

## TOPICS COVERED

1. India signs \$750-mn currency swap deal with forex-starved Maldives
2. Tribal leader Rajappa to receive award for welfare, forest conservation work (PCS)
3. Caste census report may be placed before Karnataka Cabinet on Oct. 18
4. SC helps Maharashtra woman sarpanch fight prejudice
5. India slipped on academic freedom index over the past decade: report (GS Paper-I: Article 19 (1) /PCS)
6. Ultra-processed, fast food leading cause of diabetes in India: study
7. On 'casteist' provisions in prison manuals
8. On the need for a different framework for passive MFs (GS Paper-III: Capital Market)
9. How high-performance buildings are the next step towards a sustainable future (GS Paper-III: Environment)

## India signs \$750-mn currency swap deal with forex-starved Maldives

GS Paper II:  
India-Maldives  
NEW DELHI

India signed a major currency swap agreement with the Maldives for \$750 million to help the island nation tide over its current foreign currency crunch, after Prime Minister Narendra Modi met with Maldivian President Mohamed Muizzu in New Delhi on Monday. The swap arrangement for \$400 million and an additional ₹3,000 crore (\$357 million), signed between the Reserve Bank of India and the Maldives Monetary Authority under the South Asian Association for Regional Cooperation (SAARC) Currency Swap Framework, will be available until 2027.

Among the agreements signed on Monday are for the launch of the RuPay card in the Maldives and

handover of 700 houses built with assistance by India. Memorandums of understanding were inked between the Central Bureau of Investigation and the Anti-Corruption Commission of the Maldives and between policing institutes and judicial training institutes; and also for cooperation in sports and youth affairs.

### Welcomes tourists

Speaking of people-to-people ties, which were hit by a "boycott Maldives" social media campaign in India in response to criticism of Mr. Modi in the Maldives, Mr. Muizzu said he hoped Indian tourists, whose numbers have halved this year, would return.

"India is one of our largest tourism source markets and we hope to welcome more Indian tourists

to the Maldives, allowing for shared growth and understanding between our peoples," Mr. Muizzu said in a joint press event after the talks.

India also agreed to step up cooperation on trade in national currencies, and to work on a Free Trade Agreement, as Foreign Secretary Vikram Misri said that other requests made by the Maldives, understood to include debt repayment waivers, further credit lines, and economic assistance, would be "studied" and decided on in the "coming weeks and months".

The two countries released a "vision statement" for a "comprehensive economic and maritime security partnership" to be negotiated in the future; inaugurated a jointly constructed runway for an in-



Boosting ties: Mohamed Muizzu with Narendra Modi in his first bilateral trip to India, in Delhi on Monday. SUSHIL KUMAR VERMA

ternational airport at Hanimadhoo island; and signed an agreement for India to support the Maldives on the refit of a Coast Guard ship.

There was no mention of the return of Indian military personnel to the archipelago, however, a subject that had led to considerable tension bet-

ween New Delhi and Male, until India agreed to withdraw them and replace them with technical personnel in May 2023. When asked, Mr. Misri said the issue had been "resolved satisfactorily" and did not require revisiting.

He clarified that the refit of the Maldivian Coast Guard ship *Huravee* would

be carried out at an Indian facility. This will not require Indian personnel to travel to the Maldives.

### 'Neighbourly duties'

"India has always been a First Responder for the Maldives," Mr. Modi said in a press statement after the talks. "India has always fulfilled its duties as a neighbour," he added, referring to the supply of essential commodities, drinking water during a crisis, and vaccines during the COVID-19 pandemic.

Addressing the media later, Mr. Misri said that India had played a "historic" role in the Maldives, including thwarting a coup there in 1988, and sending emergency assistance after the tsunami in 2004. He referred to India's latest currency swap arrangement as a way of sending out a

"signal of comfort and confidence in the existing foreign exchange position" for the Maldives, which had reached record lows of \$440 million, far below its pending outflows.

Mr. Muizzu's visit, his first bilateral trip to India, comes eight months after a visit to Beijing, which resulted in a number of other agreements; an economic pact to boost Chinese investments and provide currency swap arrangements; a defence pact; and debt repayment waiver for five years. Sidestepping specific questions about the Maldives-China relationship, Mr. Misri said while the two sides had discussed some "regional" issues, the "focus really was on discussing bilateral relations today".

(With inputs from Meera Srinivasan in Colombo)

## India signs \$750-mn currency swap deal with forex-starved Maldives (8 October)

- India signed a \$750 million currency swap agreement with the Maldives to address its foreign currency crunch.
- The agreement was finalized after a meeting between Prime Minister Narendra Modi and Maldivian President Mohamed Muizzu in New Delhi.
- The arrangement consists of \$400 million and an additional ₹3,000 crore (\$357 million) under the SAARC Currency Swap Framework, valid until 2027.

### Agreements signed include:

- Launch of the RuPay card in the Maldives.
- Handover of 700 houses built with Indian assistance.
- MOUs between the Central Bureau of Investigation and the Anti-Corruption Commission of the Maldives.
- Cooperation agreements between policing and judicial training institutes.
- Collaboration in sports and youth affairs.
- Mr. Muizzu expressed hope for a return of Indian tourists, emphasizing India's importance as a tourism source market.
- India agreed to enhance trade cooperation in national currencies and work on a Free Trade Agreement.
- Foreign Secretary Vikram Misri mentioned that the Maldives' additional requests, including debt repayment waivers and economic assistance, will be considered in the coming weeks and months.
- A "vision statement" was released for a comprehensive economic and maritime security partnership to be negotiated later.
- An international airport runway on Hanimadhoo island was inaugurated, and India agreed to support the refit of a Maldivian Coast Guard ship.
- There was no discussion on the return of Indian military personnel, a previous source of tension.
- Mr. Misri stated that the issue had been "resolved satisfactorily."
- The refit of the Maldivian Coast Guard ship Huravee will occur at an Indian facility without the need for Indian personnel to travel to the Maldives.
- Mr. Modi emphasized India's role as a first responder for the Maldives, citing assistance during crises, including essential supplies and COVID-19 vaccines.

- Mr. Misri highlighted India's historic role in the Maldives, including thwarting a coup in 1988 and providing emergency assistance after the 2004 tsunami.
- The currency swap arrangement signals confidence in the Maldives' foreign exchange position, which has recently fallen to record lows of \$440 million.
- Mr. Muizzu's visit marks his first bilateral trip to India, following an earlier visit to Beijing that resulted in various agreements, including economic and defense pacts.
- Mr. Misri noted that while regional issues were discussed, the primary focus was on bilateral relations.

# Tribal leader Rajappa to receive award for welfare, forest conservation work

PCS

**The Hindu Bureau**  
CHENNAI

The Hulikavu Wildlife Conservancy Foundation (HWCF) in Bengaluru has announced the nomination of J.T. Rajappa, a tribal conservationist and community leader, for the Hulikavu Progressive Adivasi Wildlife Award.

A release from the HWCF said Mr. Rajappa, born in 1965 into the Jenu Kuruba tribe, has dedicated his life to blending wildlife conservation with the uplift of forest-dwelling communities in Nagarahole, Karnataka.

Growing up in the Malalu Kolli Hadi hamlet, Mr. Rajappa developed a love for the wildlife around him. After working as a watcher for the Forest De-



J.T. Rajappa (left) was elected to the Virajpet taluk panchayat and helped resettle 300 tribal families. SPECIAL ARRANGEMENT

partment from 1984 to 1987, he became aware of the struggles faced by his community. In 2005, he was elected to the Virajpet taluk panchayat, where he began making positive changes.

Since 2007, Mr. Rajappa has played a key role in the voluntary resettlement of over 300 tribal families to

modern communities outside the Nagarahole Tiger Reserve.

As per the HWCF's release, Mr. Rajappa led the relocation of 150 families to Settahalli in Hansur taluk in 2010. He has also served on important committees, including the National Tiger Conservation Authority (NTCA) between

2012 and 2015, and the Mysore District Relocation Committee after 2015, advocating for the integration of social development with wildlife conservation.

In response to the award announcement, Mr. Rajappa said: "This substantial and prestigious award has come as a timely shot in the arm for me. I vow to work with redoubled vigour to deliver progress to my forest-dwelling communities without diminishing wildlife conservation values of Nagarahole, through my intensified effort to promote voluntary relocation as a win-win conservation solution in the years to come." The award includes a cash prize of ₹3 lakh and will be presented to Mr. Rajappa later this month.

**Tribal leader Rajappa to receive award for welfare, forest conservation work (8 October)**

- The Hulikenu Wildlife Conservancy Foundation (HWCF) in Bengaluru nominated J.T. Rajappa for the Hulikenu Progressive Adivasi Wildlife Award.
- Mr. Rajappa is a tribal conservationist and community leader born in 1965 into the Jenu Kuruba tribe.
- He has dedicated his life to combining wildlife conservation with the uplift of forest-dwelling communities in Nagarahole, Karnataka.
- Growing up in Malalu Kolli Hadi hamlet, he developed a love for wildlife.
- He worked as a watcher for the Forest Department from 1984 to 1987, which made him aware of his community's struggles.
- In 2005, he was elected to the Virajpet taluk panchayat, where he began implementing positive changes.
- Since 2007, he has played a key role in the voluntary resettlement of over 300 tribal families to modern communities outside the Nagarahole Tiger Reserve.
- In 2010, he led the relocation of 150 families to Settahalli in Hansur taluk.
- Mr. Rajappa has served on important committees, including the National Tiger Conservation Authority (NTCA) from 2012 to 2015, and the Mysore District Relocation Committee after 2015.
- He advocates for integrating social development with wildlife conservation.
- In response to the award announcement, Mr. Rajappa expressed that the award is a timely boost for his efforts.
- He vowed to work with increased determination to benefit forest-dwelling communities while preserving wildlife conservation values.
- The award includes a cash prize of ₹3 lakh and will be presented to Mr. Rajappa later this month.

# Caste census report may be placed before Karnataka Cabinet on Oct. 18

**The Hindu Bureau**  
BENGALURU

Moving a step ahead on the Socio-Economic-Educational Census, popularly known as caste census, Karnataka Chief Minister Siddaramaiah announced on Monday that the report is likely to be placed before the State Cabinet on October 18 to take a call on its implementation.

