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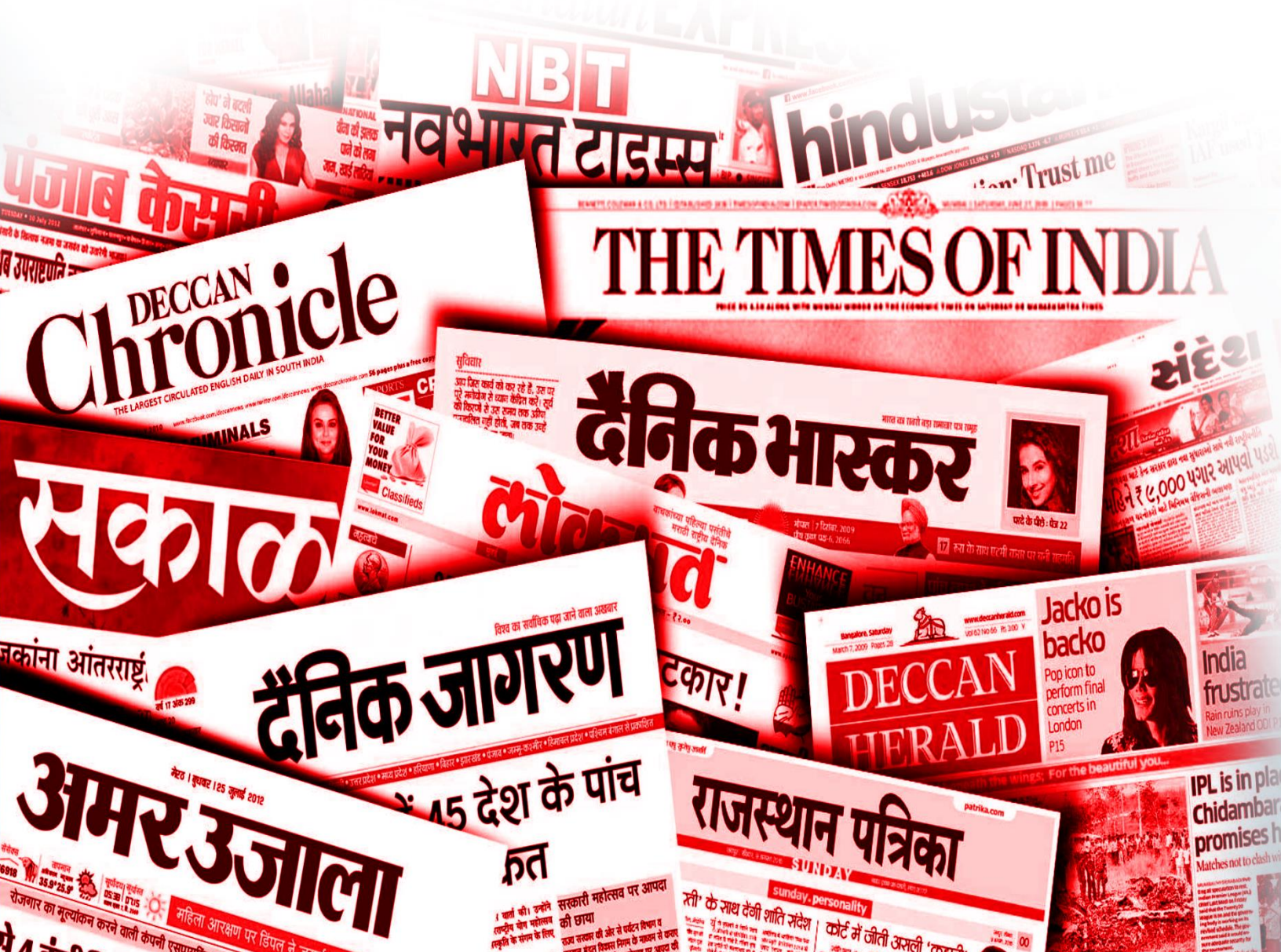

The Hindu Important News Articles & Editorial For UPSC CSE

Wednesday, 18 June, 2025

Edition: International Table of Contents

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The Kerala High Court has ordered a ban on single-use plastic (SUP) in hilly tourist areas, eateries, weddings, and official government functions, effective October 2 (Gandhi Jayanti). This decision comes amidst growing concern over the unregulated disposal of plastic waste in ecologically sensitive zones and public areas.

Kerala HC bans single-use plastic in hilly areas, hotels

Court expresses concern over irresponsible disposal of plastic waste in the State; bans use of plastic in eateries, weddings, and functions hosted by government agencies from October 2

The Hindu Bureau
KOCHI

Expressing concern about the pollution caused by unregulated and irresponsible disposal of plastic waste in the State, the Kerala High Court on Tuesday issued an order banning the use of single-use plastic items in hilly areas where visitors converge in large numbers, at functions like weddings and also in eateries, effective from October 2, Gandhi Jayanthi.

The ban is on plastic water bottles with less than five litre carrying capacity, soft drink bottles with less than two litre carrying capacity, food containers, plates, cups and straws, among others, and is extended to official functions hosted by government agencies. Irresponsible disposal of plastic waste posed a serious threat to all life forms, said the court.

Serious threat: Wild elephants eating plastic from a dumping yard at Kallar near Munnar in Kerala. FILE PHOTO

The court went on to add that an adequate number of kiosks that vend clean and safe drinking water must be set up at tourist spots in hilly areas, at weddings and other events, or water should be supplied in glass or stainless steel bottles.

'Keep waterbodies safe'

In addition, the State government and local bodies must take steps to prevent the dumping of plastic waste in waterbodies.

On its part, the State government must take steps to spread awareness on the ill effects of single-use plastics and the indiscriminate dumping of plastic waste, the court said.

