



## Promotion Not a Fundamental Right

**For Prelims:** [Scheduled Castes](#), [Scheduled Tribes](#), reservation in promotions, [Indra Sawhney Judgment](#), Article 16 (4), Article 16 (4A), Article 16(4B), M Nagaraj Case, Supreme Court.

**For Mains:** Reservation in Public Employment and Promotions and related Judgements

**Source:** [TOI](#)

### Why in News?

The [Supreme Court](#) in its recent judgement has reiterated that **promotion is not a fundamental right** for government servants in India, as the **Constitution does not prescribe any criteria for filling promotional posts.**

- This has been left to the discretion of the **legislature** and **executive**.

### Fundamental Rights:

- These are the **basic human rights enshrined in our constitution that are guaranteed to all its citizens.** These rights are essential for a person's development and well-being.
- There are **6 Fundamental Rights that are enshrined in Part III (Articles 12-35) of the Constitution.**

### What are the Constitutional Provisions Related to Reservation?

- **Article 15 (6):** It enables the State to make **special provisions for the advancement of any economically weaker section** of citizens, including reservations in educational institutions.
  - It states that such reservations can be made in any educational institution, including both aided and unaided private institutions, except minority educational institutions covered under [Article 30 \(1\)](#).
- **Article 16 (4):** Provides that the State can make any provision for the reservation of appointments or **posts in favour of any backward class of citizens** who, in the opinion of the state, are not adequately represented in the services under the State.
- **Article 16 (4A):** Provides that the State can make any provision for **reservation in matters of promotion in favour of the Scheduled Castes and the Scheduled Tribes** if they are not adequately represented in the services under the State.
- **Article 16(4B):** It enabled the unfilled SC/ST quota of a particular year to be carried forward to the next year.
  - Both Articles 16(4A) and 16(4B) were inserted by the 77<sup>th</sup> [Constitutional Amendment Act](#), 1995.
- **Article 16 (6):** It enables the State to make **provisions for reservation in appointments.** These provisions will be **subject to a 10% ceiling**, in addition to the existing reservations.

- **Article 335:** It recognises that **special measures need** to be adopted for considering the claims of SCs and STs to services and posts, in order to bring them at par.
- **82<sup>nd</sup> Constitutional Amendment Act, 2000:** It inserted a condition at the end of **Article 335 that enabled the state to make any provision in favour of the members of the SC/STs for relaxation** in qualifying marks in any examination.

## What are the Pros and Cons of Reservation in Promotion?

Pros of Reservation	Cons of Reservation
<b>Social Justice &amp; Inclusion:</b> Promotes representation of historically disadvantaged groups (SC, ST, OBC) in higher positions of services.	<b>Merit vs Reservation:</b> Raises concerns about overlooking the most qualified candidate for the promotion.
<b>Breaks Caste &amp; Social Barriers:</b> Creates a more diverse and inclusive leadership structure, fostering better understanding of societal issues.	<b>Demotivation &amp; Frustration:</b> Can lead to demotivation and frustration among general category candidates who feel passed over.
<b>Empowerment &amp; Upliftment:</b> Offers marginalised communities opportunities to advance and compete at higher levels.	<b>Creamy Layer Issue:</b> The "creamy layer" within reserved categories might still benefit, negating the upliftment purpose.
<b>Positive Discrimination:</b> Addresses past discrimination by offering a helping hand to overcome ingrained social and economic barriers.	<b>Seniority &amp; Efficiency:</b> Reservation in promotions can disrupt seniority-based promotion systems, impacting overall efficiency.

## What are the Reservation Related Developments in India?

- **Indra Sawhney Judgment, 1992:**
  - In this nine-judge bench judgement held that **Article 16(4)** of the Constitution, which allows **reservation in appointments, does not extend to promotions.**
  - Court upheld the **constitutionality of the 27% reservation but put a ceiling of 50%** unless exceptional circumstances warranting the breach, so that the constitutionally guaranteed **right to equality** under **Article 14** would remain secured.
  - Carry forward rule is valid but it is subject to 50%. There **should be no reservation in the promotions.**
  - The court clarified that **Article 16(4) is not a separate rule** that overrides Article 16(1). The article 16(1) is a fundamental right, **article 16(4) is an enabling provision.**
    - **Article 16(1):** It states that there shall be **equality of opportunity for all citizens in matters** relating to employment or appointment to any office under the State.
  - Further, the Court directed to **exclude Creamy Layer** (economically well-off) from **Other Backward Classes (OBCs)** from getting reservation benefits.
    - However, it **specifically excluded SCs and STs** from this concept.
- **77<sup>th</sup> Amendment Act (1995):**
  - This act empowered states to **maintain existing reservation policies** for promoting SC/ST employees.
  - It introduced a new article, **16(4A), allowing states to grant reservations in promotions** as long as they believe SC/STs are **underrepresented.**
- **85th Amendment Act (2001):**
  - It introduced the concept of **consequential seniority for SC/ST candidates promoted through reservations.** This applied retroactively to June 1995.
    - **"Consequential seniority"** refers to the **concept of granting seniority to government servants belonging to Scheduled Castes (SCs) and Scheduled Tribes (STs)** in cases of promotion through reservation rules.
  - This provision was brought with retrospective effect from June 1995.

- **M. Nagaraj Judgment, 2006:**
  - This judgement **partially overturned Indra Sawhney judgement.**
  - It introduced a conditional extension of the "**creamy layer**" concept to **SC/ST communities** seeking promotions in government jobs.
    - This concept was previously applied **only to Other Backward Classes (OBCs).**
  - Judgement laid down **3 conditions** to allow states to provide reservations in promotions for **SCs/STs**, as:
    - **Inadequacy of Representation:** The state must demonstrate SCs/STs are inadequately represented in promotions.
    - **Creamy Layer Exclusion:** Reservation benefits should not extend to the "creamy layer" within SCs/STs.
    - **Maintain Efficiency:** Reservation should **not affect overall administrative efficiency.**
- **Jarnail Singh vs Union of India, 2018:**
  - In this case, the Supreme Court (SC) reversed its stance on data collection.
  - **States No Longer Need Quantifiable Data:** The SC ruled that states no longer needed **to collect quantifiable data to prove the backwardness of the SC/ST community** when implementing reservation quotas for promotions.
  - It allowed the government to implement "**accelerated promotion with consequential seniority**" for SC/ST members more easily.
- **103<sup>rd</sup> Constitution (Amendment) Act, 2019:**
  - It provides for reservation to **Economically Weaker Sections (EWS)** in jobs in central government jobs as well as government educational institutions.
  - It was introduced by amending **Articles 15 and 16** and inserted **Article 15 (6)** and **Article 16 (6).**
  - It was enacted to promote the welfare of the poor not covered by the 50% reservation policy for **Scheduled Castes (SCs), Scheduled Tribes (STs) and Socially and Educationally Backward Classes (SEBC).**
  - It enables both the Centre and the States to provide reservations to the EWS of society.
- **Janhit Abhiyan v. Union of India, 2022**
  - It challenged the **103rd Constitutional Amendment** that introduced a **10% reservation for Economically Weaker Sections (EWS)** in educational institutions and government jobs.
    - In a 3-2 verdict, the **Court upheld** the amendment.
  - It allowed the government to provide reservation benefits based on economic standing, alongside existing reservations for disadvantaged social groups.

