

The Hindu Important News Articles & Editorial For UPSC CSE

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India and Russia are enhancing their cooperation in defense technology, including AI, cybersecurity, and space exploration, with the commissioning of INS Tushil, an advanced frigate.

- ➔ The ship highlights growing collaboration in naval defense and India's progress in technological innovation.

INS Tushil – Overview:

- ➔ **Type:** INS Tushil is an upgraded warship of the Krivak III class.
- ➔ **Construction:** Built in Russia, with growing "Made in India" parts in the ship.
- ➔ **Ship Series:** It's the seventh ship in a series of similar ones, with six already in service.
- ➔ **Technology:** The ship showcases India's growing tech abilities through teamwork with Russia.
- ➔ **Capabilities:** Built for operations in all areas – air, sea, underwater, and electronic warfare.
- ➔ **Weapons:** Armed with modern weapons, including those for fighting submarines and aircraft.
- ➔ **Helicopter Support:** Can carry two types of helicopters, Kamov 28 and Kamov 31.
- ➔ **Speed:** Powered by advanced turbines, it can travel at speeds over 30 knots.
- ➔ **Role:** Helps in protecting maritime trade, fighting piracy, and providing emergency help in the Indian Ocean region.

Frigate *INS Tushil* commissioned into the Indian Navy in Russia's Kaliningrad

Dinakar Peri
NEW DELHI

India and Russia will enter a new era of cooperation by taking advantage of each other's expertise in areas such as Artificial Intelligence, cybersecurity, space exploration and counter-terrorism, Defence Minister Rajnath Singh said on Monday at the commissioning of the stealth guided missile frigate *INS Tushil* at Kaliningrad, Russia.

"Made in India content is continuously increasing in many ships including *INS Tushil*. The ship is a big proof of the collaborative prowess of Russian and Indian industries. It exemplifies India's journey towards technological excellence through joint-manship," he said at the commissioning ceremony.

INS Tushil is an upgraded Krivak III class frigate of Project 1135.6 of which, six are already in service – three Talwar class ships, built at Baltiysky shipyard, St. Petersburg, and three follow-on Teg class ships, built at Yantar shipyard, Kaliningrad. All Krivak frigates are powered by engines from Zorya Nashproekt of Ukraine.

INS Tushil, the seventh in the series, is the first of the two additional follow-on ships under construction in Russia. In October 2016, India and Russia signed a deal for four stealth frigates, two to be built in Russia and two to be constructed at Goa Shipyard Ltd. under technology transfer.

The second frigate *Ta-*

mal is expected to be delivered to the Indian Navy in Russia in the first quarter of next year. The construction saw repeated delays initially due to COVID-19 and then the war in Ukraine.

"Our Navy has foiled the designs of piracy, arms and drug smugglers and non-state actors in various hot-spots. From the Gulf of Oman to the Gulf of Aden, from Suez to Malacca & from Australia to Madagascar, the Indian Navy is playing the essential role of a net security provider in IOR. India, along with its friendly countries, believes in ensuring that maritime trade in the region remains safe and secure, thereby promoting unhindered trade across the sea."

As a first responder, the Indian Navy is always prepared to provide quick and timely humanitarian assistance and disaster relief to its friends in the region, Mr. Singh said.

INS Tushil is designed for blue water operations across the spectrum of naval warfare in all four dimensions air, surface, underwater and electromagnetic. It is armed with a range of advanced weapons, the Navy said in a statement.

The ship is also capable of embarking the upgraded anti-submarine and airborne early warning helicopters, the Kamov 28 and Kamov 31. It is powered by an advanced gas turbine propulsion plant with state-of-the-art controls and is capable of achieving speeds in excess of 30 knots.

UPSC Prelims Practice Question

Ques : INS Arihant is significant for India's defense because:

- It is the first aircraft carrier designed in India.
- It strengthens India's second-strike nuclear capability.
- It is the first stealth-guided missile destroyer of India.
- It is the first indigenous frigate of India.

Ans: b)

Antiparticles, theorized in 1928, reveal the symmetry of quantum mechanics but are scarce in the universe. Recent research suggests meson decay and hypothetical particles may partially explain matter's dominance over antimatter, advancing progress on the Sakharov conditions.

Antimatter idea offers scientists clue to cracking cosmic mystery

If the universe started off with equal amounts of matter and antimatter, where has all the antimatter gone? Nobody knows for certain and the best current theory to explain the world fell woefully short of satisfying three crucial conditions, until a new study pointed out a caveat

Nirmal Raj

One of the most astonishing facts about the natural world is the existence of antiparticles. Theorised by the English physicist Paul A.M. Dirac in 1928 and observed in cosmic rays by American physicist Carl Anderson in 1932, an antiparticle is a 'partner' of a particle type that has the same mass but opposite charge. For example, the antielectron is the antiparticle of the electron; it has the same mass and is positively charged. Antiparticles are an inevitable consequence of describing the world in terms of quantum mechanics and special relativity.

An antiparticle is a particle travelling backward in time. This is not an oversimplification. If it sounds eerie, that's because it is.

Antimatter, where art thou?

But where is all the antimatter made of antiparticles? It is certainly scarce, or we would have discovered it a long time ago. Still, antiparticles are detectably numerous. Our own bodies make one antielectron every 20 seconds from the decay of potassium-40. Cosmic rays raining down on us supply antiprotons, antineutrons, and even antinuclei. Every proton and neutron – constituents of the nuclei that make up all the matter we can touch – is teeming with antiparticles.