“Most likely, the caste census report will be placed before the State Cabinet during its meeting on October 18. We will abide by whatever the Cabinet decides,” the Chief Minister told mediapersons after meeting Ministers and legislators from Other Backward Communities (OBCs) on Monday.

“I met over 30 legisla-



Karnataka Backward Classes Commission Chairperson Jayaprakash Hegde submits caste census report to Siddaramaiah. FILE PHOTO

tors and Ministers from OBC communities today, including BJP legislator N. Ravi Kumar. All of them have given me a memorandum seeking that the government accept the caste census report and implement it,” he said.

Stating that he had com-

missioned such a census for the first time in India during his earlier stint as Chief Minister (2013-18) through the Karnataka Backward Classes Commission led by H. Kantharaj.

Referring to questions raised by the Opposition on why the census report

was not implemented during his earlier stint, he said the report had not been submitted at that time.

He alleged that JD(S) leader H.D. Kumaraswamy, who succeeded him as CM at the head of the JD(S)-Congress coalition government, had refused to accept the report by the Commission. The subsequent BJP government too had desisted from accepting the report, he claimed.

“Later, when I became the CM again, the term of the Mr. Kantharaj was over. Jayaprakash Hegde was appointed chairman of the Backward Classes Commission. Mr. Hegde sought three months’ time to complete the report. The report was submitted to the government. I am yet to read the report,” he said.

## Caste census report may be placed before Karnataka Cabinet on Oct. 18 (8 October)

- Karnataka Chief Minister Siddaramaiah announced that the Socio-Economic-Educational Census, also known as the caste census, report is likely to be presented to the State Cabinet on October 18.
- The Chief Minister stated that the government will abide by the Cabinet's decision regarding implementation.
- Siddaramaiah met with over 30 legislators and Ministers from Other Backward Communities (OBCs), including BJP legislator N. Ravi Kumar.
- The legislators presented a memorandum urging the government to accept and implement the caste census report.

- Siddaramaiah noted that he commissioned the first caste census in India during his previous tenure as Chief Minister (2013-18) through the Karnataka Backward Classes Commission led by H. Kantharaj.
- He addressed the Opposition's questions about the previous non-implementation of the census, explaining that the report had not been submitted at that time.
- Siddaramaiah alleged that JD(S) leader H.D. Kumaraswamy, who succeeded him, refused to accept the Commission's report, and the subsequent BJP government also did not accept it.
- He mentioned that after becoming Chief Minister again, the term of Mr. Kantharaj ended, and Jayaprakash Hegde was appointed as the new chairman of the Backward Classes Commission.
- Mr. Hegde requested three months to complete the report, which has since been submitted to the government, though Siddaramaiah stated he has yet to read it.

## **SC helps Maharashtra woman sarpanch fight prejudice (8 October)**

- A Bench of Justice Surya Kant and Ujjal Bhuyan supported a panchayat sarpanch in Maharashtra, allowing her to continue her work.
- The Supreme Court noted that the village residents struggled to accept that a woman, Manisha Ravindra Panpatil, was elected as sarpanch.
- Manisha Panpatil won the election to the Vichkheda panchayat in Jalgaon district from a seat reserved for women in February 2021.
- Detractors accused her of encroaching on government land and living in a house on it with her mother-in-law, seeking her disqualification.
- Ms. Patil stated she lived in rented accommodation with her husband and children.
- The District Collector disqualified her as sarpanch, and this decision was upheld by the Divisional Commissioner.
- Ms. Patil lost her case in the Bombay High Court before appealing to the Supreme Court.
- The Supreme Court observed that bias against women like Ms. Patil hinders efforts to elect more female representatives.
- The court emphasized that the removal of an elected representative, especially women from rural areas, should not be treated lightly.
- The Supreme Court set aside the High Court's August 3 order and allowed Ms. Patil to continue her role as sarpanch.
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# India slipped on academic freedom index over the past decade: report

GS Paper II: Article 19 (1)

PCS

NEW DELHI

Over the past 10 years, India has plummeted on the academic freedom index ranks, according to the “Free to Think 2024” annual report published by the Scholars at Risk (SAR) Academic Freedom Monitoring Project.

SAR is a network of 665 universities across the globe, including Columbia University, Duke University, and New York University. The report has looked extensively at India, Afghanistan, China, Colombia, Germany, Hong Kong, Iran, Israel, Nicaragua, Nigeria, Occupied Palestinian Territory, Russia, Türkiye, Sudan, Ukraine, the U.K. and the U.S., while documenting 391 attacks on higher education communities in 51 countries between July 1, 2023 and June 30, 2024.

The report notes that India’s academic freedom



JNU students’ outfits have agitated against stringent measures such as penalising of protests in many areas of the campus. PTI

slipped from 0.6 points to 0.2 points from 2013 to 2023. “In India, the most pressing threats to the academic freedom of students and scholars included the ruling Bharatiya Janata Party’s efforts to exert political control and impose a Hindu nationalist agenda on universities and university policies limiting student protest,” the report states.

According to the Academic Freedom Index, In-

dia now ranks as “completely restricted”, its lowest score since the mid-1940s. The report highlights some instances of the Indian government putting in stringent measures on campuses.

## Many restrictions

Both Jawaharlal Nehru University and South Asian University announced new policies restricting student expression. While JNU

barred students from protesting near academic buildings, SAU barred students from protesting on campus at all.

The reporting period saw the BJP-led Union government battle with State governments over the control of higher education.

In Kerala, Governor Arif Mohammed Khan, an appointee of the Union government, fought with the State government over a legislative amendment that would have him replaced as the Chancellor of the State’s universities.

In April 2024, the Kerala government filed an appeal in the Supreme Court against the action of President Droupadi Murmu withholding assent to the proposed amendment.

“Similar battles for control of higher education took place in other States, including Tamil Nadu, West Bengal, and Punjab,” the report points out.

## India slipped on academic freedom index over the past decade: report (8 October)

- India has significantly declined on the academic freedom index ranks over the past 10 years, as per the “Free to Think 2024” report by the Scholars at Risk (SAR) Academic Freedom Monitoring Project.

- SAR is a network of 665 universities globally, including prominent institutions like Columbia University, Duke University, and New York University.
- The report extensively examines India and several other countries, documenting 391 attacks on higher education communities in 51 countries from July 1, 2023, to June 30, 2024.
- India's academic freedom score fell from 0.6 points to 0.2 points between 2013 and 2023.
- The report attributes the decline to the ruling Bharatiya Janata Party's efforts to exert political control and impose a Hindu nationalist agenda on universities, as well as restrictions on student protests.
- India now ranks as "completely restricted" in academic freedom, marking its lowest score since the mid-1940s.
- Instances of stringent government measures on campuses include new policies from Jawaharlal Nehru University (JNU) and South Asian University (SAU) that limit student expression.
- JNU prohibited protests near academic buildings, while SAU banned protests on campus entirely.
- The BJP-led Union government faced conflicts with State governments over control of higher education.
- In Kerala, Governor Arif Mohammed Khan clashed with the State government over a legislative amendment that would remove him as Chancellor of the State's universities.
- The Kerala government filed an appeal in the Supreme Court against President Droupadi Murmu's withholding of assent to the proposed amendment in April 2024.
- Similar conflicts over control of higher education were reported in Tamil Nadu, West Bengal, and Punjab.

# Ultra-processed, fast food leading cause of diabetes in India: study

**Bindu Shajan Perappadan**  
NEW DELHI

A diet rich in “advanced glycation end products (AGEs)”, which includes ultra-processed and fast food, is among the leading cause of India being the world’s diabetic capital, notes a first-of-its-kind clinical trial finding published in the *International Journal of Food Sciences and Nutrition* recently.

AGEs are harmful compounds that are formed when sugars react with fats or proteins during high-temperature cooking, such as frying and roasting. They are directly linked to inflammation, a key factor behind diabetes.

The study was funded by the Department of Biotechnology, Ministry of Science and Technology.

The study found that low-AGE diets exhibited improvement in the insulin-sensitivity and reduc-



Having AGE-rich foods leads to inflammation in the body, says the study. GETTY IMAGES

tion in the inflammatory levels compared to high-AGE diets. “The study revealed that low AGE diets could be a potential strategy to reduce diabetes risk,” it said.

Prevalence of diabetes, pre-diabetes, and obesity is on the rise globally, and in Asian Indians, there are currently 101 million individuals with diabetes. Earlier studies in the West have demonstrated an increased risk of chronic diseases due to the consumption of processed foods

that are high in fat, sugar, salt, and AGEs.

The current study shows that the consumption of AGE-rich foods leads to inflammation in the body. “This is because glycation – a non-enzymatic chemical process in which a sugar molecule binds to a protein or lipid molecule – can result in harmful reactions in the body,” notes the study.

It recommends that by following a low-AGE diet (fruits, vegetables, whole grains, and low-fat milk), overweight and obese individuals can reduce oxidative stress in their bodies, which refers to the imbalance of free radicals and antioxidants that results in inflammation and cell damage.

As part of the clinical trial, adults who are either overweight or obese but non-diabetic were divided into two groups. While one group was given a low-AGE

diet for 12 weeks, the other was put on a high-AGE diet. At the end of 12 weeks, the researchers found that insulin sensitivity was significantly increased in the low-AGE diet group, compared with the high-AGE diet group. The low-AGE diet group also showed lowered risk of future type 2 diabetes.

Dr. V. Mohan, chairman, Madras Diabetes Research Foundation, which carried out the study, said, “By adopting healthier diets such as green leafy non starchy vegetables, fruits, boiled foods rather than fried ones and cutting down on bakery foods and sugary foods, one can have diets which are low in dietary AGEs and thus lower the risk of type 2 diabetes.”

Dr. Mookambika Ramya Bai, the first author of the study, said, “It means going back to the healthier diets that our forefathers ate.”

