

Topics--

- **What Doomed the Dodo Bird?**
- **Understanding Destructive Interference**
- **GOES-16 Satellite**
- **Pradhan Mantri Khanij Kshetra Kalyan Yojana (PMKKKY)**
- **Realizing the rural-urban continuum**
- **Mission Mausam: Enhancing Atmospheric Observations**
- **New Trilobite Study**
- **Diuretic Drugs**
- **MVA-BN Smallpox Vaccine Effectiveness Against Mpox Infection**
- **The Discovery of Ngamugawi wirngarri:**
- **Impact of Ozone Gas on Tropical Forest Growth**

Topic --->> What Doomed the Dodo Bird?

Overview of the Dodo Bird's Extinction

Habitat: Endemic to Mauritius 

Time of Extinction: Late 17th century 

Common Myths: Slow, fat, and helpless 

Key Factors Leading to Extinction:

Human Impact:

Overhunting by sailors and settlers 

Introduction of invasive species (e.g., rats, pigs)  

Habitat Destruction:

Deforestation for agriculture  → 

Reproductive Challenges:

Ground-nesting bird with few natural defenses 

Misconceptions About the Dodo:

Often portrayed inaccurately in literature and media 

Recent research suggests it was a strong and agile bird 

Modern Interest:

De-extinction Efforts: Scientists exploring possibilities of reviving the dodo 

Cultural Impact: Symbol of extinction and conservation awareness

Topic--->>Understanding Destructive Interference

What is Destructive Interference?

Definition: The phenomenon where two or more waves superpose to form a resultant wave of lesser amplitude.

Key Characteristics:

Occurs when waves are out of phase (180 degrees apart).

Results in cancellation of the wave amplitude.

Applications of Destructive Interference

Noise Cancellation:

Used in Active Noise Cancelling (ANC) headphones.

Works by generating sound waves that are opposite to incoming noise, effectively canceling it out.

Quantum Physics:

Plays a role in quantum coherence and quantum computing.

Used to improve the performance of single-molecule switches.

Examples of Destructive Interference

Sound Waves:

Demonstrated in audio technology through noise cancellation.

Light Waves:

Observed in thin films (e.g., soap bubbles) where certain wavelengths are cancelled out.

Related Concepts

Constructive Interference: Opposite phenomenon where waves are in phase and amplify each other.

Phase Difference: The difference in phase between waves, crucial in determining the type of interference.

A microphone picks up the unwanted sound, based on which the device generates an “antiphase” wave that destructively interferes with the sound.

The technology was first invented in the 1930s; about five decades and the postwar revolution in electronics later, it had become a common feature of commercial headphones

Topic---->> GOES-16 Satellite

Overview

GOES-16: Geostationary Operational Environmental Satellite

Purpose: Weather monitoring and forecasting 🌤️

Launch: November 2016 by NASA and NOAA 🚀

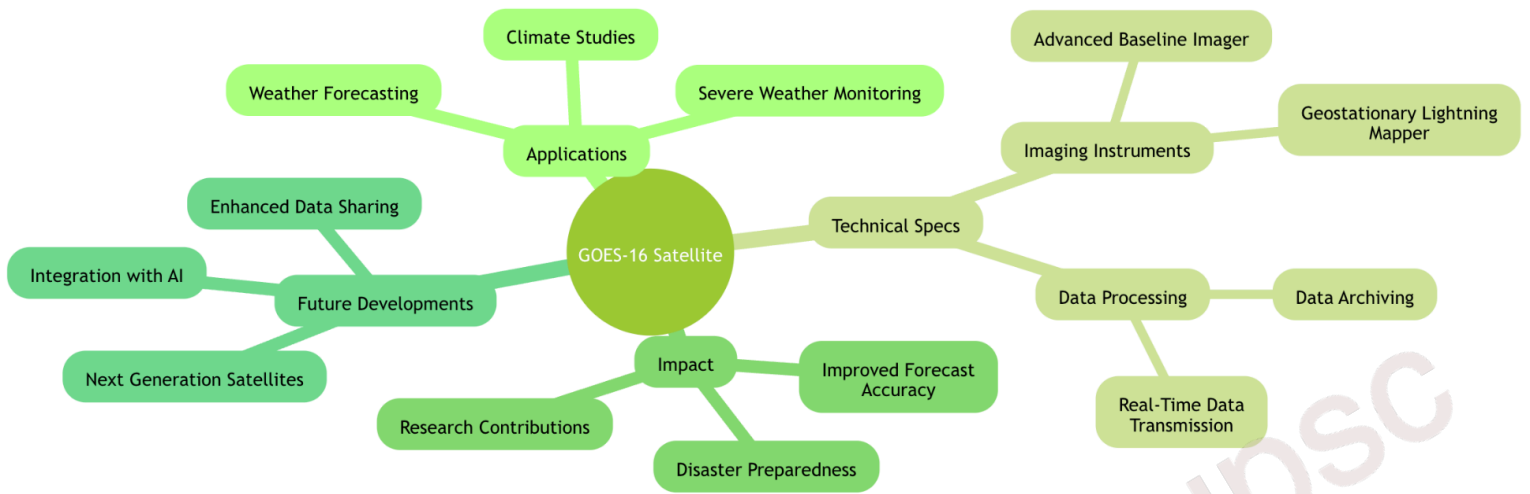


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Topic-- Democracy and Digital campaign