But it is when we look out at the universe as a whole that antimatter's scarcity becomes clear. All galaxies are made of matter, not antimatter. Even in the infant universe, there had to have been a small dissimilarity between the populations of protons and antiprotons for our predictions about the outcomes of the synthesis of nuclei in the early universe and the features of the cosmic microwave background (radiation leftover from the Big Bang) to hold.

That is, for every 1.7 billion proton-antiproton pairs, there should have been an extra unpaired proton.

Presumably the universe started out with equal amounts of matter and antimatter before something happened to distort this symmetry. That's a good thing: otherwise matter and antimatter would have mutually annihilated to fill the universe with nothing but a fog of radiation – no raw material to make stars, planets or us.

But what spoiled the symmetry? Put differently, why is there something around us rather than nothing (but that fog)? Nobody knows for certain. What we do know is that any theory attempting to explain it must satisfy three conditions, called the Sakharov conditions. The best current theory to explain the world, the Standard Model of particle physics, falls woefully short of meeting all of them.

At least this was the lore until the authors of an August 2024 preprint paper pointed out an interesting caveat.

They showed that one of the conditions can be satisfied by the Standard Model alone, provided some new particle species helps with the process of making matter.

An unsettling discovery

Look at the world in a mirror. Does it look the same? Apples would still fall and moons would circle planets because gravity would be unchanged. Protons and neutrons would cling to form nuclei



Cosmic puzzle: This composite image pieced together by data from multiple telescopes shows a part of the Milky Way galaxy's central region. The bright white portion hosts a supermassive black hole as well as energetic particle reactions that produce antimatter. PUBLIC DOMAIN

because the strong nuclear force would be preserved. But atomic nuclei won't undergo radioactive fission because that happens via the weak force. And the weak force, like a vampire, vanishes in the mirror-world.

The discovery of this fact in 1957 was profoundly unsettling because it struck at cherished notions of symmetry in nature. A parity transformation (denoted P) – the act of swapping left and right – appeared to eliminate the weak force. But soon physicists found that if they replaced a particle with its antiparticle in the mirror-world, the weak force reappeared. This action is called charge conjugation (C). It seems the universe didn't conserve P and C separately but did so when they happened together. This is called CP symmetry.

But in 1964, American physicists James Cronin and Val Fitch found that even CP symmetry is violated. And it wasn't

violated all the time – which made it more nagging. They found that it was violated around once for every thousand times a process involving the weak force happened in nature. Nine years later, Makoto Kobayashi and Toshihide Maskawa in Japan found that if there were at least three variants of every quark species – with all properties the same except for the mass – CP symmetry violation is unavoidable. And all fermion particles do come in three variants, a.k.a. generations. For instance, the up quark has two other variants: the charm and top quarks. (Around the same time, physicists also found that the strong nuclear force – involved in fission and fusion – ought to violate CP symmetry strongly but doesn't. This is called the strong CP puzzle.)

Now, as soon as CP symmetry violation was confirmed, the Soviet physicist Andrei Sakharov realised it's actually an essential condition to create a

matter-antimatter asymmetry in the early universe. Unfortunately, the amount of CP symmetry violation the Standard Model allowed for (the -1 in 1,000 rate) proved insufficient to explain the magnitude of the asymmetry. This is where the authors of the August paper have pointed out a loophole. We have known for some time that processes involving mesons – particles made of quark-antiquark pairs – violate CP symmetry, which is just how Cronin and Fitch made their discovery. Now, if a meson could decay to particles not contained in the Standard Model, the matter-antimatter asymmetry could be controlled by the product of two quantities: the amount of standard CP violation and the fraction of decays into the non-standard particles. This fraction can't be too large: otherwise we would have detected the non-standard particles in particle colliders.

The study's conceit, then, is to introduce a mechanism that ensured this fraction was large just in the early universe but evolved to a smaller number today. This can be done if the masses of the new particles vary over time, which is possible to arrange in quantum field theory.

Hard-won progress

This mechanism has thus brought one of the three Sakharov conditions within the reach of the Standard Model five decades since these conditions came to light.

The other two conditions are: (i) A large violation in a type of charge carried by particles, called the baryon number. For example, protons and neutrons have a baryon number of 1 and their antiparticles carry a value of -1. (ii) Interactions must occur out of thermal equilibrium, meaning that particle processes in the forward and backward directions do not occur at the same rate.