## Ultra-processed, fast food leading cause of diabetes in India: study (8 October)

- A diet high in advanced glycation end products (AGEs), prevalent in ultra-processed and fast food, is a leading cause of India being the world’s diabetic capital, according to a clinical trial published in the *International Journal of Food Sciences and Nutrition*.
- AGEs are harmful compounds formed when sugars react with fats or proteins during high-temperature cooking methods like frying and roasting.

- AGEs are linked to inflammation, a key factor in diabetes.
- The study was funded by the Department of Biotechnology, Ministry of Science and Technology.
- Findings indicated that low-AGE diets improved insulin sensitivity and reduced inflammation compared to high-AGE diets.
- The study suggests that low-AGE diets could be a potential strategy to reduce diabetes risk.
- Globally, diabetes, pre-diabetes, and obesity are rising, with 101 million Asian Indians currently affected by diabetes.
- Previous studies in the West have shown an increased risk of chronic diseases from consuming processed foods high in fat, sugar, salt, and AGEs.
- The current study found that consuming AGE-rich foods leads to inflammation in the body due to glycation, which causes harmful reactions.
- A low-AGE diet consisting of fruits, vegetables, whole grains, and low-fat milk may help overweight and obese individuals reduce oxidative stress, which is linked to inflammation and cell damage.
- In the clinical trial, overweight or obese non-diabetic adults were divided into two groups: one received a low-AGE diet for 12 weeks, while the other followed a high-AGE diet.
- At the end of 12 weeks, insulin sensitivity significantly increased in the low-AGE diet group, which also showed a lowered risk of future type 2 diabetes.
- Dr. V. Mohan, chairman of the Madras Diabetes Research Foundation, emphasized the importance of adopting healthier diets, including green leafy vegetables, fruits, boiled foods, and reducing bakery and sugary foods to lower dietary AGEs and diabetes risk.
- Dr. Mookambika Ramya Bai, the first author of the study, highlighted the need to return to the healthier diets of previous generations.

# Genome editing is bringing clarity to the study of hereditary cancers

CRISPR screens have transformed the study of BRCA genes by enabling high-throughput functional genetic analysis. That is, using CRISPR-Cas9, researchers can target the BRCA genes and create specific mutations in them to study their effects on DNA repair and cancer development

Sridhar Sivasubbu  
Vinod Scaria

**T**he International Agency for Research on Cancer's estimates of the burden of 36 cancers in 185 countries suggest one in five individuals has a lifetime risk of developing cancer. The agency also estimated that one in nine males and one in 12 females will die of cancer. In all, the agency counted 20 million new cancer cases and 9.74 million cancer-related deaths in 2022, which it said could rise to a whopping 32 million new cases and 16 million deaths by 2045. By then, Asia alone may account for almost half of all cases worldwide.

All cancers occur due to genetic mutations in the body's genome, and a subset of these cancers are the result of inherited mutations. Researchers have estimated that around 10% of all individuals with any cancer could have inherited a genetic mutation implicated in the cancer; they have also found the prevalence of inherited mutations to be higher among individuals with ovarian cancer (20%). It is 10% among those with breast, colorectal, lung, or prostate cancers, and a lower 6% among those with cervical cancer.

## The BRCA genes

Scientists have exhaustively documented hereditary cancers. We know there are more than 50 genetic syndromes (collections of symptoms) that predispose individuals to cancer and are caused by genetic variants that humans are capable of inheriting.

In fact, the discovery of the BRCA1 and the BRCA2 DNA-repair genes in 1994 and 1995, by Mary-Claire King et al. and Mark Skolnick et al., respectively, bolstered our understanding of hereditary cancer syndromes.

Hereditary breast-ovarian cancer syndrome is a relatively common cancer predisposition syndrome caused by mutations in the BRCA1 and the BRCA2 genes (or BRCA). In women, genetic mutations in BRCA primarily increase the risk of cancers of the breasts, ovaries, and fallopian tube. In men, they make prostate cancer and male breast cancer more likely. Many studies have also shown variations in the make-up of BRCA genes could increase the risk of pancreatic, colorectal, uterine, and some other cancers.

By some estimates, BRCA1 and BRCA2 mutations are present in around one in every 400 individuals, and therefore have an elevated risk of developing cancer. Researchers have also documented a higher than average prevalence in certain populations by virtue of these groups carrying specific variants of these genes. For example, among the Ashkenazi Jews that emerged in Central Europe and their descendants, around one in 40 individuals carry mutations in the BRCA genes – about 10-times more common than in the general population.

This higher prevalence has been attributed to some genetic bottlenecks and founder effects within the community. A genetic bottleneck is when the genetic diversity in a population drops (due to various factors), leaving their gene pool ill-equipped to fend off diseases and other threats that require adaptation. When a small group of individuals with a



All cancers occur due to genetic mutations in the body's genome, and a subset of these cancers are the result of inherited mutations. ISTOCK

genetic bottleneck found a new population, the bottleneck's effects became pronounced in this group – a phenomenon called the founder effect.

Testing for mutations in the BRCA gene is crucial because it helps individuals and clinicians identify higher risk sooner and develop personalised prevention strategies, including increased surveillance, preventive surgery, and/or targeted therapies. In a May 17 paper in the *Journal of Clinical Oncology*, the American Society of Clinical Oncology recommended 15 genes in all to ascertain an individual's risk of developing breast and ovarian cancers.

There are targeted therapies available today for individuals who develop cancers due to mutations in the BRCA genes or in genes implicated in other DNA-repair pathways. One such involves poly (ADP-ribose) polymerase (PARP) inhibitors, a new class of chemotherapy drugs. Investigators have reported promising results from recent clinical trials of PARP inhibitors, particularly in combination with platinum-based chemotherapy, offering hope for millions of people facing or experiencing hereditary cancers associated with specific mutations.

Our understanding of cancer genes and the mutations that cause cancer has improved significantly of late. One reason is tools like CRISPR screens, which have transformed the way researchers study the BRCA genes by enabling high-throughput functional genetic analysis. That is, using CRISPR-Cas9 technology, researchers can target the BRCA genes and create specific mutations in them in order to study their effects on DNA repair and cancer development.

Researchers have also used such CRISPR-based methods to explore an

**Scientists have documented hereditary cancers. There are more than 50 syndromes that predispose individuals to cancer, caused by genetic variants that humans are capable of inheriting**

individual's propensity to resist targeted therapies. For example, cancers involving mutated BRCA genes are sensitive to PARP inhibitors. But studies have shown many mutations in other genes involved in DNA repair could also influence the response to PARP inhibitors, and there doesn't yet exist a consistent method to predict it in clinical settings. So last year, a study published in the journal *Nature Communications* used genome-wide CRISPR-Cas9 screens to identify specific mutations that increase the sensitivity to PARP inhibitors.

## Risk is a spectrum

In another, more recent paper, researchers at the Wellcome Sanger Institute in the U.K. reported identifying more than 3,000 genetic changes in the RAD51C gene, which is also crucial for DNA repair, that may significantly increase the risk of breast and ovarian cancer. After they mapped the structure of the protein encoded by this gene, the researchers were able to pinpoint the portions they determined to be critical for repairing DNA. So drugs targeting this portion could pave the way for new therapeutic strategies.

The researchers used a technique called saturation genome editing to examine 9,188 variants, revealing that 3,094 could disrupt the gene's function and increase ovarian cancer risk six-fold and aggressive breast cancer risk four-fold. They also discovered variants that partially impaired RAD51C function,

suggesting a broader spectrum of risk for breast and ovarian cancers than previously understood.

The findings, published in *Cell* on September 18, offer novel insights that clinicians can use to clarify the effects of RAD51C mutations.

Importantly, the study confirmed genetic risk lies on a spectrum influenced by the extent to which genetic changes affect protein function while emphasising the value of large-scale variant analysis for better personalised medicine and cancer prevention strategies. The researchers are preparing to apply similar techniques to other genes, with plans to eventually cover the entire human genome.

## Cancer discovered early

Population prevalence studies play an important role in identifying the spread of certain hereditary cancers in different groups. These studies help uncover genetic risk factors that may be more common in certain populations due to founder events. In tandem, at-risk individuals need to undergo genetic screening at regular intervals.

The result will potentially be a cancer discovered early, which will help the individual make more informed healthcare decisions, alert their family members to risk for them as well, and adopt therapies likely to be more effective, including preventive treatment and lifestyle changes.

The ultimate outcome is for cancer morbidity and mortality to drop and, beyond, for everyone to have healthier lives.

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# A re-balancing of India's great power relations

Prime Minister's Narendra Modi's participation in the **sixth Quad Leaders' Summit in Wilmington, Delaware, U.S.** on September 21, 2024 has raised further hopes of consolidating security cooperation among the "four leading maritime democracies in the Indo-Pacific". Nevertheless, it was **India's National Security Adviser (NSA) Ajit Doval's trip to Russia in early September for the BRICS (Brazil, Russia, India, China, South Africa) NSA meeting, which included a high-profile personal meeting with Russian President Vladimir Putin,** that needs greater analysis. Mr. Doval also held one-on-one parleys with the **Chinese Foreign Minister Wang Yi,** which was equally significant since India is leaving no stone unturned to resolve the four-year-old military standoff with China at the Line of Actual Control (LAC).

India is currently busy bargaining with China, and protecting its interests while trying to keep the U.S. engaged in maintaining a rules-based order in the Indo-Pacific. The fundamental idea behind the Quad (Australia, Japan, India and the U.S.) is the creation of a strategic consortium of principles, interests and purposes that would not only strengthen each country individually but would also be capable of jointly countering the revisionist challenge to the existing global order. This is where India's relations with Russia become significant since Moscow is a bitter opponent of the Quad.

## Role of peace maker

It is not easy for India's security managers and diplomats to make this complex game work in New Delhi's interest. However, Mr. Doval has a reputation for being imaginative, nimble and persuasive. The Doval-Putin meet, where Mr. Doval conveyed Mr. Modi's Ukraine peace plan, may be interpreted as India's attempt to cross the psychological Rubicon in great power diplomacy.