Key Points:

Emerging Issues

Regulation of Expenditure

Content Oversight

Challenges of Platformisation

Disparity in Resources

Wealthier parties dominate digital ads

Need for 'segmented caps' on spending

Content Regulation

Expenditure reporting for third-party campaigners

Independent agency audits post-elections

Platformisation Challenges

Varied strategies across platforms (Google vs Meta)

Need for uniform regulatory frameworks

Need for Reforms

Update rulebook for the digital age

Comprehensive studies for robust solutions

Expand rule of law to include digital campaigns

Topic---> Pradhan Mantri Khanij Kshetra Kalyan Yojana (PMKKKY)

Overview

Objective: Enhance welfare in mining areas.

Implementation: Through District Mineral Foundation (DMF).

Funding: Collected from mining activities' contribution.

Beneficiaries: Local communities affected by mining.

Key Points:

Community development

Health, education, and infrastructure projects

Sustainable mining practices

Skill development and employment generation



Topic- Realising the rural-urban continuum

Part -1-Financial Decentralisation and Over-Centralisation of Finances

Part -1 Overview of Financial Decentralisation

Definition: Providing autonomy to local bodies in finance.

Current State: Compromised due to over-centralisation.

Impact: Local bodies are "asphyxiated" by financial constraints.

Key Issues

Tied Grants:

Linked to centrally sponsored schemes.

Limits local financial autonomy.

Property Tax and State GST:

Need for linkage to avoid loss of tied grants.

Urban-Rural Continuum:

Flagship programmes miss this critical aspect.

Example: Swachh Bharat Mission and AMRUT.

Financial Constraints

Financial Devolution:

Issues arising from tied nature of grants.

Risks:

Towns risk losing tied money grants.

Increase in tied grants relative to untied grants.

Urban Infrastructure Challenges

Liquid Waste Management:

Funding issues under AMRUT.

Initial coverage of 500 cities now limited.

Part -2 Urban-Rural Continuum in Waste Management Initiatives

Overview

Flagship Programs:

Swachh Bharat Mission

Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

Focus: Addressing urban-rural continuum in liquid waste management.

(The urban-rural divide in planning and funding for waste management projects creates challenges for contiguous areas.)

Key Challenges

Funding Limitations:

AMRUT initially covered 500 cities, now extended to all statutory towns.

Many urban inhabitants live in census towns and urban villages, often excluded from funding.

Urban-Rural Nomenclature:

Waste flow does not adhere to rigid urban-rural definitions.

Planning processes remain overly focused on these definitions, complicating funding.

State-Specific Issues:

Example: Kerala's urbanization (90% urban) complicates grant utilization.

Part -3 --Revisiting the 73rd and 74th Constitutional Amendments

Strengthening District Planning Committees

Context: Need to revisit the framework established by the 73rd and 74th Amendments 

Imaginative Thinking: Recognizing a decline in innovative solutions over the last three decades 

Key Players: Zila Panchayats and Urban Local Bodies must be mobilized for effective governance 

Current Governance Model

Structure: District bureaucracy should be subordinate to District Planning Committees (DPCs) 

Reality: DPCs often act as appendages of the district bureaucracy 

Importance of Stronger DPCs: Addressing challenges of urban-rural continuum 

Case Study: Solid Waste Management in Kerala

Public Pressure: Example of a solid waste landfill proposal being withdrawn due to community response



Ministry Coordination: Both rural and urban bodies under the same Ministry facilitated quicker resolution 

Urgent Interventions Needed

Infrastructure and Governance: Immediate actions required to bridge the urban-rural divide 🏗️

Updating Models: Need to revise outdated frameworks for urban and rural local bodies ↻

Resource Allocation: Questioning compartmentalized financial resources for urban and rural areas 💰

Topic---> Mission Mausam: Enhancing Atmospheric Observations

Objectives and Key Components

Program Overview: ₹2,000 crore initiative for atmospheric observations.