## Way Forward

- **Data-Driven Approach:** It is needed to **assess the current representation of SC/ST/OBCs** across different levels and departments. This data can be used to establish concrete targets for filling reservation quotas.
- **Focus on Merit with Relaxation:** Promoting a system that emphasises merit while allowing for some relaxation in qualifying marks for SC/ST/OBC candidates in promotions, ensuring that **qualified candidates from these communities** have a better chance while maintaining an acceptable competency level.
- **Addressing Concerns:** Acknowledge concerns about **unqualified candidates getting promoted due to reservations.**
  - Propose solutions like **rigorous training and mentorship programs** for promoted SC/ST/OBC employees **to bridge any skill gaps** and ensure they excel in their new roles.
- **Long-Term Vision:** Emphasise that **reservations are a temporary measure** to achieve long-term social justice and equal opportunity in promotions.
  - Advocate for **parallel initiatives that improve education and access to resources** for these communities, ultimately leading to a situation where reservations may not be necessary.

## Conclusion

The Supreme Court's approach on reservation in promotions has evolved over time, balancing the competing principles of equality and affirmative action. While the Court has allowed states to provide such reservation, it has also imposed certain conditions to ensure that it does not compromise administrative efficiency and the overall public interest.

### **Drishti Mains Question:**

Reservation in promotions for SCs, STs, and OBCs presents a challenge in balancing inclusivity with bureaucratic efficiency. Critically examine strategies to ensure both objectives are met effectively in the Indian administrative system.

## UPSC Civil Services Examination Previous Year Question (PYQ)

### Q. Consider the following statements: (2020)

1. The Constitution of India defines its 'basic structure' in terms of federalism, secularism, fundamental rights and democracy.
2. The Constitution of India provides for 'judicial review' to safeguard the citizens' liberties and to preserve the ideals on which the Constitution is based.

Which of the statements given above is/are correct?

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

Ans: (d)

## Increased Recovery Under IBC

For Prelims: [Insolvency and Bankruptcy Code \(IBC\), 2016](#), [Insolvency and Bankruptcy Board of India \(IBBI\)](#), Financially stressed companies, Bankruptcy, [National Companies Law Tribunal \(NCLT\)](#), [Debt Recovery Tribunal \(DRT\)](#), [Committee of Creditors \(CoC\)](#), [Insolvency professionals](#)

For Mains: [Insolvency and Bankruptcy Code \(IBC\), 2016](#), [Insolvency and Bankruptcy Board of India \(IBBI\)](#)

[Source: ET](#)

### Why in News?

Recent data from the [Insolvency and Bankruptcy Board of India \(IBBI\)](#) shows, **creditors** in India have retrieved almost **half of their claims** under the [Insolvency and Bankruptcy Code \(IBC\), 2016](#) when resolutions are concluded within the **330-day deadline**, although **delays have diminished** the proportion of money recovered.



## What are the Key Highlights of the Latest Data?

### ▪ Recovery Rates and Timeliness:

- Data shows that 947 financially stressed companies' resolutions resulted in creditors receiving ₹3.36 lakh crore, equivalent to **32.1% of their claims since the inception of the IBC (2016)**.
- Stress resolution under the [Insolvency and Bankruptcy Code \(IBC\), 2016](#) has improved in recent years, but recoveries have not kept pace.
  - Recoveries by creditors were at 54% in FY18 and FY19 but dropped to 22% in FY21 due to the pandemic.
  - Recoveries inched up to 23% in FY22 and 36% in FY23 before **declining again to 27% in FY24**.
- The number of resolutions reached a record 269 in the last fiscal year (FY 24), up from 189 in FY23 and 144 in FY22, mainly due to government filling [National Company Law Tribunal \(NCLT\)](#) vacancies in the past two years.
- Creditors have experienced **stronger cumulative recoveries** compared to the fair value of stressed companies **upon insolvency admission, at 85%**.
  - **In terms of liquidation value**, the recovery rate has reached **161.8%** of the assets.
- Experts **stress the importance of timely initiation of the Insolvency and Bankruptcy Code (IBC)** for stress resolution, as **delays (averaging 679 days) have lowered recovery rates to 26%**, impacting asset value and debt recovery.

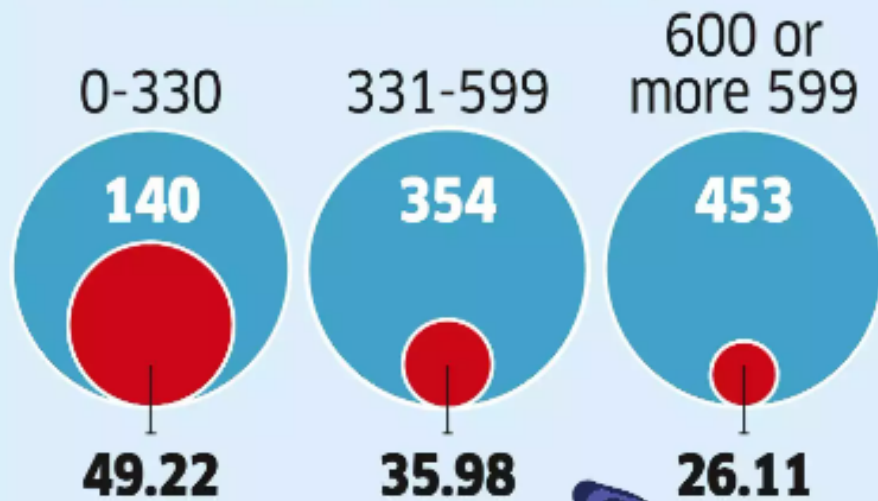
## What are the Proposed Measures to Strengthen IBC?

- **Reduce Delays:** Efficiently resolving insolvency cases within the **IBC's 330-day deadline** is imperative, with the **current average duration of 679 days** underscoring the need for streamlining processes and reducing litigation.
- **Improve Recovery Rates:** While the IBC has led to resolutions, the percentage of claims recovered by creditors needs improvement. It dropped from 49% for on-time resolutions to 26% for delayed ones. It can be achieved by:
  - Ensure **sufficient judges and staff at the NCLT** to handle cases efficiently to **expedite processing and reduce delays** caused by backlogs.
  - Review and **simplify the IBC procedures** to eliminate unnecessary steps and expedite approvals involving standardising processes.
- **Sector-Specific Regimes:** Consider **specialised insolvency regimes** for sectors like [real estate](#), which may have unique challenges compared to other industries.
- **Cross-Border Insolvency Framework:** Establish an [effective legal framework](#) based on the [UNCITRAL \(United Nations Commission on International Trade Law\)](#) to handle insolvency cases involving companies with assets in multiple countries.
- **Review Timelines:** Re-evaluate the timelines mandated by the IBC to ensure they are efficient and minimise unnecessary delays.
- **Formal Prepack for All Companies:** Allow a formal pre-packaged insolvency process for all companies, not just [Micro, Small and Medium Enterprises \(MSME\)](#). This involves **agreeing on a resolution plan** before initiating formal bankruptcy proceedings.