While the Standard Model does not meet these conditions adequately, the work discussed here serves as an important step towards understanding why matter overwhelmingly dominates over antimatter in our universe today. (Nirmal Raj is an assistant professor of theoretical physics at the Centre for High Energy Physics in the Indian Institute of Science, Bengaluru. nraj@isc.ac.in)

Standard Model of Elementary Particles

	three generations of matter (fermions)			interactions / force carriers (bosons)	
	I	II	III		
QUARKS	mass = 2.16 MeV/c ² charge = 2/3 spin = 1/2 u up	mass = 1.273 GeV/c ² charge = 2/3 spin = 1/2 c charm	mass = 172.57 GeV/c ² charge = 2/3 spin = 1/2 t top	mass = 0 charge = 0 spin = 1 g gluon	mass = 125.2 GeV/c ² charge = 0 spin = 0 H higgs
	mass = 4.7 MeV/c ² charge = -1/3 spin = 1/2 d down	mass = 93.5 MeV/c ² charge = -1/3 spin = 1/2 s strange	mass = 4.183 GeV/c ² charge = -1/3 spin = 1/2 b bottom	mass = 0 charge = 0 spin = 1 γ photon	
	mass = 0.511 MeV/c ² charge = -1 spin = 1/2 e electron	mass = 105.66 MeV/c ² charge = -1 spin = 1/2 μ muon	mass = 1.77693 GeV/c ² charge = -1 spin = 1/2 τ tau	mass = 91.188 GeV/c ² charge = 0 spin = 1 Z Z boson	SCALAR BOSONS
	mass = 0.8 eV/c ² charge = 0 spin = 1/2 ν_e electron neutrino	mass = 0.17 MeV/c ² charge = 0 spin = 1/2 ν_μ muon neutrino	mass = 18.2 MeV/c ² charge = 0 spin = 1/2 ν_τ tau neutrino	mass = 80.3992 GeV/c ² charge = 0 spin = 1 W W boson	
				GAUGE BOSONS VECTOR BOSONS	

The (current) crop of fundamental particles making up matter as we know it and the different ways they can interact. The W and Z bosons mediate the weak force. PUBLIC DOMAIN

Antiparticles and Their Mysteries

Daily News Analysis

- ➔ Antiparticles are counterparts to particles, with the same mass but opposite charge, theorized by Paul Dirac in 1928 and observed by Carl Anderson in 1932.
- ➔ For instance, the antielectron (positron) is the antiparticle of the electron and carries a positive charge.
- ➔ They are a consequence of quantum mechanics and special relativity, traveling as if backward in time.

Scarcity of Antimatter in the Universe

- ➔ While antiparticles are present in cosmic rays and even generated by human bodies, antimatter is scarce in the observable universe.
- ➔ Matter dominates galaxies, with the early universe having a slight asymmetry: for every 1.7 billion proton-antiproton pairs, one extra proton existed.
- ➔ This asymmetry allowed matter to survive annihilation and form stars and planets.

Challenges in Explaining the Asymmetry

- ➔ The Standard Model of particle physics struggles to fully explain why matter dominates over antimatter.
- ➔ Any theory addressing this requires meeting the Sakharov conditions, which include CP symmetry violation, baryon number violation, and interactions out of thermal equilibrium.

➔ Sakharov Conditions:

- Baryon Number Violation: There must be a process where particles like protons (baryons) are created or destroyed in the early universe.
- CP Symmetry Violation: The laws of physics should behave differently for matter and antimatter under specific conditions, breaking a symmetry called CP symmetry.
- Out of Thermal Equilibrium: The universe's early conditions should not allow particles and their antiparticles to convert back and forth equally; this imbalance helps matter survive.
- These three conditions explain how matter could dominate over antimatter after the Big Bang.

➔ Recent Progress

- A 2024 study showed that meson decays could satisfy CP symmetry violation in the Standard Model, involving hypothetical particles.
- The new mechanism suggests these particles were prominent in the early universe but rare today, aligning with quantum field theory.

Path Ahead

- ➔ This finding addresses one Sakharov condition but challenges remain for the others, advancing understanding of the universe's matter-antimatter asymmetry.

UPSC Mains Practice Question

Ques : Discuss the role of the Sakharov conditions in explaining matter-antimatter asymmetry in the universe. Highlight recent developments and their implications for the Standard Model of particle physics. (150 Words /10 marks)

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The UN report addresses the escalating issue of desertification and land degradation caused by climate change, highlighting the global impact of drier conditions on water, food security, and migration.

- ➔ Nations are discussing strategies to combat these challenges at a summit in Riyadh.

Global Drying Trends and Desertification

- ➔ A United Nations report highlights the increasing drying of Earth's lands, with the ability of plant and animal life to survive being severely affected. This phenomenon is attributed to human-caused climate change, water scarcity, and deforestation.
- ➔ Over 75% of the world's land has become drier from 1970 to 2020 compared to the previous three decades, with irreversible changes now affecting vast regions.
- ➔ Climate change is re-shaping life on Earth, and the land will not return to its previous condition.

Impacts of Drying Lands

- ➔ If global warming continues, nearly five billion people, including those in Europe, parts of the western U.S., Brazil, eastern Asia, and central Africa, will be impacted by drier conditions by the end of the century, up from a quarter of the global population today.
- ➔ The report warns that drier lands may lead to catastrophic effects, particularly in water access, pushing human and natural systems toward irreversible damage.

Risks to Farming and Migration

- ➔ Decreased water availability threatens farming productivity, which leads to food insecurity globally.
- ➔ Arid regions also face increased migration due to frequent water shortages and land degradation, hindering economic development.

Response to Droughts

- ➔ The ongoing UN talks are focused on addressing drought responses, with particular debate over whether wealthier nations should contribute funds to aid global drought efforts.



More than three-quarters of the world's land experienced drier conditions from 1970 to 2020 than the previous thirty-year period AFP

UN talks in Riyadh keep focus on land degradation

Associated Press

Much of the earth's lands are drying out and damaging the ability of plant and animal life to survive, according to a United Nations report released Monday at talks where countries are working to address the problem.

