



Poor Performance of India in Science Nobel Prizes

For Prelims: [Nobel Prize](#), [CV Raman](#), [Government e-Marketplace \(GeM\)](#), [Padma Shri](#), [Bharat Ratna](#), [Nuclear Fusion Projects](#), [Wireless Communication](#), [Raman Scattering Effect](#), [Homi Bhabha](#), [Satyendra Nath Bose](#), [Ribosome](#), [White Dwarf](#), [Anusandhan National Research Foundation](#), [VAIBHAV Fellowship](#).

For Mains: Research funding and state of scientific development in India.

Source: [IE](#)

Why in News?

It has been 94 years since an Indian won a [Nobel Prize](#) in the sciences — **Physics, Chemistry or Medicine** — while working in India.

- India's limited success at the Nobel Prizes is often viewed as an **indicator** of the state of its science, though other factors also contribute.
- The last Indian to receive a Nobel Prize in science was [CV Raman](#) for [scattering of light](#) in Physics in **1930**.

What are the Reasons for Poor Performance of India in Science Nobel Prizes?

- **Low Public Funding for Research:** The Indian government provides **insufficient funding** for scientific research, which hinders the development of **groundbreaking work**.
 - In India, direct funding for basic research has remained at a low of **0.6-0.8% of GDP** over the last decade, much lower than that of other [BRICS](#) nations.
 - India's **total expenditure on R&D** has, in fact, fallen from **0.82% to 0.64%** of the GDP between **2005 and 2023**.
- **Excessive Bureaucracy:** Bureaucratic **red tape** within India's research institutions stifles innovation and slows down scientific progress. Eg.
 - To order **equipment** in IIT Delhi, it takes **11 months**.
 - **Rs 150 crore GST notice served to IIT Delhi** is an example of how tax policies create financial strain on academic institutions.
 - [Government e-Marketplace \(GeM\)](#) places a burden for mandatory procurement platforms for government institutions.
- **Small Researcher Pool:** India has a **disproportionately low** number of researchers relative to its population.
 - The number of researchers in India is **five times lower than the global average**, shrinking the pool of potential **Nobel contenders**.
- **Dependence on Individual Brilliance:** In the absence of a strong research ecosystem, India's chances of winning **future Nobel Prizes** are largely dependent on the **individual brilliance** of its scientists, rather than systematic support or infrastructure.
- **Discretion in Research Institutions:** Instead of focusing on breakthrough research, many heads of research institutions allegedly use these powers for **personal career growth**, such as securing prestigious awards like the [Padma Shri](#) or [Bharat Ratna](#), or extending their post-retirement

tenures.

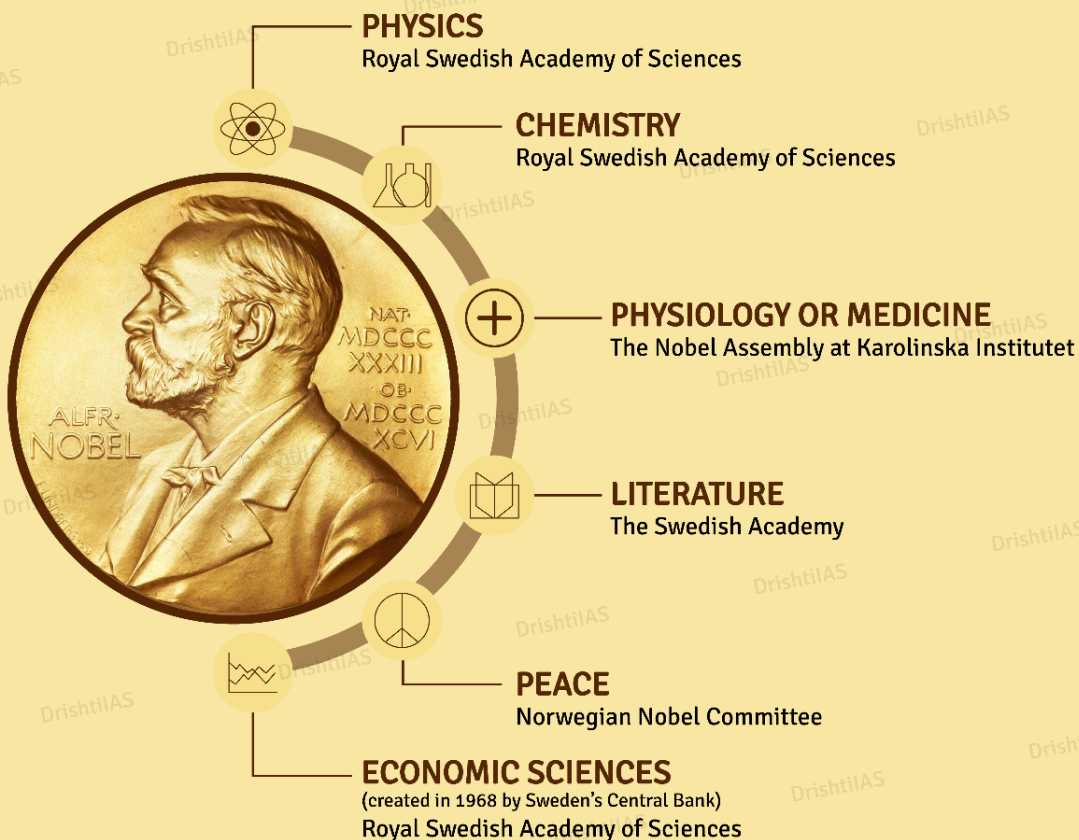
- **Lack of Clear Research Direction:** Many scientists pursue **outdated or irrelevant topics**, often based on failed experiments in the USA or EU, which have no practical applications in India.
 - E.g., Ignoring **water technologies and agricultural innovation** for high-energy particle accelerators or complex **nuclear fusion projects**.
- **Focus on Quantity Over Quality:** Most of the research carried out in government-funded research institutions is geared towards generating **"number sake" publications** rather than producing meaningful innovations.
- **Dependence on Foreign Technologies:** Instead of developing original solutions, Indian scientists are often involved in merely **duplicating or adapting** technologies developed abroad, which does not require deep scientific innovation or merit.
- **Over Reliance on Private Sector Success:** Recent successes in **vaccine development** during the **Covid-19 pandemic** were primarily achieved by **private sector labs**, illustrating a disconnect between government-funded research institutions and successful scientific breakthroughs.
 - This reliance further **undermines the credibility and necessity** of government labs in significant scientific advancements.
- **Legacy of Mediocrity:** Even when foreign-trained scientists return to India, they often **fail to live up to their potential** due to the **unhealthy institutional environment**.
 - They become trapped in a **cycle of publishing irrelevant research and seeking promotions**, rather than pursuing excellence or tackling significant scientific challenges.
- **Historical Missed Opportunities:** Several notable Indian scientists produced groundbreaking work but were either **overlooked or not nominated** for a Nobel. For example.
 - **Jagadish Chandra Bose:** Demonstrated **wireless communication** in 1895 but was not nominated, while the Nobel was awarded to **Guglielmo Marconi and Ferdinand Braun** for the exact work in **1909**.
 - **K S Krishnan:** Co-discovered the **Raman scattering effect** with C.V. Raman, but was never nominated for the Nobel.
 - **ECG Sudarshan:** The Nobel Prizes in Physics, in **1979 and in 2005**, were given for work in which the most fundamental contributions had come from Sudarshan but he was overlooked for the prize.
 - ECG Sudarshan worked on **electromagnetic interaction** between elementary particles.
- **Nominations but No Wins:** Several Indian scientists, such as **Meghnad Saha, Homi Bhabha, Satyendra Nath Bose, G N Ramachandran, and T Seshadri**, were nominated multiple times for Nobel Prizes but did not win.
- **Western Dominance in Nobel Prizes:** Nobel Prizes have been dominated by scientists from the **US and Europe**, which have stronger scientific infrastructure and research ecosystems.
 - Of the **653 people** who have won the Nobel Prize for Physics, Chemistry or Medicine, more than **150 belong to the Jewish community**, an astoundingly high proportion. But **Israel has won only four Nobel Prizes in science**.