Key Highlights of the Court Order:

- **Scope of the Ban:**
  - The ban includes plastic water bottles (less than 5 litres), soft drink bottles (less than 2 litres), plastic food containers, plates, cups, straws, and related items.
  - Targeted Locations:

    - Hilly regions with high tourist footfall (e.g., Munnar, Wayanad)
    - Hotels, restaurants, and roadside eateries
    - Social gatherings like weddings
    - Official government events
- Environmental Justification:
    - The court cited serious threats to life forms, including wild animals like elephants seen consuming plastic from dumping sites, as a trigger for intervention.
- Alternatives & Infrastructure:
    - The court directed the setting up of clean drinking water kiosks in public places and events, promoting the use of glass or stainless steel bottles as sustainable alternatives.
- Waterbody Protection:
    - The state government and local bodies have been ordered to prevent dumping of plastic waste in rivers, lakes, and other waterbodies, which has become a critical ecological issue.
- Awareness and Enforcement:
    - The court stressed the need for public awareness campaigns on the environmental and health hazards of SUPs and demanded that the government implement the ban strictly.

Significance :

- Judicial Activism in Environmental Protection:
    - The court's proactive stance reflects the growing role of the judiciary in enforcing environmental governance, especially where administrative mechanisms are lagging.
- Decentralised Environmental Management:
    - By directing local bodies to act, the judgement strengthens the role of urban local governments and panchayats in managing ecological concerns.
- Sustainable Tourism and Public Events:
    - The order aligns with the principles of sustainable development and eco-tourism, particularly in fragile hill ecosystems.
- Plastic Pollution as a National Concern:
    - Despite national regulations (Plastic Waste Management Rules, 2016 and 2022 amendments), implementation gaps remain. This judgment can serve as a model for other states.
- Behavioral Change through Institutional Action:
    - By integrating judicial mandates with public events (weddings, functions), the move promotes mass awareness and behavioral transition away from plastic dependence.

Conclusion:

- The Kerala High Court's order banning single-use plastic in sensitive regions and social gatherings is a landmark step in bridging the gap between environmental law and ground-level implementation. It underscores the urgent need for multi-stakeholder coordination, public awareness, and

infrastructure support to move towards a plastic-free, sustainable future. Other states and Union Territories must draw lessons from Kerala's judicially driven environmental initiative.

UPSC Mains Practice Question

Ques : What are the challenges in enforcing single-use plastic bans in India? Suggest measures to enhance compliance and public participation, drawing examples from state-level initiatives. **(250 words)**

Page 06: GS 3 : Science and Technology

According to the 2025 report by the Stockholm International Peace Research Institute (SIPRI), India has increased its nuclear warhead stockpile from 172 in 2024 to 180 in 2025. This reflects India's ongoing nuclear modernization program, including the development of canisterised missiles and enhanced delivery systems. The report also flags rising global nuclear tensions, especially between India and Pakistan, and the weakening of global arms control regimes like the New START Treaty.

India increased its nuclear warhead count to 180 in 2024: SIPRI report

The Hindu Bureau
NEW DELHI

Nearly all of the nine nuclear-armed countries, including India and Pakistan, continued intensive nuclear modernisation programmes in 2024, upgrading existing weapons and adding newer versions, the Stockholm International Peace Research Institute (SIPRI), a global think tank, says in its 2025 report.

India is believed to have once again "slightly expanded" its nuclear arsenal in 2024 and continued to develop new types of nuclear delivery systems. "India's new 'canisterised' missiles, which can be transported with mated warheads, may be capable of carrying nuclear warheads during peacetime, and possibly even multiple warheads on each missile, once they become operational," the SIPRI says.

'Nearly all of the nine nuclear-armed countries upgraded weapons, added newer versions'

"Pakistan also continued to develop new delivery systems and accumulate fissile material in 2024, suggesting that its nuclear arsenal might expand over the coming decade," it says, observing that in early 2025, tensions between India and Pakistan briefly spilled over into armed conflict.

"The combination of strikes on nuclear-related military infrastructure and third-party disinformation risked turning a conventional conflict into a nuclear crisis," says Matt Korda, associate senior researcher with SIPRI's Weapons of Mass Destruction Programme and associate director for the Nuclear Information Project at FAS. "This should act as a stark warning for states seeking to increase their reliance on nuclear weapons," he says.

The findings, SIPRI says, are that a dangerous new nuclear arms race is emerging at a time when arms control regimes are severely weakened. The nine nuclear-armed countries are the United States, Russia, the United Kingdom, France, China, India, Pakistan, the Democratic People's Republic of Korea (North Korea), and Israel.

Call for caution

According to the SIPRI estimates, India's stored warheads increased to 180 in January 2025, from 172 in January 2024; whereas that of Pakistan remained at 170. The U.S. has 1,770 deployed and 1,930 stored warheads, while its inventory stands at 5,177 in 2025 compared with 5,328 in 2024.

Russia has 1,718 deployed and 2,591 stored warheads, and its inventory stands at 5,459, as against 5,580 in 2024. China has 24 deployed warheads and 576 stored ones, with its inventory rising to 600 in January 2025 from 500 in 2024.

The total inventory stands at 12,241, of which 9,614 warheads are in "military stockpiles for potential use". An estimated 3,912 warheads are deployed with missiles and aircraft, and the rest are in central storage.

The report cautions that if no new agreement is reached to cap their stockpiles, the number of warheads deployed on strategic missiles might increase after the expiry of the bilateral 2010 Treaty on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START) in February 2026.