The report was released at the UN summit in Riyadh, Saudi Arabia, on combating desertification — once-fertile lands turning into deserts because of hotter temperatures from human-caused climate change, lack of water and deforestation. It found that more than three-quarters of the world's land experienced drier conditions from 1970 to 2020 than the previous thirty-year period. "The drier climates now affecting vast lands across the globe will not return to how they were," said Ibrahim Thiaw, chief of the United Nations Convention to Combat Desertification (UNCCD), which is facilitating the Riyadh talks. "This change is redefining life on earth."

At the talks, which started last week and are set to end on Friday, nations are discussing how better they can help the world deal with droughts — a more urgent lack of water over shorter periods — and the more permanent problem of degrading land.

If global warming trends continue, nearly five billion people — including in most of Europe, parts of the western U.S.,

Farming is particularly at risk, with drier land being less productive and hurting both yields and the availability of food for livestock, the report said

Brazil, eastern Asia and central Africa — will be affected by the drying by the end of the century, up from a quarter of the world's population today, the report warned. UNCCD's chief scientist Barron Orr warned drier land could lead to "potentially catastrophic impacts affecting access to water that could push people and nature even closer to disastrous tipping points," where humans are no longer able to reverse damaging effects of climate change.

Sergio Vicente-Serrano, one of the lead authors of the report, said that as the atmosphere heats up because the burning of coal, oil and gas spews planet-warming emissions, it leads to more evaporation on the ground. That makes water less available for humans, plants and animals, making it harder to survive.

Farming is particularly at risk, with drier land being less productive and hurting both yields and the availability of food for livestock, the report said. That can lead to food insecurity for communities worldwide.

Aridity also leads to more migration, because erratic rainfall, degrading land and frequent water shortages make it harder for regions or nations to develop economically, the report said. It said the trend is especially noticeable in some of the world's driest areas such as southern Europe, the Middle East and North Africa and southern Asia. Negotiators in Riyadh are mainly discussing how best the world can respond to more frequent and damaging droughts.

Jes Weigt, of European climate thinktank TMG, said it's still a sticking point because countries can't agree on whether rich nations should be forking out funds for drought responses around the world. Any money pledged would go towards better forecasting and monitoring systems as well as creating reservoirs and other water-management structures.

UPSC Mains PYQ : 2019

Ques : Discuss the causes and consequences of land degradation in India. (150 Words /10 marks)

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The Government is introducing the Merchant Shipping Bill, 2024 and the Coastal Shipping Bill, 2024 to replace outdated legislation and modernise India's maritime framework.

- ➔ Key features include easing vessel registration, expanding the definition of vessels, and aligning with global conventions.
- ➔ The reforms promote safety, investment, and sustainable development.

On reforms in merchant shipping

Have the Merchant Shipping Act, 1958, and the Coasting Vessels Act, 1838 failed in addressing the contemporary needs of the merchant marine sector? What are some of the international maritime conventions that India has ratified? Will the new Bills address maritime training and education as well?

EXPLAINER

Amitabh Kumar

The story so far:

The Government is preparing to introduce several significant bills aimed at driving much-needed reforms in the shipping industry. Key among them are the Merchant Shipping Bill, 2024 and the Coastal Shipping Bill, 2024, both of which promise to bring transformative changes to boost the sector.

Why a new bill?

The Merchant Shipping Act, 1958, and the Coasting Vessels Act, 1838, which the new bills aim to repeal, have become outdated and fail to address the contemporary needs of the merchant marine sector. Significant regulatory gaps exist, particularly for vessels operating in the offshore sector which comprise nearly 50% of Indian-flagged vessels. Furthermore, maritime training was liberalised allowing private sector participation, yet there is no legal framework in the existing Act to regulate their activities effectively.

The Merchant Shipping Act, 1958, also restricts seafarers' welfare provisions to Indian-flagged ships, despite 85% of the 2,80,000 active Indian seafarers working on foreign-flagged vessels. Additionally, the Act lacks enabling provisions for implementing certain international conventions that India has signed or plans to ratify. Crucially, the outdated, license-era provisions of the Act have become a roadblock to modernising maritime administration, which needs to transition from being a mere regulator to a regulator-cum-facilitator, thereby promoting the 'ease of doing business'.

What are the features of the Merchant Shipping Bill?

The Merchant Shipping Bill introduces significant changes to modernise India's maritime framework, drawing upon the best practices of leading maritime jurisdictions like the U.K., Norway, and Singapore. Some of the key reform measures include:

• **Ease of registration:** The existing law restricts vessel registration to entities with 100% Indian ownership. The new Bill proposes significant reforms to attract foreign investment. It also reduces the ownership threshold for Indian citizens/entities from 100% to 51%, enabling more flexibility. It allows Limited Liability Partnerships (LLPs), Non-Resident Indians (NRIs), and Overseas Citizens of India (OCIs) to own and register Indian vessels. This is in line with the law of the U.S. where Green card holders are permitted to own American flagships or Singapore law where permanent residents can own ships of their flags. It also permits foreign entities to hold shares in Indian vessels while ensuring majority ownership remains with Indian entities, NRIs, or OCIs.

