the fact that Anthropic has been able to announce specific vulnerabilities it has been able to co-develop patches for in established pieces of open source software indicates that its value as a cybersecurity tool is too significant for large IT and software firms to ignore.

The issue with making Mythos available generally is a transitional one. While Mythos is arguably the first to develop a model that can identify vulnerabilities, it is likely that other models with these capabilities will appear eventually. Anthropic's logic with Project Glasswing is that if the companies and individuals developing these foundational systems have access, they can get a head start in plugging vulnerabilities before attackers gain access to Mythos-class models and start attempting cyberattacks with these capabilities.

What are the implications for India? Is the government doing anything?

The Indian IT industry relies on a range of foreign platforms and software, and often builds its own bespoke software solutions. If Project Glasswing finds a wide range of bugs before Mythos-class models proliferate, Indian companies would benefit by patching all the software they use in time. However, their own software may be vulnerable to sophisticated attackers. No Indian IT firm has been publicly listed as a Project Glasswing partner as yet. The Data Security Council of India under Nasscom has been holding meetings on Mythos over the last week, its CEO Vinayak Godse told The Hindu. The IT Ministry and its subordinate Indian Computer Emergency Response Team have been studying the implications of Mythos, a senior government official told The Hindu.

EW BRAIN-INSPIRED 'MEMRISTORS' PROMISE TO REDUCE AI ENERGY USE

Researchers from the University of Cambridge have reported a new kind of brain-inspired nanodevice, a hafnium-oxide memristor, that could dramatically cut artificial intelligence's (AI) energy bill by bringing memory and computation into the same component.

The findings were published in Science Advances on March 20.

Most of today's computers have the von Neumann architecture: the memory, e.g. its DRAM, is located in one place and its processors — which are usually GPUs when the workload is to run AI models — are in another location. So for every calculation, data needs to be transported between the DRAM and the GPUs.

In modern computing setups that handle large AI models, this movement of data, rather than the calculations themselves, can dominate total energy use, especially when information must travel on and off chips or across multiple servers. Loading a single byte of data from off-chip memory can cost much more energy than adding two numbers the moment they arrive, in the same location.

The human brain takes a different approach. Every synapse — the junctions where neurons communicate — both stores and processes information locally, which means memory and processing are fused inside the same biological hardware. This is one reason the human brain can run roughly 1014 synaptic operations per second on about 20 W of power (less than a dim household light bulb), but an AI model running in a data centre will need at least hundreds to thousands of times more power for the same number of operations.

The field of neuromorphic computing aims to recreate this architecture by building electronic devices that act more like synapses and neurons than like traditional transistors and RAM chips.

Resistor with memory

The Cambridge team, which has also been working on neuromorphic computing, reported that its new memristor can also store and process data in the same place. By avoiding having to transport data, the chip cut energy use by more than 70%, the researchers estimated. The term 'memristor' is a combination of 'memory' and 'resistor'. A resistor is a small device that applies a fixed amount of resistance to a current passed through it. (If you took science in high school, you must have seen one in your lab: a small, bean-shaped piece with bands of colours and two pins at the ends.) Unlike a resistor, a memristor has variable resistance — but it's also capable of something unusual. When a current is passed through it, the memristor offers some resistance. When the current is removed, the memristor 'remembers' the resistance it offered and maintains it.

In a neuromorphic chip, each memristor can serve as an artificial synapse, with its resistance level representing the strength of the connection between two neurons.

Memristors are nanomaterials and don't take up much space. Their energy demand is also very small.

They are usually made of a thin layer of titanium dioxide (TiO2) sandwiched between two metal electrodes. Most oxide-based memristors on the market or in prototypes rely on a small conductive filament that forms and breaks inside a thin layer of metal oxide. This filamentary mechanism lets the device switch between different resistance states but tends to be fickle:

filaments grow unpredictably or need relatively high voltages to form, which can increase the energy demand.

Hafnium oxide is already widely used in advanced CMOS transistors, which means chip manufacturers know how to deposit and integrate it at scale. By showing that hafnium-based films can reliably behave like synapses and with a low energy demand, the Cambridge team has narrowed the gap between cutting-edge neuromorphic research and the use of semiconductors in industry.

However, there is a catch: the multicomponent films used in the study currently require fabrication temperatures around 700 °C, which is far higher than the temperature used to make commercial semiconductors, and the process also takes longer. The researchers wrote in their paper that they are currently working to ensure future production of this neuromorphic chip aligns with conventional technologies.