# Costly Delay

## Resolution duration (Days)

● No of cases ● Recovery\*



\*% of creditors' claims approved by NCLT

Insolvency cases pertain to late 2016-March 2024

Source: IBBI

**679 DAYS** Average time taken for resolution of a stressed firm

**32.10%** Average recovery rate involving 947 resolved cases

## What are the Key Highlights of the Insolvency and Bankruptcy Code, 2016?

### ▪ About:

- The **Insolvency and Bankruptcy Code (IBC), 2016** provides a framework for resolving the bankruptcy and insolvency of companies, individuals, and partnerships in a **time-bound manner**.
  - **Insolvency** is a state where the **liabilities of an individual** or an organisation **exceed its assets and that entity is unable to raise enough cash to meet**

**its obligations** or debts as they become due for payment.

- **Bankruptcy** is when a person or **company is legally declared incapable of paying their due and payable bills.**

- The **Insolvency and Bankruptcy Code (Amendment) Act, 2021** modified the 2016 Code to offer a **more efficient insolvency resolution** framework for MSMEs, ensuring quicker, cost-effective, and value-maximising outcomes for all stakeholders.

- **Insolvency and Bankruptcy Board of India (IBBI):**

- **IBBI** serves as the **regulatory authority** overseeing insolvency proceedings in India.
- The IBBI's Chairperson and three full-time members are appointed by the government and are experts in the fields of finance, law, and insolvency.
- It also has ex-officio members.

- **Adjudication of Proceedings:**

- **National Companies Law Tribunal (NCLT)** adjudicates proceedings for companies.
- **Debt Recovery Tribunal (DRT)** handles proceedings for individuals.
  - They play a pivotal role in approving the initiation of the resolution process, appointing professionals, and endorsing the final decisions of creditors.

- **Procedure for Insolvency Resolution under the Code:** Initiated by either **debtor or creditor** upon default, insolvency professionals manage financial information and debtor assets, with a 180-day legal action prohibition during resolution.

- **Committee of Creditors (CoC):** The CoC, formed by **insolvency professionals** and comprising financial creditors, determines the fate of outstanding debts through debt revival, repayment schedule changes, or asset liquidation, with a 180-day deadline before the debtor's assets are liquidated.

- **Liquidation Process:** Proceeds from the sale of the debtor's assets are distributed **first to insolvency resolution costs**, second to secured creditors, third to dues for workers and employees, and fourth to unsecured creditors.

### **Drishti Mains Question:**

Q. Discuss the challenges faced in the implementation of the Insolvency and Bankruptcy Code (IBC) in India and suggest measures to strengthen its effectiveness.

## **UPSC Civil Services Examination, Previous Year Question (PYQ)**

### **Prelims**

**Q. Which of the following statements best describes the term 'Scheme for Sustainable Structuring of Stressed Assets (S4A)', recently seen in the news? (2017)**

**(a)** It is a procedure for considering ecological costs of developmental schemes formulated by the Government.

**(b)** It is a scheme of RBI for reworking the financial structure of big corporate entities facing genuine difficulties.

**(c)** It is a disinvestment plan of the Government regarding Central Public Sector Undertakings.

**(d)** It is an important provision in 'The Insolvency and Bankruptcy Code' recently implemented by the Government.

**Ans: (b)**

# Pandemic Treaty

**For Prelims:** [World Health Assembly \(WHA\)](#), [genomic sequences](#), [antimicrobial resistance](#), [Public Health Emergency of International Concern \(PHEIC\)](#), [International Health Regulations \(2005\)](#)

**For Mains:** Key components and developments of the Draft Pandemic Treaty, Existing framework for Global Health Cooperation

**Source:** WHO

## Why in News?

Recently, the [World Health Assembly \(WHA\)](#) in the annual meeting, agreed on a set of critical amendments to the [International Health Regulations \(2005\) \(IHR\)](#), and made concrete commitments to completing negotiations on a global pandemic agreement by 2025.

- These amendments will strengthen global preparedness, surveillance and responses to public health emergencies, including pandemics.

## What is the World Health Assembly (WHA)?

- **About:**
  - The World Health Assembly (WHA) is **WHO's decision-making body** attended by delegations from all of WHO's member states.
  - It is **held yearly** at the headquarter of WHO, i.e., Geneva, Switzerland.
- **Functions of WHA:**
  - **Deciding** on the Organization's policies.
  - **Appointment** of the Director-General of WHO.
  - **Administration** of financial policies.
  - **Review and approval** of the proposed programme budget.

## What are the Key Amendments Agreed to IHR?

- **Definition:**
  - Introduction of a **definition of pandemic emergency** to enhance international collaboration in response to potential pandemics.
  - Definition includes criteria such as wide **geographical spread, exceeding health system capacity**, causing social and economic disruption, and requiring rapid international action.
- **Commitment to Solidarity and Equity:**
  - It includes establishing a **Coordinating Financial Mechanism** to support the identification and access to financing needed to address the needs and priorities of developing countries.
  - It will also include developing and **strengthening core capacities** and other pandemic emergency prevention, preparedness and response-related capacities.
- **Cooperation for Effective Implementation:**
  - It involves creation of a **States Parties Committee** to promote cooperation and effective implementation of the amended regulations
  - The creation of **National IHR Authorities** to improve coordination of implementation within and among countries.

## What is the Need for Global Health Cooperation?

### ▪ **Curbing Infectious Diseases:**

- Pandemics like [Covid-19](#) have highlighted the interconnectedness of our world. A disease outbreak in one country can rapidly spread across borders. Global cooperation allows for
  - **Information Sharing:** Early detection and sharing of disease outbreaks **enables a faster global response**. The [World Health Organization \(WHO\)](#)'s role in identifying and tracking **Covid-19 variants is a prime example**.
  - **Coordinated Research & Development:** Collaboration facilitates faster development of vaccines, diagnostics, and treatments.

