

The Hindu Important News Articles & Editorial For UPSC CSE

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Edition: International Table of Contents

Page 01 Syllabus : GS 1 & 3 : Geography & Indian Economy	₹45,000-cr. Ken-Betwa link project launched
Page 05 Syllabus : GS 3 : Indian Economy	'We want to be among the top five maritime nations by 2047'
Page 07 Syllabus : GS 3 : Disaster & Disaster Management	How the 2004 Indian Ocean quake transformed tsunami science
Page 07 Syllabus : Prelims Fact	Scientists find bacteria living on fish brains
Page 10 Syllabus : Prelims Fact	U.S. and China renew S&T Agreement
Page 09 : Editorial Analysis: Syllabus : GS 3 : Disaster & Disaster Management	The lapses in the disaster management Bill

It's about quality

Page 01 : GS 1 & 3 – Geography & Indian Economy – Infrastructure

The Ken-Betwa river-linking project aims to address water scarcity in Bundelkhand by linking two rivers, improving irrigation, drinking water supply, and energy generation.

₹45,000-cr. Ken-Betwa link project launched

Modi lays the foundation stone for the river-linking project aimed at solving the water woes of the Bundelkhand region, spread across parts of the States of Uttar Pradesh and Madhya Pradesh; PM credits Dr. Ambedkar's vision for river valley projects, claims the Congress never gave architect of the Constitution credit for water conservation efforts

Mehul Malpani
BHOPAL

Prime Minister Narendra Modi on Wednesday laid the foundation stone for the Ken-Betwa river-linking project in Madhya Pradesh's Khajuraho, aimed at solving the water woes of the Bundelkhand region, spread across parts of Uttar Pradesh and Madhya Pradesh. The project is estimated to cost around ₹45,000 crore.

Speaking at the event, Mr. Modi credited Dr. B.R. Ambedkar's vision for India's major river valley projects, and accused the Congress of not giving due recognition to the architect of the Constitution.

"The major river valley projects of India were based on the vision of Babasaheb Ambedkar. The Central Water Commission

exists today because of the efforts of Dr. Ambedkar but the Congress never gave him credit for his water-conservation efforts. No one was even allowed to know about it," he said, amid the ongoing controversy over Union Home Minister Amit Shah's remarks on Dr. Ambedkar. The Congress had staged protests seeking Mr. Shah's resignation over the issue.

"Who thought of a visionary water-conservation plan? The truth was suppressed. The true servant was forgotten so that credit could go to one person. I tell you that after the country got Independence, the credit for the farsightedness behind India's water management and construction of dams goes to Babasaheb Ambedkar," he said.

Mr. Modi said that the Congress governments of



Narendra Modi examines a project map during the event to lay the foundation stone for river linking project in Khajuraho. ANI

the past were "experts in making announcements" but did not have the "intention to implement the schemes".

Prosperity on cards

He claimed that the Ken-Betwa project will bring prosperity to the drought-prone Bundelkhand region. "The people of Bundelkhand struggled for ev-

ery drop of water but the previous governments did not find any permanent solution to the water crisis."

"Even after seven decades of Independence, disputes over river water between States continued but no concrete efforts were made to resolve them," Mr. Modi said.

"When Atal [Bihari Vajpayee] ji's government was

SP hails project, Congress flags ecological impact

NEW DELHI

While the Congress on Wednesday described the Ken-Betwa river linking project as "another proof" of difference between Prime Minister Narendra Modi's "talk and walk" on environment, the SP sought to take credit for conceptualising it. » PAGE 5

formed, he came up with a permanent solution through the river-linking initiative and even started the work but it was discontinued after 2004. Today, Atal ji's dream is about to be realised," he added.

The Ken-Betwa river linking project is expected to address drinking and irrigation water needs of at least 10 districts of Madhya

Pradesh and various districts of Uttar Pradesh. The project is also aimed at generating more than 100 MW of hydropower and 27 MW of solar energy.

The Prime Minister also laid foundation for the Daudhan dam irrigation project, which is expected to address irrigation needs of 11 lakh hectares of land in the region.

Mr. Modi said that Madhya Pradesh has become the first State in the country with two river-linking projects under way at the moment. Recently, he had also launched the Parbati-Kalisindh-Chambal river-linking project that spreads between Rajasthan and Madhya Pradesh.

Apart from the Ken-Betwa project, the Prime Minister also virtually inaugurated a floating solar energy project in Madhya Pradesh's Omkareshwar,

the State's first solar power plant. He also laid the foundation stone for the construction of 1,153 Atal Gram Seva Sadans and released a commemorative stamp and coin in the honour of former Prime Minister Vajpayee, on the occasion of his birth centenary.

Madhya Pradesh Governor Mangubhai Patel, Chief Minister Mohan Yadav, Union Jal Shakti Minister C.R. Patil, Union Minister and former Chief Minister Shivaraj Singh Chouhan, State BJP chief and Khajuraho MP V.D. Sharma and other leaders were present at the ceremony.

Speaking about concerns that the river-linking project may cause harm to the animals at the Panna Tiger Reserve, Mr. Modi said the animals at the reserve will be kept in mind while building the canal for the project.

- ➡ The project involves building canals, dams, hydropower, and solar energy components.
- ➡ It is part of India's broader water management strategy.

Ken-Betwa River-Linking Project Overview

➡ Objective:

- The Ken-Betwa river-linking project aims to resolve the long-standing water scarcity issues in the drought-prone Bundelkhand



Daily News Analysis

region, spanning parts of Uttar Pradesh and Madhya Pradesh.

- The project focuses on linking the Ken and Betwa rivers to ensure a stable and reliable water supply to the region.