There is little doubt about India's willingness, as an aspiring global power, to shoulder the responsibility in peace making which may include the meaningful role of a dialogue facilitator or an interlocutor, if not mediator. The Doval-Putin meet was after Mr. Modi's first-ever visit to Ukraine in August, and to Moscow in July. In particular, the Russia visit had drawn scathing criticism from Ukraine. But despite its criticism of Indian policies, Ukraine, on many occasions, has asked New India to help resolve the conflict.

Mr. Doval subsequently met French President Emmanuel Macron in Paris, on the sidelines of annual India-France Strategic Dialogue, to apprise him of India's mediatory efforts. Many factors have prompted India to insert itself into global peace-making initiatives, and India's Russia dilemma is the most important of them. While India's strategic relationship with the U.S. is relatively new, India-Russia relations have endured for over six decades, and New Delhi has



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By attempting to play a meaningful role in resolving the Ukraine conflict, India can hope to reset the terms of its engagement with both the West and Russia

no appetite to relinquish the military advantages that come with this relationship. But since the war in Ukraine has triggered Russia's total break with the West, Moscow's pivot toward China has become even more pronounced. Functioning more or less as the junior partner of China, Russia has been struggling to preserve its partnership with India since its leverage with China has steadily shrunk due to fierce military resistance by Ukraine.

From an Indian perspective, this needs correction because the Russia-China economic-military ties are getting too close to be ignored by New Delhi.

The West may have reconciled itself to India's purchase of Russian oil at discounted rates as well as New Delhi's silence on Russian aggression in Ukraine. Nevertheless, India's demonstration of independent foreign policy comes with a normative cost. The West has come to view India as being blatantly indifferent on issues which are so consequential for the remaking of the global order after the Ukraine conflict shattered the remnants of the post-Cold War landscape. By attempting to play a meaningful role in resolving an intractable conflict of epic global proportions, India can hope to reset the terms of its engagement with the West and Russia. Even though some voices would treat it as an attempt to please Washington, others would sound equally compelling in arguing that India is merely emphasising its strategic autonomy while buttressing its position as '*Vishwa Bandhu*', or a friend to the world.

## Russia's China embrace

What has been the hallmark of India's foreign policy under Mr. Modi's leadership during the last one decade is a **friendly, cooperative and sometimes transactional relationship with the U.S., and a non-adversarial, non-ideological and dispassionate relationship with Russia.** However, Russia's foreign policy under Mr. Putin has been primarily driven by two key objectives: a **deepening Moscow-Beijing nexus** and the **promotion of a multi-polar world order which would counter the hegemonic dominance of the western bloc led by the U.S.** Mr. Putin's **anti-western strategy includes both China and India as close allies. But India is unwilling to oblige as its strategic priorities do not fully align with those of Russia or China.**

Russia's apparent unwillingness to diminish its partnership with India should have been **predicated on the preservation of a reasonable balance of power between India and China and the avoidance of any major conflict between them.** But the Russians have failed to give the same degree of concentrated attention to India which they have given to China. The reason is not far to seek. If Moscow's pursuit of closer ties with Beijing has been driven by a shared geopolitical contest with Washington, Russia's ties with India

have lacked a similar motivation.

Consequently, New Delhi is increasingly finding Moscow's usefulness largely exhausted due to Russia's deepening China connection. China has not only been engineering many of India's security difficulties on their Himalayan borders but is also trying to profit from them. The most damaging has been the active support to Pakistan in elevating terrorism as a legitimate tool of statecraft. In the Indian world view, Russia's prioritisation of China in its foreign policy has lent Russian diplomacy an exasperating character.

Russia's break in its relations with the U.S. has pushed Moscow into a tighter embrace with Beijing, at a moment when relations between India and China are yet to be normalised. Moreover, Russia's ambitions of posing a serious challenge to American primacy by asserting a leadership role in the Shanghai Cooperation Organisation and BRICS also remain unfulfilled. With the Ukraine war, Russia's task of managing its relationship with India has become considerably more complicated. And that is what makes India concerned about it, leading to rebalancing of India's great power relations.

## From past to present

This bold rebalancing does not necessarily require anything as far reaching as a full-fledged India-U.S. alliance. It requires our collective ability to turn increasingly away from the nostalgic images of Russia protecting India from the machinations of the Pakistan-U.S.-China nexus in the Bangladesh war. There is much scepticism about the merits of India's peace efforts when the war between Russia and Ukraine is showing no signs of de-escalation. The argument is that New Delhi does not really have the leverage to push either side to the negotiating table. Nor has the Indian leadership been accustomed to incur the displeasure of both parties in mediation efforts. But that should not be the justification for not trying to play the game of mediation. Symbolically as well as practically, Mr. Doval's publicly advertised and deft diplomatic interactions with Mr. Putin and Mr. Macron herald a new foreign policy dynamic in which conflict resolution efforts are viewed as a vital component of India's strategic autonomy.

In the end, the U.S.'s desire of seeing a ruined Russia is something India is not able to accept. It is also imperative for New Delhi to preserve the gains of the last two decades by fortifying its strategic partnership with the U.S. While the U.S. is undoubtedly the key player in the Quad, India too understands its underlying agenda, and accepts its fundamental features. New Delhi is aware of the structural impediments that stand in the path of any far-reaching development of India-China relations, and has no emotional commitment to their early improvement at strategically prohibitive cost.

## A re-balancing of India's great power relations (8 October)

- Prime Minister Narendra Modi participated in the sixth Quad Leaders' Summit in Wilmington, Delaware, on September 21, 2024, enhancing hopes for security cooperation among the Quad nations (Australia, Japan, India, U.S.).
- India's National Security Adviser (NSA) Ajit Doval visited Russia in early September for the BRICS NSA meeting, meeting with President Vladimir Putin.
- Doval also held discussions with Chinese Foreign Minister Wang Yi, focusing on resolving the military standoff with China at the Line of Actual Control (LAC).
- India is negotiating with China while engaging the U.S. to maintain a rules-based order in the Indo-Pacific.
- The Quad aims to create a strategic consortium to counter challenges to the global order, making India's relations with Russia significant as Moscow opposes the Quad.
- Managing this complex diplomatic landscape is challenging for India's security and diplomatic officials.
- Doval is known for being imaginative, nimble, and persuasive; his meeting with Putin discussed Modi's Ukraine peace plan, marking a significant diplomatic step for India.
- India seeks to take on a greater role in global peace-making and may act as a dialogue facilitator or mediator.
- Doval's meeting with Putin followed Modi's visits to Ukraine and Moscow, despite criticism from Ukraine regarding India's policies.
- Ukraine has repeatedly sought India's assistance in resolving the conflict, indicating its interest in India's involvement.
- Doval met French President Emmanuel Macron to update him on India's mediation efforts.
- India's historical relationship with Russia, which has lasted over six decades, is crucial for New Delhi, despite the changing geopolitical landscape.
- The Ukraine conflict has intensified Russia's alignment with China, complicating India's position as it seeks to maintain its strategic partnership with Moscow.
- India must address the growing Russia-China ties that could undermine its interests.
- The West has accepted India's purchase of discounted Russian oil and its neutral stance on the Ukraine conflict, but perceives India as indifferent on significant global issues.
- By engaging in conflict resolution, India aims to redefine its relations with both the West and Russia, balancing its strategic autonomy while promoting its role as a global friend.

## **Russia's China embrace**

- Under Modi's leadership, India's foreign policy has emphasized a friendly and cooperative relationship with the U.S. and a non-adversarial relationship with Russia.
- Russia's foreign policy, under Putin, focuses on strengthening ties with China and promoting a multi-polar world to counter U.S. dominance.
- India does not fully align with Russia's or China's strategic priorities, leading to a cautious stance towards Moscow's anti-western strategy.

- Russia has not maintained the same level of attention to India as it has to China, impacting their relationship.
- India perceives diminishing usefulness in its partnership with Russia due to the latter's deepening ties with China.
- China exacerbates India's security challenges along the Himalayan border and supports Pakistan's use of terrorism.
- Russia's prioritization of China in its foreign policy frustrates Indian diplomacy and complicates India's relationship with Moscow.
- The breakdown of U.S.-Russia relations has tightened Moscow's alignment with Beijing, while India-China relations remain unresolved.
- Russia's ambitions to challenge U.S. primacy through organizations like the Shanghai Cooperation Organisation and BRICS have not materialized.
- The ongoing Ukraine war complicates Russia's relationship with India, prompting India to rebalance its great power relations.
- This rebalancing does not necessitate a full India-U.S. alliance but requires moving away from historical narratives of Russia's protective role.
- Skepticism exists about India's peace efforts amid the unresolved Ukraine conflict, questioning India's leverage in mediation.
- Indian leadership has not traditionally incurred displeasure from both sides in mediation, but this should not prevent attempts at conflict resolution.
- Doval's diplomatic engagements with Putin and Macron signal a shift towards integrating conflict resolution into India's strategic autonomy.
- India does not support the U.S. desire for a weakened Russia and aims to maintain the strategic gains of the past two decades.
- While the U.S. is a key player in the Quad, India understands its agenda and the structural challenges hindering India-China relations.
- India lacks an emotional commitment to hastily improving relations with China at a high strategic cost.

# Unpacking the Centre's affidavit on marital rape

The Marital Rape Exception (MRE), in Section 63, Exception 2 of the Bharatiya Nyaya Sanhita, 2023 (Section 375, Exception 2 of the Indian Penal Code, 1860) states that 'Sexual intercourse or sexual acts by a man with his own wife, the wife not being under eighteen years of age, is not rape.' The provision is under challenge before the Supreme Court of India and the Centre has filed an affidavit in support of MRE which needs unpacking.

## The issue of 'expectation'

Most of the arguments made by the Centre will, by now, be familiar to those acquainted with the debate around marital rape. It is stated that the differential treatment of married and unmarried women by MRE does not violate Article 14 of the Constitution of India (the right to equality) because married and unmarried women are not equally placed. The factum of marriage, it is argued, creates 'a continuing expectation of reasonable sexual access', which is absent in case of a stranger or of another intimate relationship. This, the affidavit contends, is a sufficient basis for the legislature to make a distinction between an incident of rape within and outside marriage. As a legal argument, this is alarmingly vague. Who gets to define what 'reasonable sexual access' means? And on what parameters? Is it a subjective definition (the person who has the expectation decides) or an objective one (there is one standard for everyone)? Does it encompass questions of different sexual acts or frequency or both?