Key Highlights of the Report:

- **India's Nuclear Expansion:**
  - Warhead count increased to 180 (from 172).
  - Focus on 'canisterised' missiles that can carry mated warheads and potentially Multiple Independently targetable Reentry Vehicles (MIRVs).
  - Emphasis on survivable second-strike capability and rapid deployment.
- Pakistan's Parallel Development:
  - Continued accumulation of fissile material.
  - Introduction of new delivery systems.
  - Potential expansion of arsenal over the coming decade.
- Rising Regional Tensions:
  - Armed skirmishes between India and Pakistan in early 2025.
  - Strikes on nuclear-related infrastructure increased risk of escalation.
  - Third-party disinformation campaigns amplified crisis intensity.
- Global Nuclear Risks:
  - Total global inventory at 12,241 warheads.
  - 9,614 in military stockpiles, 3,912 deployed.
  - Breakdown of arms control efforts (e.g., New START Treaty expiring in 2026 without clear replacement).
- India's Position and Strategic Rationale:
  - India's nuclear policy remains governed by "No First Use" and "credible minimum deterrence".
  - The modernization efforts align with the evolving regional threat landscape — notably China's expanding arsenal and assertiveness, and Pakistan's tactical nuclear doctrine.
  - Development of canisterised and mobile launch platforms indicates a shift toward quicker deployment and enhanced deterrence credibility.

Challenges and Concerns:

- Risk of Arms Race in South Asia:
  - The growth of nuclear capabilities in both India and Pakistan could lead to a destabilizing arms race, especially in the absence of structured bilateral arms control dialogue.
- Strategic Ambiguity and Crisis Escalation:
  - Incidents involving strikes on nuclear-linked assets, even conventional, can lead to misperception-driven escalation, especially with disinformation in play.
- Erosion of Global Arms Control Frameworks:
  - The potential end of the New START treaty between the U.S. and Russia without a successor could lead to unregulated deployment of strategic weapons, indirectly affecting India's security calculus.
- Pressure on India's Strategic Autonomy:

- India may face diplomatic pressure to join future arms control frameworks or the Nuclear Non-Proliferation Treaty (NPT), which it currently stays out of due to structural inequities.

Way Forward for India:

- Strengthen command-and-control structures and early-warning systems to reduce accidental escalation.
- Engage in track-II or regional dialogues on nuclear risk reduction with neighbours.
- Continue to modernize arsenal for credible deterrence, but within the framework of transparency, restraint, and international norms.
- Enhance public diplomacy to reaffirm India's commitment to no-first-use and nuclear disarmament goals under UN frameworks.

UPSC Mains Practice Question

Ques:"India's evolving nuclear doctrine reflects a shift in strategic realism amidst regional instability." Critically examine this statement in the context of the SIPRI 2025 report.**(250 words)**

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A landmark study published in Cell has demonstrated that rice plants (Oryza sativa) can adapt to cold by altering epigenetic marks—chemical modifications on DNA that regulate gene expression without changing the underlying genetic code. Remarkably, these changes were heritable across five generations, lending experimental support to Lamarck's theory of acquired characters—long thought obsolete in the face of Darwinian natural selection and Mendelian genetics.

Rice reveals surprise ability to adapt to cold faster than evolution

A landmark study has shown that rice plants that have learned to tolerate cold temperatures by changing epigenetic marks on a gene called *ACT1* could also pass the ability to express this gene down five generations; this change was induced by exposing normal rice plants to low temperatures which gives credence to Lamarck's views on evolution

Arun Panchapakesan

In the early 1800s, 'the theory of acquired characters' was the most widely accepted explanation of evolution. Simply put, the theory stated that characteristics that an organism developed during its lifetime, through use, disuse or environmental influence, could be inherited by its offspring.

The French naturalist Jean-Baptiste Lamarck formalised this idea in two laws in 1809, and it remained unrivalled until half a century later. In 1859, Charles Darwin proposed natural selection, which said that variations are passed from parents to offspring and that changes that confer benefits survive while the detrimental ones perish. The two ideas co-existed for a brief while until two major scientific developments challenged Lamarck's views.

The first was German evolutionary biologist August Weismann's demonstration that even after cutting the tails of mice continuously for over five generations, there was no inheritance of this acquired characteristic in the offspring. The second was the rediscovery of the work of Gregor-Johann Mendel, who showed that inheritance is governed by stable, particulate units (now called genes) that are passed unchanged from parents to offspring.

The integration of Mendel's work with Darwin's ideas laid the foundation for understanding heredity. When DNA was later identified as the genetic material, it explained how changes in DNA sequence (called mutations) are passed from parents to offspring. Traits that improve an organism's chances of survival and reproduction are more likely to be passed on while less advantageous traits tend to be lost over time. This was called, in short, survival of the fittest.

For a long time, Lamarck's ideas lay forgotten.

If you have it, express it

In 1956, Canadian plant geneticist Royal Alexander Brink noticed something strange in maize. Despite having two copies of the gene for rich, purple-coloured kernels, some plants produced only weak pigments. Even more curious, their offspring also showed weak pigmentation despite carrying the same genes. This suggested that something other than DNA was influencing the trait and that this mysterious influence was heritable.

Scientists soon realised that having a gene is not enough: it must also be expressed, meaning its information must be used to make proteins. This expression is regulated in various ways.

Researchers subjected the rice plant *Oryza sativa* to low temperatures and used the number and quality of seeds produced as a way to assess how well the rice adapted. WOODY YAN/UNSPLASH

One important method involves small chemical tags added to the DNA that help cells decide whether a gene should be switched on or off. This system of gene regulation without altering the DNA sequence is called epigenetics.

In 1975, scientist Arthur Riggs proposed that these chemical tags, or epigenetic marks, could be inherited. This meant organisms could potentially pass on instructions about gene activity without changing their DNA sequence. Since it's easier to change these marks than to mutate DNA, it raised an intriguing possibility: if an environmental trigger caused a heritable epigenetic change, then Lamarck might have been partly right.