• Additionally, the Bill allows the registration of vessels chartered by Indian entities under the bareboat charter-cum-demise, enabling entrepreneurs to acquire ownership of vessels at the end of the charter period. This provision, particularly beneficial for capital-deficient entrepreneurs, facilitates entry into the shipping industry without upfront investment.

• India is the second largest ship recycling centre after Bangladesh, and the ship recycling industry practises the concept of cash purchase of the vessel before it is brought for demolition. Often



Quick change: Catamaran boats pass by a merchant navy ship anchored off Visakhapatnam. FILE PHOTO

it becomes difficult for cash buyers to register the vessels for their final voyage, as they no more remain 'seaworthy'. To address challenges faced by the ship recycling industry, the Bill introduces provisions for temporary registration of vessels destined for demolition. This measure is expected to bolster activities at India's ship recycling hubs like Alang.

• **Enlarging the scope of vessels:** The existing Act regulates only mechanised ships (engine-fitted vessels) above a certain size, leaving smaller mechanised vessels and all non-mechanised vessels outside its ambit. This regulatory gap has allowed many vessels to operate without adequate oversight. India's offshore drilling sector gained prominence in 1974 when Sagar Samrat, a merchant vessel designed for exploratory offshore drilling, drilled the first well in Bombay High. Since then, the offshore sector has employed a diverse range of mechanised and non-mechanised vessels, such as accommodation barges, work barges, submersibles, and drones. However, these vessels remain either unregulated or inadequately regulated under the current framework, exposing the sector to operational and safety risks.

The new Bill seeks to address this issue by expanding the definition of 'vessels' to uniformly include a wide range of crafts, including submersibles, semi-submersibles, hydrofoils, non-displacement crafts, amphibious crafts, wing-in-ground crafts, pleasure crafts, barges, lighters, Mobile Offshore Drilling Units (MODUs), and Mobile Offshore Units (MOUs), whether mechanised or not. This definition is expected to enhance transparency and ensure comprehensive regulatory oversight in the offshore sector.

Furthermore, the 26/11 Mumbai attacks, which exploited gaps in maritime security, underscored the urgent need for stricter regulation of all categories of vessels. By empowering authorities to issue instructions to all types of vessels, the new Bill aims to strengthen coastal

security, making India's coastline safer and more secure.

What about marine pollution?

The Government has recently undertaken several initiatives to minimise pollution from shipping activities. Some of the measures include reducing the sulphur content in marine fuel from 3.5% to less than 0.5%, banning the use of single-use plastics on Indian ships, and launching the online portal 'Swachh Sagar' to facilitate the proper disposal of ship-generated waste at Indian ports.

The International Maritime Organization (IMO) has adopted several conventions aimed at preventing and combating marine pollution, such as the Civil Liability Convention (CLC), the Convention on Limitation of Liability on Maritime Claims (LLMC), the Bunker Convention, the International Convention for the Prevention of Pollution from Ships (MARPOL), and the Wreck Removal Convention. The existing law, however, has either omitted or partially implemented these conventions. The new Bill fully incorporates these international conventions, aligning India's maritime regulatory framework with global standards. This comprehensive approach reinforces India's commitment to combating marine pollution and safeguarding the maritime environment for sustainable shipping practices.

What are provisions for seafarers'?

The remarkable growth in the number of Indian seafarers employed on foreign-flagged ships over the last 7-8 years stands out as one of the biggest success stories in Indian merchant shipping. The workforce has grown from 1,16,000 in 2015-16 to 2,85,000 today, with nearly 85% of these seafarers serving on foreign-flagged vessels.

However, the existing Act lacks provisions for the welfare and safety of this vast workforce working on foreign-flagged vessels. The proposed Bill addresses this gap by extending the scope

of welfare measures initiated by the Union government to include Indian seafarers working on foreign-flagged ships as well. Furthermore, it seeks to extend the protections and benefits outlined in the Maritime Labour Convention (MLC) to all Indian seafarers, ensuring better working conditions, safety standards, and support systems for those contributing to the global maritime industry.

What about maritime training?

Under Entry 25 of List I (Union List) of the Constitution, the Union Government is responsible for the education and training of the mercantile marine and the regulation of such education and training provided by States and other agencies. In the past, maritime training was primarily conducted by government-run institutions directly under the administrative control of the maritime regulator, the Director General of Shipping. Consequently, there was no need for a specific legal framework to regulate these institutions.

However, following economic liberalisation, maritime training was opened to the private sector. Today, over 160 maritime training institutes operate across the country, yet their activities are governed solely by rules, government orders, and notifications rather than an enabling legal framework. This regulatory gap has allowed unauthorised institutes to operate without obtaining proper approvals, making it challenging for the maritime administration to take action against offenders.

The proposed Bill seeks to address this significant anomaly by introducing clear legal provisions for regulating maritime training in line with the constitutional mandate. This step is expected to eliminate illegal maritime training institutes and associated fraudulent practices, which often exploit unsuspecting rural youth, while ensuring the delivery of high-quality, standardised maritime education nationwide.

Is there a focus on coastal shipping?

The Government has taken a significant step by distinguishing between the technical regulation of ships and the commercial utilisation of Indian coastal waters, removing provisions related to the latter from the Merchant Shipping Act. These aspects, including licensing, permissions for operations along the Indian coast and Exclusive Economic Zone (EEZ), creation of a coastal plan involving the Union and States, and the integration of inland and coastal shipping, have been incorporated into the proposed Coastal Shipping Bill, 2024. This focused approach aims to foster growth and development of the Indian coastal sector.