That marriage creates a continuing expectation of reasonable sexual access is, at the outset, a dubious claim. More importantly, however, it remains to be established that it is a sound legal argument against striking down MRE. Going by traditional gender norms, marriage also creates a



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It is very much within the jurisdiction of the judiciary to determine whether 'marital rape exception' violates a fundamental right

continuing expectation that a husband will 'provide for' his wife. Surely that cannot be grounds for saying that if a wife takes her husband's cars and sells them as scrap metal without his consent (perhaps even by force), she has not committed theft. It is also unclear why marriage creates such an expectation but other intimate relationships (for instance, live-in relationships) do not. Ordinarily, an expectation (a hope or belief that something will happen) is personal. It can arise as much in one kind of relationship as it can in another, depending on the person and the relationship. Perhaps the subtext of this claim is that the expectation of sexual access in a marriage is socially sanctified and acceptable in a way that a similar expectation in a live-in relationship is not. Even if that were the case, it remains to be argued why that ought to be legally relevant in a jurisdiction where individual autonomy (including sexual autonomy) and the dignity of the individual are constitutionally protected.

## 'Institution' and 'misuse'

Other familiar arguments found in the Centre's affidavit are that the recognition of marital rape as a criminal offence would affect the sanctity of the institution of marriage and potentially lead to false allegations of marital rape which would be difficult to disprove. As I have argued in this space, there is no evidence to suggest that the recognition of marital rape has a causal link with the strength of the institution of marriage. In any case, if the institution of marriage is so dependent on the impunity of a husband who rapes his wife, perhaps that is a reason to question its value and consider reforming it. The argument grounded in concerns of 'misuse' is a red herring. Any criminal offence may be misused and the very purpose of a criminal trial

is to determine whether an alleged offence was committed (usually, to a standard beyond reasonable doubt). Moreover, statistics show that sexual offences are generally under-reported, and the real challenge is in proving, rather than disproving, an allegation of rape.

## Arguments on jurisdiction

The Centre's affidavit also makes the claim that marital rape is a social, not a legal issue, and, therefore, not within the Court's jurisdiction. Given that law regulates (nearly) every aspect of human life and society, it is not clear whether and how there can be such a watertight distinction between a social and a legal issue. In any case, the fact that the Centre has addressed arguments on Articles 14 and 21 (the right to life) in its affidavit indicates that there is a legal issue at stake here. A related argument is that the decision on what should or should not be a criminal offence is a matter of legislative, rather than judicial, competence. There is some merit to this claim. It may, however, prove largely irrelevant. The Court is not required, in this matter, to declare marital rape a criminal offence (though the issue may colloquially be framed as such), but to assess the constitutionality of an existing law. MRE, being a 'law', is subject to Part III of the Constitution of India. In other words, the Court may not be empowered to decide whether marital rape should be a criminal offence or not, but it is very much within the jurisdiction of the Court to determine whether MRE violates a fundamental right, and to strike it down if it does.

Thus, the Centre's affidavit reshapes many familiar arguments in favour of MRE, but the legal merit of these arguments is questionable.

*The views expressed are personal*

## Unpacking the Centre's affidavit on marital rape (8 October)

- The Marital Rape Exception (MRE) in Section 63, Exception 2 of the Bharatiya Nyaya Sanhita, 2023, states that sexual acts by a man with his wife, if she is over eighteen, do not constitute rape.
- This provision is being challenged in the Supreme Court of India, with the Centre filing an affidavit in support of the MRE.
- One key argument presented by the Centre is that the differential treatment of married versus unmarried women does not violate Article 14 (the right to equality) because they are not equally placed.
- The Centre claims that marriage creates a "continuing expectation of reasonable sexual access," which does not apply to strangers or other intimate relationships.
- This argument raises questions about the definition of "reasonable sexual access": who defines it, what parameters are used, and whether it is subjective or objective.

- The assertion that marriage creates this expectation is considered dubious, and the legal basis for upholding the MRE is questioned.
- Traditional gender norms also suggest that marriage creates expectations for husbands to provide for their wives, raising the issue of whether similar expectations can justify theft if a wife acts without her husband's consent.
- The distinction made between marriage and other intimate relationships, such as live-in relationships, is unclear in terms of the expectation of sexual access.
- Expectations in relationships are typically personal and can arise similarly across different types of relationships, depending on individual dynamics.
- The subtext may suggest that the expectation of sexual access within marriage is socially accepted, while it is not viewed the same way in live-in situations.
- Even if societal norms favor marital expectations, the legal relevance of this distinction is questioned in light of constitutional protections for individual autonomy and dignity.

### **‘Institution’ and ‘misuse’**

- The Centre’s affidavit argues that recognizing marital rape as a criminal offense could undermine the sanctity of marriage and lead to false allegations that are hard to disprove.
- There is no evidence linking the recognition of marital rape to the strength of the institution of marriage.
- If marriage relies on a husband's impunity to rape, it raises questions about the institution's value and suggests a need for reform.
- Concerns about the "misuse" of marital rape allegations are seen as a distraction; any criminal offense can be misused.
- The purpose of a criminal trial is to determine if an offense occurred, typically requiring proof beyond a reasonable doubt.
- Statistics indicate that sexual offenses are generally under-reported, making it more challenging to prove allegations than to disprove them.
- The affidavit claims marital rape is a social issue outside the Court's jurisdiction, but law regulates many social aspects, questioning the validity of this distinction.
- The Centre’s reference to Articles 14 (right to equality) and 21 (right to life) indicates there are legal issues involved.
- The argument that decisions on criminal offenses should be legislative rather than judicial has some merit but may be largely irrelevant.
- The Court’s role is to assess the constitutionality of existing laws, including the MRE, under Part III of the Constitution of India.
- The Court can determine if MRE violates fundamental rights and can strike it down if it does.
- Overall, the Centre’s affidavit reiterates familiar arguments supporting MRE, but the legal validity of these arguments remains questionable.

## Medicine Nobel 2024:

# Victor Ambros and Gary Ruvkun get the call for discovery of microRNA

The finding revealed what biologists believed they knew about gene regulation to be incomplete



GARY RUVKUN



VICTOR AMBROS

■ Victor Ambros and Gary Ruvkun have been jointly awarded the Nobel Prize for Physiology for 2024, the Nobel Academy at the Karolinska Institutet announced on Monday

■ They were awarded the prestigious prize for the discovery of microRNA and its role in post-transcriptional gene regulation

■ “Victor Ambros and Gary Ruvkun were interested in how different cell types develop. They discovered microRNA, a new class of tiny RNA molecules that play a crucial role in gene regulation,” the Nobel Assembly said in a statement

■ Ambros and Ruvkun’s work revealed a then previously unknown principle of gene regulation that turned out to be essential for multicellular organisms, including humans

■ The duo made their finding by studying the 1-mm-long

### roundworm *Caenorhabditis elegans*

■ The body makes proteins in a complex process with two broad steps: transcription and translation

■ During transcription, a cell copies a DNA sequence into messenger RNA (mRNA) in the nucleus. The mRNA moves from the nucleus, through the cell fluid, and attaches itself to the ribosome

■ During translation, another type of RNA called transfer RNA (tRNA) ‘brings’ amino acids to the ribosome, where they are linked together in the order specified by the mRNA to make a protein

■ MicroRNA, or miRNA, regulates the production of proteins by bonding with and subsequently silencing the mRNA at an appropriate juncture. The process is called post-transcriptional gene regulation

■ Ambros and Ruvkun found the first miRNA gene in *C. elegans* in 1993. It was called *lin-4*. They confirmed its role by modifying the miRNA to result in different parts of the worm’s developmental process to be thrown out of sync

■ By studying a second miRNA gene they found seven years later, called *let-7*, they confirmed miRNAs are actually present across the animal kingdom

■ “MiRNAs are proving to be fundamentally important for how organisms develop and function,” the Assembly added in its statement

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## Regulation role

The discovery of microRNA changed the understanding of gene regulation

This year's Nobel Prize in Physiology, or Medicine, awarded to Victor Ambros and Gary Ruvkun, is for their discovery of microRNA, small RNA regulators of gene expression in eukaryotes, and its role in gene regulation after transcription – the process of making an RNA copy (messenger RNA or mRNA) of a gene's DNA sequence – and before cellular machinery is activated for protein production. Before the discovery of microRNAs and their role in gene regulation, it was believed that gene regulation was limited to specialised proteins called transcription factors, which bind to specific regions in DNA and determine which mRNAs are produced. In 1993, using 1 mm long mutant roundworms called *C. elegans*, the winners of this year's Nobel provided proof that gene regulation is not confined to transcription factors. Instead, regulation by microRNAs occurs at a later stage in the process of gene expression, post-transcription. Despite these seminal findings, it was initially thought that this unusual mechanism of gene regulation was peculiar to *C. elegans* and not relevant to more complex organisms, including humans. However, the discovery of another microRNA encoded in a gene present in all organisms indicated that microRNA's role in gene regulation extends beyond roundworms. By 2001, microRNAs were found to be abundant in invertebrates and vertebrates, with some highly conserved across species, suggesting that "microRNA-mediated post-transcriptional regulation is a general regulatory function". As per current knowledge, the human genome codes for over 1,000 microRNAs.

Cancer, diabetes and autoimmune diseases are associated with dysregulated microRNA expression. In the case of cancer, dysregulation may include amplification or deletion of microRNA genes, abnormal transcriptional control of microRNAs, and defects in the microRNA biogenesis machinery. Studies have shown that dysregulated microRNAs affect the biological capabilities that cancer cells acquire during tumour development, including sustaining proliferative signalling, resisting cell death, and activating processes that allow cancer cells to spread in the body. Preliminary studies have also indicated that certain microRNAs can serve as potential biomarkers for human cancer diagnosis, prognosis, and therapeutic targets. It is now known that beyond perturbing immune responses, disruption and dysfunction of microRNAs can initiate the production of autoantibodies and contribute to the pathogenesis of autoimmune diseases, including rheumatoid arthritis and multiple sclerosis. Several microRNA-associated diagnostic biomarkers have already been developed and used clinically, though they have yet to be commercialised. Likewise, candidate drugs targeting microRNAs are currently being tested in clinical trials.