Inheritance, at least in some cases, could be due to environmental influence. The DNA itself didn't need to change.

Over the next 50 years, sporadic reports appeared stating that this might be the case – but none were convincing enough to firmly prove that a natural environmental cue could induce a heritable epigenetic change.

Lamarck redeemed

On May 22, a landmark study published in *Cell* showed, for the first time, that rice plants can acquire tolerance to cold temperatures by changing the epigenetic marks on a gene called *ACT1*. Surprisingly, this change was induced by exposing normal rice plants to low temperatures. Even more surprisingly, the change was heritable over five generations – proof that what Lamarck suggested over two centuries ago could indeed happen, albeit in a laboratory. The authors of the study achieved the feat by subjecting the rice plant *Oryza sativa* to low temperatures and using the number and quality of seeds produced as a way to assess how well the rice adapted. They observed that from the second generation onwards, seed quality improved and, importantly, the improvement was sustained across subsequent generations.

ACT1 is normally expressed at high levels in rice. But when exposed to cold, its expression is switched off by the addition of a methyl group, an epigenetic tag that tells the plant's cells not to produce the protein. Without sufficient _ACT1_, normal rice plants struggle to survive in the cold

Then they sequenced the total DNA of the cold-adapted rice and compared it with a control group grown under identical conditions but without the cold exposure. Although they found multiple genetic differences, none appeared to account for the enhanced cold tolerance. They next examined differences in gene expression between the two groups and identified 12 genes whose activity varied.

To understand why these 12 genes produced different levels of protein, the researchers investigated epigenetic marks and discovered more than 12,380 differences between the two groups. One of these changes was near a gene they called *ACT1*. Interestingly, *ACT1* was also among the 12 genes with altered expression.

What life has endured

The team then explored how this epigenetic change regulated *ACT1*. They found that ACT1, a gene involved in plant growth and development, is normally expressed at high levels in rice. But when exposed to cold, its expression is switched off by the addition of a methyl group, an epigenetic tag that tells the plant's cells not to produce the protein. Without sufficient *ACT1*, normal rice plants struggle to survive in the cold. The cold-adapted plants, however, didn't add this methyl signal. As a result, they continued to produce the *ACT1* protein, which supported their development under cold stress. These epigenetic marks were then passed on to their offspring, ensuring subsequent generations also expressed *ACT1* and survived in cold conditions.

In the century or so since they were discarded, Lamarck's ideas on evolution have been exhumed several times – mostly for criticism. It is perhaps poetic that nature itself had to step in to show us that he was not entirely wrong and that the environment can indeed influence heredity. The cold-adapted rice has shown us that sometimes, very rarely, inheritance is not determined by the code for life but rather by what that life has endured.

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THE GIST

The French naturalist Jean-Baptiste Lamarck formalised the theory of acquired characters; Darwin proposed natural selection. The two ideas co-existed for a brief while until major developments forced Lamarck's theory into dormancy

When researchers proposed that epigenetic marks could be inherited, it raised the possibility that if an environmental trigger caused a heritable change, then Lamarck might have been partly right. Inheritance could be due to environmental influence. The DNA itself didn't need to change

Lamarck's ideas on evolution have been exhumed several times — mostly for criticism. It is perhaps poetic that nature itself had to step in to show us that he was not entirely wrong and that the environment can indeed influence heredity

Key Scientific Insights:

- Epigenetics as a Mode of Inheritance:
  - Traditional genetics holds that DNA sequence (mutations) determines heritable traits.
  - Epigenetics shows that external environmental factors (like cold stress) can modify gene expression through chemical tags (e.g., DNA methylation) without altering the gene sequence.
  - These epigenetic modifications can be passed on to future generations under specific conditions.
- ACT1 Gene and Cold Tolerance:
  - The gene ACT1 supports plant growth and development.
  - In normal rice plants, cold exposure suppresses ACT1 via methylation, impairing cold survival.
  - In cold-adapted rice, this suppression does not occur, allowing ACT1 expression to continue—leading to enhanced cold tolerance and higher seed quality.
- Heritable Adaptation Without DNA Mutation:
  - Sequencing revealed no major genetic mutation responsible for adaptation.
  - Over 12,000 epigenetic differences were detected, proving that the change was epigenetic, not genetic.
  - The trait was passed to five generations, confirming stable inheritance of acquired environmental response.

Significance of the Study:

- Reviving Lamarck's Legacy in Modern Science:
  - The experiment offers rare, empirical validation of Lamarckian inheritance—the idea that traits acquired during an organism's lifetime can be passed on.
  - Though Darwinian selection remains the dominant evolutionary model, this study shows that non-genetic inheritance plays a supplementary role.
- Implications for Crop Science and Agriculture:
  - Offers a potential new pathway to develop climate-resilient crops without genetic modification (GM).
  - Epigenetic editing may become a tool for rapid, inheritable plant adaptation, especially in the era of climate change.
- Philosophical and Ethical Dimensions of Inheritance:
  - Challenges the notion that genetic code is the sole determinant of biological destiny.
  - Opens debate on how environmental stress not only influences individuals but also shapes generations.
- Scientific Paradigm Shift:
  - Reinforces that inheritance is multi-layered, involving both genetic and epigenetic factors.
  - Highlights the need to revisit and integrate historical scientific theories in light of modern evidence.

Conclusion:

- The cold-tolerant rice experiment is not just a scientific breakthrough in plant genetics—it is a philosophical vindication of Lamarckian thought and a practical gateway to future-ready agriculture. It underscores that inheritance is not only about what genes you have, but also about how life's experiences shape gene expression, with consequences that echo across generations. As climate pressures mount, epigenetic science may hold the key to rapid, sustainable adaptation in both plants and potentially animals.