Indian-Origin Scientists to Win Nobel Prize in Sciences:

- **Hargovind Khorana (in Medicine in 1968):** For interpretation of the **genetic code and its function in protein synthesis**.
- **Subrahmanyan Chandrasekhar (in Physics in 1983):** For his theoretical studies of the physical processes of importance to the **structure and evolution of the stars**.
 - He showed that when the **hydrogen fuel** of stars of a certain size begins to run out, it collapses into a compact, brilliant star known as a **white dwarf**.
- **Venkatraman Ramakrishnan (in Chemistry 2009):** For studies of the structure and function of the **ribosome**.

Nobel Prize

- ✦ Established by the will of Alfred Nobel (inventor of Dynamite)
- ✦ Awarded to those who have conferred the greatest benefit to humankind, during the preceding year
- ✦ First awards were handed out in 1901



- ✦ The Prize Ceremony is held in Stockholm, Sweden, in December every year
 - ▲ The Peace Prize is not awarded at Stockholm ceremony but presented annually in Oslo, Norway, on the same day
- ✦ Each Nobel laureate receives a gold medal, a diploma, and a monetary award
- ✦ Nobel Prize cannot be given posthumously (after death). Also, up to 3 people can share a Nobel Prize award between them

✦ **First Indian Nobel Laureate: Rabindranath Tagore for Literature, 1913**

▲ **First Indian Woman Nobel Laureate: Mother Teresa for Peace, 1979**



What are the Major Government Initiatives for Promotion of Research?

- [Anusandhan National Research Foundation \(ANRF\)](#)
- [Technology Incubation and Development of Entrepreneurs \(TIDE 2.0\)](#)
- [VAIBHAV Fellowship](#)
- [Information on Impacting Research Innovation and Technology \(IMPRINT - II\)](#)
- [Information on SERB Science and Technology Award for Research \(SERB-STAR\)](#)
- [Impactful Policy Research in Social Science \(IMPRESS\)](#)
- [Scheme for Promotion of Academic and Research Collaboration \(SPARC\)](#)

What can be Done to Improve the Performance of India in Science Nobel Prizes?

- **Increase Public Funding for R&D:** The Indian government should commit to increasing the percentage of GDP allocated to research and development, aiming to **reach at least 1.5% in the near term.**
- **Encouraging High-Impact Research:** Promote and fund **high-risk, high-reward research initiatives** that could lead to groundbreaking technologies.
- **Revamping Evaluation Processes:** Create **diverse panels of reviewers** with relevant expertise to evaluate research proposals.
 - This will help ensure that valuable ideas are not overlooked due to biases or misunderstandings.
- **Expand the Researcher Pool:** Promoting [STEM education](#) and investing in higher education can help cultivate a larger and more skilled pool of researchers.
- **Reform Research Institutions:** Ensure that funding and opportunities are allocated based on **merit and potential societal impact** rather than personal ambition.
- **Leverage Public-Private Partnerships:** Facilitate collaborations between government research institutions and private sector firms to enhance research capabilities and drive innovation.
- **Recognise Scientific Talent:** Establish national awards and recognition programs for outstanding scientific contributions to encourage more significant efforts toward groundbreaking work.
- **Strengthen Global Collaborations:** Encourage Indian scientists to collaborate with international research communities, sharing knowledge and resources to raise the profile of Indian research on the global stage.

Drishti Mains Question:

Discuss the reasons for the limited success of Indian scientists in winning Nobel Prizes in the fields of Physics, Chemistry, and Medicine.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. Who among the following scientists shared the Nobel Prize in Physics with his son? (2008)

- (a) Max Planck
- (b) Albert Einstein
- (c) William Henry Bragg
- (d) Enrico Fermi

Ans: (c)

Q. Nobel Prize winning scientist James D. Watson is known for his work in which area? (2008)

- (a) Metallurgy
- (b) Meteorology
- (c) Environmental protection
- (d) Genetics

Ans: (d)

Mains

Q. The Nobel Prize in Physics of 2014 was jointly awarded to Akasaki, Amano and Nakamura for the invention of Blue LEDs in 1990s. How has this invention impacted the everyday life of human beings? (2021)

MSP and its Legalisation

For Prelims: [Cabinet Committee on Economic Affairs \(CCEA\)](#), [Rabi crops](#), [Agricultural Prices Commission \(APC\)](#), [National food security](#), [Food Corporation of India's \(FCI\)](#).

For Mains: Issue of MSP legalisation, Impact of MSP legalisation of Farmers.

Source: [TH](#)

Why in News?

Recently, the [Cabinet Committee on Economic Affairs \(CCEA\)](#) increased the **Minimum Support Price** for six [rabi crops](#) (wheat, barley, gram, lentil, rapeseed, mustard, and safflowerfor).