➡ Key Components of the Project

- **Canal Construction:** The primary feature of the project involves constructing a canal to transfer water from the Ken River to the Betwa River. This will ensure water availability for both irrigation and drinking needs in the region.
- **Daudhan Dam:** The project includes the construction of the Daudhan Dam on the Ken River. The dam will store water, regulate its flow, and supply water for irrigation purposes.
- **Hydropower Generation:** The project aims to generate over 100 MW of hydropower, which will help meet the region's electricity demands and contribute to sustainable energy production.
- **Solar Power Generation:** In addition to hydropower, the project will also generate 27 MW of solar power, promoting clean energy and further supporting the region's energy needs.

➡ Benefits of the Project

- **Water Supply:** The project will significantly improve the drinking water supply to at least 10 districts in Madhya Pradesh and several districts in Uttar Pradesh. It will provide a reliable water source for domestic consumption.
- **Irrigation:** The canal will provide irrigation facilities to approximately 11 lakh hectares of agricultural land. This will enhance agricultural productivity and improve livelihoods for farmers in the region.
- **Economic Development:** By addressing water and energy needs, the project is expected to stimulate economic growth in the Bundelkhand region, boosting agriculture, energy production, and local infrastructure.

Environmental and Ecological Considerations

- ➡ **Wildlife and Habitat Protection:** The project passes through ecologically sensitive areas such as the Panna Tiger Reserve. Special measures will be implemented to mitigate any potential negative impact on local wildlife and natural habitats.
- ➡ **Sustainability:** The combination of hydropower generation and solar power aligns with the project's focus on sustainability, reducing the environmental footprint while addressing the water and energy needs of the region.

Strategic Importance

Daily News Analysis

- ➡ **River-Linking Initiative:** This project is a crucial part of India's larger river-linking strategy, aimed at resolving inter-state water disputes and ensuring long-term water security for drought-prone regions.
- ➡ **Regional Transformation:** By improving water availability, irrigation, and energy access, the project is expected to bring about significant socio-economic development in the Bundelkhand region, fostering overall regional growth.

UPSC Mains Practice Question

Ques : Examine the significance of the Ken-Betwa river-linking project for sustainable water management and regional development. Discuss its potential environmental and socio-economic impacts. **(150 Words /10 marks)**



The article discusses the Indian government's initiatives and targets for the maritime sector.

- This includes Maritime Vision 2047, the development of maritime infrastructure, cruise tourism, and legislative reforms.
- Key reforms like the Coastal Shipping Bill and Merchant Shipping Bill aim to boost India's maritime capabilities.

'We want to be among the top five maritime nations by 2047'

Union Minister says large international cruise ships are coming to India because of the modern facilities and that the country's performance in cargo operations has been exemplary over the last 10 years; more than ₹80 lakh crore will be invested in sectors such as shipbuilding, green ports and modernisation of ports, he adds; part of the Lothal maritime museum will open by September 2025

INTERVIEW

Sarbananda Sonowal

Dinakar Peri
Sreeparna Chakrabarty

The soon-to-be enacted twin Bills – the Coastal Shipping Bill and the Merchant Shipping Bill – will provide a huge impetus to coastal shipping, besides enhancing Indian ship ownership and promoting ease of doing business in the country, says Union Minister for Shipping and Ports Sarbananda Sonowal. He speaks on maritime vision 2047, tourism and other recent legislations. Excerpts:

Can you elaborate on the maritime vision 2047?

In the last 10 years, this sector has seen exemplary performance. According to

World Bank Logistics Performance Index reports, 2023, among 139 countries, India's position improved from 54 to 38 in the last 10 years due to various initiatives. If we talk of container dwell time [time spent by a cargo container at a port or terminal before it is moved out], it is about three days, which is much better than in many advanced countries. In turnaround time [time required for a ship to unload its cargo and depart], ours is 0.9 days, better than Canada, Australia, Germany and the U.S.

We have more than 176 maritime nations across the world. Among them, we want to become the world leader in different verticals like shipbuilding, ship repair and ship recycling. By 2030, we want to become one of the top 10 nations, and by 2047, we want to be among the top five. So this is the vision we have developed and whatever follow-up action is

needed to be undertaken, that has already started.

When the maritime Amrit Kaal Vision 2047 was launched by Prime Minister Narendra Modi last year, it was decided to make an investment of more than ₹80 lakh crore in 25 years of our journey in different verticals like shipbuilding, green ports, green shipping, and modernisation of ports, etc. For example, in cargo handling capacity, the target is to reach 10,000 million metric tonnes by 2047. Today, we have a capacity to handle 1,600 million metric tonne.

To become a world leader, we have to develop world-class ecosystem with global standards in all the verticals, be it port management systems, cargo handling, shipbuilding, ship repair, ship recycling, also in all kinds of cruises – ocean cruise, coastal cruise, river cruise and inland waterways, coastal shipping and EXIM (ex-



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port-import) cargo. In all these verticals, India will have to showcase its credibility, quality, and capability.

Is the Ministry working on any tourism initiatives, specially, cruise tourism?

We have already developed six international cruise terminals. They are like airports, as in, whatever facilities are there in air-

ports, same facilities are being developed in these cruise terminals. Many international cruise liners like Cordelia and Costa Serena are coming to these terminals. These quality ships are coming to India because of the modern facilities. Not only infrastructure but also various other measures to promote cruise tourism, including incentives like tax exemp-

tions etc., are being provided. We have also worked on lighthouse tourism. We have more than 200 lighthouses along our coastlines. Earlier, up to 2014, the tourist footfall was only 4.34 lakh, but now it has gone up to 16.19 lakh, which is a 273 % growth in 10 years' time.

The Union Cabinet gave approval to the National Maritime Heritage Complex project in Lothal, Gujarat, in October. What is the progress and by when can it be completed?

When the entire project is completed, it would be the largest maritime museum in the world. It is expected to be completed by 2029. Its Phase-1A would be open to people from September 2025.

International collaborations with more than 20 countries have been proposed for development of

the complex. These collaborations will bring in joint maritime research activities, preservation of maritime heritage, exchange of information, artefacts, technical know-how, among other things.