Neuromorphic engineering is the branch of engineering that seeks to create applications that emulate the brain's structure using three-dimensional arrays of neuron-like and synapse-like components that interact in complex ways. The underlying technologies promise to require less energy than regular GPUs. The Cambridge memristor could be a part of these brain-inspired devices. That said, even if today's neuromorphic circuits can replicate the behaviour of millions of neurons, they are still a long way from being as complicated as the human brain. The Cambridge team's work has improved synaptic components and has made it easier to build larger, even more energy-efficient neuromorphic systems.

HOW ENERGY EFFICIENCY DRIVES SEASONAL MOUNTAIN BIRD MIGRATION

A new study published in Science Advances challenges the long-held belief that birds migrate up and down mountains to escape temperature changes. Instead, researchers argue that energy efficiency is the primary driver.

The Old Theory vs. The New Finding

The traditional view held that birds move to cooler elevations in summer and warmer ones in winter. However, the study found that elevational migration is common even in equatorial tropics, where seasonal temperature variation is minimal — undermining the temperature-gradient hypothesis.

What the Study Did

Researchers from the U.K., U.S., and Taiwan analysed citizen science (eBird) data covering 10,998 populations of 2,684 bird species across 34 mountain regions worldwide. They compared real distribution patterns against a simulation model called SEDS (Seasonally Explicit Distributions Simulator), which modelled bird movement based on energy availability and demand.

Key Findings

Birds move primarily to access food more easily, avoid competition, and minimise thermoregulation costs — all aimed at optimising their energy budget.

28 out of 34 mountain regions matched the simulation's predicted patterns.

Notably, many birds actually move upslope in winter, which goes against the temperature gradient.

Climate Change Implications

Under worst-case 2100 climate scenarios, the model predicts an average upslope shift of ~129 metres for mountain birds — driven not directly by temperature, but through its effect on energy and resource availability.

Indian Context

Dr. Tarun Menon's Ph.D. research on elevational migration in the Himalayas supports these findings, showing that seasonal shifts in insect abundance at different elevations closely correspond to the movement patterns of insectivorous birds — consistent with the energy efficiency hypothesis.

Bottom Line

Resource distribution — shaped by both climate change and human activity — matters far more than temperature alone in determining how and where mountain birds move. Understanding this is crucial for future conservation and habitat management.

FLOODS AND LANDSLIDES LEAVE 77 DEAD IN 10 DAYS IN AFGHANISTAN

Widespread flooding, landslides and lightning strikes triggered by heavy rain and storms across Afghanistan have left 77 people dead and 137 injured over the past 10 days, the country's Disaster Management Authority said Saturday.

Key Takeaways:

— More rain has been forecast for the coming days throughout Afghanistan, and the authority warned the public to stay away from river banks and areas prone to flooding. So far this year, dozens of people have died due to extreme weather in Afghanistan, an impoverished country that is highly vulnerable to extreme weather events. Earlier this year, heavy snowfall and flash floods left dozens of people dead across the country.

— Businesses, agricultural land, water wells and irrigation canals have also been damaged, with more than 5,800 families affected overall, the authority said.

— Several highways connecting the country's capital to the provinces have also been damaged by floods and landslides, forcing travelers to take long, circuitous routes to reach Kabul, Public Works Ministry spokesman Ashraf Haqshinas said Saturday.

— They include the Kabul to Jalalabad highway, which is the main route linking the capital to the Pakistani border and eastern Afghan provinces. A landslide and rockfalls, as well as flooding, shut the highway on Thursday morning, and Haqshinas said crews were working to re-open the road.

— Flooding has also shut the Salang Pass, a high mountain pass in the Hindu Kush mountain range that connects Kabul to the country's north, including the major cities of Kunduz and Mazar-e-Sharif.

— Snow and heavy rain often trigger flash floods that kill scores, or even hundreds, of people at a time in Afghanistan. In 2024, more than 300 people died in springtime flash floods.

Do You Know:

— A landslide is a physical phenomenon in which a mass portion of rock, debris, or soil falls due to the influence of gravity. Landslides are one of the common geological hazards in hilly areas throughout the world.