### ▪ **Addressing Antibiotic Resistance:**

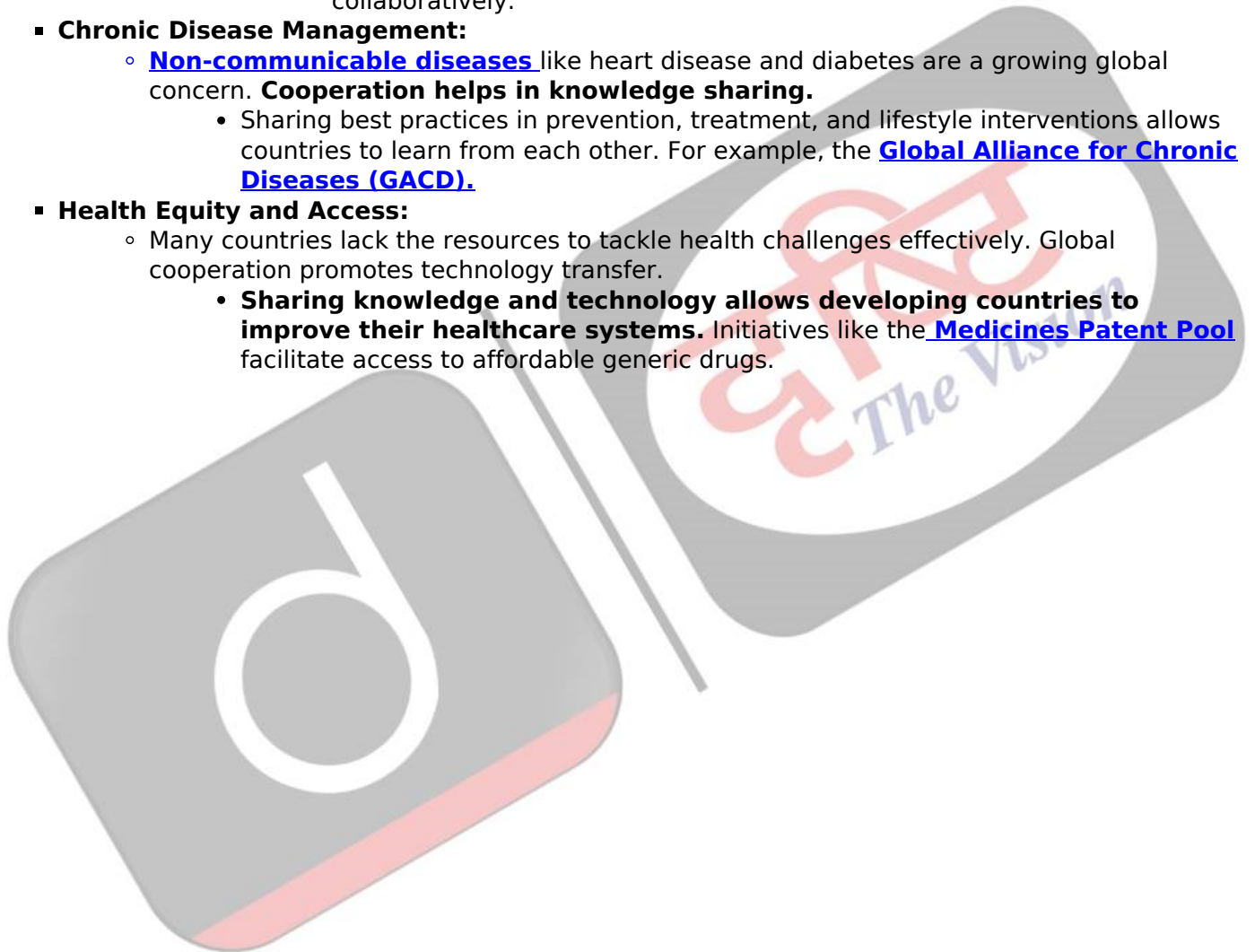
- The overuse and misuse of antibiotics in one country can create resistant bacteria that spread globally. Global cooperation helps in
  - **Standardised Practices:** Establishing common guidelines for antibiotic use in humans and animals helps slow resistance.
    - According to the WHO, [antimicrobial resistance](#) is a global health threat that could lead to millions of deaths each year if not addressed collaboratively.

### ▪ **Chronic Disease Management:**

- [Non-communicable diseases](#) like heart disease and diabetes are a growing global concern. **Cooperation helps in knowledge sharing**.
  - Sharing best practices in prevention, treatment, and lifestyle interventions allows countries to learn from each other. For example, the [Global Alliance for Chronic Diseases \(GACD\)](#).

### ▪ **Health Equity and Access:**

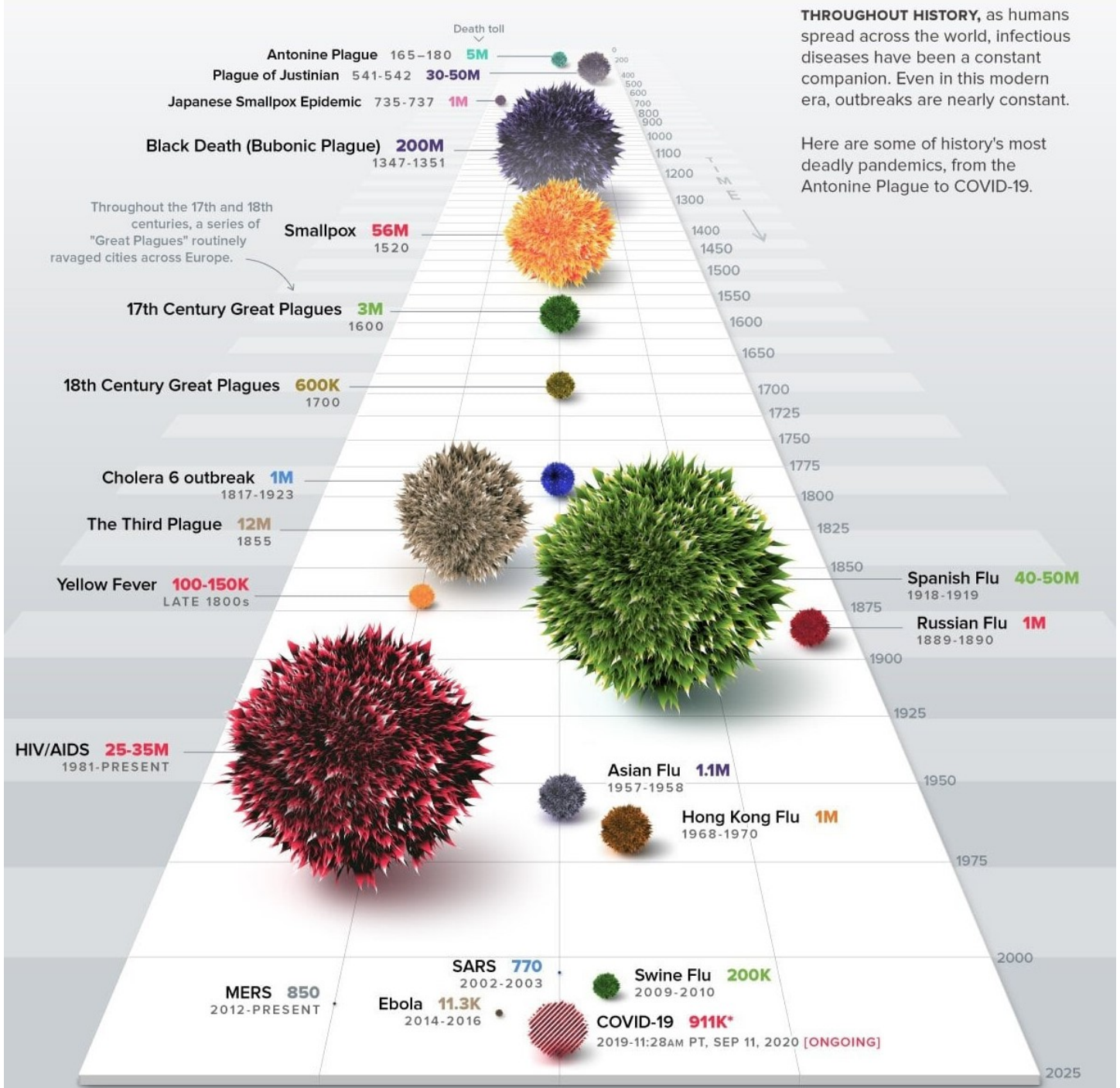
- Many countries lack the resources to tackle health challenges effectively. Global cooperation promotes technology transfer.
  - **Sharing knowledge and technology allows developing countries to improve their healthcare systems**. Initiatives like the [Medicines Patent Pool](#) facilitate access to affordable generic drugs.





