DAILY CURRENT AFFAIRS 28-02-2025

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Mount Fentale Volcano Emits Methane

Syllabus: GS-1: Physical Geography – Volcanoes.

Context:

- Recently, scientists observed extraordinary **methane emissions** from **Mount Fentale**, a volcano in northern **Ethiopia**.
- The emissions peaked at **58 metric tonnes per hour** on **31 January 2025**, raising concerns about **climate change and ecosystem impact**.

The Methane Emission Phenomenon

- **Unusual Volcanic Emissions**: Unlike typical volcanic gases (**CO_2 and SO_2**), Mount Fentale released **large amounts of methane (CH_4)**.
- **Methane's Climate Impact**:
  - 28 times more effective than **CO_2** in trapping heat over a century.
  - Contributes to **global warming** and alters atmospheric composition.

Historical Context of Mount Fentale

- **Location**: Northern **Ethiopia**, in the East African Rift region.
- **Last Major Eruption**: **1820**, causing lava flow.
- **Earlier Eruptions**: Notable eruption in the **13th century**, destroying an Abyssinian town.
- **Recent Activity**: Signs of **magma intrusion** detected in **September 2024**.

Decline of Emissions and Future Monitoring

- **Gradual Decrease**: By **9 February 2025**, emissions declined, reasons remain unclear.

- **Possible Causes**:
  - Temporary geological activity.
  - Subsurface methane reservoir depletion.
- **Ongoing Monitoring**:
  - Scientists are closely tracking Mount Fentale.
  - Concern over **similar emissions elsewhere** in the world.

Implications for Climate Change

- **Short-term Impact**: Even temporary methane spikes **amplify warming effects**.
- **Significance of Natural Methane Sources**:
  - Traditionally, methane sources were considered **biogenic (wetlands, agriculture)** or **anthropogenic (fossil fuels, waste)**.
  - This event highlights **volcanic activity** as a potential methane source.
- **Need for Better Monitoring**:
  - Strengthening **global greenhouse gas tracking systems**.
  - Improving **climate models** to factor in such emissions.
- **Policy Recommendations**:
  - Enhanced **satellite monitoring** for early detection.
  - Increased focus on **natural methane contributors** in **climate mitigation strategies**.

Conclusion

- The **Mount Fentale methane emissions** incident is a **rare geological event** with significant **climate implications**.
- It underscores the **need for continuous research** on **volcanic greenhouse gas emissions** and their role in **global warming**.
- Future policies should integrate **natural emissions tracking** to enhance **climate resilience**.

Gold Card Visa

Syllabus:GS-2: International Relations – USA Visa Policy.

Context:

- The United States is set to reintroduce its EB-5 visa program under a new name, the **"Gold Card Visa."**
- It requires a **$5 million investment** to obtain a **Green Card** and a **path to US citizenship**.

What is an Investment Visa?

An investment visa allows foreign nationals to secure **residency** or **citizenship** in a country by making substantial financial investments. These visas, commonly referred to as **Golden Visas**, offer:

- **Long-term residency**
- **Tax incentives**
- **Business and investment opportunities**

Eligibility Criteria for Investment Visas

- **Minimum Investment Requirement**
  - Varies by country (typically **$200,000 to $5 million**).
- **Types of Eligible Investments**
  - **Real Estate:** Buying property.
  - **Business Capital:** Investing in local businesses or startups.
  - **Government Bonds:** Purchasing government securities.
  - **Economic Development Funds:** Contributing to national projects.
- **Minimum Stay Requirement**
  - Some countries require investors to reside for a minimum number of days per year.

Examples of Countries Offering Golden Visas

Country	Investment Requirement	Residency Period
USA (Gold Card Visa)	$5 million investment	Green Card + Path to Citizenship
UAE	AED 2 million	10-year residency

Country	Investment Requirement	Residency Period
Portugal	€500,000 (funds, job creation)	Path to EU citizenship
New Zealand	Flexible investment policies	Attracting wealthy investors

How the Investment Visa Process Works

- **Application Submission**
  - Investor provides **financial records, proof of funds, and investment plans**.
- **Background Check**
  - Government conducts **due diligence** and verifies the **source of funds**.
- **Investment Confirmation**
  - Investor transfers the required amount into an **approved investment channel**.
- **Residency Approval**
  - If all conditions are met, a **residency permit is granted**.
- **Path to Citizenship**
  - Some countries allow **citizenship** after **5-10 years** of continuous residency.

Impact of the US Gold Card Visa

- **Attracts high-net-worth individuals** willing to invest in the US economy.
- **Boosts job creation** through investment in businesses and infrastructure.
- **Enhances US global competitiveness** in attracting foreign capital.
- **Supports economic recovery** by increasing foreign direct investment (FDI).

Feature	Green Card (Permanent Residency)	Gold Card Visa (Investment-Based Residency)
Definition	A permanent residency permit allowing foreign nationals to live and work in the US indefinitely.	A residency program granted through a high-value financial investment.
Eligibility Criteria	Employment, family sponsorship, asylum, lottery, or investment (EB-5).	Requires a minimum **$5 million investment** in approved sectors.
Path to Citizenship	Eligible to apply for US citizenship after **5 years** of continuous residency.	Also provides a path to citizenship after a specified period of residency.
Work	Green Card holders can work	Typically allows business operations

Feature	Green Card (Permanent Residency)	Gold Card Visa (Investment-Based Residency)
Authorization	freely in the US without restrictions.	and investment activities, with work restrictions varying by country.
Investment Requirement	Not mandatory (except for EB-5 Green Card).	Requires a significant financial investment in real estate, businesses, or government funds.
Residency Obligation	Must reside in the US for at least **6 months per year** to maintain status.	May have flexible residency requirements depending on the country's policies.
Family Inclusion	Includes spouse and unmarried children under 21.	Usually includes immediate family members (spouse and children).
Tax Implications	Subject to **US taxation on worldwide income**.	May offer tax benefits or exemptions depending on the country.
Application Processing Time	Varies by category; **can take several years** (especially for high-demand countries).	Generally faster, with processing times **ranging from months to a few years**.
Revocation Risk	Can be revoked due to criminal offenses, prolonged absence, or fraud.	Can be revoked if investment is withdrawn, criteria are not met, or fraudulent activities are detected.