UPSCMainsPractice Question

Ques:Discuss how epigenetic mechanisms can be leveraged to develop climate-resilient crops. What are the ethical and ecological considerations involved? (250 Words)

Page 09 : GS 2 : International Relations

In the wake of Israel's strike on Iran's nuclear-linked military infrastructure and the resurgence of global nuclear tensions, experts argue that the world has entered a "third nuclear age"—one that is far more unpredictable, fragmented, and dangerous than the structured bipolar deterrence of the Cold War era.

The third nuclear age

Priyanjali Malik

Author of India's Nuclear Debate: Exceptionalism and the Bomb

The world has entered a third nuclear age. Israel's bombing of Iran, supposedly to address the nuclear threat posed by the regime, contravenes diplomatic norms, tests international law to breaking point, and goes against the Nuclear Non-Proliferation Treaty which seeks to control proliferation through negotiations and treaty obligations. Yet no major power has criticised Israel's actions.

After the first nuclear age of the Cold War and its terrifying bipolar logic of mutually assured destruction between the U.S. and the USSR, followed by the relative optimism of the post-Cold War second nuclear age that assumed nukes could be pushed into the background until somebody figured out how to achieve total nuclear disarmament, we appear to have entered a third age where nuclear weapons and deterrence are back in focus.

Attitudes towards proliferation and deterrence began to harden with China's nuclear build up in the mid-2010s, which coincided with deteriorating relations between Russia and the West. Since then, Russia has threatened nuclear use over Ukraine, Europe is reconsidering how to deter Russia in the wake of waning American support for NATO, and some, including U.S. President Donald Trump and Prime Minister Narendra Modi, perceive a nuclear element to the recent hostilities between India and Pakistan. However, it would be a mistake to think that the third age reprises the first: this one is messier and more unpredictable.

The first nuclear age

The first nuclear age was consumed by superpower rivalry, epitomised by massive American and Soviet nuclear arsenals on hair-trigger alert. The other three nuclear powers played supporting parts as the superpowers first furiously increased their arsenals and then sought to create a nuclear regime that could accommodate their rivalry and achieve stability at lower levels of nuclear possession. After negotiating the NPT, the USSR and the U.S. engaged in bilateral arms control treaties that required reductions in their stockpiles from a peak of almost 70,000 warheads between them. The last of these, the New START, which limits deployed warheads to 1,550 each, expires in February 2026 and there are no negotiations for a successor treaty or extension.

The second nuclear age

At the same time, Russia and the U.S. are modernising their arsenals. America's 30-year, $1.5-2 trillion upgrade started under President Barack Obama soon after he was awarded the Nobel Peace Prize in 2009 in part for his efforts "to create a world free from nuclear weapons". China (at 600 warheads) is believed to have the fastest growing arsenal. Even if the U.S. and Russia were willing to discuss arms control, China's nuclear ambitions are likely to overshadow the conversation.

These nuclear modernisation programmes began during the second nuclear age. A negotiated test ban and talk of a fissile ban treaty were attempts to freeze the status quo and prevent new nuclear entrants. Even India and Pakistan's nuclear tests did little to change the idea that nuclear use was beyond the pale. It was the age of lofty proclamations of Global Zero (though Mr. Obama was quick to caveat his 2009 speech and say it might not happen in his lifetime) – a concept being valiantly promoted by the signatories of the Nuclear Ban Treaty that was negotiated in 2017 without a single nuclear weapons state supporting it.

In hindsight, it was an age of cynicism. Despite hailing Global Zero, the overriding achievement was the extension in perpetuity of the NPT and with it, the status of the five nuclear weapons states. It made a mockery of the NPT's Article 6, which called on nuclear possessors to "pursue negotiations in good faith" to achieving nuclear disarmament. Instead, extension of their status combined with counter-proliferation appeared to be making the world safe for their continued possession of nukes. This age *normalised* nuclear possession. We are now reaping the dividends of that, as possession appears to be yielding to nuclear use.

A messier age

The third nuclear age is messier because the renewed salience of nukes is superimposed on a global order in flux. China views its aggressive nuclear build up as providing a "strategic counterbalance" to shape the global balance of power. The U.S.'s apparent retreat under Mr. Trump has prompted NATO's European allies to look to France and Britain to deter a resurgent Russia. Britain is reconsidering an airborne deterrent 25 years after scrapping it and has budgeted £15 billion for warhead development and modernisation in its 2025 Strategic Defence Review. France is modernising and reopening old bases; it may consider basing nuclear assets with its neighbours, at their request. After the consolidation of the 1980s and '90s, nuclear weapons are moving out once again. Last year, Vladimir Putin transferred tactical nuclear weapons to Belarus.

Overshadowing these developments is the real fear of nuclear use. During the Cold War, the risk was that the two adversaries could slide into a nuclear war through accident or miscalculation. Deterrence was the ultimate guarantor of the status quo. However, Mr. Putin's nuclear threats over Ukraine show that nuclear weapons are being used to change the status quo. He is believed to have contemplated some nuclear use in 2022.

After Hiroshima, nuclear deterrence has been based on nukes being the final resort. If thinking on deterrence shifts in this nuclear age at a time of global realignment and potential instability, then we are entering a period of self-inflicted nuclear insecurity.

If thinking on deterrence shifts in this age of global realignment and potential instability, we are entering a period of self-inflicted nuclear insecurity

What is the 'Third Nuclear Age'?

- Coined to capture the current global security environment, the third nuclear age refers to a post-post-Cold War period where:

- Nuclear weapons are back at the centre of global security calculations.
- Non-proliferation regimes are weakening, and arms control efforts have stalled.
- The risk of actual nuclear use is higher due to regional conflicts, shifting deterrence logic, and aggressive posturing by new and old powers alike.