This (NMHC) would be a centre for learning, study and research globally on maritime issues. Here you will discover precious information related to maritime activities across the world in various civilisations.

The project is anticipated to have a daily footfall of up to 25,000 and will create 22,000 jobs. At present, 65% physical progress for the phase 1A of the project has been achieved.

Can you talk of the recent laws that have been enacted?

Legislative reforms are crucial for growth and development, through the rationalisation and

simplification of laws and the adoption of global best practices.

The revamped Major Port Authority Act, National Waterways Act, Inland Vessel Act, and Recycling of Ships Act have already accelerated growth and unlocked the hitherto untapped potential of the port, waterways, and ship recycling sectors.

Two new legislations, the Coastal Shipping Bill and the Merchant Shipping Bill, are soon to be enacted. These will provide a huge impetus to coastal shipping, integrating coastal and inland waterways, enhancing Indian ship ownership, promoting coastal security, combating marine pollution, securing seafarer's welfare along with regulating quality maritime training, boosting shipbuilding and ship recycling, and promoting ease of doing business in India.

(For full interview, go to bit.ly/sonowalint)

Government Initiatives, Missions, and Targets Regarding Maritime Sector

- **Maritime Vision 2047**
 - India aims to become a global leader in maritime sectors such as shipbuilding, ship repair, and ship recycling.
 - By 2030, India plans to be among the top 10 maritime nations and top 5 by 2047.
 - The country intends to enhance cargo handling capacity from 1,600 million metric tonnes to 10,000 million metric tonnes by 2047.
 - The vision includes investment of ₹80 lakh crore in the maritime sector over the next 25 years.
- **Infrastructure Development**
 - Investment will be directed towards the modernisation of ports, development of green ports, and eco-friendly shipping.
 - The Ministry plans to develop world-class ecosystems in all verticals, including port management systems, cargo handling, and inland waterways.

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➡ Cruise Tourism Development

- The government has developed six international cruise terminals with facilities comparable to airports.
- Tax exemptions and incentives have been introduced to promote cruise tourism.
- Cruise tourism has been boosted with quality international cruise liners visiting Indian ports.
- Lighthouse tourism has grown by 273% in 10 years, attracting 16.19 lakh visitors.

➡ National Maritime Heritage Complex

- A major project located in Lothal, Gujarat, this complex will be the world's largest maritime museum.
- Phase-1A will open to the public in September 2025, with full completion expected by 2029.
- The project will include international collaborations for research, preservation, and exchange of maritime knowledge.
- It is expected to attract 25,000 daily visitors and create 22,000 jobs.

➡ Recent Legislative Reforms

- The Major Port Authority Act, National Waterways Act, Inland Vessel Act, and Recycling of Ships Act have been enacted to streamline growth in the port, waterways, and ship recycling sectors.
- The Coastal Shipping Bill and Merchant Shipping Bill are set to be enacted to boost coastal shipping, promote shipbuilding, enhance Indian ship ownership, improve coastal security, and ensure seafarer welfare.

UPSC Mains Practice Question

Ques : Discuss the key initiatives under the Maritime Vision 2047 to enhance India's position in the global maritime sector. How will recent legislative reforms like the Coastal Shipping Bill and Merchant Shipping Bill contribute to these goals? (250 Words /15 marks)

—It's about quality—

The 2004 Indian Ocean earthquake and tsunami, one of the deadliest natural disasters in history, highlighted the vulnerability of coastal regions to massive seismic events.

How the 2004 Indian Ocean quake transformed tsunami science

The transoceanic reach of the 2004 tsunami was a big surprise. With no recorded history of any event of such magnitude, researchers had not anticipated it occurring along India's eastern seaboard. But in the two decades since, their understanding of tsunamis has leapt forward

Kusala Rajendran
G. P. Rajendran

December 26, 2004, marks the 20th year since the 2004 Indian Ocean earthquake and tsunami. The tsunami generated by the quake of magnitude 9.1 was sourced off the Sumatran coast and was the third largest (by magnitude) in the world since 1900. The source was 30 km below the ocean floor, in the Sunda trench, where part of the Indo-Australian plate subducts beneath the Burma microplate, which is a part of the Eurasian plate.

The 2004 earthquake ripped through 1,300 km of the plate boundary, the fault tearing from Sumatra in the south to Gogo Islands in the north. The quake was felt in Indonesia, Bangladesh, India, Malaysia, the Maldives, Myanmar, Singapore, Sri Lanka, and Thailand. It caused severe damage and killed hundreds in Northern Sumatra and in the Andaman and Nicobar Islands. The tsunami was most impactful on distant shores, affecting 17 countries lining the Indian Ocean.

In all, with an astounding death toll of around 227,000 plus 1.7 million more displaced, the 2004 tsunami is the deadliest in recorded history.

Unprecedented magnitude

In less than six years, on March 11, 2011, a magnitude 9.1 earthquake hit the east coast of Japan, the largest ever recorded in that country. It generated a tsunami that reached as high as 39 metres and travelled up to 8 km inland. The twin disasters killed more than 18,000 people, displaced more than 500,000, and resulted in the Fukushima Daiichi nuclear power plant accident.

Although devastating tsunamis have occurred in the past – 1960 Chile and 1964 Alaska, for example – the two 21st century events taught us important lessons. Particularly, the 2004 tsunami highlighted how vulnerable the world was to natural hazards. It landed like a bolt from the sky, hitting the most unexpected locations, and placed a premium on the importance of tackling disaster risk through preparedness and resilience.

As Margareta Wahlström, head of the UN Office for Disaster Risk Reduction (UNISDR), observed in a panel discussion: "Ten years after the Indian Ocean tsunami, the world has taken significant measures to make the world a safer place against disasters."