The move aligns with the Government's flagship 'Sagarmala' program, which emphasises the promotion of coastal shipping through initiatives like dedicated berths for coastal vessels and enhanced hinterland connectivity for coastal cargo movement. Infrastructure development and a robust regulatory framework must progress simultaneously, making the introduction of the Coastal Shipping Bill both timely and essential.

Maritime development, like any developmental initiative, should remain bipartisan and above party politics. By fostering investment, enhancing safety, combating marine pollution, and supporting seafarers' welfare, the proposed reforms promise to unlock the true potential of India's maritime sector.

Amitabh Kumar is Former Director General Shipping, Government of India. Views expressed are personal.

THE GIST

➔ The Merchant Shipping Bill, 2024 introduces significant changes to modernise India's maritime framework, drawing upon the best practices of leading maritime jurisdictions like the U.K., Norway, and Singapore.

➔ Under Entry 25 of List I (Union List) of the Constitution, the Union Government is responsible for the education and training of the mercantile marine and the regulation of such education and training provided by States and other agencies.

➔ The Government has recently undertaken several initiatives to minimise pollution from shipping activities. Some of the measures include reducing the sulphur content in marine fuel from 3.5% to less than 0.5%, banning the use of single-use plastics on Indian ships etc.

Key Features of the Merchant Shipping Bill, 2024

Ease of Registration

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Daily News Analysis

- The new Bill reduces Indian ownership requirements from 100% to 51%, enabling more flexibility and attracting foreign investment.
- Limited Liability Partnerships (LLPs), Non-Resident Indians (NRIs), and Overseas Citizens of India (OCIs) can own and register Indian vessels.
- Provisions allow bareboat charter-cum-demise registrations, aiding capital-deficient entrepreneurs to acquire vessels.
- Temporary registration provisions address challenges in the ship recycling industry, bolstering hubs like Alang.

Enlarging the Scope of Vessels

- The Bill expands the definition of vessels to include mechanised and non-mechanised crafts, such as barges, submersibles, and drones.
- Comprehensive regulation of offshore vessels enhances safety and operational standards.
- Strengthened oversight addresses coastal security risks exposed by incidents like the 26/11 Mumbai attacks.

Measures to Combat Marine Pollution

- Initiatives include reducing sulphur content in marine fuel to 0.5% and banning single-use plastics on ships.
- The Bill incorporates international conventions such as MARPOL and the Wreck Removal Convention, aligning with global standards.
- The introduction of the 'Swachh Sagar' online portal facilitates proper waste disposal, promoting sustainable shipping practices.

Welfare Provisions for Seafarers

- Indian seafarers have grown from 1,16,000 in 2015-16 to 2,85,000, with 85% employed on foreign-flagged vessels.
- The Bill extends welfare measures to seafarers on foreign-flagged ships, ensuring better working conditions and safety standards.
- Provisions align with the Maritime Labour Convention (MLC) for seafarer welfare.

Strengthening Maritime Training

- Maritime training, previously regulated through notifications, now gains a legal framework under the Bill.
- This ensures the elimination of unauthorised institutes and safeguards rural youth from fraudulent practices.

Focus on Coastal Shipping

- The Coastal Shipping Bill, 2024, separates technical regulation from commercial aspects of coastal waters.
- Initiatives align with the Sagarmala Program, promoting dedicated berths, hinterland connectivity, and integrated inland and coastal shipping.

Conclusion

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Daily News Analysis

- ➔ The proposed reforms aim to attract investment, enhance safety, support seafarers, and reduce marine pollution.
- ➔ These measures promise to unlock the full potential of India's maritime sector while fostering bipartisan support for sustainable development.

Need for New Legislation in the Shipping Sector

- ➔ The Merchant Shipping Act, 1958, and the Coasting Vessels Act, 1838 have become outdated and fail to address contemporary maritime needs.
- ➔ Regulatory gaps exist for offshore vessels, which constitute nearly 50% of Indian-flagged vessels.
- ➔ Maritime training, though liberalised, lacks a legal framework, and welfare provisions for Indian seafarers on foreign vessels are insufficient.
- ➔ The existing Acts do not facilitate the implementation of international conventions signed by India, hindering modernisation and the 'ease of doing business.'

UPSC Mains Practice Question

Ques : Discuss the significance of the Merchant Shipping Bill, 2024, in addressing regulatory gaps and promoting India's maritime sector. Highlight its provisions aimed at enhancing seafarer welfare, coastal security, and environmental sustainability. **(250 Words /15 marks)**

In News : Prime Minister Shri Narendra Modi launches LIC's Bima Sakhi Yojana

The Prime Minister launched the Bima Sakhi Yojana to promote financial inclusion and empower rural women through microinsurance services.

- The initiative focuses on training women Self-Help Group (SHG) members as insurance agents to bridge the gap in rural financial services.



Bima Sakhi Yojana

- Launched to empower women as facilitators of financial services in rural areas.
- Aims to train rural women as insurance facilitators under the Life Insurance Corporation (LIC) and Rural Postal Life Insurance (RPLI).
- Women act as intermediaries, creating awareness and assisting with documentation for life insurance policies.
- Provides income opportunities for women while ensuring the penetration of insurance in underserved regions.
- Encourages financial literacy and security for rural households.
- Focused on boosting women's confidence and promoting their participation in financial decision-making.