# HISTORY OF PANDEMICS

**PAN-DEM-IC** (of a disease) prevalent over a whole country or the world.



## What is the Existing Framework for Global Health Cooperation?

### ▪ Multilateral Agencies:

- Various multilateral organisations like **WHO**, [UNICEF](#), [UNFPA](#), and [UNAIDS](#) play crucial roles in specific health areas like child health, reproductive health, and [HIV/AIDS](#).
- The WHO acts as the central coordinating authority on global health within the [United Nations](#) system.
  - It **sets international health standards**, provides technical assistance to countries, and monitors and coordinates the global response to health

emergencies.

- **International Health Regulations (IHR):**
  - This is a **legally binding agreement** between 196 countries. It outlines the rights and obligations of countries regarding public health events with international implications.
- **Global Health Initiatives:**
  - These are targeted programs tackling specific health challenges. Examples include the **Global Fund to Fight AIDS, Tuberculosis and Malaria**, and [Gavi, the Vaccine Alliance](#).
- **Public-Private Partnerships:**
  - Collaboration between governments, NGOs, and the private sector allows for leveraging resources and expertise.
    - Example, **Bill & Melinda Gates Foundation**.
- **Regional Organizations:**
  - Regional bodies like the Pan American Health Organization (PAHO) for the Americas and the African Union play a role in coordinating health efforts within their regions.

## Conclusion

The **World Health Assembly's (WHA) recent amendments to the International Health Regulations (IHR)** and commitment to a global pandemic agreement by 2025 signify a significant step towards improved global health security.

These changes, including a definition for pandemic emergencies, a focus on equity and financing, and stronger national and international cooperation, aim to equip the world to better detect, prevent, and respond to future health threats.

### **Drishti Mains Question:**

Q. What are the recent amendments agreed regarding the pandemic treaty? Also, highlight the existing framework for Global Health Cooperation.

## UPSC Civil Services Examination, Previous Year Questions (PYQs)

### **Prelims**

**Q1. With reference to agriculture in India, how can the technique of 'genome sequencing', often seen in the news, be used in the immediate future? (2017)**

1. Genome sequencing can be used to identify genetic markers for disease resistance and drought tolerance in various crop plants.
2. This technique helps in reducing the time required to develop new varieties of crop plants.
3. It can be used to decipher the host-pathogen relationships in crops.

**Select the correct answer using the code given below:**

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

**Ans: (d)**

### **Mains**

Q. What are the research and developmental achievements in applied biotechnology? How will these

achievements help to uplift the poorer sections of society? (2021)

**Q.** What is the basic principle behind vaccine development? How do vaccines work? What approaches were adopted by the Indian vaccine manufacturers to produce COVID-19 vaccines? (2022)

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## Rising Global Temperatures

**For Prelims:** [Global warming](#), [ocean acidification](#), [India Meteorological Department](#), [Greenhouse Gases \(GHG\)](#), [Methane](#), [Heatwaves](#), [Urban Heat Islands](#)

**For Mains:** Environmental pollution and degradation, Rising Global Temperatures, Global warming

**Source:** [IE](#)

### Why in News?

The world is witnessing a **concerning trend of record-breaking temperatures** across the globe, exacerbated by [global warming](#). From the scorching 56.7°C recorded in Death Valley, California over a century ago to the recent 52.9°C reading in Delhi, temperature extremes are becoming more prevalent as the planet continues to heat up.

- If the 52.9°C recorded at a station in Delhi is verified, it would be an all-time high for India.

### Note:

- The Mungeshpur weather station in Delhi recorded a record high temperature of 52.9°C, the highest ever in India. However, the [India Meteorological Department \(IMD\)](#) later clarified that the extreme temperature was due to an **error in the sensor or local factors**.

### What is the Historical Context of Global Temperature Records?

- **Historical High:** The highest temperature ever recorded on Earth was 56.7°C in Death Valley, California, in 1913.
  - **United Kingdom:** Surpassed 40°C for the first time in July 2022.
  - **China:** Recorded its highest temperature of 52°C in a northwestern town last year.
  - **Europe:** Sicily, Italy, reached 48.8°C in 2021, a record for the continent.
  - **India:** Rajasthan's Phalodi recorded the highest temperature of 51°C in 2016.
- **Global Trends:** An analysis shows nearly **40% of the Earth experienced its highest-ever daily temperature between 2013 and 2023**.
  - **This includes diverse regions, from [Antarctica](#) to various parts of Asia, Europe, and the Americas.**
  - **[Global average temperatures are currently about 1.61°C](#)** higher than pre-industrial levels.



# Cities experience higher temperatures

For two consecutive days, Delhi reported daytime temperature above 50°C, the highest ever recorded in the city

■ Altered thermodynamic, aerodynamic properties of the cities tend to trap more heat, making cities warmer than their rural and suburban counterparts

■ Climate change too is causing a significant increase in temperature

■ Urbanisation and global warming together play a pivotal role in the overall warming in any city

■ All 141 cities show an increase in night-time land surface temperature, with an average increase of 0.53°C per decade

■ Urbanisation alone is causing additional warming of about 60%, while the climate change

is responsible for the remaining smaller share

■ Tier-II cities in the eastern part of the country have stronger urbanisation-driven warming than even large metros and mega cities

■ Tailored city specific action plans are needed for sustainable urban growth for cities with a large heat exposure



## How Global Warming is Exacerbating Global Temperatures?

- **Definition:** Global warming refers to the long-term increase in Earth's average surface temperature due to human activities, primarily the emission of **greenhouse gases (GHG)** like **carbon dioxide (CO<sub>2</sub>)** and **methane (CH<sub>4</sub>)**.
- **Greenhouse Gases and Temperatures:** GHGs trap heat in the Earth's atmosphere, preventing it from escaping into space.
  - Increased concentrations of these gasses enhance this effect, leading to more heat being retained and higher global temperatures.
- **Global Temperature Rise:** The planet's average surface temperature has risen about **1°C since the late 19<sup>th</sup> century**, a change driven largely by increased GHG emissions into the atmosphere and other human activities.
  - The **past decade has seen many of the warmest years on record, with 2023 and 2024** showing unprecedented temperature increases.
  - The period from May 2023 to April 2024 was the warmest 12-month period, with global temperatures about 1.61°C above pre-industrial levels.
- **India Compare to Global Warming Trends:** India's warming is **less than the global average**.
  - Indian temperatures have increased by **0.7 degrees Celsius since 1900**, while global land temperatures have risen by 1.59°C. When including oceans, global temperatures are now at least 1.1°C higher than pre-industrial levels.
- **Global Warming and Heatwaves:** Global warming is causing an increase in global temperatures and the **frequency of heatwaves**.
  - In India Heat waves typically occur from March to June, and in some rare cases, even extend till July. On an average, five-six heat wave events occur every year over the northern parts of the country.
  - **Heatwaves in India are becoming more severe**, with heatwave conditions even in **February, a winter month** for which heatwave thresholds are not defined.
    - The current high temperatures in Delhi and North India seem **abnormal compared to the average temperatures from 1981-2010**.
    - In the future, temperatures of 45°C and above may become the new normal, and a reading of 50°C will no longer be seen as unusual.
- **Geographical Variability:** Global warming is not causing a uniform rise in temperatures everywhere. Some regions experience faster warming due to factors like:
  - **Polar Amplification:** The **Arctic** and other polar areas are warming much faster due to melting sea ice and permafrost.
  - **Land vs Water:** Land warms faster than oceans, so continental interiors warm faster than coastal regions.