The 2004 tsunami surprised researchers and hazard managers alike with its transoceanic reach. With no recorded history of any event of such magnitude, the research community hadn't anticipated it occurring along India's eastern seaboard. The only previous tsunami had occurred in 1881, caused by a large earthquake (magnitude 8.0) off Car Nicobar island, and another in 1883 due to the explosion of Krakatau. These events produced only small sea surges as recorded by tide gauges at different points on the east coast.

However, in the two decades since 2004, researchers have made tremendous leaps in the scientific understanding of tsunami generation and the technical aspects of earthquake monitoring. The Indian Tsunami Early Warning Centre (ITEWC), established in 2007 by the Union Ministry of the Earth Sciences of the Government of India, is perhaps the most significant step in this direction.

Operating from the Indian National Centre for Ocean Information Services (INCOIS) at Hyderabad, ITEWC operates seismological stations as well as bottom pressure recorders and tidal stations across the Indian Ocean basin – all 24/7. These systems can transmit offshore and deep ocean tsunami observations that enable early warnings. Earthquake data from the stations operated by the India Meteorological Department (IMD) and 350 global stations are also available at INCOIS.

Ocean monitoring systems also pass data in real time. In about 10 minutes, for example, the system can identify a potential tsunami-producing earthquake and issue tsunami alerts or warnings – depending on the expected severity – for countries bordering the Indian Ocean. India is the fifth country in the world, after the U.S., Japan, Chile, and Australia, to have an advanced tsunami warning system of this kind.

A new practice

The 2004 incident also spurred important new developments in research. The work of tsunami geology, pioneered by Brian Atwater of the U.S. Geological Survey, prompted researchers in Asian countries



Coastal devastation on Katchal Island, part of the Andaman and Nicobar Islands, in 2005. The island lost some 90% of its population in the December 26, 2004, tragedy. AFP/GETTY IMAGES

including India to search for evidence of tsunamis in history. Atwater's work along the Washington coast of the western U.S. had revealed evidence of an earthquake and tsunami in 1700, plus their predecessors. One fascinating part of this work was the use of land elevation changes caused by the earthquake, which left trees stressed or just killed them. Atwater had used the imprints of these effects to determine when some piece of land had been deformed and thus when it was suffering the effects of a tsunamigenic earthquake.

Inspections of subsidised mangrove swamps revealed how the 2004 earthquake had rendered changes in elevation of up to 3.5 metres at some places along the Andaman and Nicobar Islands. Scientists also wondered if there could have been past events that also caused the mangroves to subside. As it turned out the 2004 earthquake had reopened the coffins of the past and exposed their skeletons, in the form of dead roots sticking out from tidal platforms during a low tide. Such roots exposed near Port Blair were used to infer that the last earthquake had occurred about a thousand years ago.

Excavations at Mahabalipuram, a port of the Pallava dynasty, unearthed evidence of a tsunami of the same vintage. It was the first proof of a pre-2004 tsunami reported by an Indian team. Researchers also sifted through sedimentary deposits along the islands and coastal areas of the mainland to find evidence of other ancient tsunamis, while learning to distinguish between tsunami and storm deposits.

This effort is a good example of how the 2004 tsunami prompted the science of tsunami geology to become a new practice, leading to many new research papers and doctoral theses. The demand for more knowledge about tsunamis also facilitated quantum leaps in the use of GPS systems and earthquake instrumentation. With funding from the Ministry of Earth Sciences, research institutes established several new stations



The No. 3 nuclear reactor of the Fukushima Daiichi nuclear power plant burning after the earthquake and tsunami triggered an explosion. Satellite image taken March 14, 2011. DIGITALGLOBE

along the Andaman and Nicobar Islands, strengthening seismic observations and geodetic studies.

In another important step, the tsunami modelling using mathematical tools helped researchers determine inundation limits. In particular, the disaster provided a stark reminder that nuclear power plants established along Indian coasts could be vulnerable to a hitherto underestimated risk. While the Kalpakkam nuclear power plant withstood the giant waves, it also shut down automatically after the rising water levels tripped the detectors. There was no release of radioactive material and the reactor was restarted six days later.

But the 2011 Tohoku earthquake reminded the world, and India, how quickly a nuclear disaster can happen in the absence of a failsafe. It was clear the radiation from the Fukushima facility had entered the human food chain. Researchers even found radioactive caesium in the breast milk of some women tested near Fukushima prefecture three months after the disaster. What if the waves in 2004 had been high enough to damage the reactors at Kalpakkam?

This question continues to resonate as the government has been pursuing large developmental projects in Great Car Nicobar, including the construction of an international transshipment terminal. Some experts have also argued that the last great earthquake that affected the region before 2004 was a millennium ago, so there is no imminent danger. But this question hinges on how much we still don't know. What if an unbroken patch of the subduction zone between Myanmar and India gives way? A still-unexamined portion of the crust between Great Nicobar and Car Nicobar suddenly breaking into a powerful earthquake and a tsunami can't be ruled out.

Experts and policymakers must also focus on other problem spots, like the Makran Coast in the northern Arabian Sea and the Myanmar coast adjoining the Northern Indian Ocean. Both of them have the potential to produce large

Excavations at Mahabalipuram, a port of the Pallava dynasty, unearthed evidence of a tsunami of the same vintage. Researchers also sifted through sedimentary deposits along coastal areas of the mainland to find evidence of other ancient tsunamis

tsunamis. The Makran Coast, cutting through Iran and Pakistan, could direct a tsunami's energy towards India's west coast, which also hosts nuclear reactors and the city of Mumbai.

A major milestone

Science tells us that stress builds between tectonic plates until it reaches a critical strain, at which point the accumulated potential energy is released as an earthquake. Subduction zones like the Andaman-Sumatra region are becoming significant as they provide clues to earthquake generation. The discovery of slow slips – tectonic faults that move many orders of magnitude slower and generally just a bit deeper – has also added a new dimension to this picture.