Evolution of Nuclear Ages:

- First Nuclear Age (Cold War Era):
  - Defined by bipolar rivalry between the U.S. and USSR.
  - Logic of Mutually Assured Destruction (MAD) ensured stability through fear.
  - Led to arms control treaties (e.g., SALT, START) and the NPT (1968).
- Second Nuclear Age (Post-Cold War Optimism):
  - Hopes for global disarmament (e.g., Obama's "Global Zero").
  - New entrants like India, Pakistan, and North Korea, but nuclear use still taboo.
  - Treaty-based deterrence and arms control were maintained, albeit cynically.
  - The NPT was extended indefinitely, solidifying nuclear inequality.
- Third Nuclear Age (Post-2010s – Present):
  - China's rapid nuclear expansion, Russia's tactical deployments (e.g., in Belarus).
  - Decline of U.S. commitment to multilateral security frameworks.
  - Rising regional nuclear flashpoints: India-Pakistan, Israel-Iran, North Korea.
  - Nuclear coercion and brinkmanship replacing deterrence.
  - Collapse or stagnation of arms control regimes (e.g., end of INF, New START expiry looms in 2026).
- Key Developments Reflecting the Third Nuclear Age:
  - Russia's use of nuclear threats in the Ukraine conflict to deter Western intervention and maintain strategic advantage.
  - Israel's strikes on Iran's nuclear sites challenging international law and bypassing diplomatic negotiation.
  - India-Pakistan dynamics increasingly perceived through a nuclear lens post-Balakot.
  - Nuclear modernisation programmes in the U.S., Russia, China, UK, France—driven by new technologies (MIRVs, canisterised missiles, hypersonics).

Implications for Global Security:

- Breakdown of the Disarmament Agenda:
  - The vision of nuclear disarmament, once politically attractive, has lost traction.
  - The NPT's Article VI—mandating disarmament—has become symbolic, not actionable.
- Erosion of Norms Against Nuclear Use:
  - The taboo around nuclear first use is weakening.
  - Leaders now invoke nuclear threats more openly as tools of geopolitical leverage.
- Strategic Unpredictability:

  - Multiple nuclear-armed states with diverse doctrines and ambitions.
  - Deterrence logic is no longer uniform—some states see nuclear threats as a means to alter the status quo, not preserve it.
- Shift from Deterrence to Coercion:
  - The Cold War notion of deterrence as a stabilizing factor is giving way to nuclear coercion and brinkmanship, as seen with Putin and North Korea.
- India's Position in This Landscape:
  - Maintains a "No First Use" and "Credible Minimum Deterrence" doctrine.
  - Faces threats on two nuclear fronts—China (modernizing and expanding rapidly) and Pakistan (with battlefield nuclear weapons).
  - Needs to balance deterrence and restraint, while modernizing delivery systems (e.g., Agni-V, canisterised missiles).

Conclusion:

- The third nuclear age is not simply a repetition of earlier eras—it is more complex, multipolar, and uncertain. Nuclear weapons, once considered the ultimate deterrent of last resort, are now entering conventional political discourse as tools of threat and tactical maneuvering. The absence of a robust global arms control framework, coupled with regional rivalries and declining diplomatic norms, makes this age inherently unstable. Unless collective global leadership reinvigorates disarmament and restraint, the third nuclear age risks spiraling into nuclear insecurity by design.

UPSC Mains Practice Question

Ques: How has the return of nuclear threat rhetoric affected global strategic stability? Evaluate with reference to recent geopolitical events. (**250 words)**

Page : 13: GS 2 : International Relations

At the recent UN Ocean Conference in Nice, global leaders and financial institutions pledged around $10 billion toward ocean conservation. However, this falls far short of the $175 billion annual investment estimated by the UN to sustainably protect marine ecosystems. A major hurdle remains the lack of clear, enforceable international regulation, particularly for the high seas—areas of the ocean beyond national jurisdiction.

Investors want clear ocean management rules for funding

NEWS ANALYSIS

Reuters
LONDON

A U.N. push for investment to protect the world's oceans yielded around $10 billion in deals at a conference last week, way below the estimated annual need as many investors seek clearer regulation on ocean management before committing funds.

While political leaders at the United Nations conference in Nice took steps to tackle overfishing and pollution threatening delicate ecosystems and the people who depend on them, getting countries to agree to better governance has proven tough.

Just 50 countries have so far ratified a new High Seas treaty which sets out rules agreed by more than 130 nations in 2023 to govern international waters and clamp down on harmful practices. The United States, pulled out of various climate initiatives by President Donald Trump, is among those yet to ratify the treaty.

The lack of a clear governing framework and robust ocean-related data has stymied private sector finance to date, said Oliver Withers, head of nature at British lender Standard Chartered.

"The major dynamic that doesn't apply to terrestrial is the high seas don't belong to any one individual sovereign," he said. "It is a significant challenge, there is no single sovereign responsible for the high seas."

Lukewarm waters: Just 50 countries have so far ratified a new High Seas treaty on rules. REUTERS

Of the deals chalked up in France, the bulk came from public sector banks, including $2.5 billion in funding by the Development Bank of Latin America and the Caribbean (CAF) and €3 billion ($3.5 billion) from a group of development banks to fight plastic pollution.

While a step up, the total figure falls far short of what is needed.

Between 2015 and 2019, only $10 billion was invested against the U.N. estimate of $175 billion in required annual funding.

"Public finance isn't enough but private finance is even less. So, I think, it's a space in its infancy," said Francine Pickup, Deputy Director, Bureau for Policy and Programme Support at the U.N. Development Programme.

Improving policy

Ms. Pickup said improving the policy backdrop and regulation, including removing subsidies she said encouraged harmful practices such as overfishing, was key, followed by the creation of a pipeline of investments including in start-ups focused on ocean-related technology.