- **Elevation:** Higher elevations experience slower warming as the atmosphere traps less heat.
- **Ocean Currents:** Regions influenced by warm currents like the **Gulf Stream warm faster.**
- **Landlocked Countries:** Landlocked areas have less evaporative cooling and the continental effect, leading to more extreme temperature swings.
- **Urban Heat Islands (UHIs):** UHIs are **metropolitan areas significantly warmer than surrounding regions** due to heat-absorbing surfaces and energy use.
  - As global temperatures rise, **UHI intensity is expected to increase, amplifying heatwaves in cities.**
  - The higher urban temperatures also drive greater fossil fuel-powered cooling, further contributing to **GHG emissions** and warming.
  - Populations in UHIs are especially vulnerable to the health risks posed by the compounded effects of UHIs and climate change.

## What are the Consequences of Rising Global Temperatures?

- **Sea Level Rise:** As temperatures rise, glaciers and **ice sheets melt**, adding water to the oceans and **causing sea levels to rise.** This inundates coastal areas, displaces communities, and disrupts ecosystems.
  - **Global sea level** has risen by about 8 inches since 1880 and is projected to rise by at least another foot by 2100. In a **high-emissions scenario, it could potentially rise as high as 6.6 feet.**
- **Ocean Acidification:** The oceans absorb a significant amount of the CO<sub>2</sub> released into the atmosphere. This makes the **oceans more acidic**, harming marine life and disrupting ocean ecosystems crucial for the health of the planet.
  - **Hurricanes** are expected to become stronger and more intense as the climate warms, leading to increased storm intensity and rainfall rates.
- **Droughts and Heat Waves:** **Droughts** and heat waves are expected to become more intense, while cold waves are expected to become less intense and less frequent.
- **Wildfire Season:** **Wildfire** season has been **prolonged and intensified due to warming temperatures and long-term drought**, increasing the risk of fires.
  - Human-caused climate change has **already doubled the area of forest burned** and is projected to further increase the amount of land consumed by wildfires in Western states by around 2050.
- **Biodiversity Loss:** Rising temperatures and changing weather patterns disrupt ecosystems and habitats, pushing many plant and animal species towards extinction.
- **Climate change:** Extreme weather disrupts food production, leading to shortages and price hikes that harm vulnerable populations.
  - Rising temperatures worsen air quality, increase heat-related illnesses, and facilitate disease spread.
  - The economic consequences are severe, with high costs for repairing infrastructure, declining agricultural yields, and escalating disaster relief.



# GEO-ENGINEERING



Geoengineering means manipulating the earth's climate to lower its temperature to counter global warming

## TYPES OF GEO-ENGINEERING

### CARBON DIOXIDE REMOVAL

Technology/ Method Proposed	Proposed Effects/actions	Potential Side Effects	Feasibility/Cost Effectiveness
Land Use Management	Afforestation/ Reforestation	Minimum Side Effects	High feasibility, Low Cost
Bio-energy with carbon capture and storage (BECCS)	Biomass harvested and used as fuel	Potential land use conflict	Comparatively expensive
Direct CO <sub>2</sub> Capture	Industrial Process	Minimal	High technical feasibility
Fertilization of the ocean	Increased CO <sub>2</sub> absorption by promoting algae growth	High potential for adverse side effects	Feasible but not cost-effective
Accelerated Weathering	Pulverization of silicate rocks	Potential respiratory health impact	Could be combined with crop production, a feasible option at scale

### SOLAR RADIATION MANAGEMENT

Stratospheric aerosol injection	For reflecting sunlight back into space	Likely impact on the hydrological cycle	Feasible and potentially highly effective
Marine cloud brightening	Seeding of marine clouds with seawater aerosol	Likely impact on precipitation pattern	Low to medium cost and feasible at scale
Giant defectors in outer space	Mirror placed in near earth orbit	Regional climate effects	Capital-intensive and long gestation
Surface albedo approaches	Painting the roof of the building bright white, Installing desert reflector	Major Impact on Desert Ecosystem	High labor and maintenance cost

### REGULATION

- ↘ No specific international or Indian regulations on geoengineering.

### INDIA'S EFFORTS

- ↘ **Department of Science and Technology:**
  - ◆ Geoengineering climate-modelling research programme (since 2013)

### IISc:

- ◆ Initiative to understand the implications of solar geoengineering for developing countries
- ◆ Scientists simulated injecting 20 million tonnes of sulphate aerosols into the Arctic stratosphere



Drishti IAS

## Way Forward

- **Six-Sector Solution:** Follow the [United Nations Environment Programme's roadmap](#), which includes **reducing emissions** across sectors like energy, industry, agriculture, forests, transport, and buildings.
- **Carbon Offsetting:** Invest in projects that draw down carbon from the atmosphere, such as reforestation or [carbon capture and storage](#).
- **Reduction in Greenhouse Gas Emissions:** Transition to [renewable energy sources](#) like Solar, wind, geothermal, and hydro power can significantly reduce our dependence on fossil fuels.
  - Implementing [energy-efficient practices](#) in homes, industries, and transportation can drastically cut down on energy consumption.

- **Sustainable Agriculture:** Adopt **climate-smart agricultural practices**, such as sustainable irrigation techniques, [drought-resistant crop varieties](#), and [agroforestry](#).
  - Enhance food storage and distribution systems to minimise losses and ensure access to food during extreme weather events.
  - Reducing deforestation, utilising regenerative agriculture techniques, and promoting plant-based diets can all contribute.
- **Support Climate-Vulnerable Populations:** Assist communities most vulnerable to climate change impacts, such as those in low-lying coastal areas and developing countries.

**Drishhti Mains Question:**

Q. Evaluate the role of global warming in exacerbating heatwaves and its impact on urban heat islands. How can urban planning mitigate these effects?

## UPSC Civil Services Examination, Previous Year Questions (PYQs)

### **Prelims**

**Q1. Which of the following statements is/are correct about the deposits of 'methane hydrate'? (2019)**

1. Global warming might trigger the release of methane gas from these deposits.
2. Large deposits of 'methane hydrate' are found in Arctic Tundra and under the sea floor.
3. Methane in atmosphere oxidizes to carbon dioxide after a decade or two.

**Select the correct answer using the code given below.**

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

**Ans: (d)**

### **Mains:**

**Q. 'Climate change' is a global problem. How India will be affected by climate change? How Himalayan and coastal states of India will be affected by climate change? (2017)**

## Migratory Diadromous Fishes

**Source: DTE**

### **Why in News?**

A recent study has raised concerns about the effectiveness of [Marine Protected Areas \(MPAs\)](#) in safeguarding the habitats of **rare migratory fish species**.

- The study found that a significant portion of **these protected areas do not align with the core habitats of the target species**, raising questions about the efficacy of current conservation efforts.

## What are the Findings of the Study about Diadromous Fish Species?

### ▪ About Study:

- The study examined 11 rare and data-poor **diadromous fish species**. These species **migrate between saltwater and freshwater environments**.

### ▪ Findings:

- The researchers found that only **55% of the modelled core** habitats for these species overlapped with the designated MPAs.
  - And, of **these protected areas, only 50% had measures in place for the protection of the fish**.
- Less than 30% of endangered species, such as the **Mediterranean twaite shad**, had their core habitats within the MPAs.
- Species like **European eel** and **European smelt**, which had nearly 70% of their core habitats within MPAs.