Of late, researchers have been studying seismic slips at plate boundaries to understand the processes that occur before and after major earthquakes. They have elucidated the occurrence of premonitory and post-seismic slip transients using laboratory experiments and numerical simulations. Some of these studies have implications for earthquake prediction: they indicate a creative process that initially involves stable, slow rupture growth within a confined zone on a fault just before unstable, high-speed rupture.

One paper published in 2015 (coauthored by one of the authors of this article) indicated a perceptible downward ground movement in South Andaman between 2003 and 2004, before the earthquake – a silent event with a moment magnitude of 6.3. This event could have been the precursor to the megathrust earthquake. Analyses of geodetic data on a wider set of global earthquakes published in *Science* also confirmed short-term precursory fault slips before large earthquakes.

After it happened, the 2004 Andaman-Sumatra earthquake became a major milestone in modern seismological research, providing science with a treasure trove of data to help glean new insights about earthquake generation and related hazards.

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- ➡ It spurred advancements in tsunami warning systems and scientific research. Lessons learned from this disaster continue to shape global disaster management strategies.

20th Anniversary of the 2004 Indian Ocean Earthquake and Tsunami

Overview of the 2004 Disaster

- ➡ On December 26, 2004, a magnitude 9.1 earthquake struck off the coast of Sumatra, triggering one of the deadliest tsunamis in recorded history.
- ➡ The earthquake originated 30 km below the ocean floor in the Sunda Trench, where the Indo-Australian plate subducts beneath the Burma microplate.
- ➡ The rupture extended over a 1,300 km stretch of the plate boundary, affecting Indonesia, Bangladesh, India, Sri Lanka, Thailand, and other nations.
- ➡ The tsunami impacted 17 countries along the Indian Ocean, causing over 227,000 deaths and displacing 1.7 million people.

Subsequent Disasters and Lessons Learned

- ➡ In March 2011, a magnitude 9.1 earthquake off Japan triggered a tsunami and the Fukushima nuclear disaster, showing the ongoing vulnerability to natural disasters.
- ➡ The 2004 tsunami highlighted the unpredictability of such events and underscored the necessity for disaster preparedness and resilience.

Scientific Advancements Post-Tsunami

- ➡ The 2004 tsunami was a shock to researchers, as it was the first recorded massive tsunami along India's eastern seaboard.
- ➡ The Indian Tsunami Early Warning Centre (ITEWC) was set up in 2007, improving earthquake and tsunami monitoring.
- ➡ ITEWC operates seismological stations and ocean monitoring systems to issue early warnings for the Indian Ocean region, with alerts sent within 10 minutes of detecting potential tsunami-producing earthquakes.

Impact on Tsunami Research

- ➡ The tsunami prompted the development of tsunami geology, with significant findings in India and other countries.
- ➡ Excavations in Mahabalipuram uncovered evidence of a tsunami from the same period as the 2004 disaster.
- ➡ Researchers studied sedimentary deposits along the coast, discovering more ancient tsunamis and establishing a new scientific field focused on tsunami research.

Nuclear Vulnerabilities and Future Risks

Daily News Analysis

- The 2004 tsunami revealed vulnerabilities in nuclear power plants along India's coast.
- Though the Kalpakkam nuclear power plant withstood the tsunami, it was automatically shut down due to rising water levels, highlighting potential risks to nuclear facilities.
- Following the Fukushima disaster, the risks to nuclear plants from tsunamis became clearer, spurring calls for increased safety measures.

Emerging Tsunami Risks

- The Makran Coast, spanning Iran and Pakistan, poses a potential tsunami threat to India's west coast, including Mumbai, where nuclear reactors are located.
- Research has also identified other seismic risks, including slow seismic slips that could provide clues about impending earthquakes and tsunamis, enhancing predictive capabilities.

Ongoing Research and Seismological Milestones

- The 2004 event marked a significant milestone in seismological research, offering valuable data on earthquake generation and related hazards.
- Studies on seismic slips at plate boundaries and pre-earthquake phenomena have advanced, offering new insights into earthquake prediction and risk mitigation strategies.

PYQ : UPSC Mains : 2017

Ques : In December 2004, tsunami brought havoc on 14 countries including India. Discuss the factors responsible for the occurrence of Tsunami and its effects on life and economy. In the light of guidelines of NDMA (2010) describe the mechanisms for preparedness to reduce the risk during such events. **(250 words/15m)**

A new study challenges the long-held belief that the brain is sterile by revealing that bacteria can thrive in fish brains.

- This discovery suggests the possibility of a brain microbiome in vertebrates, including humans.

Analysis of the news:

- A study by the University of New Mexico challenges the belief that the brain is sterile, showing bacteria can thrive in fish brains.
- Researchers identified living bacteria in fish olfactory bulbs and other brain regions using DNA extraction and microscopic imaging.

Origins of Brain Microbes:

- Some bacteria may have colonized the brain before the evolution of the blood-brain barrier, while others likely entered via the gut or bloodstream, continuously infiltrating the brain.
- The brain's microbial community appears dynamic, shaped by both early colonization and ongoing interaction with other bodily systems.

Implications for Humans:

- While fish are different from humans, the findings raise questions about whether a similar brain microbiome might exist in humans and other vertebrates.
- The study may also reveal potential roles for microbes in brain processes, similar to the gut-brain axis.



Bacteria, it appears, can breach the blood-brain barrier and thrive. CREDIT: SSA

Scientists find bacteria living on fish brains

Arkatapa Basu

For decades, scientists have believed the human brain is a sterile fortress, protected from microbial invaders by the robust blood-brain barrier. But a new study, published in *Science Advances*, challenges this assumption by showing bacteria can't just make their way to the brain, they can thrive there.

