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1. One Nation, One Election Bills Introduced: Key Highlights

Introduction

The government has introduced two Bills in the Lok Sabha, marking the first steps toward implementing the "One Nation, One Election" policy. This initiative aims to synchronize elections for the Lok Sabha and state Assemblies. Law Minister Arjun Ram Meghwal presented these Bills during the Winter session of Parliament on December 17, 2024.

Key Features of the Bills

1. Simultaneous Elections for Lok Sabha and State Assemblies

O The Constitution Amendment Bill seeks to align the terms of Lok Sabha and state Assemblies to enable simultaneous elections.

O Municipal elections are excluded for now, simplifying the implementation process.

2. Timeline for Implementation

O The earliest simultaneous elections may occur in the 2034 election cycle, assuming the current and next Lok Sabha complete their full five-year terms.

3. Transition Mechanism

O The Bills propose measures for mid-term elections, should any Assembly or Lok Sabha dissolve before completing its term.

Constitutional Amendments Proposed

1. New Article 82A

O Facilitates simultaneous elections by aligning Assembly terms with the Lok Sabha.

O Allows curtailing or extending Assembly terms to synchronize with Lok Sabha elections.

2. Article 83

O In case of mid-term dissolution, the next Lok Sabha's tenure will be limited to the remainder of the original term.

3. Article 172
O Similar provisions for state Assemblies, aligning their terms with the Lok Sabha in case of mid-term dissolution.

4. Article 372
O Adds provisions for "conduct of simultaneous elections."

High-Level Committee Recommendations
The amendments align with the report of the High-Level Committee chaired by former President Ram Nath Kovind, submitted in March 2024.

Practical Implications
Election Commission's Role
O Empowered to decide whether simultaneous elections are feasible.
O Can recommend deferring specific Assembly elections if conditions are not favorable.

Union Territories and Special Amendments
The second Bill, The Union Territories Laws (Amendment) Bill, 2024, proposes changes to align with the new election framework:
• Applies to the Government of Union Territories Act (1963), the National Capital Territory of Delhi Act (1991), and the Jammu and Kashmir Reorganisation Act (2019).

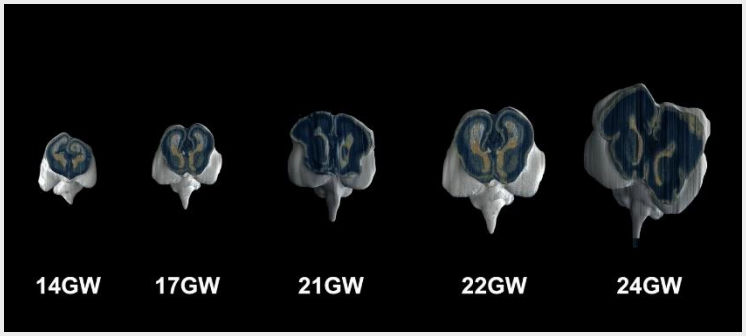
Challenges and Future Steps
1. Special Majority Requirement
O The Constitutional amendment requires approval by two-thirds of members "present and voting" in both Houses of Parliament.
2. State Legislature Ratification
O Municipal elections are excluded to avoid the need for ratification by at least half of all state legislatures.
3. Long-Term Transition
O Full implementation is expected only after significant adjustments to legislative and electoral processes.

Conclusion
The Bills mark a critical step towards electoral reform, though challenges in logistics, coordination, and constitutional alignment remain. The government's vision aims to streamline India's election cycle, potentially reducing costs and improving governance efficiency.

Relevance: GS Prelims & Mains Paper II; Governance

2. IIT-Madras Researchers Map Foetal Brain: Key Details

Significance of the Study
IIT-Madras researchers have developed a cellular-level map of growing foetal brains, a first-of-its-kind resource for neuroscientists. This repository, named Dharini, helps study brain development and its links to neurological diseases.



What Does the Dataset Include?

1. Data Overview

O Researchers used the brains of five stillborn babies, aged between 4 and 24 weeks of gestation.

O The dataset contains 5,132 cross-sectional plates of the brain at cellular resolution.

O A detailed 3D model was created by combining these plates, marking 500 distinct brain structures.

2. Accessibility

O The dataset is freely available to researchers and students worldwide.

O Plans are underway to expand the mapping to neonates, children, and adults.