## Regulation role (8 October)

### The discovery of microRNA changed the understanding of gene regulation

- The 2023 Nobel Prize in Physiology or Medicine was awarded to Victor Ambros and Gary Ruvkun for their discovery of microRNA and its role in gene regulation.
- MicroRNAs are small RNA regulators of gene expression in eukaryotes, influencing gene regulation post-transcription and before protein production.
- Prior to this discovery, gene regulation was believed to be solely dependent on transcription factors that bind to DNA.
- In 1993, Ambros and Ruvkun demonstrated using mutant roundworms (*C. elegans*) that gene regulation also involves microRNAs, occurring at a later stage of gene expression.
- Initially, it was thought that microRNA regulation was limited to *C. elegans*, but further research revealed its relevance in more complex organisms, including humans.
- By 2001, microRNAs were found to be abundant in both invertebrates and vertebrates, with some conserved across species, indicating a general regulatory function.
- The human genome is known to code for over 1,000 microRNAs.
- Dysregulated microRNA expression is associated with various diseases, including cancer, diabetes, and autoimmune disorders.
- In cancer, dysregulation may involve amplification or deletion of microRNA genes, abnormal transcriptional control, and defects in microRNA biogenesis.
- Dysregulated microRNAs affect key biological capabilities in cancer cells, such as sustaining proliferative signaling, resisting cell death, and promoting metastasis.
- Some microRNAs have shown potential as biomarkers for cancer diagnosis, prognosis, and therapeutic targets.
- Disruption of microRNAs can lead to autoantibody production and contribute to autoimmune diseases like rheumatoid arthritis and multiple sclerosis.
- Several diagnostic biomarkers associated with microRNAs have been developed for clinical use, though commercialization is pending.
- Candidate drugs targeting microRNAs are currently being tested in clinical trials.

## Marina mayhem (8 October)

### The deaths at the Chennai air show could have been prevented

- The October 6 air show at Chennai's Marina beach, organized by the Indian Air Force (IAF) for its 92nd anniversary, resulted in the deaths of five people due to heatstroke, with dehydration and suffocation also being factors.
- Over 200 attendees reportedly fainted during the event, despite advisories from the IAF urging spectators to prepare for the heat, which was around 34°C to 35°C.

- Tamil Nadu Health Minister M. Subramanian stated that 102 individuals were sent to nearby government hospitals for treatment.
- Following the event, chaos ensued on Chennai's roads, with overcrowding on Metro Rail and Mass Rapid Transit System (MRTS) trains, leading to severe congestion at stations.
- Tamil Nadu Chief Minister M.K. Stalin announced a compensation of ₹5 lakh each to the families of the deceased and attributed traffic congestion to the overwhelming response to the event.
- Chennai has hosted similar events before; an IAF air show on September 6, 2003, attracted about 13 lakh people without any heatstroke fatalities, although traffic management issues were present.
- There is a concern that lessons from previous events have not been learned, with shared blame between the State government and railway administration for inadequate preparations.
- Defence officials should have provided better input based on their experience with air shows nationwide.
- Following a 1989 fighter jet crash at a New Delhi air show, the IAF had improved its protocols for future events.
- The Health Minister claimed the government had exceeded the IAF's logistical requirements, but complaints about inadequate facilities contradicted this assertion.
- Authorities should have managed the number of attendees at the Marina more effectively, possibly by livestreaming the event and utilizing volunteers from higher education institutions to assist with crowd management and emergency response.
- A critical review of planning by defence officials and host states is necessary to prevent similar incidents in the future.

# On 'casteist' provisions in prison manuals

How do existing prison manuals reinforce colonial-era caste-based discrimination? How do they contravene Article 14 of the Constitution? Why did the Supreme Court flag the Union government's 2016 Model Prison Manual? What does the verdict say? What happens next?

GS Paper II: Polity

## EXPLAINER

Aaratrika Bhaumik

### The story so far:

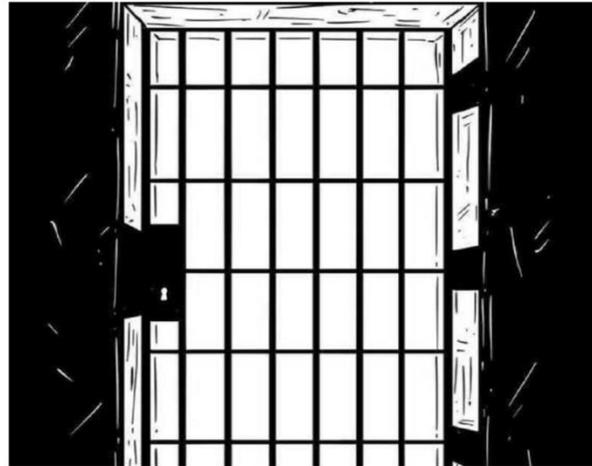
The Supreme Court on October 3 declared that caste-based division of labour in prisons is "unconstitutional". A three-judge Bench headed by Chief Justice of India D.Y. Chandrachud struck down several provisions in State prison manuals, that reinforced caste differences, for being violative of the fundamental rights of prisoners.

### What was the case?

The court was hearing a Public Interest Litigation (PIL) petition filed by journalist Sukanya Shantha highlighting provisions in prison manuals in States such as Uttar Pradesh, West Bengal, Odisha, Maharashtra, Tamil Nadu, and Kerala that legitimised caste inequalities. For instance, it was pointed out that the separation of Thevars, Nadars, and Pallars in different sections of the Palayamkottai Central Jail in Tamil Nadu constituted a "glaring instance of caste-based segregation of barracks". Similarly, the Rajasthan Prison Rules, 1951, allocated latrine duties to the "Mehtar" caste – a Scheduled Caste community – while Brahmins or "sufficiently high caste Hindu prisoners" were assigned to the kitchens, thereby perpetuating caste-based labour divisions.

### How do prison manuals reinforce colonial stereotypes?

The now-repealed Criminal Tribes Act, 1871, permitted the British colonial regime to designate certain marginalised communities as "criminal tribes" based on the stereotypical notion that they were "born criminals." Following the revocation of the Act, these groups were reclassified as "denotified tribes" yet prison manuals continued to label them as "habitual offenders" sans any conviction. The court noted that such



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classification perpetuates colonial-era caste-based discrimination, exacerbating the social and economic marginalisation of these communities.

Citing examples from various prison manuals, the court highlighted that Rule 404 of the West Bengal Jail Code stipulates that a convict overseer may be appointed as a night guard only if "he does not belong to any class that may have a strong natural tendency to escape, such as men of wandering tribes." Similarly, prison manuals in Andhra Pradesh, Tamil Nadu, and Kerala define "habitual criminals" as individuals who, by "habit," are "robbers, housebreakers, dacoits, thieves, or receivers of stolen property" or who "habitually commit extortion, cheating, counterfeiting coins, currency notes, stamps, or forgery," even in the absence of any prior convictions. Further, the rules in Andhra Pradesh

equated "a member of a wandering or criminal tribe" with "a bad or dangerous character, or one who has ever escaped or attempted to escape from lawful custody," prohibiting their employment in any labour outside the prison walls.

### How are fundamental rights of prisoners violated?

Underscoring that caste may be employed as a criterion for classification only when it seeks to benefit victims of caste discrimination, the top court ruled that the prison manuals failed to achieve this objective and instead contravened Article 14 of the Constitution. "Segregating prisoners on the basis of caste would reinforce caste differences or animosity that ought to be prevented in the first place", it reasoned. The judges further opined that differentiating between inmates based on "habit," "custom,"

"superior mode of living," and "natural tendency to escape" offends principles of substantive equality.

"By assigning cleaning and sweeping work to the marginalised castes, while allowing the high castes to do cooking, the Manuals directly discriminate. This is an instance of direct discrimination under Article 15(0)", the Bench asserted. Furthermore, assigning specific tasks to these communities based on their purported "customary" roles, rather than offering "more skilled, dignified, or intellectual work," was deemed to result in indirect discrimination.

Referring to prison rules that require food to be cooked by members of a "suitable caste" or "menial duties" to be exclusively performed by communities "accustomed" to such work, the court noted that these practices constituted untouchability, prohibited under Article 17. "When Prison Manuals restrict the reformation of prisoners from marginalised communities, they violate their right to life. At the same time, such provisions deprive prisoners from marginalised groups of a sense of dignity and the expectation that they should be treated equally", the CJI underscored.

### What were the directions issued?

All States and Union Territories were directed to amend their prison manuals and rules within three months to abolish such discriminatory practices.

Several lacunas were also flagged in the Union government's Model Prison Manual, 2016, and the Model Prisons and Correctional Services Act, 2023. The 2016 manual, in particular, faced criticism for offering a vague definition of "habitual offender", allowing States to define the term based on stereotypical assumptions against denotified tribes. Consequently, the court ordered that necessary reforms be implemented in both the 2016 manual and the 2023 Act within three months. To ensure compliance with these directives, district legal services authorities and boards of visitors were tasked with conducting regular inspections.

## THE GIST

The court was hearing a Public Interest Litigation (PIL) petition filed by journalist Sukanya Shantha highlighting provisions in prison manuals in States such as Uttar Pradesh, West Bengal, Odisha, Maharashtra, Tamil Nadu, and Kerala that legitimised caste inequalities.

Citing examples from various prison manuals, the court highlighted that Rule 404 of the West Bengal Jail Code stipulates that a convict overseer may be appointed as a night guard only if "he does not belong to any class that may have a strong natural tendency to escape, such as men of wandering tribes."

All States and Union Territories were directed to amend their prison manuals and rules within three months to abolish such discriminatory practices.

## On 'casteist' provisions in prison manuals (8 October)

How do existing prison manuals reinforce colonial-era caste-based discrimination? How do they contravene Article 14 of the Constitution? Why did the Supreme Court flag the Union government's 2016 Model Prison Manual? What does the verdict say? What happens next?

- On October 3, the Supreme Court declared that caste-based division of labor in prisons is "unconstitutional."