— According to the World Health Organisation (WHO)- Landslides occur when large masses of soil, rocks or debris move down a slope due to a natural phenomenon or human activity. Mudslides or debris flows are also a common type of fast-moving landslide

— According to WHO, areas that are most vulnerable to landslides include:

• Any area where surface runoff is directed or land is heavily saturated;

• Steep terrain, including areas at the bottom of canyons;

• Land that has been modified due to human activity, such as deforestation or construction;

• Land previously burned by wildfires;

• Channels along a stream or river.

— Excessive or continuous rainfall over a period of days, or during particular seasons, can lead to stagnation of water and cause flooding.

NATURE'S SIGNALS

Q: What are sentinel species?

A: A sentinel species is a species whose members' health signals the condition of the ecosystem in which they live. Scientists monitor them because they are among the first to respond to stressors in their environment, such as pollution and disease, and their response also tends to be more apparent than most other species.

In other words, they can provide early warnings of ecosystem decline.

Sentinel species tend to occupy a fixed territory and live long enough to accumulate toxins. They also have physiologies that amplify the effects of environmental change. Thus, when something goes wrong in their habitat, they show it first.

The most common example is frogs. Their skin is permeable and absorbs whatever enters the water or soil around them, making them very sensitive to pesticides and pathogens. A declining frog population has often been a sign of wider ecological stress, even before other indicators detect the problem.

Canaries in coal mines worked on the same principle: the bird's faster metabolism made it succumb to carbon monoxide before human miners could notice anything. Researchers also use honeybees to track agricultural chemical loads, polar bears to monitor Arctic contaminant accumulation, and certain fish species to detect industrial runoff.

On April 9, the International Union for Conservation of Nature declared the emperor penguin to be an endangered species. Emperor penguins are sentinel species for warming in the Antarctic region. Climate change is projected to halve their population by the 2080s.

BIOLOGICS: SCIENCE BEHIND MODERN MEDICINE

India's biopharma push

The "Biopharma SHAKTI" programme, announced with a total outlay of 10,000 crores over a period of 5 years.

The programme envisions transforming India into a global biomanufacturing hub through strengthened research programmes by establishing three new National Institutes for Pharmaceuticals Education and Research (NIPERs). It also seeks to strengthen the existing infrastructure, and create a network of 1,000 accredited clinical trial sites.

Hence, the programme signals a shift towards strengthening domestic production of biologics and biosimilars with the already existing strength in small molecule production.

Also, in January 2026, Biologics X 3DCC Summit – a landmark unified summit that merges two of India's most influential scientific conferences: the 6th Annual Summit on Biopharmaceutical Product Development (Biologics 2026: Emerging Frontiers) and the 3rd Edition of the International Conference on Advances in 3D Cell Culture (3DCC 2026) – was held.

The initiative aimed to bring together stakeholders to promote collaboration and accelerate the translation of affordable therapies from bench to bedside. It also highlighted recent advances in 3D cell culture for developing monoclonal antibodies, cell and gene therapies, and other next-generation biotherapeutics.

However, the question remains: What makes such technologies possible in the first place? How do biologics, ranging from fertility treatment to vaccines and RNA platforms, differ from conventional drugs?

What are biologics?

Modern medicine is dependent on two broad categories of therapeutics:

1) **Chemically synthesised drugs –**

   It includes drugs like paracetamol (an antipyretic) and amlodipine (used to control blood pressure), whose chemical structures are known and well characterised.

2) **Biologics –**

   Like blood, plasma, monoclonal antibodies, and insulin. Biologics are generally obtained as complex mixtures, and are not easily identified or completely characterised.

They are generally derived directly from natural sources like microorganisms, animals and humans (e.g., blood, platelets), or through cutting edge biotechnological procedures (cell free synthesis).

Crucially, the rapidly evolving field of biotechnology has made the biotech industry highly dynamic with frequent innovations and short product life cycles. And biologics now encompass a wide range of therapeutic solutions from IVF to vaccines.

Modern in vitro fertilisation

With advances in therapeutics and rising incomes, the demand for biologics has increased significantly. For instance, many middle-income couples now choose delayed pregnancy. In such cases, the Anti-Müllerian Hormone (AMH) test is widely used in reproductive medicine because it helps assess ovarian reserve.

Compared to earlier tests determining the ratio of follicle-stimulating hormone to luteinizing hormone (FSH/LH), AMH level is considered a more reliable indicator of fertility potential.

Consequently, modern in vitro fertilisation (IVF) treatments rely heavily on accurate AMH testing. These tests typically use mouse monoclonal antibodies produced in hybridoma cell lines. These antibodies are highly specific antibodies produced by identical immune cells derived from a single parent cell.