How Was the Dataset Created?

1. Brain Preservation

O Brains were carefully frozen to avoid tissue damage.

O Thin slices (10–20 microns) were prepared from the frozen brains.

2. Processing Steps

O Each slice was stained, imaged at high resolution (0.5–1 micron), and digitized.

O Advanced tools were used to assemble these slices into a 3D brain map.

3. Technology Development

IIT-Madras researchers developed their own:

O Brain-freezing platform and automated slicing equipment.

O Staining, imaging, and visualization systems.

O Tools for high-resolution annotation and 3D visualization.

Applications of Brain Maps

1. Understanding Brain Development

O Offers insights into the rapid growth of the brain during gestation.

O Identifies structural and functional milestones of the brain in the womb.

2. Neurological and Developmental Disorders

O Helps study conditions like autism spectrum disorder and cerebral palsy.

O May provide clues to why some infants suffer permanent brain damage after oxygen deprivation while others recover.

3. Mental Health Research

O Provides a foundation for studying disorders such as depression, anxiety, and bipolar disorder.

Global Brain Mapping Initiatives

1. Pioneering Projects

O Allen Brain Institute in USA created the first complete brain atlas of a mouse in 2006.

O In 2016, the same institute released a human brain atlas, including 1,356 plates of a female adult brain.

2. Goals of Brain Mapping

O Explore brain structures, cell types, connections, electrical activity, and gene expression.

Conclusion

The foetal brain map developed by IIT-Madras is a groundbreaking resource for understanding brain development and associated disorders. Alongside global initiatives, it represents a critical step forward in neuroscience, with immense potential for medical and research advancements.

Relevance: GS Prelims & Mains Paper III; Science & Technology

3. Arctic Tundra: From Carbon Sink to Carbon Source

Introduction

Arctic tundra is now a source – not a sink – of carbon emissions |

The Arctic tundra, a once-frozen treeless biome storing carbon for millennia, has now become a net emitter of greenhouse gases (GHGs) like carbon dioxide (CO_2) and methane (CH_4). According to NOAA's Arctic Report Card, wildfires and rising temperatures are the key drivers of this alarming shift, with significant global climate implications.

How the Arctic Tundra Stores Carbon

1. The Carbon Cycle in Tundra

O In typical ecosystems, plants absorb CO_2 through photosynthesis and return it to the atmosphere after decomposition.

O In the Arctic, the cold climate slows decomposition, trapping organic matter in permafrost (frozen ground lasting at least two years).

2. Scale of Carbon Storage

O Arctic soils hold over 1.6 trillion metric tonnes of carbon, double the amount currently in the atmosphere.

Why Is the Tundra Emitting More Carbon?

1. Rising Temperatures

O The Arctic is warming four times faster than the global average.

O Thawing permafrost activates microbes that decompose organic matter, releasing CO_2 and CH_4 into the atmosphere.

O Twila Moon, lead editor of the Arctic Report Card, compares permafrost to frozen chicken: "Once thawed, microbes begin breaking it down, causing it to rot."

2. Increased Wildfires

O Wildfires have become more frequent and intense.

O 2023 was the worst wildfire season in Arctic history, while 2024 ranked second for wildfire emissions.

O Smoke from wildfires adds GHGs and accelerates permafrost thawing.

3. Net Carbon Emissions

O Between 2001 and 2020, Arctic tundra released more carbon than its plants absorbed — likely for the first time in thousands of years.

Future Implications

1. Global Impact

O The Arctic's shift from a carbon sink to a source will exacerbate climate change, increasing global temperatures and worsening its impacts.

2. Potential Solutions

O Reducing global GHG emissions could reverse the trend, making the tundra a carbon sink again.

O Scientists emphasize that lower climate change levels would result in fewer emissions from thawing permafrost.

3. Challenges Ahead

O Despite calls for action, global GHG emissions continue to rise.

O The Global Carbon Project predicts 41.6 billion tonnes of CO_2 emissions in 2024, up from 40.6 billion tonnes in 2023, driven by fossil fuel use and deforestation.

Conclusion

The transformation of the Arctic tundra into a carbon source highlights the urgent need for global action to reduce emissions. Without intervention, this ecosystem's shift will further accelerate climate change, amplifying its already severe consequences worldwide.

Relevance: GS Prelims & Mains Paper III; Environment