- The **increase of MSP ignited debate** around the farmers' demand **for the legalisation of MSP** and its effect on the agricultural ecosystem.

Better support



The Cabinet increased the minimum support prices for rabi crops

Crop	MSP for rabi 2025-26*	MSP for rabi 2024-25*	Increase in MSP
Wheat	₹2,425	₹2,275	₹150
Barley	₹1,980	₹1,850	₹130
Gram	₹5,650	₹5,440	₹210
Lentil (masoor)	₹6,700	₹6,425	₹275
Rapeseed & mustard	₹5,950	₹5,650	₹300
Safflower	₹5,940	₹5,800	₹140

(*per quintal)

Cabinet Committee on Economic Affairs (CCEA)

- It is chaired by **the Prime Minister**, and **sets priorities for public sector investments**.
- It continuously **reviews economic trends** to develop an integrated economic policy framework and oversees policies and activities in the economic field, including foreign investment, requiring high-level decisions.

What is the Minimum Support Price?

- **About:**
 - The MSP **regime was established in 1965** by setting up the [Agricultural Prices Commission \(APC\)](#) (later renamed as CACP) as a form of market intervention to enhance **national food security** and protect farmers from significant decline in market prices.
- **MSP Calculation:**
 - **The CACP** calculates **three categories of production costs for each crop**, both at the state level and as all-India averages.
 - **A2:** Covers all paid-out costs directly incurred by the farmer in cash and kind on seeds, fertilisers, pesticides, hired labour, leased-in land, fuel, irrigation, etc.
 - **A2+FL:** Includes an estimated value of unpaid family labour with A2.
 - **C2:** It is a **more comprehensive cost** that factors in **rentals and interest for owned land and fixed capital assets**, on top of A2+FL.
 - The government maintains that the **MSP was fixed at a level of at least 1.5 times the all-India weighted average Cost of Production (CoP)**, but it calculates this cost as 1.5

times the A2+FL cost.



MINIMUM SUPPORT PRICE (MSP)

The rate at which the govt. purchases crops from farmers; based on a calculation of at least 1.5x the cost of production incurred by the farmers

RECOMMENDED BY

Commission for Agricultural Costs & Prices (CACP) (recommends MSPs for 22 mandated crops and Fair and Remunerative Price for Sugarcane)

22 MANDATED CROPS

(14 Kharif, 6 Rabi and 2 Other Commercial crops)

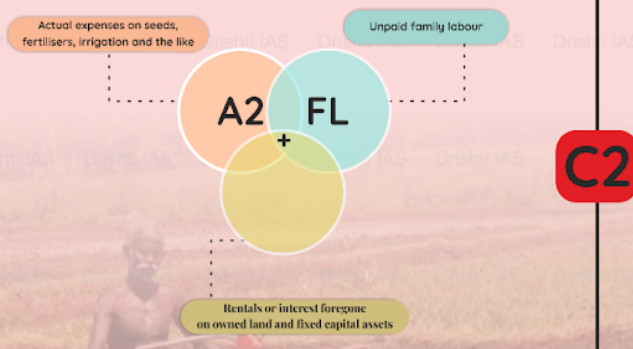
7	CEREALS	Paddy, Wheat, Barley, Jowar, Bajra, Maize And Ragi
5	PULSES	Gram, Arhar/tur, Moong, Urad And Lentil
7	OILSEEDS	Groundnut, Rapeseed/mustard, Soyabean, Sunflower, Sesamum, Safflower And Niger Seed
	RAW COTTON	
	RAW JUTE	
	COPRA	

MSP is the price at which the govt. is supposed to procure the mandated crops from farmers if the market price falls below it

FACTORS FOR RECOMMENDING MSP

- ▶ Cost of cultivation
- ▶ Demand-Supply situation for the crop
- ▶ Market price trends
- ▶ Inter-crop price parity
- ▶ Implications for consumers (inflation)
- ▶ Environment (soil and water use)
- ▶ Terms of trade b/w agri and non-agri sectors (ratio of farm inputs and outputs)

Considers both A2+FL and C2 costs



MSP has no statutory backing — a farmer cannot demand MSP as a matter of right



Drishti IAS

What are the Concerns Related to MSP in India?

- **Limited Coverage:** According to the **Shanta Kumar Committee's 2015 report**, only **6% of farmers benefit** from the MSP. Mainly those in regions with access to procurement infrastructure, such as Punjab and Haryana, while a large number of farmers in other states are left out.
- **Skewed Crop Focus:** The MSP system is **focused primarily on a few crops, especially rice and wheat**, leading to a **lack of incentive for farmers to grow other crops**, which affects crop diversification and can contribute to overproduction of these staple crops.
- **Overburdening Procurement System:** The MSP often leads to **large-scale government procurement**, especially of rice and wheat, **causing storage challenges and wastage**, and straining the **Food Corporation of India's (FCI)** resources.
- **Environmental Impact:** The **focus on certain water-intensive crops like rice** (supported by MSP) leads to **environmental concerns** such as groundwater depletion, particularly in regions like Punjab.
- **Dependence on Middlemen:** In some cases, even when MSP is declared, farmers face difficulties in **accessing procurement agencies directly**, leading to dependence on middlemen who may exploit them by offering lower prices.

What are the Needs and Challenges for Legalising MSP in India?

- **Need:**
 - **Income Security for Farmers:** Legalising MSP would **ensure guaranteed income for farmers**, protecting them from fluctuations in market prices.
 - Ensured income is crucial as **many farmers face distress due to price crashes**, especially during bumper harvests .
 - **Boost to Agricultural Investment:** A legally guaranteed MSP can **encourage farmers to invest more in agricultural inputs**, modern technology, and sustainable farming practices.
 - With assured returns, **farmers are more likely to adopt measures that improve productivity and sustainability.**
 - **Reduction of Rural Poverty:** By offering a stable price, **legal MSP can reduce rural poverty** and improve the standard of living for small and marginal farmers.
 - **Stabilizing Agricultural Markets:** MSP serves as a price stabilization tool, preventing the volatility of crop prices in open markets and **reducing inflation burden on the consumer.**
 - The **legal backing of MSP** could smoothen supply chain and ensure consistent crop procurement.
 - **Mitigation of Distress Sales:** Farmers often resort to distress sales due to a lack of remunerative prices. The **legally enforcing MSP could prevent distress sale.**
- **Challenges:**
 - **Fiscal Burden on the Government:** Legalising MSP across all crops would **require the government to procure large quantities at assured prices**, significantly increasing the fiscal burden.
 - As per government, extending MSP to all farmers and crops could cost over **Rs 10 lakh crore annually**, which is financially unviable for the government.
 - **Market Distortion:** Legal MSP could distort free market mechanisms by discouraging private traders and businesses from participating in the agricultural market.
 - Excessive reliance on **MSP could disrupt competitiveness** in the domestic and export market and leads to **legal battle for India at WTO.**
 - **Storage and Infrastructure Constraints:** Legalising MSP would require large-scale procurement, which in turn necessitates substantial improvements in storage and logistics infrastructure.
 - The government faces storage limitations, with **existing infrastructure being insufficient to handle** an expanded procurement system for all crops .
 - **Implementation Challenges:** Implementing **MSP uniformly across India is challenging due to diverse agricultural practices and climates**, making it hard to set MSP levels that benefit all farmers,