Researchers from the University of New Mexico, led by biologist Irene Salinas, made this startling revelation when studying salmon and trout. Using DNA extraction and microscopic imaging, they identified living bacteria in the fishes' olfactory bulbs and other brain regions. The results showed the olfactory bulb, which is directly connected to the nasal cavity, harboured bacteria as did deeper-lying brain tissue.

"Our findings demonstrate that microorganisms ... redefine the boundaries between microbiota and the healthy vertebrate brain," the researchers wrote in their paper.

The presence of bacteria in fish brains raised several questions. The foremost was about how they managed to cross the blood-brain barrier. Salinas & co. discovered that many of these microbes possessed unique adaptations that helped them breach the barrier. Some produced molecules called polyamines that can open tight junctions in the barrier fluid; others were able to evade immune responses or outcompete their rivals, ensuring their survival in the brain's delicate environs.

The group also explored the origins of these brain-dwelling microbes. Some bacteria seemed to have colonised the brain much before the blood-brain barrier had evolved to its present form. Others likely travelled up from the gut or the bloodstream, continuously infiltrating the brain throughout the fishes' lives. The researchers said the presence of more than one pathway suggests the brain's

Many microbes had adaptations that helped breach the barrier. Some produced polyamines that can open tight junctions in the barrier fluid; others evaded immune responses, ensuring survival in the brain's delicate environs

microbial community is dynamic, shaped by both early colonisation and ongoing interaction with other bodily systems. A particularly striking finding was the image of a bacterium caught mid-transit across the barrier, offering direct visual evidence. Some researchers have hypothesised that these microbes might be engulfed by immune cells while others have suggested they could play active roles in physiological processes – just like the human gut microbiome does in regulating digestion, immunity, and mood.

"Microorganisms shape the vertebrate brain via complex biological processes, the best characterised being the gut-brain axis," to quote from the paper. "This bidirectional communication involves molecular mediators released by microorganisms but not direct microbial colonisation of the brain. Our findings uncover remarkable associations between the salmonid brain and bacteria during healthy physiological states. Whether this is a hallmark of other teleosts or a universal symbiotic relationship found in all vertebrates remains to be investigated." Teleosts refers to a group of more than 26,000 fish species, making up the vast majority of all known fish.

Fish are very different from humans yet the study also opens the door to rethinking the brain's microbiome in vertebrates, including humans. If bacteria can thrive on fish brains, it's possible they may do so on human brains as well.

The U.S. and China extended their 1979 science and technology cooperation agreement for five more years, emphasizing basic research and mutual benefits.

- The renewal seeks to address concerns about technology exports and intellectual property.
- The agreement continues to shape bilateral scientific relations.

U.S. and China renew S&T Agreement

What new measures were added to the Agreement in 2024? What does this indicate about the evolving relationship between the U.S. and China?
How has the U.S. benefited from its collaboration with China under this Agreement?

EXPLAINER

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The story so far:

In December 13, China and the U.S. agreed to extend their Agreement on Co-operation in Science and Technology for an additional five years, effective from August 27, 2024, and also signed a protocol to amend it. Observers have welcomed the development as an affirmation of science and technology cooperation between the two major powers. The Agreement was first signed on January 31, 1979, by Chinese leader Deng Xiaoping and U.S. president Jimmy Carter at a time when both countries had established diplomatic relations and agreed to cooperate on agricultural research and technology. Since then, the Agreement has been renewed every five years while expanding in scope. The Agreement is governed by the U.S.-PRC Joint Commission on Scientific and Technological Cooperation. The U.S. and China each appoint co-chairs and an agency from each country is nominated as the 'executive agent'. There are also additional protocols between agencies and 40 sub-agreements in different areas, from agriculture to nuclear fusion.

Why do bilateral S&T agreements matter?

Bilateral science and technology agreements have been key to promote cooperation in these fields. Often there are specific agreements or cooperation pacts as part of a larger engagement framework. While these agreements don't mention specific investments in science and technology, they often pave the way for forms of cooperation that aren't confined to state institutions. They also facilitate joint research, mobility between the countries for students and scientists, encourage institutional cooperation, and set up bilateral research centers. India has



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such agreements with 83 countries.

But while countries sign such agreements as part of routine engagements, both countries need to have the capacity and intentions to pursue the cooperation earnestly for the instruments to succeed. Token initiatives have never cut it. In this regard, the Agreement between China and the U.S. is probably the most successful of its kind.

What does the renewed agreement stipulate?

Conflicts between the U.S. and China, particularly over technology exports to China and concerns about China overtaking the U.S. in science and technology indicators, have become sticking points of late. To address them, the newly amended Agreement has measures to enhance provisions for researcher safety and data reciprocity.

The collaboration will henceforth be confined to the intergovernmental level, to basic research, and to previously identified themes of mutual benefit. The instrument will also exclude cooperation in critical and emerging technologies to assuage stakeholders that China won't extract disproportionate benefits, allegedly at the U.S.'s expense.

Indeed, experts who reviewed the Agreement have flagged China's ability to make better use of the research ecosystem and concerns about intellectual property rights. One report by the Congressional Research Service stated: "In 2017, U.S. patent and trademark officials identified over 400 [Chinese] patents tied to [Agreement] projects that [China] commercialised without U.S. commercial benefit"

So, before the Agreement was renewed this year, the U.S. was faced with three options: to renew it as usual for five years, to rescind it or to renew it with new measures to restrict the scope and add additional conditions. The U.S. opted for the third, implying that while there are deep concerns about the Agreement's continued usefulness to the U.S., the outgoing administration would rather not allow it to altogether expire or rescind it.

What has the U.S. gained?

China expanded its cooperation in science and technology in the 1970s by signing agreements with the U.S. and the European Union. Until then these deals had been restricted to some east European countries and the erstwhile Soviet Union. Between then and now, the

country has emerged as a strong contender for the leadership of global science.