Maternal age strongly influences pregnancy outcomes, as advanced age increases the risk of conditions such as Down syndrome in newborns, while early first pregnancy is protective against certain cancers. Nevertheless, IVF treatments continue to be widely marketed.

But IVF has limited success rates (around 17 per cent per cycle) compared with natural conception (around 31 per cent), partly due to the artificial environment of fertilisation. Alternative approaches, such as gamete intrafallopian transfer (GIFT), use superovulation drugs produced in Chinese hamster ovary (CHO) cell lines.

Vaccine technologies

Vaccine technologies range from inactivated viruses to nucleic acid–based platforms such as RNA vaccines and viral vector vaccines (e.g., adenovirus-based platforms like Covishield).

CRISPR-based genome editing therapies are also advancing rapidly in the field of genomic medicines. As of 2025, however, monoclonal antibodies (mAbs) remain the largest segment of products, accounting for 54.2 per cent of the biologics market.

Challenges in therapeutic biologics

However, therapeutic biologics face many challenges involving the production, purification, administration, detection, quantification, and targeting of proteins of interest (POIs) among thousands of background proteins.

Earlier, researchers purified only microgram to milligram quantities of proteins from kilograms of animal tissue, often obtained from slaughterhouse waste. However, this approach has two major limitations:

First, protein distribution in cells is highly skewed. For example, about 97 per cent of protein in human red blood cells is haemoglobin, while thousands of other proteins constitute only about 3 per cent.

Second, even with extensive purification and quality control, contaminant proteins often remain. This is particularly concerning during therapeutic administration, as proteinaceous infectious agents (prions) such as those causing diseases of the nervous system (like mad cow disease, kuru, and scrapie) pose serious risks. In addition, contaminating viral nucleic acids requires extensive safety testing.

How advances in cloning technology address challenges

Major advances in cloning technology have addressed many challenges in protein production. Because genes are modular, a gene from one organism can be expressed in another unrelated host with minor modifications.

For example, human genes can be cloned into simple unicellular bacteria to produce proteins, which are then extracted and purified after cell lysis (The process of breaking open a cell to extract its internal contents, like proteins, metabolites, DNA, RNA, generally for analysis or purification of specific components.). This approach poses minimal ethical concerns and low risk when non-pathogenic bacteria are used.

However, biologically active proteins – particularly larger ones – often require complex folding mechanisms and specialised cellular machinery that can vary between organisms. Proteins can also contain an additional layer of structural information beyond the amino acid sequence known as glycosylation (addition of sugar molecules to proteins). AMH is a glycosylated peptide.

Protein folding

Proteins are synthesised as linear, straight chains of amino acids (polypeptides). But the protein can do its job only if this one-dimensional chain of amino acids folds into the correct three-dimensional structure, which is suitable for their biological function.

Why therapeutic proteins are produced in mammalian cells

In some cases, protein function and recognition depend not only on the amino acid code but also on specific sugar modifications, which simple bacteria cannot produce. While some glycosylation patterns are conserved from yeast to humans, others vary between organisms.

Therefore, such therapeutic proteins are produced in mammalian cells like Chinese Hamster Ovary (CHO) cell lines. In these systems, extrachromosomal plasmid DNA is introduced into CHO cells, which gets integrated into the genome through random or cite-specific integration. The gene dose and protein production can be controlled by varying the concentration of suitable selection marker (mostly an antibiotic added to the culture).

However, integration of foreign DNA can result in genetic instability of host cells. Clones are sometimes lost or can accumulate sub-variants in a subpopulation of clonal cell lines. It affects purity, titre, and quality of the final product. Also, spontaneous mutations can accumulate and further affect the final product.

Decoding biomanufacturing: cells, systems, and scale-up

These challenges are particularly important because a large spectrum of current vaccines is usually manufactured using cell-based expression systems, such as mammalian and insect cell lines, as well as bacterial or yeast cultures.

Recently, plant molecular farming has been used for the production of seasonal influenza vaccines. It is envisaged to play a unique role in low-resource areas in the development of niche and orphan vaccines, and in the production of virus like particles (VLPs) (These are non-infectious nanostructures that closely mimic the architecture and surface features of native viruses while lacking genetic material.).