- Differences in production costs across states further complicate uniform MSP enforcement .
- **Overproduction and Environmental Impact:** Legalising MSP might incentivize overproduction of certain crops like wheat and rice, which are already extensively procured under the MSP system.
 - This could lead to environmental degradation, including groundwater depletion and soil pollution.

Way Forward

- **Correcting MSP Implementation:** Reform MSP to **ensure it targets crops based on regional needs** and market demand.
 - **Strengthen procurement infrastructure and encourage crop diversification** to reduce over-reliance on specific crops like wheat and rice.
- **Encourage Crop Diversification:** The government should incentivise crop diversification to address the environmental and economic issues.
 - MSP should be introduced or expanded for other crops, including **pulses, oilseeds, and millets**, to promote sustainable farming and reduce pressure on water resources.
- **Direct Benefit Transfers (DBT):** To reduce inefficiencies and **curb the dependence on middlemen, the government can explore direct benefit transfers for farmers.**
 - This could allow farmers to receive the difference between the MSP and market price directly into their bank accounts if they cannot sell at MSP.
- **Allied Activities for Farmers:** Promote allied agricultural activities like **horticulture, dairy farming, and fisheries** to provide farmers with additional income sources, making agriculture more sustainable and less dependent on MSP.
- **Skill Development for Manufacturing Jobs:** Expand skill development programs to equip rural populations, particularly youth and women, with manufacturing and technical skills.
 - This would create **employment opportunities outside agriculture**, supporting the transition to non-farm incomes.

Drishhti Mains Question:

Critically analyse the concerns associated with the legalisation of Minimum Support Price system and suggest a way forward.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims:

Q. Consider the following statements: (2020)

1. In the case of all cereals, pulses and oil-seeds, the procurement at Minimum Support Price (MSP) is unlimited in any State/UT of India.
2. In the case of cereals and pulses, the MSP is fixed in any State/UT at a level to which the market price will never rise.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (d)

Mains:

Q. What are the reformative steps taken by the Government to make the food grain distribution system more effective? **(2019)**

Ensuring Railway Safety

For Prelims: [Railway Infrastructure](#), [Kavach](#), [National Rail Plan](#), [Depreciation Reserve Fund](#), [Extra-Budgetary Resources](#), [Dedicated Freight Corridors](#), [NITI Aayog](#), [High-Speed Rail Corridors](#), [Railway Safety Authority](#), [Rashtriya Rail Sanraksha Kosh](#), [Railway Infrastructure Authority of India](#), [Railway Accident Investigation Board](#), [Railway Infrastructure Company](#), [Kakodkar Committee](#).

For Mains: Steps needed for ensuring railway safety.

Source: [TH](#)

Why in News?

Recently, there has been a **spate of accidents** across railway zones after which the government has called for **urgent steps** to prevent them.

What is the Status of Railway Accidents?

- **Decrease Over the Decades:** In the **1960s**, the number of railway accidents was significantly higher, with an **annual average of 1,390**.
 - Over the last decade, this number dropped to **around 80 accidents per year**, indicating a notable improvement in safety measures and operational efficiency.
- **Recent Trends in Consequential Accidents:** Despite the reduction in **overall accidents**, there were still **34 consequential accidents in 2021-2022, 48 in 2022-2023, and 40 in 2023-2024**.
 - A **consequential accident** injures and/or kills people, damages **railway infrastructure**, and disrupts rail traffic.
- **Primary Causes of Accidents:** According to public records, **55.8%** of all accidents involving trains have been due to the failure of **Railway staff** and another **28.4%** due to failures on the part of **non-staff people**. **Equipment failure** accounted for **6.2%**.
- **Signalling Failures in Major Accidents:** Both the **Balasore (2023)** and **Kavaraipettai (2024)** railway accidents were attributed to **signalling system errors**.

What are the Causes of Railway Accidents?

- **Inadequate Safety Technologies:** **Kavach** has the potential to prevent collisions by **automating** braking and issuing alerts, its limited deployment makes it ineffective on a larger scale.
 - By February 2024, the Railways had installed **'Kavach' on 1,465 route km, or 2% of its total route length**.
- **Signalling System Failures:** Faulty signalling systems have directly caused some major accidents, including the **Balasore and Kavaraipettai incidents**.
 - **Since 1990-1991**, the Railways has classified nearly 70% of all major accidents as

derailments due to **signalling errors**.