According to one February 2024 paper, China's research and development (R&D) spending increased from \$375 million in 1979 to \$442 billion in 2021, second only to the U.S. In 1985, there were 2,770 Chinese undergraduate students in the U.S. and 109,525 in 2000. Both the number of papers coauthored by Chinese and U.S. authors and the variety of fields in which this has happened have increased. On the back of these data, Deborah Seligsohn of the Centre for Strategic and International Studies, Washington, DC, has argued that the U.S. wasn't poorly served by the Agreement and has received significant value as well.

For the same reasons, the incoming Trump administration isn't likely to rescind the new agreement, although it might attach more conditions and further limit its scope. It will still be valuable to China for keeping the door to non-zero cooperation in science and technology, including to promote the mobility of its researchers, open. Likewise, the U.S. could maintain a handle on China's rise vis-à-vis science and technology rather than lose all leverage.

In all, the Agreement teaches us that while bilateral science and technology agreements are important, making the best use of them demands capacity-building and sustained investment in R&D. Otherwise the participating countries won't be able to absorb the principal advantages such agreements generate. The Agreement catalysed China's transformation from a 'junior partner' in 1979 to a formidable competitor in 2024. Even if the U.S. deems its success to be 'extreme', the Agreement forces the two countries to respond to each other's concerns using the language of science and technology and cooperation.

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THE GIST

➤ The U.S. and China renewed their Agreement on Co-operation in Science and Technology for five years with new amendments addressing researcher safety and data reciprocity.

➤ The Agreement catalysed China's rise from a junior partner in 1979 to a formidable global competitor in science and technology, marked by massive growth in R&D spending, student exchanges, and research output.

➤ While Trump's administration might scrutinise the Agreement more closely, it recognises the importance of maintaining cooperation with China, particularly to monitor and manage China's technological advancements.

Initial Agreement:

- Signed on January 31, 1979, by U.S. President Jimmy Carter and Chinese leader Deng Xiaoping.

- Established during the early days of U.S.-China diplomatic relations.
- Focused initially on agricultural research and technology.

Renewal and Extension:

- Renewed every five years, with the most recent extension on December 13, 2024.
- The renewed agreement includes a protocol to amend it, reflecting current concerns.

Purpose and Scope:

- Promotes scientific collaboration between the U.S. and China.
- Encourages joint research, mobility for students and scientists, and institutional cooperation.
- Governed by the U.S.-PRC Joint Commission on Scientific and Technological Cooperation.

Recent Amendments:

- The collaboration will be confined to basic research and areas of mutual benefit.
- Excludes critical and emerging technologies to prevent disproportionate benefits to China.
- Includes provisions to enhance researcher safety and data reciprocity.

Significance for U.S. and China:

- Both nations have benefited from the Agreement, with China significantly advancing its scientific position.
- U.S. gains in terms of collaboration and retaining leverage over China's technological rise.

The lapses in the disaster management Bill

The Disaster Management (Amendment) Bill, 2024, raises serious concerns. Instead of filling in the gaps in the Disaster Management Act (DMA), 2005, the Bill has removed scope for participatory governance, accountability, and efficiency from the Act.

The lapses

First, the semantics. The Bill uses top-down guarded terminology such as 'monitor' and 'guidelines'. Instead, terms such as 'supervision' and 'direction' could have established greater trust and bonding with communities and local governments. On the other hand, in global legal research documents, such as the Yokohama Strategy, the Hyogo Framework for Action, and the Sendai Framework for Disaster Risk Reduction, local communities are known as the 'first responders' to disasters. It is imperative to build on the capacities and wisdom of local communities.

Second, even though the Bill defines a 'hazard', 'resilience', and 'vulnerability', these definitions are mere mechanical words or inconsequential without acknowledging the substantive roles of local communities, panchayats, wards and NGOs in disaster management. Whether during Cyclone Aila in 2009 in the Sundarbans, the Kedarnath glacial lake outburst flood of 2013, or the floods in Kerala in 2018, villagers and fisherfolk began rescuing people before the National Disaster Response Force or Coast Guards could reach the victims.

The Bill is silent on intersectional discrimination. Whenever authorities are open to a just approach to discrimination and vulnerability, the datasets change phenomenally. Ignoring intersectional vulnerability even after 20 years of the Act weakens the Bill's claim to be holistic and inclusive. Women, the disabled, "lower" castes, and LGBTQIA communities may not show the several layers of discrimination



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Instead of filling in the gaps in the Disaster Management Act, 2005, the Bill has removed scope for participatory governance, accountability, and efficiency from the Act

they suffer.

There is also nothing in the Bill on the performance evaluation of district authorities. If the authorities had failed to be prepared for a disaster and then a disaster strikes, sometimes they try to take attention away from their dereliction of duty and bring focus to individual philanthropy efforts. This makes the ground fertile for political poaching of the electorate.

The Bill excludes 'law and order' from the Act. It clarifies that, 'the expression "man made causes" does not include any law and order related matter'. Why then does it bring the State Director Generals of Police into the State Executive Committees (SECs)?

Accountability is the next casualty. Sections 12 and 13 of the DMA, which covered the minimum standards of relief for disaster victims and the possibility of loan repayment relief, have been omitted. Similarly, Section 19, which demanded that State governments follow guidelines on minimum standards of relief, has also been dropped. These Sections also carried special provisions for widows, orphans, the homeless, and provided ex gratia assistance on account of loss of life as also assistance on account of damage to houses and for restoration of means of livelihood. There is no replacement for this in the Bill.

The DMA had made some mandatory requirements for better enforcement of disaster management provisions by various departments and ministries under the Government of India. Section 35(2b) and Section 35(2d) that ensured integration and preparedness in the plans have been dropped in the Bill. At another place, the SEC no longer has to do basic homework for preparedness; sub clauses (2a) and (2b) of Section 22 are deleted in the Bill. There is little in terms of good governance in the Bill as most of its

measurable indices for performance assessment of officials in the field are fuzzy or inaccurately mentioned.