Eligibility:

- **Eligibility:** Women aged 18–70 years with at least a Class 10 education.
- **Support:** Monthly stipends of ₹7,000 (Year 1) and ₹6,000 (Year 2).

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Other Initiatives for Financial Inclusion of Women

- ➔ **Pradhan Mantri Jan Dhan Yojana (PMJDY):** Over 55% of accounts under PMJDY are held by women, ensuring access to basic banking services.
- ➔ **Self-Help Groups (SHGs):** Programs like NRLM (National Rural Livelihoods Mission) promote women-led SHGs for microcredit access.
- ➔ **Mudra Yojana for Women:** Offers collateral-free loans to women entrepreneurs.
- ➔ **Stand-Up India Scheme:** Provides loans for women setting up greenfield enterprises.
- ➔ **Mahila E-Haat:** A digital platform to support women entrepreneurs.
- ➔ **Mahila Kisan Sashaktikaran Pariyojana:** Focused on empowering women in agriculture and allied sectors.
- ➔ **Financial Literacy Camps:** Conducted by banks and NGOs to educate women on savings, credit, and insurance.

Achievements

- ➔ Financial inclusion has increased from 35% in 2011 to over 80% in 2023. Women-owned 56% of Jan Dhan accounts, ensuring their integration into formal banking.
- ➔ SHGs have mobilized over ₹75,000 crore in credit, empowering women entrepreneurs.
- ➔ Mudra loans supported over 60% women beneficiaries.
- ➔ Financial literacy efforts led to increased awareness and use of digital banking tools by women.

In energy-dependent world, the issue of food security

“Addressing food insecurity and energy poverty is central to achieving global stability, but tackling these issues independently is no longer sufficient,” warns the World Bank in its latest report on climate and development. The intertwined crises of food and energy security are defining the trajectory of the 21st century, casting a long shadow over global stability. Both systems are under siege – food production is strained by climate change, population growth, and inequality, while energy systems face geopolitical tensions, outdated infrastructure, and the slow transition from fossil fuels. Yet, their interconnectedness presents an even greater challenge: agriculture, a lifeline for humanity, is both a significant energy consumer and a contributor to climate change. As the world teeters on the edge of multiple tipping points, can we truly address one without confronting the other?

Dependency on carbon-intensive energy

Agriculture consumes nearly 70% of global freshwater resources and is responsible for over 20% of greenhouse gas emissions. Its dependence on fossil fuels – for mechanisation, irrigation, fertilizer production, and transportation – has created a vicious cycle of environmental degradation. This reliance also exposes food systems to energy price shocks, threatening global stability. Rising temperatures and erratic weather patterns further disrupt agricultural output, putting the livelihoods of 2.5 billion people at risk. Between 2020 and 2023, nearly 11.8% of the global population faced severe food insecurity, a figure projected to rise to 956 million by 2028.

Renewable energy investments reached \$500 billion in 2022, but fossil fuel consumption remains robust due to short-term economic and geopolitical pressures. Nations such as the United States, Brazil, and Guyana continue to expand oil and gas production, prioritising exports and domestic energy security. This ongoing dependency on carbon-intensive energy exacerbates the vulnerability of global food systems, particularly in regions with limited



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There is a need to reimagine agriculture, with the twin crises of food and energy insecurity set to challenge global priorities

access to reliable energy. Energy poverty reveals sharp global inequities. Low-income countries account for a small fraction of global energy demand but suffer disproportionately from supply disruptions. Extreme weather events frequently damage energy infrastructure in regions where power grids are already unreliable. In rural areas, energy deficits hinder agricultural productivity, leading to higher food prices and deepening poverty. In sub-Saharan Africa, per-hectare fertilizer usage remains far below the global average, contributing to food insecurity despite \$1.9 billion spent on fertilizer imports by the top 10 African importing countries in 2021 – more than double the amount in 2016.

Agriculture's reliance on fossil fuels further highlights its vulnerability. Natural gas, critical for fertilizer production, is both a feedstock and an energy source, with 80% of it used for ammonia synthesis and 20% powering the process. Volatility in natural gas prices directly impacts fertilizer costs and global food prices. Geopolitical actions, such as China's 2021 ban on phosphate fertilizer exports, disrupt agricultural supply chains. India, which imports 60% of its diammonium phosphate (DAP) fertilizers, experienced significant delays during critical cropping seasons, exposing its vulnerability to external shocks.

Renewable energy offers a glimmer of hope, but its deployment remains uneven. High-income countries installed 83% of new renewable capacity in 2022, leaving low-income nations reliant on outdated, carbon-intensive systems. While solar-powered irrigation and biomass energy solutions could transform agriculture, high costs and inadequate infrastructure limit their reach. The transition risks bypassing those who need it most.

Demands on agriculture

Meanwhile, agriculture is being increasingly burdened with competing demands. Beyond feeding a growing population, it is expected to support the global energy transition by producing biofuels. This dual role often pits food security against energy needs, as biofuel production requires vast land and water resources. In a world

where nearly 12% of the population faces hunger, is prioritising energy over food morally defensible? The financial costs of addressing food and energy insecurity are substantial yet achievable. The World Food Security Outlook estimates that ensuring basic caloric needs for the world's most vulnerable populations will require \$90 billion annually until 2030. Tackling malnutrition among women and children demands an additional \$11 billion per year, while transforming global food systems could cost \$300 billion-\$400 billion annually – just 0.5% of global GDP. However, for low-income nations, these costs are staggering, with food insecurity expenses in some cases surpassing 95% of GDP.