- **Network Congestion:** High levels of congestion on the railway network are highlighted as a significant safety issue.
 - According to the [draft National Rail Plan](#), nearly **30%** of the railway network is utilised to **more than 100% capacity** exacerbating the safety risks.
- **Insufficient Track Maintenance:** The Railways needs to keep up existing equipment, including **replacing tracks and wagons** and maintaining trackside infrastructure.
 - But in the **2023-2024 budget, capital outlay** for track renewal dropped to **7.2%**.
 - Appropriations to the [Depreciation Reserve Fund](#) also fell **96%** between 2014-19.
- **High Operating Ratio:** The **operating ratio (OR)** in 2024-2025 is estimated to be **Rs 98.2**, a small improvement from **2023-2024 (Rs 98.7)** but a decline from **Rs 97.8 in 2016**.
 - A higher OR leaves **less for capex** and makes the Railways more dependent on **budgetary support** and [Extra-Budgetary Resources \(EBRs\)](#).
 - This financial tension results in underfunding for **critical safety upgrades** and infrastructure improvements.
 - OR is the amount the Railways spends to earn Rs 100.
- **Slow Infrastructure Development:** Of the [Dedicated Freight Corridors \(DFCs\)](#) the government mooted in 2005, only the [eastern DFC](#) is fully operational.
 - The **western DFC is partly ready**; the east coast, **east-west sub-corridor**, and **north-south sub-corridor DFCs**, amounting to 3,958 km, are still in **planning**.
 - Such a demand and supply gap of infrastructure compounds the safety problem.
- **Off-Setting of Loss:** As per [NITI Aayog](#), freight rates increased **more than thrice** as fast as passenger rates in 2009-2019 but Railways' freight profit is **offset significantly by passenger losses**.
 - In **2019-2020**, the revenue from passenger services was a little over **Rs 50,000 crore** and losses were **Rs 63,364 crore**.
- **Prolonged Working Hours:** One key cause of railway accidents, especially [Signal Passed at Danger \(SPAD\)](#) cases, is loco pilots' extended working hours.
 - Manpower shortages force them to **exceed the 12-hour duty limit**, causing fatigue and increasing the risk of human error.

What Recommendations have various Committees made to Enhance Railway Safety?

- **Rakesh Mohan Committee (2010):**
 - Revamp the accounting system to align with Indian GAAP ([Generally Accepted Accounting Principles](#))
 - Focus on **long-distance and inter-city transport**, speed upgrades, and [High-Speed Rail corridors](#) for passenger services
 - Develop **logistics parks** at key network hubs
- **Kakodkar Committee (2012):**
 - Establishing a statutory [Railway Safety Authority](#)
 - Forming a non-lapsable [Rashtriya Rail Sanraksha Kosh \(RRSK\)](#) of Rs. 1 lakh crores over **5 years** for safety projects.
 - Adopting advanced technologies for **track maintenance and inspection**.
- **Bibek Debroy Committee (2014):**
 - Establishing a [Railway Infrastructure Authority of India](#).
 - **Outsourcing** non-core activities.
- **Vinod Rai Committee (2015):**
 - Setting up an **independent Railway Safety Authority** with statutory powers
 - Forming a [Railway Accident Investigation Board](#) for impartial inquiries
 - Establishing a separate [Railway Infrastructure Company](#) for owning and maintaining railway assets

What are the Steps taken for Railway Safety?

- [Kavach System](#)
- [Rashtriya Rail Sanraksha Kosh \(RRSK\)](#)

- [Eliminated Unmanned level crossing](#)
- **GPS-based Fog Safety Devices**

What can be Done to Prevent Railway Accidents?

- **Addressing Loco Pilot Vacancies:** Indian Railways faces about **18,799 loco pilot vacancies**. Immediate action is needed to **fill these positions** to prevent overworking pilots and **reduce errors from stress and exhaustion**.
- **Implement 'Kavach' Anti-Collision System:** The **Railways must expedite the installation of Kavach** on more routes, especially **high-traffic and high-risk sections**, to prevent future collisions.
- **Address Network Congestion:** Prioritising **Dedicated Freight Corridors (DFCs)** and completing pending projects can help **distribute traffic more evenly** and reduce congestion.
- **Independent Railway Safety Authority:** Creating an independent **Railway Safety Authority** as recommended by the [Kakodkar Committee](#) would ensure a more **specialised and independent** approach to railway safety oversight.
- **Work Hour Regulations:** Stricter **enforcement of work hour limits** and ensuring that crew members have **adequate rest** are essential to reduce human errors.
- **Improve Signal Infrastructure:** Investments in advanced **signal and communication technologies** can drastically reduce the chances of accidents caused by **signal failures**.
- **Installation of Fencing Along Tracks:** Installing **fences along railway tracks** in high-risk areas could prevent **cattle runovers** that have been a cause of derailments.
- **Increasing Passenger Revenue:** Increasing **passenger fares** judiciously or **improving the efficiency of passenger services** could help mitigate losses.

Drishti Mains Question:

Q. Assess the significance of infrastructure development, including the completion of Dedicated Freight Corridors (DFCs), in improving railway safety and operational efficiency.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims:

Q. Consider the following communication technologies: (2022)

1. Closed-circuit Television
2. Radio Frequency Identification
3. Wireless Local Area Network

Which of the above are considered Short-Range devices/technologies?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (d)

Mains

Q. The setting up of a Rail Tariff Authority to regulate fares will subject the cash strapped Indian Railways to demand subsidy for obligation to operate non-profitable routes and services. Taking into account the experience in the power sector, discuss if the proposed reform is expected to benefit the consumers, the Indian Railways or the private container operators. **(2014)**

International Abhidhamma Divas

Source: [PIB](#)

Why in News?

Recently, India's Prime Minister addressed a ceremony in celebration of **International Abhidhamma Divas (IAD)** and recognition of [Pali](#) as a [classical language](#).

- It was organised by the [International Buddhist Confederation \(IBC\)](#) and the **Ministry of Culture**.

What are Key Facts About International Abhidhamma Divas?

- **About IAD:** Abhidhamma Divas commemorates the **descent of [Lord Buddha](#)** from the **celestial realm** of the thirty-three divine beings (**Tāvātimsa-devaloka**) to Sankassiya (Sankisa Basantapur, Farrukhabad) in **Uttar Pradesh**.
 - The importance of this location is highlighted by the presence of the [Asokan Elephant Pillar](#).
- **Story behind Abhidhamma:** According to the Pali texts, Buddha preached the **Abhidhamma** first to the **Gods** of the **Tavatimsa heaven**, who were headed by his **mother**.
 - After having returned to the earth again, he conveyed the message to his disciple **Sariputta**.
- **Mark of Event:** Abhidhamma Divas coincides with the end of the [rainy retreat \(Vassa\)](#) and the **Pavāraṇā festival**.
 - **Rainy retreat (Vassa)** is an annual **three-month monastic retreat** practised especially in the [Theravada Buddhist](#) tradition during the [monsoon season](#).
 - The **Pavāraṇā festival** marks the **conclusion of Vassa**, where monks come together to **confess any faults or mistakes** made during the retreat and invite their fellow monks to point out any shortcomings they may have noticed.
 - Pavāraṇā festival is celebrated on **full moon day of the 11th lunar month** which usually in October.

What is Abhidhamma Pitaka?