Molecular engineering is followed by process scale-up in bioreactors, which convert low-value inputs into high-value biological products. Key determinants of biological production are temperature, pH, dissolved oxygen, cell density, and growth media composition. In bioreactors, these variables are monitored and controlled through oxygen transfer, mixing, and flow rates to optimize product formation.

Since different cells vary in size and structural properties, shear forces must also be regulated. Thus, stirred tank reactors are suitable for robust microbial cells, while gentle bag reactors are ideal for mammalian cells. Advances in sensors and process analytics now enable precise monitoring and balancing of bioreactor input and output fluxes.

Current trends emphasise continuous production, single-use bioreactors, and cell-free synthesis, supported by automation and AI-driven process monitoring to improve manufacturing and scalability.

Ethical and economic concerns

Despite rapid advances in biotechnology, important ethical and economic concerns are emerging. Many innovations are developed using publicly funded research, yet their commercialisation often limits access for those who cannot afford them.

Early biotechnology research investments were largely venture-driven, with profits frequently reinvested into scientific research. But as breakthrough achievements become increasingly difficult, investors may choose safer options. Such options may be less relevant to the current priorities of societies, and primarily cater to only a few.

For example, the current flow of funds in ageing research outpaces the funding required for neglected tropical diseases like Leishmania, Schistosomiasis, and even enteric diseases like cholera and diarrhoea that still cause a large number of fatalities in poor countries.

PHYTOREMEDIATION

Core Concept:

— Turning toward more sustainable and eco-friendly technologies to remediate the soil pollution, scientists have developed methods of "Phytoremediation", a remediation method that uses living organisms like plants, microalgae, and seaweeds.

— It uses "hyperaccumulator" plants to absorb the toxic materials present in the soil and accumulate in their living tissue. Even though most plants do sometimes accumulate toxic substances, hyperaccumulators have the unusual ability to absorb hundreds or thousands of times greater amounts of these substances than is normal for most plants.

— In phytoremediation, suitable plant species can be used to 'pick up' the pollutants from the soil through their roots and transport them to their stem, leaves and other parts. After this, these plants can be harvested and either disposed of or even used to extract these toxic metals from the plant.

— This process can be used to remove metals like silver, cadmium, cobalt, chromium, copper, mercury, manganese, molybdenum, nickel, lead and zinc; metalloids such as arsenic and selenium; some radionuclides; and non-metallic components such as boron.

— Bioremediation is the use of microbes to clean up contaminated soil and groundwater. Microbes are very small organisms, such as bacteria, that live naturally in the environment.

— Bioremediation stimulates the growth of certain microbes that use contaminants as a source of food and energy. Contaminants treated using bioremediation include oil and other petroleum products, solvents and pesticides.

BIOLUMINISCENCE

Core Concept:

— Bioluminescence is the property of a living organism to produce and emit light. This phenomenon is rare in ecosystems on land, but it is common in the marine environment.

— Many marine organisms such as bacteria, algae, jellyfish, worms, crustaceans, sea stars, fish and sharks, are able to produce their own light. Luminescence is generally higher in deep-living and planktonic organisms than in shallow species. Also, the appearance of bioluminescent light differs, depending on the habitat and organism in which it is found.

— According to NOAA, bioluminescence is the result of an enzymatic reaction. An enzyme speeds up the chemical reaction by helping a substrate react. The enzyme is reused in the reaction instead of being transformed into another molecule.

— Bioluminescence is not common in India. However, there are several tourist places across the world which are famous for the phenomenon. The Blue Grotto in Malta is one of nine caves near the island of Filfa that produces a phosphorescent glow. Similar to the Blue Grotto is Bioluminescent Bay in Puerto Rico, San Diego in California, Navarre Beach in Florida, and Toyama Bay in Japan.

— Biofluorescence is a phenomenon in which living organisms absorb light of a shorter wavelength (higher energy) and re-emit it at a longer wavelength (lower energy).

— It is a type of fluorescence that specifically occurs in living organisms. The phenomenon has been observed in various plants, animals, and some microorganisms, often appearing as vibrant colours under specific lighting conditions.

STUDY UNRAVELS WHY MEN EXPERIENCE MORE SKIN INFECTIONS THAN WOMEN

Men experience more skin infections than women — doctors have known this for a while. They have proposed both behavioural and physiological reasons for this difference but the exact mechanism has been unclear.

Recently, scientists at UT Southwestern Medical Centre in Texas in the U.S. reported that the male sex hormones, androgens, which include testosterone, help bacteria communicate and cause skin infections by activating a bacterial signalling system called quorum sensing.