### ▪ Challenges faced by these fishes:

- **Diadromous fish are highly sensitive to a range of anthropogenic pressures** such as agricultural and pollutant runoffs, habitat destruction, barriers to migration, fishing, bycatch, and [climate change](#).
- **Barriers to migration, such as dams, weirs, and locks**, can have a significant impact on these fish as they move between **freshwater and marine habitats throughout their life cycle**.

### ▪ Impact of Climate Change:

- **Fish are Swimming Further North in the Ocean** because warmer waters are pushing them towards cooler areas.
- **Southern Populations of these Fish are Declining Significantly** due to factors like habitat loss or changes in food availability.
- **The Timing of their Migrations is also Changing**, which can harm the survival of their young and make it harder for them to find food.

## What are Diadromous fishes?

### ▪ About:

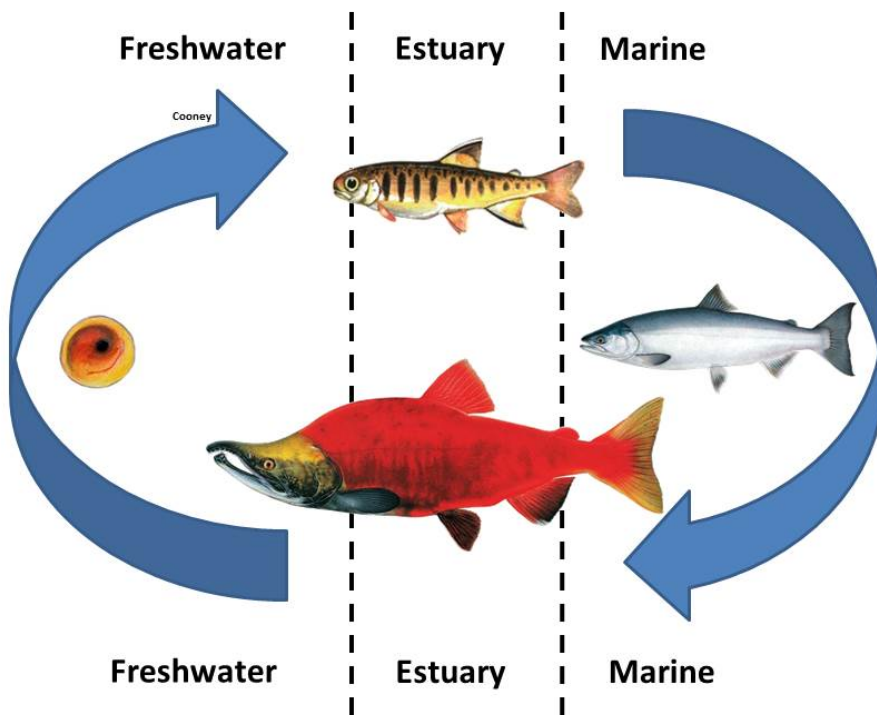
- These are a group of fish that **migrate between freshwater and saltwater** environments throughout their lives.
- This unique life cycle allows them to **take advantage of the different resources** available in each habitat.

### ▪ Types:

- **Anadromous Fish:** These fish spend most of their lives in the **ocean but return to freshwater** rivers and streams to spawn (release or deposit eggs).
  - **Examples: salmon, trout, and shad.**

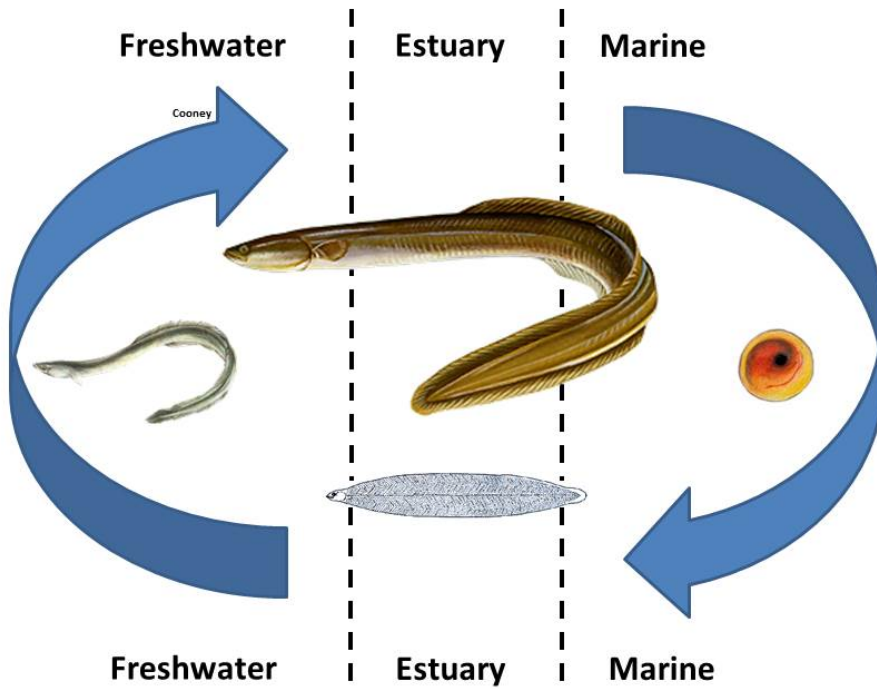


## Anadromous Life Cycle



- **Catadromous Fish:** These fish spend most of their lives in **freshwater** but **migrate to the ocean** to spawn.
  - **Example:** Eel

## Catadromous Life Cycle



## Marine Protected Areas in India



Read more: [Marine Protected Areas](#), [International Marine Protected Areas Congress](#)

### UPSC Civil Services Examination Previous Year Question (PYQ)

**Q** Recently, our scientists have discovered a new and distinct species of banana plant which attains a height of about 11 meters and has orange coloured fruit pulp. In which part of India has it been discovered? (2016)

- (a) Andaman Islands
- (b) Anaimalai Forests
- (c) Maikala Hills
- (d) Tropical rain forests of northeast

**Ans:** (a)

## Lost Nile Branch Key to Pyramid Construction

**Source:** TH

### Why in News?

Recently, a study discovered an ancient Nile river branch that helped transport workers and materials to Egypt's pyramids, now buried under modern landscapes.



- Researchers employed technologies including **satellite imagery, high-resolution digital elevation data, and historical maps to trace** the path of the now-vanished **Ahramat Branch of Nile River**.

## What are the Key Highlights of the Study?

- The revelation of the **Ahramat Branch**, a previously unknown **Nile channel** from **Lisht (village) to Giza (city)**, illuminates its crucial role in transporting workers and materials for pyramid construction, offering insight into their geographic and **logistical considerations**.
- The study shows that natural events such as [climate change](#), [tectonic shifts](#), and human activities, along with environmental factors like [desertification](#) and [changes in rainfall](#), have altered the Nile's landscape, and branches over time, impacting the region's ecology and water systems.