- The [Abhidhamma Pitaka](#) is the **last of three Pitakas** that constitute to **Pali Canon**, one of the most popular scriptures of **Theravada Buddhism**.
 - Abhidhamma Pitaka is a **detailed scholastic analysis** and summary of the Buddha's teachings in the **Suttas**. It deals with the **philosophy, doctrine, psychology, metaphysics, ethics, and epistemology** of Buddhism
 - The other remaining Pitakas of Tipitaka are **Vinaya Pitaka** and **Sutta Pitaka**.
 - [Vinaya Pitaka](#) is the **monastic rules of conduct** for monks and nuns of the Sangha.
 - [Sutta Pitaka](#) contains **suttas (teachings/discourses)** delivered by the Buddha and his close disciples.
- The Abhidhamma Pitaka consists of **seven different books**.

- **Dhammasangani** (Enumeration of Phenomena)
- **Vibhanga** (Book of Treaties)
- **Dhatukatha** (Discussion with Reference to the Elements)
- **Puggalapanatti** (Description of Personality)
- **Kathavatthu** (Points of Controversy)
- **Yamaka** (Book of Pairs)
- **Patthana** (Book of Relations)

BUDDHISM

ORIGIN

- **6th century BC**, based on the teachings of Gautam Buddha

MAIN FEATURES

- **Essence** - Attainment of enlightenment (Nibbana)
- **Supreme Deity** - None

PRINCIPLES

- Avoid the extremes; follow Madhyam Marg (middle path)
- Individualistic component (everyone is responsible for their own happiness)
- **4 Noble Truths:**
 - Dukkha (suffering)
 - Samudya (cause of suffering)
 - Nirodha (suffering could be ended)
 - Atthanga Magga (8-fold path to achieve this)
- **8-Fold Path:**
 - Right - view, intention, speech, action, livelihood, mindfulness, effort and concentration

BUDDHISM REJECTS

- Authenticity of Vedas
- Concept of soul (atman) (unlike Jainism)

MAJOR BUDDHIST TEXTS

- **Sutta Pitaka** (main teachings of Buddha - Dhamma)
- **Vinaya Pitaka** (rules of conduct for monks/nuns)
- **Abhidhamma Pitaka** (philosophical analysis)
- Other imp texts - **Divyavadana, Dipavamsa, Mahavamsa, Milind Panha**

Budhha's teachings were rehearsed, authenticated & divided in 3 Pitakas at the 1st Buddhist Council

These teachings were written down c. 25 BC in Pali

4 BUDDHIST COUNCILS

Buddhist Council	Patron	Venue	Chairman	Year
First	Ajatashatru	Rajgriha	Mahakashyapa	483 BC
Second	Kalashoka	Vaishali	Sabbakami	383 BC
Third	Ashoka	Patliputra	Mogaliputra	250 BC
Fourth	Kanishka	Kundalban (Kashmir)	Vasumitra	72 AD

What are Key Facts About Pali Language?

- **Origin of Pali:** Pali belongs to the **Indo-European language family**.
 - **Initially**, Pali was thought to be **identical with Magadhi**, the language of **Magadha** (modern-day Bihar).
 - Recent studies show **Pali** has a stronger resemblance to the **Prakrits of Western India**.
- **Classical Language:** The Union Cabinet has approved the recognition of **Pali** alongwith Prakrit, Marathi, Assamese, and Bengali as **classical languages**.
- **Connection with Ashoka:** Emperor Ashoka's inscriptions were written **Pali** especially in modern-day **Uttar Pradesh**.
- **Connection with Buddhism:** Pali is the language of the **three Theravada Buddhist canon** i.e.,

Vinaya Pitaka, Sutta Pitaka and Abhidhamma Pitaka.

- **Scripts of Pali:** Originally it was written in **Brahmi and Kharosthi scripts**. As Buddhism spread, Pali was written in local scripts like **Sinhalese** in Sri Lanka, **Burmese** in Myanmar, **Thai** in Thailand and **Khmer** in Cambodia.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. With reference to the cultural history of India, consider the following pairs: (2020)

1. Parivrajaka – Renunciant and Wanderer
2. Shramana – Priest with a high status
3. Upasaka – Lay follower of Buddhism

Which of the pairs given above are correctly matched?

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

Ans: (b)

Q. With reference to the cultural history of India, which one of the following is the correct description of the term 'paramitas'? (2020)

- (a) The earliest Dharmashastra texts written in aphoristic (sutra) style
- (b) Philosophical schools that did not accept the authority of Vedas
- (c) Perfections whose attainment led to the Bodhisattva path
- (d) Powerful merchant guilds of early medieval South India

Ans: (c)

Q. With reference to the religious history of India, consider the following statements: (2020)

1. Sthaviravadins belong to Mahayana Buddhism.
2. Lokottaravadin sect was an offshoot of Mahasanghika sect of Buddhism.
3. The deification of Buddha by Mahasanghikas fostered the Mahayana Buddhism.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 3 only
- (d) 1, 2 and 3

Ans: (b)

Plankton Inflation and Vertical Migration

[Source: TH](#)

Why in News?

Recently, researchers studied **vertical migration** of **Pyrocystis noctiluca**, a specific **bioluminescent phytoplankton** species which is capable of **inflating its size** during its migration.

- This species can expand to **six times** its original size of a **few hundred microns**, aiding its **buoyancy**.

What are Key Facts Related to Vertical Migration of Phytoplankton?

- **Vertical Migration:** Many plankton travel from the **cold, dark depths of the ocean** to the **surface**, then **drift back down** into the darkness in a continuous cycle called **vertical migration**.
 - The movement mechanism of **single-celled phytoplankton**, especially those without swimming appendages, remains largely **unexplained**.
- **Density Dynamics of Phytoplankton:** Phytoplankton are generally **5%-10% denser than seawater**, which poses a challenge for their ability to remain near the surface for photosynthesis.
 - *Pyrocystis noctiluca* cells behave like **little submarines** which can control their **density** so they can choose where they want to reach the ocean's surface.
- **Ballooning Mechanism:** The research team utilised a **“gravity machine”** which can **alter water pressure and density**, mimicking the ocean's depths.
 - The team found that **inflated cells** were less dense than the surrounding seawater, allowing them to **float** toward the surface **despite gravity**.
- **Inflation During Cell Division:** The inflation process **occurs naturally** during the phytoplankton's cell cycle.
 - When a **single cell divides**, an internal structure called a **vacuole** acts as a **flexible water tank**, taking in freshwater and causing the **new cells to swell**.
 - This **inflation** allows the lighter **daughter cells to float upward**, reaching the nutrient-rich surface waters.
 - The entire cell cycle of **Pyrocystis noctiluca** lasts approximately **seven days**, which aligns with the vertical pursuit of **light and essential nutrients**.