- A three-judge Bench led by Chief Justice D.Y. Chandrachud struck down provisions in State prison manuals that reinforced caste differences, violating prisoners' fundamental rights.
- The case arose from a Public Interest Litigation (PIL) filed by journalist Sukanya Shantha, highlighting provisions in prison manuals from several States, including Uttar Pradesh, West Bengal, Odisha, Maharashtra, Tamil Nadu, and Kerala, that legitimized caste inequalities.
- The court noted the separation of Thevars, Nadars, and Pallars in different sections of Palayamkottai Central Jail in Tamil Nadu as a clear example of caste-based segregation.
- Rajasthan Prison Rules, 1951, allocated latrine duties to the “Mehtar” caste (a Scheduled Caste community), while assigning kitchen duties to Brahmins or “sufficiently high caste Hindu prisoners,” perpetuating caste-based labor divisions.
- The now-repealed Criminal Tribes Act, 1871, allowed the British to label certain marginalized communities as “criminal tribes,” reinforcing the stereotype that they were “born criminals.”
- After the revocation of the Act, these groups were reclassified as “denotified tribes,” but prison manuals continued to refer to them as “habitual offenders” without any conviction.
- The court observed that such classifications perpetuate colonial-era caste-based discrimination, worsening the social and economic marginalization of these communities.
- Rule 404 of the West Bengal Jail Code states that a convict overseer may serve as a night guard only if he does not belong to classes with a “strong natural tendency to escape,” such as wandering tribes.
- Prison manuals in Andhra Pradesh, Tamil Nadu, and Kerala define “habitual criminals” as individuals who, by “habit,” are involved in serious crimes, even without prior convictions.
- Rules in Andhra Pradesh link membership in a wandering or criminal tribe to “bad or dangerous character,” barring them from employment in any labor outside prison walls.

### **How are fundamental rights of prisoners violated?**

- The Supreme Court ruled that caste may be used for classification only to benefit victims of caste discrimination, noting that prison manuals contravened Article 14 of the Constitution.
- The court reasoned that segregating prisoners by caste reinforces caste differences and animosity, which should be prevented.
- Differentiating between inmates based on “habit,” “custom,” “superior mode of living,” and “natural tendency to escape” violates principles of substantive equality.
- The court identified direct discrimination under Article 15(1) in assigning cleaning and sweeping work to marginalized castes while allowing high castes to cook.
- Assigning tasks based on purported “customary” roles, instead of offering more skilled or dignified work, results in indirect discrimination.

- The court noted that prison rules requiring food to be cooked by members of a “suitable caste” or limiting “menial duties” to certain communities constitute untouchability, which is prohibited under Article 17.
- The court emphasized that prison manuals restricting the reformation of marginalized community prisoners violate their right to life and dignity.
- Directions were issued for all States and Union Territories to amend their prison manuals and rules within three months to abolish discriminatory practices.
- The court flagged issues in the Union government’s Model Prison Manual, 2016, and the Model Prisons and Correctional Services Act, 2023.
- The 2016 manual was criticized for providing a vague definition of “habitual offender,” allowing States to define it based on stereotypes against denotified tribes.
- The court ordered necessary reforms to be implemented in both the 2016 manual and the 2023 Act within three months.
- District legal services authorities and boards of visitors were tasked with conducting regular inspections to ensure compliance with these directives.

# On the need for a different framework for passive MFs

Why has SEBI relaxed requirements for asset management companies with respect to passive mutual funds?

**GS Paper III: Capital Market**  
**सप्टापरिचो वनोसि**

**The story so far:**

The Securities and Exchange Board of India (SEBI) on September 30, introduced the liberalised Mutual Funds Lite (MF Lite) framework for passively managed schemes. The framework intends to promote the entry of new players into the MF ecosystem, present diversified investment opportunities for retail investors through less risky schemes and enhance market liquidity.

**Why a separate framework?**

Passively managed mutual fund schemes are generally considered less risky compared to their actively managed peers. They usually track a benchmark index, say BSE Sensex or Nifty50, and try to mimic their performance. In other words, these funds try and deliver returns in tandem with the benchmark they are following. Since the underlying constituents of the benchmark indices are

publicly available, passively managed schemes can be easily tracked and therefore, the associated risks are lower in comparison to their active peers.

SEBI observed that passive funds’ investment strategy imbibes on mimicking instruments already bearing established rules. Asset management companies (AMCs) of the fund, thus have “negligible discretion” about asset allocation and the investment objective. Thus, the regulator held that the current framework, intended primarily for active mutual fund operators, may not be relevant for passively managed schemes. Thus, opting to introduce the “relaxed framework”. The light touch regulations would include relaxed requirements relating to eligibility criteria for sponsors (the ones who set up and register the mutual fund) including net worth, track record and profitability etc.

**How does it help new players’ entry?**

This would be encouraged by two measures – governance structures (and

responsibilities) and requirements for net worth holdings. Net worth is the difference between the assets and liabilities of the fund. The framework deems a minimum net worth of ₹35 crore to be appropriate for AMCs operating a passive fund. Emphasising on the need for liquid money, the regulator observed that the fund may require to deploy the entire amount of the net worth in liquid assets on a perpetual basis. Thus, a lower minimum requirement could provide the “desired head start for a cost effective and competitive passive MF industry”.

According to stockbroking firm AngelOne, the framework would likely attract both existing and new market players.

Further, with respect to governance, SEBI explored that in management of passive funds, the oversight role of trustees (tasked with protecting the investors’ interest) also gets considerably reduced. Thus, a case for relaxation.

However, it stipulated that the role of trustees in averting conflict of interest and overseeing related party transactions,

undue influence of sponsors, misconduct including market abuse and misuse of information including front running would still be relevant along with AMCs. Important to note here however, that certain oversight measures relating to daily operations would now be entirely with the board of the AMC, the paper held. For example, ensuring fairness in fees and expenses charged and more importantly, maintaining the tracking error and difference within the regulatory limit.

**What about risks and disclosures?**

The success of a passively managed scheme is subject to two factors, namely, TER (refers to the costs associated with running and managing a scheme) and tracking error. Thus, the latest framework moves away from metrics such as strategy and investment avenues, among other things. These would not form part of the scheme information document (SID) that contains all the relevant information for a prospective retail investor. SEBI however sought that the prospective investor be informed about the name of the underlying benchmark, among other things, in the SID. SEBI’s consultation paper had also concentrated focus on costs for compliance considering the lowered risks.

It provided that the responsibilities of the risk management committee(s), being limited in the paradigm, could be instead additionally carried out by the audit committee of the AMC.

**THE GIST**

Passively managed mutual fund schemes are generally considered less risky compared to their actively managed peers. They usually track a benchmark index, say BSE Sensex or Nifty50, and try to mimic their performance.

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The success of a passively managed scheme is subject to two factors, namely, TER (refers to the costs associated with running and managing a scheme) and tracking error.

## On the need for a different framework for passive MFs (8 October)

## **Why has SEBI relaxed requirements for asset management companies with respect to passive mutual funds?**

- On September 30, the Securities and Exchange Board of India (SEBI) introduced the liberalised Mutual Funds Lite (MF Lite) framework for passively managed schemes.
- The framework aims to promote new players in the mutual fund ecosystem, provide diversified investment opportunities for retail investors through less risky schemes, and enhance market liquidity.
- Passively managed mutual fund schemes are considered less risky than actively managed ones as they typically track benchmark indices like BSE Sensex or Nifty50 and aim to mimic their performance.
- These funds deliver returns in line with the benchmark, making them easier to track and associated with lower risks.
- SEBI noted that the investment strategy of passive funds involves mimicking instruments that have established rules, allowing asset management companies (AMCs) minimal discretion regarding asset allocation and investment objectives.
- The regulator determined that the current framework, designed primarily for active mutual fund operators, was not suitable for passively managed schemes.
- SEBI opted to introduce a "relaxed framework" with light touch regulations.
- The new regulations will include relaxed eligibility criteria for sponsors (those who set up and register the mutual fund), such as net worth, track record, and profitability.

## **How does it help new players' entry?**

- The framework encourages governance structures and net worth requirements for asset management companies (AMCs) operating passive funds.
- A minimum net worth of ₹35 crore is deemed appropriate for AMCs managing a passive fund.
- The regulator noted the importance of maintaining liquid assets, suggesting that a lower minimum requirement could help establish a cost-effective and competitive passive mutual fund industry.
- The framework is expected to attract both existing and new market players, according to stockbroking firm AngelOne.
- SEBI recognized that the oversight role of trustees in managing passive funds is reduced, justifying some relaxations.
- Trustees must still play a role in preventing conflicts of interest, overseeing related party transactions, and addressing misconduct such as market abuse and front running.
- Daily operational oversight will now primarily rest with the AMC's board, including ensuring fairness in fees, expenses, and maintaining tracking errors within regulatory limits.

- The success of a passively managed scheme depends on two factors: Total Expense Ratio (TER) and tracking error.
- The new framework shifts focus away from metrics like strategy and investment avenues in the scheme information document (SID).
- SEBI mandates that prospective investors be informed about the underlying benchmark name in the SID.
- The consultation paper emphasized compliance costs considering the lowered risks associated with passive funds.
- Responsibilities of risk management committees may be supplemented by the audit committee of the AMC.

## Stock Market Index

A stock market index is like a report card for a particular group of companies listed on the stock market. It helps investors see how well or poorly the stock market (or a specific section of it) is performing. If the index goes up, it usually means the stocks in that group are doing well; if it goes down, the opposite is true.

### BSE Sensex:

- **Full form:** BSE stands for the **Bombay Stock Exchange**, and **Sensex** is short for the **Sensitive Index**.
- **What it is:** The Sensex tracks the performance of **30 large, well-established, and financially sound companies** listed on the Bombay Stock Exchange.
- **Why it's important:** Since these companies are leaders in their industries (like banking, IT, manufacturing, etc.), the Sensex gives a quick snapshot of how the overall stock market and the economy are performing.
- **Example:** If the Sensex goes up, it means the majority of these 30 companies are doing well, and it suggests good market health.