Main Focus:

Improve Monsoon Forecasts 🌧️

Enhance Air Quality Alerts 🌫️

Extreme Weather Warnings ⚡

Critical Elements:

Next-Generation Radars 

Advanced Satellite Systems 

High-Performance Supercomputers 

Improved Earth-System Models 

GIS-Based Decision Support System 

Agencies Involved:

Ministry of Earth Sciences (MoES)

Implementation Plan

Tranche Until 2026:

60 Weather Radars

15 Wind Profilers

15 Radiosondes

Data Parameters:

Wind Speeds

Atmospheric Pressure

Humidity

Temperature

Historical Context

Predecessor: The 'Monsoon Mission' launched in 2012.

Previous Approaches: Statistical methods for forecasting were broad and often inaccurate.

Evolution of Weather Models:

Dynamical Models:

Introduced high-performance computing.

Provide medium-range forecasts.

Can be customized for various weather events.

Challenges and Considerations

Cost Factor:

High investment in technology and infrastructure.

Adaptability:

Models need to cater to diverse climatic conditions.

Mission Mausam: Novel Weather Management Initiative

Overview of Mission Mausam

Objective: Actively changing weather patterns through innovative techniques.

Key Focus Areas:

Cloud Seeding: Enhancing or reducing rain through chemical spraying.

Lightning Control: Reducing lethal lightning strikes, especially in high-risk areas.

Challenges and Historical Context

Historical Background: Research in weather modification dates back to the 1950s with various experiments in India.

Key Challenges:

Unpredictable Outcomes: Seeded clouds may cause rain in unintended areas.

Understanding Processes: Gaining insights into how these weather modification processes work is crucial.

Statistical Insights

Lightning Statistics:

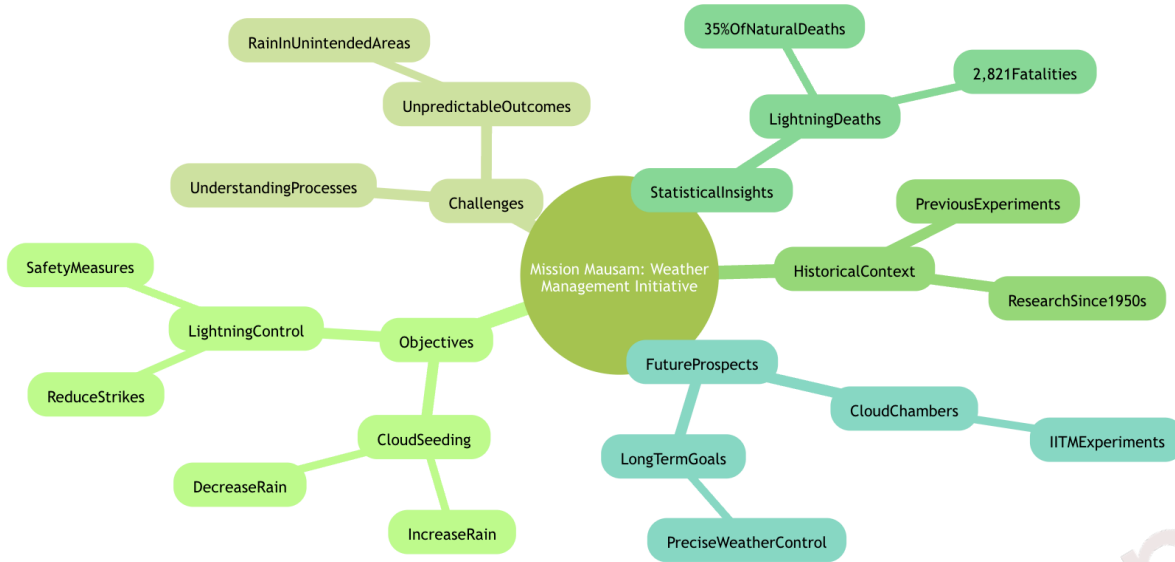
Major cause of natural deaths in India (35% of related deaths in 2022).

2,821 fatalities attributed to lightning strikes.

Future Prospects

Technological Developments: Establishing large cloud chambers for experimentation at IITM.

Long-term Goals: Aiming for a future where weather can be controlled more precisely.



Topic --->>New Trilobite Study

Key Findings

Trilobite Species: New fossils from upstate New York.

Additional Legs: Discovery of a fifth pair of appendages under the head.

Research Institutions: Led by the American Museum of Natural History and Nanjing University.

Importance of Study

Helps understand segmentation of trilobite heads.

Suggests the fifth pair of legs may be more common among trilobites.

Trilobite Overview

Extinct arthropods related to lobsters and spiders.

Body segments consist of head, thorax, and tail.

Functions of Appendages:

Sensing

Feeding

Locomotion

Counting Methods

Two Methods:

Counting grooves (furrows) on the exoskeleton.

Counting preserved antennae and legs.

Challenges: Often discrepancies between the two methods.