## What are Key Facts About Egyptian Pyramids?

- The **pyramids of Egypt** are massive, ancient stone structures built as **tombs for pharaohs (ancient Egyptian rulers)** and important figures during the Old Kingdom (roughly 2700–2200 BCE) and Middle Kingdom periods (2050–1650 BCE).
- There are over 118 identified pyramids in Egypt, but the most famous are the three **pyramids at Giza**:
  - **Great Pyramid of Giza**: The oldest of the **Seven Wonders of the Ancient World** and the largest pyramid ever built. It was constructed for **Pharaoh Khufu (Cheops)**.
  - **Pyramid of Khafre (Chephren)**: This pyramid appears larger than the Great Pyramid due to its steeper angle and the **presence of the Sphinx**, a massive statue with a human head and a lion's body, located nearby.
  - **Pyramid of Menkaure (Mycerinus)**: The smallest of the three main pyramids at Giza, built for **Pharaoh Menkaure**.

## Nile River

- The **Nile River originates** south of the equator in **Burundi, Africa**.
- Flowing northward through northeastern Africa, the Nile traverses Egypt and 10 other African countries, including **Burundi, Tanzania, Rwanda, the Democratic Republic of the Congo, Kenya, Uganda, Sudan, Ethiopia, and South Sudan**, before reaching its endpoint at the Mediterranean Sea.
- The Nile is formed by **three principal streams**, the **Blue Nile, Atbara** which flow from the highlands of Ethiopia, and the **White Nile** the headstreams of which flow into Lakes Victoria and Albert.
- Nile River, the **longest river in the world**, called the father of African rivers.



## UPSC Civil Services Examination Previous Year Question (PYQ)

### Prelims

**Q. Consider the following pairs: (2020)**

	River	Flows into
1.	Mekong	Andaman Sea
2.	Thames	Irish Sea
3.	Volga	Caspian Sea
4.	Zambezi	Indian Ocean

**Which of the pairs given above is/are correctly matched?**

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

**Ans: (c)**

## World's First Wooden Satellite

[Source: TH](#)

Japanese researchers have built the world's first wooden satellite, **LignoSat**, crafted from **magnolia wood**, with each side measuring merely 10 centimetres.

- The satellite will be launched on a [SpaceX rocket](#) from the **Kennedy Space Center** in September 2024 to the [International Space Station \(ISS\)](#), where it will be deployed from the **Japanese ISS experiment module** to assess its **strength and durability**.
- Researchers believe the wooden material of the device will completely burn up when it re-enters the atmosphere, **preventing** the creation of **harmful metal particles** that can affect the environment and telecommunications when a satellite is retired.
- In another development, a rocket launched from California by the [European Space Agency \(ESA\)](#) and **JAXA** carried the **EarthCARE satellite**, which will orbit 400 kilometres above Earth for three years to study how **clouds affect** [climate change](#).

**Read more:** [ISRO's new NavIC Satellite NVS-01](#)

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## Exercise Red Flag

[Source: TOI](#)

Eight [Indian Rafale fighter jets](#), accompanied by two IL-78 air-to-air refuellers and three C-17 Globemaster-III strategic airlift aircraft, are poised to participate in the prestigious **multi-national 'Red Flag' exercise** in Alaska, USA.

- The two-week advanced aerial combat training exercise, Exercise Red Flag, aims to **integrate aircrew** in a multinational environment, with over 100 aircraft from four nations and around 3,100 personnel participating from 1st -14th June 2024.
- The **IAF participated twice in the Red Flag exercise**, known as the **most realistic air combat training**, where fighter pilots refine skills against numerous targets, authentic threats, and adversary forces.
- Other combat exercises in which IAF regularly participates:

Air Combat Exercises	Location
Iniochos	Greece
Orion	France
Blue Flag	Israel
Pitch Black	Australia
Desert Flag	UAE

**Read more:** [US Cancels Red Flag](#)

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# RudraM-II

[Source: TH](#)

Recently, the [Defence Research and Development Organisation \(DRDO\)](#) successfully flight-tested the **Rudra M-II Missile** from a **Sukhoi-30 MKI fighter jet**.

- The RudraM-II is a **solid-propelled air-launched missile** system developed indigenously for **Air-to-Surface operations**.
  - It can **neutralise various types of enemy** assets.
  - It is expected to play a vital role in strengthening India's air security and defence preparedness, acting as a **'force multiplier'**.
- Its performance was evaluated using advanced range tracking instruments, including electro-optical systems, radar, and telemetry stations.
- **Specifications:**
  - **Range:** 300 kilometres
  - **Speed:** Up to **Mach 5.5**
  - **Payload:** 200 kilograms
  - **Detection:** Can detect enemy radio frequencies and signals from radars from over 100 km
- It can **replacement Russia's Kh-31 missile** currently used in India's Sukhoi fighter jets.



[Read more: Anti Radiation Missile: Rudram-1, India's Fighter Jets.](#)

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# Carnian Pluvial Episode

[Source:TH](#)

The **Carnian Pluvial Episode (CPE)** was a period of **extended and intense rainfall** that occurred in the late **Triassic Period** (approx. **230 million years ago**).

- It had a significant impact on the **evolution** of both terrestrial and marine life.
- Researchers believe that this prolonged rainfall was the result of global **climate change** caused by **extensive volcanic activity** in the **Wrangellia Province** (located in western coast of North America).

- During the late Triassic period, all of the Earth's landmasses were joined together to form one large **supercontinent** known as **Pangaea**.
- **Impact of CPE:**
  - It caused **mass extinction of marine life and terrestrial species**, wiping out about one-third of all species and leading to a decrease in biodiversity.
    - However, it also created an opportunity for **new and different marine and terrestrial species to evolve**, including the rise of dinosaurs .
- The CPE is believed to have set the stage for the **Mesozoic Era**, known as the **age of the dinosaurs**, in which dinosaurs emerged and flourished, dominating terrestrial ecosystems for the next 150 million years.





# Geologic Time Scale

Eon	Era	Period	Epoch	MYA	Life Forms		
Phanerozoic	Cenozoic (CZ)	Quaternary (Q)	Holocene (H)	0.01	Age of Mammals	Extinction of large mammals and birds Modern humans	
			Pleistocene (PE)				
		Neogene (N)	Pliocene (PL)	2.6		Age of Reptiles	Placental mammals Early flowering plants Dinosaurs diverse and abundant
			Miocene (MI)	5.3			
			Oligocene (OL)	23.0			
		Paleogene (PG)	Eocene (E)	33.9		Age of Amphibians	Mass extinction First dinosaurs; first mammals Flying reptiles
			Paleocene (EP)	56.0			
				66.0			
				66.0			
		Mesozoic (MZ)	Cretaceous (K)			Age of Fishes	Mass extinction First land plants Mass extinction Primitive fish Trilobite maximum Rise of corals Early shelled organisms
	Jurassic (J)		145.0				
	Triassic (TR)		201.3				
			251.9				
	Paleozoic (PZ)		Permian (P)	298.9	Marine Invertebrates		
			Pennsylvanian (PN)	323.2			
			Mississippian (M)	358.9			
			Devonian (D)	419.2			
		Silurian (S)	443.8				
		Ordovician (O)	485.4				
		Cambrian (C)	541.0				
	Proterozoic					Complex multicelled organisms	
Archean	Precambrian (PC, W, X, Y, Z)			2500	Simple multicelled organisms		
				4000	Early bacteria and algae (stromatolites)		
					Origin of life		
Hadean				4600	Formation of the Earth		

**Read more:** [Mass Extinction](#), [Bharitalasuchus Tapani: A Carnivorous Reptile](#), [Footprints of 3 Dinosaur Species: Rajasthan](#)