To date, the sector has received just a small slice of overall funds, data shared with Reuters by industry tracker Sightline Climate showed.

Between 2020 and 2025, ocean tech received just 0.4% of the $202 billion invested across all sectors during that period, although the data showed a stronger start to 2025.

"What we seek as investors is that governments and the policymakers address systemic risks," said Robert-Alexandre Poujade, biodiversity lead at BNP Paribas Asset Management, adding he would welcome the treaty "if it has lots of teeth and enforcement mechanisms".

Fixing the funding shortfall also requires a concerted effort by policymakers and investors to tackle overlapping challenges to protecting marine biodiversity and ocean health.

A warming planet is heating up the oceans, exacerbating effects such as water acidification and coral bleaching that climate scientists say will be improved if the world manages to cut carbon emissions as planned.

Overfishing and polluting sea vessels, offshore oil drilling and, potentially, deep-sea mining that collectively damage ocean health also require firmer policy action, scientists, ocean experts and investors say.

While action has hitherto been slow, there were signs of progress in Nice, as more than 20 countries backed a call by France to prevent deep sea mining; and a number of fresh Marine Protected Areas were created.

Key Highlights:

- **High Seas Treaty and Ratification Gap:**
  - The 2023 High Seas Treaty, agreed upon by over 130 nations, aims to regulate international waters, curb overfishing, and create a legal framework for marine biodiversity conservation.
  - Only 50 countries have ratified it so far; key countries like the United States have not, reducing its legitimacy and global enforceability.
- **Private Sector Reluctance:**
  - Private investors are hesitant due to regulatory ambiguity, absence of sovereign responsibility, and lack of ocean-specific data.
  - Only 0.4% of global climate investment between 2020 and 2025 went to ocean tech, highlighting an underdeveloped investment ecosystem.
- **Public Sector Dominates Funding:**
  - Most of the funding commitments in Nice came from development banks, such as:
  - $2.5 billion from the Development Bank of Latin America and the Caribbean.
  - €3 billion ($3.5 billion) from European development banks to combat plastic pollution.
- Subsidies and Harmful Practices:

  - Continued subsidies for overfishing and polluting maritime activities remain unaddressed, undermining conservation efforts.
  - Experts call for regulatory reform, removal of such subsidies, and development of investment-ready ocean tech start-ups.
- Systemic Risks and Investor Demand:
  - Investors like BNP Paribas demand robust enforcement mechanisms in treaties to tackle systemic environmental risks.
  - There is an urgent need for a pipeline of bankable ocean conservation projects, backed by policy certainty.
- Climate Change as an Aggravator:
  - Ocean warming, acidification, and coral bleaching—worsened by climate change—require simultaneous action on carbon emissions and marine protection.
  - Activities such as offshore oil drilling, sea vessel pollution, and potential deep-sea mining demand stricter policy regulation.
- Positive Developments:
  - Over 20 countries supported France's call to halt deep-sea mining.
  - New Marine Protected Areas (MPAs) were announced—showing incremental progress.

Implications for Global Environmental Governance

- Highlights the gap between political rhetoric and institutional action on marine conservation.
- Demonstrates that global commons like the high seas suffer from a tragedy-of-the-commons problem—no single actor is accountable.
- Points to the urgency of multilateral regulatory frameworks with strong enforcement to unlock private climate finance for oceans.
- Reflects a broader challenge in climate negotiations—the disconnect between ambition, enforcement, and funding.

Conclusion:

- The global ocean conservation effort is in its infancy, hindered by a lack of binding governance, cohesive funding mechanisms, and private investor confidence. While the UN Ocean Conference in Nice generated some momentum, it underscored the need for ratification of treaties, policy reform, and investment innovation to protect the Earth's largest ecosystem. Oceans—central to planetary health and climate stability—need clearer rules, stronger enforcement, and unified global action to attract the scale of investment they urgently require.

UPSC MainsPractice Question

Ques: Why are the high seas particularly difficult to govern? Evaluate the effectiveness and limitations of the High Seas Treaty in this context. **(250 Words)**

Page : 08 Editorial Analysis

India needs to design an inclusive pension system

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Pensions are essential for maintaining economic stability and dignity after retirement. Retirees often face financial instability due to reduced earning capacity, rising health-care costs, and inflation, necessitating a safety net in the form of pensions.

The Economic Survey 2025-26 reports that Indian pension assets amount to just 17% of GDP, compared with up to 80% in many advanced economies. Currently, only around 12% of India's workforce is covered by formal pension schemes. The coverage is also disproportionate, with public sector and organised private sector workers being protected under multiple parallel schemes. In contrast, the only protection for the informal sector is voluntary adoption under the National Pension System and Atal Pension Yojana. These two schemes accounted for about 5.3 % of the total population in FY24.

Integrate the informal sector

Notably, almost 85% of the informal labour force is generating more than half of the country's GDP. As markets evolve, the gig economy will only expand further. Their exclusion from the pension framework is not only a policy gap but also a looming financial crisis in the making. By 2050, India's old-age dependency ratio will increase to 30%. Consequently, India's path to achieve developed economy status by 2047 will depend, in no small measure, on our efforts to secure the future against old-age poverty.

Currently, the expansion of pension coverage is hindered by issues that are linked to scalability, sensitisation, and sustainability.

The primary reason for the exclusion of informal workers from the pension framework is the fragmented nature of pension schemes. Although the government has introduced social security for gig workers, funded in part by aggregators, this only addresses a fraction of the informal sector and adds another parallel scheme to an already complex web. On the contrary, most mature economies have a well-structured pension ecosystem with multiple tiers that cater to the diverse needs of the entire population. For example, Japan operates a mandatory flat-rate contributory scheme for all residents between the ages 20 to 59 years, encompassing the self-employed, farmers, public and private employees, and their dependents. Similarly, New Zealand offers a universal, flat-rate public pension to residents aged 65 years and over, subject to a 10-year residency requirement; roughly 40% rely on it as their main income during old age.