Their findings, published in Nature Microbiology, show that reducing testosterone levels in mouse models increased the animals' resistance to infections. When the researchers applied testosterone topically to female mice, the infection became more severe.

Skin's hormones

Sex hormones are generally thought to be produced by the testes or ovaries. However, Tamia Harris-Tryon, Associate Professor of dermatology and immunology at UT Southwestern, and her team had previously shown using an advanced technique called liquid chromatography tandem mass spectrometry that the skin also generates and secretes extremely small concentrations of these hormones.

The skin is a hormonally responsive organ. Its sebaceous glands can produce hormones, making testosterone readily available to microbes living on the skin's surface. This is relevant to bacteria like Staphylococcus aureus. They don't begin an infection right away. Instead, they wait and multiply, and activate their disease-causing machinery only once the colony is dense enough to have a fighting chance. Bioinformatic analysis further revealed that the bacteria also respond to the host's hormones.

To test whether testosterone from the skin drives infection, the researchers engineered mice that were unable to produce testosterone in the skin. These animals had markedly less severe infections and less skin barrier damage compared to normal mice. When testosterone was applied to hormone-deficient female mice, the infection became more severe.

The effect was specific to androgens. Female sex hormones, oestradiol and progesterone, didn't affect the bacteria's quorum sensing — where bacteria release chemical signals into their environment and as the bacterial population grows, the concentration of these signals rises.

Beyond antibiotics

S. aureus is the leading cause of skin infections worldwide. It commonly colonises the skin and nose but when it enters the bloodstream, it can cause septicaemia, a life-threatening condition that could lead to organ failure.

These infections have been increasingly harder to treat, thanks to the rise of multi-drug-resistant S. aureus, a strain that resists methicillin and other related antibiotics. Doctors have associated it with prolonged hospital stays and higher mortality.

Conventional antibiotics try to kill bacteria or inhibit their growth, which creates strong evolutionary pressures that encourage bacteria to develop resistance to antibiotics. However, the new study targeted quorum sensing, which disrupts the bacteria's ability to coordinate harmful behaviours without necessarily threatening their survival.

This approach could lead to therapies that are more effective, less disruptive to the body's natural microbiome, and less likely to drive antibiotic resistance.

NEW CELL THERAPY SHOWS PROMISE TO TREAT FRAILTY AMONG ELDERLY

In many Indian homes, ageing unfolds quietly. A grandfather who once walked to the local market now pauses every few steps. A grandmother takes days to recover from a minor fall. Such changes are often dismissed as "normal ageing". Medicine, however, increasingly recognises these signs as part of a condition called frailty, which is a state of accelerated biological ageing marked by lower endurance and slower recovery.

Frailty affects up to one in four people over the age of 50 worldwide. In India, where the population aged 60 and over is projected to rise to nearly 20% by 2050, the condition is likely

widespread but rarely diagnosed. Unlike diseases such as diabetes or hypertension, frailty has no standard treatment protocol and is under-visible in policy.

A new international study suggests that this long-neglected condition may finally be biologically treatable.

Measurable gain

Researchers studying elderly individuals with frailty found that a single infusion of mesenchymal stem cells significantly improved their physical endurance. Participants aged 70 to 85 years who received the highest dose walked on average 60 m farther in a six-minute walk test nine months after treatment, which is a nearly 20% improvement over their baseline performance.

The study was part of phase IIb of the CRATUS trial and was conducted by a team that included researchers from U.S.-based biotechnology firm Longeveron. The firm's mesenchymal stem cell product is called Lomecel-B (or laromestrocel). The study's findings were published in the journal Cell Stem Cell on March 5.

For the first time, there seems to be a treatment that targets accelerated ageing itself.

Since frailty increases the risk of falls, hospitalisation, post-surgical complications, and premature death, even modest gains in endurance can be the difference between independent living and prolonged dependence.

Mesenchymal stem cells

Frailty is not a single disease with a single cause, rather it arises from the cumulative effects of chronic inflammation, muscle loss, vascular ageing, immune dysfunction, and long-term stress. Because there is no single molecular target, most medical research has focused on managing the consequences of frailty rather than reversing the condition itself.

The authors of the new study used mesenchymal stem cells, which are naturally found in bone marrow and fat tissue. These cells are biologically versatile as they can differentiate into bone, cartilage or muscle and, importantly, release molecules into the bloodstream that reduce inflammation and promote tissue repair.