What are Planktons?

- **About Planktons:** Plankton are **microscopic organisms** that play a crucial role in marine ecosystems, serving as the **foundation** of the entire **marine food web**.
 - An organism is classified as **plankton** if it is carried by tides and currents and **lacks the ability to swim** against these forces.
- **Types of Plankton:**
 - **Phytoplankton:** **Plant-like organisms** that perform **photosynthesis**, converting sunlight into energy, and are vital for producing oxygen and absorbing carbon dioxide. E.g., **Cyanobacteria**, **Blue-green algae**, **diatoms**, **dinoflagellates**.
 - Phytoplankton depend on nutrients like **phosphate**, **nitrate**, and **calcium** from their environment to thrive.
 - **Zooplankton:** **Animal-like organisms** that include microscopic animals (such as **krill and sea snails**) and weak swimmers like **jellyfish**. E.g., Radiolarians, Foraminiferans, **cnidarians**, **crustaceans**, **chordates**, and **molluscs**.
- **Size of Planktons:** Plankton can vary in size, from **microscopic organisms** to larger species

like **crustaceans and jellyfish**.

- **Role in the Marine Food Web:** Phytoplankton form the base of the marine food web, supporting various marine life.
 - **Zooplankton** primarily **feed on phytoplankton** and, in turn, serve as food for larger marine animals, creating a **critical food chain link**.
 - **E.g., Krill** are a major component of the diet of **humpback, right, and blue whales**.
- **Migration Patterns:** During the **day**, zooplankton drift to **deeper waters** to evade predators, but at **night**, they **rise to the surface** to feed on phytoplankton.
 - This process is considered the **largest migration** on Earth; so many animals make this journey that it can be **observed from space**.
- **Habitat:** Plankton inhabit both **saltwater and freshwater ecosystems**.
 - **Clearer waters** typically indicate **fewer plankton**, while more **turbid waters (cloudy or muddy)** are often **richer in plankton**.



Cyanobacteria



Diatom



Dinoflagellate



Green algae



Coccolithophore



Copepods



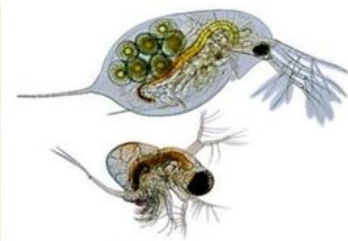
Rotifers



Ostracods



Protozoans



Cladocerans



Crustaceans

UPSC Civil Services Examination, Previous Year Question

Prelims

Q. Consider the following kinds of organisms:

1. Copepods
2. Cyanobacteria
3. Diatoms
4. Foraminifera

Which of the above are primary producers in the food chains of oceans?

- (a) 1 and 2
- (b) 2 and 3
- (c) 3 and 4
- (d) 1 and 4

Ans: (b)

Q. Which one of the following is the correct sequence of a food chain? (2014)

- (a) Diatoms-Crustaceans-Herrings
- (b) Crustaceans-Diatoms-Herrings
- (c) Diatoms-Herrings-Crustaceans
- (d) Crustaceans-Herrings-Diatoms

Ans: (a)

Funga Taxonomic Kingdom

Source: DTE

Why in News?

Recently, **Chile and the United Kingdom** have prepared a proposal named '**pledge for fungal conservation**' to give fungi its **own taxonomic kingdom** named '**funga**'.

- The proposal would be submitted during the 16th Conference of Parties (COP16) of the [UN Convention on Biological Diversity \(CBD\)](#) in Cali, Colombia in October 2024.

What are the Key Highlights of the Pledge for Fungal Conservation?

- **About the Proposal:** It aims to recognise fungi as an **independent kingdom**, termed Funga, alongside **plants (flora) and animals (fauna)**.
 - It advocates for the recognition of fungi in **legislation, policies, and global agreements** to maintain fungi's ecological benefits.
- **Current Status:** In August 2021, the [International Union for the Conservation of Nature Species Survival Commission \(IUCN SSC\)](#) and [IUCN Re:wild](#) became the first organisations to recognise fungi as one of three kingdoms of life.
 - The **Chilean-British-led "3F" (Flora, Fauna, and Funga) initiative** emphasises the need for international recognition and protection of fungi.
- **Wide Diversity:** As per **Mycologists**, only **8%** of the total **2.2 and 3.8 million species** of fungi are scientifically known and about **2,000 new species** are discovered annually across the world.
 - **Mycologist studies fungi** such as moulds, yeasts, and mushrooms.
- **Ecological Importance of Fungi:** Fungi help in **decomposition, forest regeneration, carbon sequestration**, and maintaining the global nutrient cycle.
 - They play a vital role in **mammalian digestion** and are crucial in the production of **antibiotic medication**.

- Several common food products, including **bread, cheese, wine, beer, and chocolate**, depend on fungi for their production
- Fungi also help in **cleaning polluted soils** and offer sustainable food alternatives to animal products e.g., **amino acids, fibre, and antioxidants**.
- Boreal forest fungi **absorb** significant amounts of **carbon** through **root symbiosis** with plants, thus contributing to mitigating climate change.
- **Threats to Fungi: Overharvesting, nitrogen enrichment in soils**, deforestation, climate change, pollution, and the wide scale use of fungicides endanger fungal species.
 - These threats jeopardise the **symbiotic relationships** fungi have with plants and animals, disrupting ecosystem stability.

What are Key Facts About Fungi?

- **About Fungi:** Fungi is a group of **eukaryotic, non-phototrophic organisms** with rigid cell walls. It includes **mushrooms, moulds and yeasts**.
- **Cell Structure:** Fungi have a unique cell wall composed of **chitin** which is a defining feature of the fungal kingdom.
 - **Plants** have cell walls made of **cellulose**, and **bacteria** have **peptidoglycan** in their walls.
- **Nutritional Mode:** Fungi are **heterotrophic**, meaning they obtain nutrients by absorbing organic matter from their environment.
 - They do this through **external digestion**, where they **secrete enzymes** to break down complex substances before absorbing the simpler molecules.
- **Reproductive Strategies:** Fungi reproduce through both **asexual** and **sexual** means, often utilising spores.
- **Growth Form:** Fungi typically grow as **mycelium**, a network of **filamentous** structures called **hyphae**.
- **Symbiotic Relationships:** Fungi are known for forming **symbiotic relationships** with other organisms, such as **mycorrhizal associations** with plants.
 - Some fungi also form **lichens** in association with **algae**.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims:

Q. Which of the following have species that can establish a symbiotic relationship with other organisms? (2021)

1. Cnidarians
2. Fungi
3. Protozoa

Select the correct answer using the code given below.