The implications of inaction are dire. Food insecurity is projected to cost the global economy trillions in lost productivity and adverse health outcomes. Climate-induced energy disruptions threaten to destabilise entire regions, driving social unrest and mass migration. For example, Africa's mineral wealth, essential for renewable technologies, is often extracted without benefiting local economies, perpetuating cycles of poverty and underdevelopment.

Need for inclusivity

Despite record investments in renewables, fossil fuel expansions continue unabated. Every delay compounds the human, environmental, and economic costs, narrowing opportunities for a resilient future. Clean energy solutions must address structural barriers to inclusivity, ensuring that the most vulnerable communities are not left behind.

Ultimately, the twin crises of food and energy insecurity challenge global priorities. The solutions are within reach, but they require a fundamental shift in perspective. Agriculture must be reimagined as both a source of sustenance and a cornerstone of sustainable development. Failure to act will create the risk of pushing millions into hunger and undermining global climate goals. As the clock ticks, the question remains: will the world rise to meet the moment?

The views expressed are personal

GS Paper 02 : Social Justice

GS Paper 03 : Indian Economy

PYQ : (UPSC CSE (M) GS-2 2018) : How far do you agree with the view that the focus on lack or availability of food as the main cause of hunger takes the attention away from ineffective human development policies in India? (250 words/15m)

UPSC Mains Practice Question: Discuss the interplay between food security and energy poverty, focusing on the challenges posed by agriculture's dependence on fossil fuels. Suggest measures to ensure sustainable development without compromising global climate goals. (250 Words /15 marks)

Context :

- ➔ The intertwined crises of food insecurity and energy poverty threaten global stability, amplified by climate change and geopolitical tensions.
- ➔ Agriculture, a major energy consumer and greenhouse gas emitter, highlights the challenges of balancing food production with energy needs. Inclusive, sustainable solutions are critical to ensure food and energy security for vulnerable populations.

Interconnected Crises of Food and Energy Security

- ➔ The World Bank highlights the intertwined crises of food and energy security as critical challenges in the 21st century.
- ➔ Food systems are strained by climate change, population growth, and inequality, while energy systems face geopolitical tensions, outdated infrastructure, and slow transitions to renewables.
- ➔ Agriculture, a significant energy consumer and greenhouse gas emitter, underscores the interconnectedness of these crises.

Agriculture's Dependency on Carbon-Intensive Energy

- ➔ Agriculture accounts for 70% of global freshwater use and contributes over 20% of greenhouse gas emissions.
- ➔ Its reliance on fossil fuels for irrigation, mechanization, and fertilizer production creates a cycle of environmental degradation and vulnerability to energy price shocks.

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- ➔ Between 2020 and 2023, severe food insecurity affected 11.8% of the global population, with projections of 956 million people affected by 2028.

Energy Inequities and Challenges

- ➔ Despite \$500 billion invested in renewable energy in 2022, fossil fuel consumption persists due to geopolitical and economic pressures.
- ➔ Energy poverty disproportionately affects low-income countries, hindering agricultural productivity and driving up food prices.
- ➔ Sub-Saharan Africa's low fertilizer usage and high import costs exacerbate food insecurity, despite spending \$1.9 billion on fertilizers in 2021.

Geopolitical and Economic Risks in Agriculture

- ➔ Natural gas, critical for fertilizer production, is both a feedstock and energy source, making agriculture vulnerable to price volatility.
- ➔ China's 2021 ban on phosphate fertilizer exports disrupted global supply chains, with significant impacts on countries like India, which imports 60% of its diammonium phosphate fertilizers.

Renewable Energy and Its Limitations

- ➔ Renewable energy deployment remains uneven, with 83% of new capacity installed in high-income nations in 2022.
- ➔ Solutions like solar irrigation and biomass energy have transformative potential but are limited by high costs and insufficient infrastructure in low-income regions.

Competing Demands on Agriculture

- ➔ Agriculture faces dual demands: feeding a growing population and supporting the energy transition through biofuel production.
- ➔ Biofuel production often competes with food security, as it requires extensive land and water resources.
- ➔ Addressing global caloric needs for vulnerable populations requires \$90 billion annually until 2030, with an additional \$300–\$400 billion needed to transform food systems.

Implications of Inaction

- ➔ Inaction on food and energy insecurity could cost trillions in lost productivity and health outcomes.

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Daily News Analysis

- ➡ Energy disruptions driven by climate change risk destabilizing regions, leading to unrest and migration.
- ➡ Exploitation of Africa's mineral wealth for renewables without benefiting local economies perpetuates poverty.

Call for Inclusive and Sustainable Solutions

- ➡ Clean energy solutions must address structural barriers to inclusivity to ensure vulnerable communities are not left behind.
- ➡ Agriculture needs reimagining as a cornerstone of sustainable development, balancing food security with environmental and energy goals.
- ➡ Immediate, inclusive action is essential to avoid deepening hunger and undermining global climate objectives.