An added advantage is that, unlike many cell therapies, mesenchymal stem cells do not strongly activate the recipient's immune system, thus reducing the need for immunosuppressive drugs. This is a critical safety consideration for older adults who are also frail.

The findings also confirm that while frailty has important social and psychological components, it is also a biological condition that could benefit from timely intervention. This said, how exactly laromestrocel works is unclear.

UNDERSTANDING PARKINSON'S DISEASE AND ITS SYMPTOMS

April marks Parkinson's disease Awareness Month, highlighting the need for early recognition of this progressive neurodegenerative disorder and the importance of support groups for patients and caregivers. Though awareness has improved, healthcare providers still find delayed diagnosis a major challenge as symptoms are often overlooked or misunderstood. Identifying the condition early and starting appropriate treatment can help manage symptoms effectively and improve quality of life, they say.

There are three cardinal symptoms of Parkinson's disease, Dr. Damodaran said: "Tremors or shaking of hands is one of them. Slowness is the other main symptom. They may walk slowly or drink coffee slowly. Tightness (rigidity) is the third symptom of this disease."

Vivek Iyer, joint director and senior consultant, neurology, SIMS Hospital, Chennai, pointed out that patients with Parkinson's are usually in the fifth or sixth decade of their life. Constipation and rapid eye movement, sleep behaviour disorders such acting out of dreams or violent movements during sleep are the cardinal non-motor symptoms that can predate onset of motor symptoms by one or two decades. Most patients do not present to a neurologist if non-motor symptoms are predominant, resulting in delays in diagnosis, he explained.

Dr. Damodaran said that appropriate diagnosis is crucial. The ultimate goal of treatment, he added, is providing a good quality of life. "Enabling patients to be independent is the aim," he said.

Though, currently there is no cure for Parkinson's disease, early detection is vital in order to slow down the progress of the disease and control symptoms. Medicines can be prescribed according to the symptoms — tremor, rigidity and emotional disturbances, he said.

Surgical treatment

Dr. Iyer said that Deep Brain Stimulation (DBS) was a surgical treatment offered for Parkinson's disease. However, it may not be suitable for all patients. There is also adaptive DBS, a technology which can be programmed as per the patient's needs. This adapts to specific symptoms in patients such as tremors or stiffness. It can automatically adjust electrical stimulation in real time, based on the brain's activity. "MR-guided focused ultrasound treatment is for tremor dominant Parkinson's disease and other varieties of tremors, available in select centres in India," he added.

For a condition like Parkinson's disease, support groups play an important role not only for patients but also their caregivers. "A support system is essential for patients and their caregivers. For patients, it is a common forum where they can discuss their problems and get a chance to undergo physiotherapy, psychotherapy, psychological counselling and occupational therapy. For caregivers, it helps understand the disease and help avoid burn out," said Shubha Subramanian, senior consultant, neurology, Kauvery Hospital, Vadapalani, Chennai.

Though there are a number of support groups, not many are aware of them. This gap needs to be addressed, she said.

HECTOCOTYLUS: A MATING ARM

Octopuses often live solitary lives and rarely encounter mates, which means they need to be very good at recognising other octopuses if they are to have reproductive success.

Now, researchers have found that male octopuses have a specialised arm, known as the hectocotylus, as a sophisticated sensory organ to identify females. Scientists previously thought this arm served as a tool to deliver sperm, but the new work has revealed that the hectocotylus actually 'tastes' the female by touching her.

Specifically, the hectocotylus detects progesterone, a hormone found in the female's reproductive tract and skin. Once it does, the male locates the oviduct for insemination. And the hectocotylus allows males to do this even in complete darkness.

The researchers also found a receptor called CRT1 that triggers mating behaviour. CRT1 evolved from ancient neurotransmitter receptors and today serves two purposes. While the octopus uses similar receptors to hunt for prey by sensing chemical compounds on the seafloor, CRT1 has also specialised over millions of years to recognise progesterone with a high affinity.

By analysing various cephalopod species, the team found that this evolutionary innovation is a widespread trait across both octopuses and squids and that it merges sensory assessment and gamete delivery into a single appendage, allowing the octopuses to reproduce efficiently during their brief encounters.

The findings also highlight how small changes in protein structures can help organisms develop complex new behaviours, and contribute to the already vast biodiversity of the oceans.