Examination of Fossils

Focus on *Triarthrus eatoni* fossils.

Notable for their gold shine due to pyrite preservation.
New Findings: Previously undescribed leg underneath the head.



Topic --->>Diuretic Drugs

Overview of Diuretic Drugs

Definition: Medications that promote the elimination of excess fluid from the body.

Types: Thiazide, Loop, Potassium-sparing.

Uses: Heart failure, hypertension, renal diseases.

Key Components

Mechanism of Action:

Inhibition of sodium reabsorption.

Increased urine output.

Common Diuretics:

Thiazide (e.g., Hydrochlorothiazide)

Loop (e.g., Furosemide)

Potassium-sparing (e.g., Spironolactone)

Clinical Applications

Heart Failure Management:

Reducing fluid retention.

Improving symptoms of congestion.

Hypertension Control:

Lowering blood pressure effectively.

Kidney Disease Treatment:

Preventing fluid overload.

Safety and Efficacy

Side Effects:

Electrolyte imbalance (e.g., hypokalemia).

Dehydration risk.

Recent Studies:

New findings suggest risks and benefits of specific diuretics:

Thiazide diuretics linked to adverse effects.

Combination therapies improving outcomes in heart failure patients.

Topic--->> **MVA-BN Smallpox Vaccine Effectiveness Against Mpox Infection**

Overview

Vaccine: Modified Vaccinia Ankara-Bavarian Nordic (MVA-BN)

Disease: Mpox (Monkeypox)

Efficacy: Estimated at 58% effectiveness with one dose

Mpox: A viral disease caused by the monkeypox virus, related to smallpox.

Smallpox: A contagious disease caused by the variola virus, eradicated in 1980.



Topic →? > The Discovery of Ngamugawi wirngarri:

Overview

Discovery: Ancient Devonian coelacanth fish

Location: Gogo Formation, Western Australia

Significance: Linked to tectonic activity and evolutionary history

The fossil named *Ngamugawi wirngarri* fills gaps in the coelacanth lineage, marking a transition between primitive and anatomically-modern forms.

Key Themes

Fossil Discovery

Well-preserved specimen

Importance of geological context

Tectonic Activity

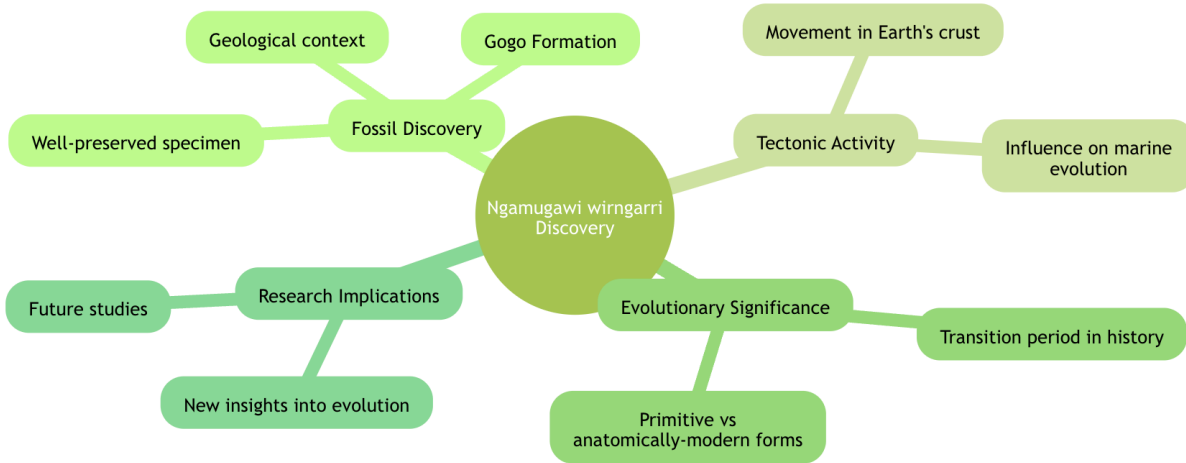
Movement in Earth's crust

Impact on marine life evolution

Evolutionary Significance

Transition in coelacanth history

Filling evolutionary gaps



Topic--->> Impact of Ozone Gas on Tropical Forest Growth 🌳

Overview

Ozone Reduction: Ozone gas reduces tropical forest growth.

Carbon Emission: Estimated 290 million tonnes of carbon uncaptured annually.

Growth Reduction: Average reduction of 5.1% in new yearly growth.

Regions Affected: Effects vary geographically, stronger in certain areas.

Research Methodology: Experiments conducted to measure ozone susceptibility of tropical tree species.

Modeling: Results incorporated into a computer model of global vegetation.

Mains Q -- "Rural urban continuum has its own challenges " Explain (15 marks)

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