As India undergoes a demographic shift, policymakers must plan a truly inclusive pension system

As a large proportion of the current pension coverage for the informal sector is voluntary, the next roadblock in expansion is a lack of awareness. As financial literacy in India remains low, efforts at sensitisation need to start at the grass-root level. For example, the financial literacy policy in Australia enables the school curriculum to incorporate a component on superannuation planning.

In the Netherlands, occupational pension funds provide annual disclosures of accrued pension rights to active participants. The United Kingdom runs an opt-out pension scheme for its employees, which promotes participation by default. Sensitisation is also linked with increasing accessibility of pension products, such as in Nigeria, which has invested heavily in a digital pension infrastructure to increase the reach of its pension system.

Ensuring sustainability and liquidity

Finally, sustaining the financial health and liquidity of pension funds are critical to securing sufficient resources for a dignified retirement. The Mercer CFA Institute Global Pension Index 2024 Report assigned an overall value of 44% to the Indian pension system, with a sharp decline in the adequacy ratio.

Notably, China, which performed on the index, is currently facing challenges in maintaining its public pension system without support from private pension funds. Thus, support from private funds is important in developing a robust market. The Netherlands, Denmark and Australia also rely on private funds to support the public pension systems. In the United States, pension fund investments are secured through targeted debt funds to ensure reliable returns.

A three-tiered framework

To address the problems of scalability, sensitisation and sustainability, at the outset, India should harmonise fragmented schemes into a tiered system overseen by a unified regulator. In an ideal design, the first tier would comprise a mandatory basic pension guarantee, offering a flat-rate contributory pension for all, irrespective of employment status. The next tier would cover occupational pensions that may be mandatory, or on an opt-out basis, establishing employer-based schemes with auto-enrolment, subject to minimum contribution standards. The final tier would include voluntary pension savings, incentivised through tax benefits, market-linked returns, and flexible products to supplement retirement income.

In addition, measures such as targeted financial literacy campaigns at the school and college levels, user-friendly digital enrolment platforms, and mandated annual disclosures of pension entitlements can significantly enhance public participation and trust in the system. Further, robust investment regulations and oversight are necessary to monitor pension fund performance and ensure sufficient liquidity to meet long-term pension obligations.

As India undergoes a demographic shift, a minimum pension guarantee and a well-structured pension system for everyone, including informal workers, will ensure basic financial security during retirement. Policymakers must act now to design a truly inclusive pension system for all, regardless of their occupational status.

The views expressed are personal

Paper 02: Social Justice

UPSC Mains Practice Question: Despite demographic transition, India's pension coverage remains low. What are the reasons behind this and how can India ensure universal old-age income security? (250 words)

Context :

India is witnessing a demographic transition with a growing elderly population and an expanding informal workforce. Yet, only 12% of India's workforce is covered by formal pension schemes. A recent article by Neha Lodha from the Vidhi Centre for Legal Policy highlights the need for an inclusive, scalable, and sustainable pension system, especially for informal sector and gig economy workers.

Key Issues Highlighted:

1. Low Pension Coverage and Assets:

- India's pension assets are only 17% of GDP, compared to ~80% in advanced economies.
- The informal sector, which contributes more than 50% of GDP, is largely excluded.
- Existing schemes like the National Pension System (NPS) and Atal Pension Yojana (APY) are voluntary and have limited reach (covering only 5.3% of population in FY24).

2. Fragmentation of Pension Schemes:

- Multiple parallel schemes (EPFO, NPS, APY, etc.) create complexity.
- Gig workers and self-employed individuals are either partially covered or left out.

3. Lack of Awareness and Financial Literacy:

- Voluntary pension schemes suffer from low enrolment due to poor awareness.
- Global examples like Australia and the UK integrate superannuation planning in school curricula or use auto-enrolment schemes.

4. Sustainability Concerns:

- India's Mercer CFA Global Pension Index score (2024): 44%, with declining adequacy.
- Countries like China face pension sustainability issues; others like Netherlands, Denmark, and Australia use private pension funds for stability.
- Absence of robust investment and liquidity strategies in India limits pension fund viability.

Suggested Framework for India:

Three-Tier Pension System:

1. **Tier 1: Mandatory Basic Pension**
    - Flat-rate contributory scheme for all, including informal and gig workers.
    - Ensures universal old-age income security.
2. **Tier 2: Occupational Pension**
    - Employer-based, mandatory or opt-out schemes.
    - Auto-enrolment, minimum contribution standards for scalability.
3. **Tier 3: Voluntary Pension Savings**
    - Tax incentives, market-linked returns, flexible instruments.
    - Supplements formal retirement income.

Enablers and Reforms:

- **Unified Regulator:** Streamline fragmented pension schemes.
- **Digital Pension Infrastructure:** For easier enrolment and access (e.g., Nigeria's model).
- **Mandatory Annual Disclosures:** Enhances transparency and builds trust.
- **Investment Oversight:** To ensure long-term fund adequacy and liquidity.
- **Financial Literacy Campaigns:** Target school, college, and workplace levels.

Conclusion:

India's vision of becoming a developed nation by 2047 hinges on creating a resilient and inclusive social security net. A well-designed, multi-tier pension system—backed by regulatory unification, financial literacy, and technological integration—can provide dignified retirement to all, especially the 85% informal workforce. As the old-age dependency ratio rises to 30% by 2050, reforms today are essential to avert future social and economic stress.