### Nifty50:

- **Full form:** Nifty50 is a combination of two words: **National Stock Exchange (NSE)** and **Fifty** (for the 50 companies it tracks).
- **What it is:** Nifty50 is an index that tracks the performance of **50 major companies** listed on the **National Stock Exchange (NSE)**, which is another leading stock exchange in India.
- **Why it's important:** Like the Sensex, Nifty50 represents companies from various sectors like IT, banking, pharmaceuticals, etc. It helps investors gauge the overall health of the market.
- **Example:** If the Nifty50 is rising, it generally means the companies included in this index are performing well, signaling a good market trend.

### How are They Different?

- **Number of companies:** Sensex tracks 30 companies, while Nifty50 tracks 50 companies.

- **Stock exchange:** Sensex is for the BSE (Bombay Stock Exchange), and Nifty50 is for the NSE (National Stock Exchange).
- **Purpose:** Both indices are used to measure the stock market's performance, but since they track different companies, they give slightly different pictures of the market.

### **Significance**

- For someone investing in the stock market or considering investments, tracking the Sensex and Nifty50 can give a quick understanding of how the overall market is performing. When these indices rise, it often indicates a good time to invest; when they fall, it may suggest caution.



GETTY IMAGES

# How high-performance buildings are the next step towards a sustainable future

As urbanisation accelerates, India risks surpassing global benchmarks for energy efficiency and carbon emissions in buildings. In such a scenario, HPBs offer resilience through adaptive, self-sufficient structures. They promote social well-being by nurturing healthier indoor environments

**GS Paper III: Environment**  
Sandhya Patil

**T**he conversation around sustainability in the buildings sector has often centred on climate change, resource use, and energy efficiency. Buildings are significant contributors to global emissions, especially in fast-growing cities, so improving their energy and carbon efficiency is vital. Failing to act could result in higher energy consumption, greater dependence on fossil fuels, and missed climate targets, all of which will further strain urban infrastructure.

Globally, buildings account for nearly 40% of total final energy consumption over their lifespan, primarily for operational needs such as running HVAC systems and lighting.

This significant energy use leads to approximately 28% of energy-related carbon emissions arising from both on-site energy consumption and indirect emissions from power plants and other off-site sources. In India, buildings account for more than 30% of the national energy use and 20% of its carbon emissions, according to the Bureau of Energy Efficiency.

As urbanisation accelerates, India risks surpassing global benchmarks for energy efficiency and carbon emissions in buildings, including standards set by the International Energy Agency, building certification programmes, and the European Union's Energy Performance of Buildings Directive.

With India's urban population expected to reach 600 million by 2030, this challenge is becoming even more urgent. As cities grow, the demand for new construction also increases, and without action the sector's carbon footprint will increase drastically.

Adopting energy-efficient and low-carbon building practices is thus key to meet climate goals and to promote sustainable urban growth.

## What are high-performance buildings?

Terms like "green buildings" and "high-performance buildings" (HPBs) are often used interchangeably in the field of sustainable construction. Both concepts aim to reduce environmental impact and energy consumption and improve occupant comfort, but differ significantly in their methods and outcomes.

Green buildings are often seen as a foundational step toward sustainable development, with certification programmes playing a crucial role in their creation. These programmes assess the design intent and the final outcomes across various categories, using established benchmarks to ensure the builder is meeting essential sustainability goals. Their key areas of concern are energy efficiency, water conservation, and materials sourcing.

HPBs elevate these ideas by striving for peak efficiency in every aspect of their form and function. From energy and water use to occupant health and comfort, HPBs are designed with specific, measurable goals to achieve results beyond what the local government requires. They use advanced technologies and smart design strategies to continuously track their performance metrics, ideally in real-time. Specifically, HPBs leverage site-specific design approaches, such as natural lighting, ventilation, and terrain water management using sustainable materials, insulation, and low U-value windows to maximise thermal efficiency and reduce energy demand.

Advanced technologies include energy-efficient HVAC systems, greywater recycling, rainwater harvesting, smart lighting controls, and advanced metering. A 'building management system' (BMS) allows operators to monitor an HPB's performance, including sharing real-time analytics to optimise resource use.

Some HPBs already exist in India. One notable example is Unnati in Greater

Noida, which features a façade designed according to the Sun's path in the local sky to improve thermal comfort and reduce glare. This is complemented by high-performance glass with a low solar heat gain coefficient, which improves energy efficiency and indoor environmental quality.

Similarly, Indira Paryavaran Bhawan in New Delhi utilises an advanced HVAC system featuring a unit where chilled water circulates through beams in the ceiling, taking advantage of natural convection and reducing energy consumption.

These building designs have paved the way for net-zero buildings (structures that generate as much energy and water as they consume) and grid-interactive buildings, which actively participate in energy demand management. Both push the boundaries of sustainability.

## Benefits of HPBs

HPBs offer environmental benefits and address long-term operational challenges that building owners and occupants often face. Rather than focusing solely on saving energy, HPBs create a holistic environment where technology, design, and sustainability intersect to enhance building performance.

For example, their use of smart systems to dynamically manage resource use ensures building systems last longer and don't need frequent upgrades. The Infosys campus in Bengaluru has a facility that monitors the entire building's performance using a BMS and makes the requisite changes as and when to maintain peak performance. These buildings often achieve higher returns on investment due to higher property value and lower maintenance costs. Similar examples include the Atal Akshay Urja Bhavan in New Delhi and the Infosys campus in Hyderabad.

HPBs that take advantage of automation and artificial intelligence in addition to existing features can even

create intelligent ecosystems. For example, computers in buildings can adjust lighting, temperature, and ventilation based on occupancy patterns or weather conditions to create a more personalised, energy-efficient milieu.

From a market perspective, HPBs are becoming a symbol of forward-thinking development. Beyond their immediate benefits, they signal a shift toward buildings that prioritise the well-being of occupants with superior air filtration systems, maximal natural light, and optimal thermal comfort.

## How can HPBs help India's cities?

Life in India is guided by resource scarcity, fluctuating energy markets, and rising temperatures. HPBs offer resilience through adaptive, self-sufficient structures. They promote social well-being by nurturing healthier indoor environments, including air quality.

For example, TCS Banyan Park in Mumbai incorporates extensive green spaces and water features and its daytime lighting strategy includes well-placed windows and skylights to reduce artificial lighting. Such projects consume fewer resources while elevating the quality of the workplace.

For India, where rapid urbanisation can and does strain public infrastructure, HPBs offer a proactive solution that positions the built environment as a driver of the country's transition to a low-carbon, more sustainable economy. In sum, in a rapidly changing real-estate landscape, where adaptability is key, HPBs stand out as future-proof investments capable of weathering evolving environmental and economic pressures while delivering value.

Sandhya Patil is a sustainability expert with the Indian Institute for Human Settlements (IHS) and anchors technical assistance for ASSURE. The author does not have any financial interests vested with any company or organisation that would benefit from this article.

# How high-performance buildings are the next step towards a sustainable future (8 October)

**As urbanisation accelerates, India risks surpassing global benchmarks for energy efficiency and carbon emissions in buildings. In such a scenario, HPBs offer resilience through adaptive, self-sufficient structures. They promote social well-being by nurturing healthier indoor environments.**

- The conversation around sustainability in the buildings sector focuses on climate change, resource use, and energy efficiency.
- Buildings are significant contributors to global emissions, particularly in fast-growing cities.
- Improving energy and carbon efficiency in buildings is vital to avoid higher energy consumption, increased fossil fuel dependence, and missed climate targets.
- Buildings account for nearly 40% of total final energy consumption globally, primarily for operational needs like HVAC systems and lighting.
- This energy use leads to approximately 28% of energy-related carbon emissions, stemming from on-site energy consumption and indirect emissions from power plants.
- In India, buildings account for over 30% of national energy use and 20% of carbon emissions, according to the Bureau of Energy Efficiency.
- As urbanization accelerates, India risks exceeding global benchmarks for energy efficiency and carbon emissions in buildings.
- The standards set by the International Energy Agency, building certification programs, and the EU's Energy Performance of Buildings Directive are at risk of being surpassed.
- India's urban population is expected to reach 600 million by 2030, making the challenge more urgent.
- Increased demand for new construction without action will drastically raise the sector's carbon footprint.
- Adopting energy-efficient and low-carbon building practices is essential to meet climate goals and promote sustainable urban growth.

## **What are high-performance buildings?**

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## **Benefits of HPBs**

- HPBs (High-Performance Buildings) offer environmental benefits and address long-term operational challenges for building owners and occupants.
- They create a holistic environment where technology, design, and sustainability intersect to enhance building performance.
- Smart systems in HPBs dynamically manage resource use, extending the lifespan of building systems and reducing the need for frequent upgrades.
- The Infosys campus in Bengaluru uses a Building Management System (BMS) to monitor and optimize the building's performance continuously.
- HPBs typically achieve higher returns on investment due to increased property value and lower maintenance costs.
- Examples of HPBs include the Atal Akshay Urja Bhavan in New Delhi and the Infosys campus in Hyderabad.
- HPBs utilizing automation and artificial intelligence can create intelligent ecosystems that adjust lighting, temperature, and ventilation based on occupancy patterns and weather conditions.
- From a market perspective, HPBs symbolize forward-thinking development, prioritizing occupant well-being with superior air filtration, natural light, and thermal comfort.
- In India, HPBs provide resilience against resource scarcity, fluctuating energy markets, and rising temperatures through adaptive, self-sufficient structures.
- They promote social well-being by creating healthier indoor environments with improved air quality.

- The TCS Banyan Park in Mumbai features extensive green spaces, water features, and a lighting strategy that reduces reliance on artificial lighting.
- HPBs consume fewer resources while enhancing workplace quality, addressing the challenges of rapid urbanization that strain public infrastructure.
- They present a proactive solution for transitioning to a low-carbon, sustainable economy in India.
- In a changing real-estate landscape, HPBs are seen as future-proof investments that can adapt to evolving environmental and economic pressures while delivering value.

GS Paper III: Environment

Question: Examine the role of High-Performance Buildings (HPBs) in achieving energy efficiency and environmental sustainability in urban development. (150 Words/10 Marks)