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (d)

Q. Consider the following: (2021)

1. Bacteria
2. Fungi

3. Virus

Which of the above can be cultured in an artificial/synthetic medium?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (a)

Q. Lichens, which are capable of initiating ecological succession even on a bare rock, are actually a symbiotic association of (2014)

- (a) algae and bacteria
- (b) algae and fungi
- (c) bacteria and fungi
- (d) fungi and mosses

Ans: (b)

Q. With reference to the food chains in ecosystems, which of the following kinds of organism is/are known as decomposer organism/organisms? (2013)

1. Virus
2. Fungi
3. Bacteria

Select the correct answer using the codes given below:

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (b)

Q. Improper handling and storage of cereal grains and oilseeds result in the production of toxins known as aflatoxins which are not generally destroyed by normal cooking processes. Aflatoxins are produced by(2013)

- (a) bacteria
- (b) protozoa
- (c) moulds
- (d) viruses

Ans: (c)

Presidential Visit to Malawi and Mauritania

[Source: PIB](#)

Recently, India's President visited **Malawi and Mauritania**.

- This is the **first-ever visit** by an Indian **President** to **Malawi and Mauritania**.
- India is the **4th largest trading partner** of Malawi with bilateral trade of **USD 256.41 million** in 2021-22.
 - India's investment in Malawi stands over **USD 500 million**.
 - Malawi (formerly known as **Nyasaland**) is a **landlocked** country in **southeastern Africa**.



- In 2019-20, total bilateral trade between India and **Mauritania** was **USD 94.53 Million**.
 - Indigenous **Berber people** and the **Moors** inhabit Mauritania.
 - Mauritania lies in **western Africa** and is located in the **Atlantic Ocean**.
 - India opened its mission in **Nouakchott (Mauritania capital)** in June 2021.



Read More: [New Pathways in India-Africa Collaborations](#)

WHO Approves First Mpox Diagnostic Test

Source: [TH](#)

Recently, the [World Health Organization \(WHO\)](#) has listed the first [Mpox](#) **in vitro diagnostic** under its Emergency Use Listing procedure.

- **About:** Mpox, also known as **monkeypox**, is a [DNA virus](#). It was **first identified in monkeys in 1958** but has since been found to infect humans as well.
- **Transmission:** Primarily **transmitted to humans from animals**, particularly rodents and primates, through direct contact or through contaminated objects.
- **Symptoms:** Fever, headache, muscle aches, and a characteristic rash that progresses from macules to papules to vesicles and pustules.
- **Global Outbreak:** In August 2024, WHO declared the mpox outbreak a [public health emergency](#), leading to coordinated efforts to control its spread.
- **Emergency Test:**
 - The emergency use approval of the **Alinity m MPXV assay**, developed by Abbott Molecular Inc, will play a **crucial role in enhancing diagnostic capacity** in countries experiencing Mpox outbreaks.
 - Currently, **35 laboratories across India are equipped to test** suspected cases of Mpox.

Read more: [WHO Declares Mpox a PHEIC](#)

Fortified Rice

Source: [PIB](#)

The Union Cabinet has approved the continuation of [fortified rice](#) distribution under government schemes, including [PMGKAY](#), from July 2024 to December 2028, aimed at combating micronutrient deficiencies in India.

- **About Fortification:** Fortification is the process of adding nutrients to food products that are not naturally present or are present in insufficient amounts.
 - [Rice fortification](#) can be achieved by either coating grains with a micronutrient premix or by blending extruded rice kernels enriched with micronutrients with regular rice.
 - Fortification **aligns with WHO guidelines** and is crucial as 65% of India's population consumes rice daily.
 - India's rice fortification program **started in 2019** as a pilot program and scaled up in a 3 phased manner.
 - Fortified rice has been distributed in states like **Jharkhand and Maharashtra**, with no reported adverse effects.
- **PM-GKAY:** [PMGKAY](#) aimed at providing each person who is covered under the [National Food Security Act 2013](#) with an additional 5 kg grains (wheat or rice) for free, in addition to the 5 kg of subsidised foodgrain already provided through the [Public Distribution System \(PDS\)](#).
- **Safety Assurance:** Scientific evidence confirms that fortified rice is safe for individuals with [Thalassemia](#) and [Sickle Cell Anaemia](#).
- **Labeling Update:** The requirement for health advisories on fortified rice packaging has been removed after a review found no safety risks, aligning with global practices where organizations like WHO and the FDA do not mandate such advisories.
 - Currently, 18 countries actively allow rice fortification.

Read more: [Fortification of Rice](#)

Supreme Court Unveils New Justice Statue

Source: [HT](#)

Recently, the **Lady Justice statue** was unveiled at the [Supreme Court](#), on the directions of [the Chief Justice of India](#).

- The statue was **without the blindfold**, and with the [Constitution](#) held in place of the sword, signifying that the law in India is both informed and not driven by retribution.
- **About Lady Justice:**
 - Lady Justice is an **allegorical figure** representing the **moral authority within judicial systems**.
 - It is often depicted alongside Prudentia, another allegorical figure representing wisdom and prudence.
 - **Traditional Depiction:**
 - Traditionally, the blindfold symbolised [equality before the law](#), implying that **justice should be delivered impartially**, without being swayed by the wealth, power, or status of the parties involved.
 - **The sword** historically represented the **authority of the law and its power to punish** wrongdoing.
 - **New Depiction:**
 - The new statue, **dressed in a saree** instead of Lady Justice's robe, **reflects a departure from colonial influences** like replacing colonial-era laws like

the [IPC](#) and [CrPC](#).

- Despite the changes, **the scales of justice** in Lady Justice's right hand have been retained, representing societal balance and the **importance of carefully weighing facts and arguments from both sides** before reaching a verdict.



Read More: [New Criminal Laws Come into Force](#)

PDF Reference URL: <https://www.drishtias.com/current-affairs-news-analysis-editorials/news-analysis/21-10-2024/print>