The Bill also suffers from speciesism. The thousands of animals which die after every disaster are not even mentioned.

The District Disaster Management Authorities (DDMA) seem to have little responsibility in implementing the Animal Birth Control (ABC) Rules, 2023,

brought out by the same government. This gap fails the Rules as well as the preparedness for a disaster.

The Bill suggests an Urban Disaster Management Authority (UDMA) under Section of 41A. What brought the need for this additional authority? It is unclear. The Municipal Corporation is the highest revenue generator for any city as it controls land, buildings, builders, and property taxation. But in what way can a Municipal Corporation improve disaster management if it encourages urban flooding by allowing encroachments over aquifers, water bodies, city forests, river beds and markets?

Regional collaboration

Finally, the world is grappling with zoonotic and epizootic diseases. Given this scenario, a regional plan of action through increased trust, collaboration, and emergency strategies was awaited. The Bill could have mentioned regional groupings such as SAARC, BIMSTEC, and BRICS, to be approached in the event of a disaster. The Bill was expected to encourage international collaboration, democratisation, and decentralisation of the role and responsibilities of the National Disaster Management Authority. It could have at least referred to the 2011 SAARC Agreement on Rapid Response to Natural Disasters. Given the porous boundaries of South Asian countries, to ignore regional collaboration is a serious lapse.



GS Paper 03 : Disaster & Disaster Management

PYQ: (UPSC CSE (M) GS-2 2020): Indian Constitution exhibits centralising tendencies to maintain unity and integrity of the nation. Elucidate in the perspective of the Epidemic Diseases Act, 1897; The Disaster Management Act, 2005 and recently passed Farm Acts. (250 words/15m)

UPSC Mains Practice Question: Critically analyze the Disaster Management (Amendment) Bill, 2024, with a focus on its implications for inclusivity, accountability, and regional collaboration in disaster governance. (250 Words /15 marks)

Context :

- The Disaster Management (Amendment) Bill, 2024, modifies the Disaster Management Act, 2005, but has raised concerns about its top-down approach, lack of inclusivity, and accountability.
- It excludes key provisions for relief measures and ignores the role of local communities.
- The Bill also misses opportunities for regional and international collaboration.

Key Concerns Raised

- **Shift from Participatory Governance**
 - The Bill replaces inclusive governance under the Disaster Management Act (DMA), 2005, with a top-down approach.
 - It uses terms like "monitor" and "guidelines" instead of fostering trust with local communities through "supervision" and "direction."
 - Undermining Local Communities
 - Global frameworks like the Yokohama Strategy, Hyogo Framework, and Sendai Framework highlight local communities as "first responders."
 - The Bill ignores the vital roles of local communities, panchayats, and NGOs, which have historically been at the forefront of disaster response (e.g., Kerala floods, Kedarnath disaster).

Gaps in Inclusivity and Evaluation

- **Intersectional Discrimination**
 - The Bill lacks provisions addressing vulnerabilities of women, disabled individuals, marginalized castes, and LGBTQIA communities.
 - Ignoring intersectional challenges reduces its claim to inclusiveness.
- **Performance Evaluation**

Daily News Analysis

- No mechanisms exist for evaluating district authorities' disaster preparedness.
- Failure to address accountability fosters opportunities for political exploitation.

➡ **Key Highlights of the Disaster Management (Amendment) Bill, 2024**

- **Preparation of Plans:** Disaster management plans will now be prepared by NDMA and SDMA, instead of the National and State Executive Committees.
- **Enhanced Functions:** NDMA and SDMA will periodically assess disaster risks, provide technical assistance, recommend relief standards, and prepare disaster databases.
- **Disaster Database:** Mandates comprehensive national and state-level disaster databases.
- **Urban Disaster Management Authorities:** State governments can establish Urban Disaster Management Authorities for state capitals and cities with municipal corporations.
- **State Disaster Response Force (SDRF):** States can constitute SDRFs with defined functions and terms of service.
- **Statutory Status:** National Crisis Management Committee (NCMC) and High-Level Committee (HLC) are given statutory status.
- **Appointments:** NDMA can specify staff and appoint experts with central government approval.

Omission of Key Provisions

- ➡ **Accountability and Relief Measures**
- ➡ Sections 12, 13, and 19 of the DMA, which mandated minimum standards for relief and special provisions for widows, orphans, and the homeless, have been removed.
- ➡ Provisions ensuring loan repayment relief and ex gratia assistance are missing without replacements.

Preparedness and Integration

- ➡ Sections 35(2b) and 35(2d), ensuring integration and preparedness in disaster management plans, have been omitted.
- ➡ State Executive Committees (SECs) are no longer required to prepare for disasters effectively, as Sections 22(2a) and 22(2b) are deleted.

Flaws in Good Governance and Speciesism

- ➡ **Neglect of Animals**
 - The Bill fails to address disaster-related deaths of animals.
 - It overlooks implementing the Animal Birth Control (ABC) Rules, 2023, for disaster preparedness.
- ➡ **Urban Disaster Management Authority (UDMA)**
 - The creation of UDMA lacks clarity in its purpose.
 - Municipal Corporations, responsible for urban development, often exacerbate flooding through encroachments on natural resources.

Missed Opportunities in Regional Collaboration

➡ Global and Regional Synergy

- The Bill fails to incorporate international collaboration mechanisms, ignoring groupings like SAARC, BIMSTEC, and BRICS.
- The absence of references to the 2011 SAARC Agreement on Rapid Response to Natural Disasters highlights its oversight of regional disaster strategies.

Conclusion

- ➡ The Disaster Management (Amendment) Bill, 2024, weakens the foundational principles of participatory governance, inclusivity, accountability, and preparedness established by the DMA, 2005.
 - ➡ Its omissions and top-down approach limit its effectiveness in addressing disaster management comprehensively.
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