Currency Swap

Syllabus: GS-3: Indian Economy –RBI operations

Context:

- The **Reserve Bank of India (RBI)** has announced a **$10 billion dollar/rupee swap auction** to inject liquidity into the financial system.
- This decision addresses **long-term liquidity concerns** among domestic lenders.
- Liquidity concerns arise due to **foreign capital outflows** from Indian stock markets.
- Capital outflows are driven by:
    - **Higher returns in the U.S.** amid President Donald Trump's corporate tax cuts.
    - **Ongoing trade tariff wars**, leading to a stronger U.S. dollar.

What is currency swap?

- A currency swap is a financial agreement between two parties to exchange a specified amount of one currency for another, along with an agreement to reverse the transaction at a predetermined exchange rate on a future date.

Key Features of the Swap Auction

- This is the **second rupee infusion** in less than a month.
- **First swap auction:**
  - Conducted on **January 31, 2025**, worth **$5 billion**.
  - **Tenor:** Six months.
- **Latest swap auction:**
  - Worth **$10 billion**.
  - **Tenor:** Three years.
- The combined effect of these two auctions will inject approximately **₹1.3 trillion** into the banking system.

Mechanism of the Swap Auction

- Lenders **deposit their dollar reserves** with the **RBI**.
- In return, they receive **rupees** at a pre-determined **buyback premium**.
- This helps:
  - **Stabilise the rupee** amid global volatility.
  - **Ease liquidity constraints** in the domestic financial system.
  - **Mitigate inflationary pressures**.

Current Economic Challenges

- **Similar Measure in 2019:**
  - RBI conducted a **long-duration currency swap** due to global financial volatility.
  - At the time, **India's forex reserves were rising**, ensuring dollar availability.
- **Present Situation (2024-25):**
  - The rupee has **depreciated by 3.3%** against the U.S. dollar between **October 2024 and February 2025**.
  - On **December 19, 2024**, the rupee breached the **₹85 per dollar** mark.

- **Foreign portfolio investors (FPIs) and foreign institutional investors (FIIs)** have withdrawn **$31 billion** from Indian equity markets.
- Since **December 2024**, the **RBI has sold $111.2 billion** (~18% of its forex reserves) to stabilise the rupee.

Impact and the Way Forward

- The RBI's **long-term currency swap** is now a **necessity rather than a proactive measure**.
- Indian banks must utilize this **liquidity infusion** effectively by:
  - **Extending credit** to businesses.
  - Supporting **capital investment cycles**.
  - Encouraging **employment generation and wage growth**.
  - Boosting **consumer demand**.
- This could **propel India's real GDP growth beyond the current 6.4%**, despite global economic uncertainties.

Soyabean Market Trends

Syllabus: GS-3: Indian Agriculture – Procurement Mechanisms.

Context:

- In recent months, the Indian soyabean market has faced challenges despite government interventions.

Analysis of the Indian Soyabean Market Challenges

Current Procurement Status

- The Government of India set a procurement target of **30 lakh tonnes** but has managed to procure only **14.71 lakh tonnes** as of February 2025.
- Procurement involves sub-agents purchasing directly from farmers, ensuring immediate payments.
- Despite these efforts, wholesale prices have not seen significant improvement.

Price Dynamics

- Soyabean is harvested in **September**, with the marketing year running from **September to October**.
- Prices have consistently remained **below the Minimum Support Price (MSP) of ₹4,892 per quintal**:
  - **September:** ₹5,220 per quintal
  - **November:** ₹4,511 per quintal
  - **December:** ₹4,872 per quintal (slight recovery)
- Wholesale market prices, particularly in **Latur, Maharashtra**, dropped to around ₹4,200 per quintal in **November and December**, indicating a weak price recovery.

Market Reactions

- Government procurement has not significantly influenced market prices.
- Traders expect **continued price stagnation**, given the presence of government stocks.
- The market's reaction suggests a **disconnect between procurement policies and price stabilization goals**.

Export Considerations

- **Soyameal**, a byproduct of soyabean, plays a significant role in Indian exports.
- **Indian soyameal prices:$380 per tonne** vs. **Argentina's $360 per tonne**, making Indian exports less competitive.
- Proposed solutions include:
  - **Government subsidies** to boost exports.
  - **Concerns over further price drops** if government stocks enter the market.

Future Outlook

- A **major price recovery is unlikely** until government stocks (20 lakh tonnes) are released.
- Possible solutions:
  - **Incorporating soyabean into the Public Distribution System (PDS)** to increase demand.
  - **Exploring additional domestic uses** to create price stability.
- Long-term market stability may require a **holistic approach**, integrating procurement, exports, and domestic consumption strategies.

National Science Day

Syllabus: GS-3: Science and Technology

Context:

Prime Minister Narendra Modi on Friday (February 28, 2025) greeted people on the occasion of National Science Day and called for leveraging science to build a Viksit Bharat.

Sir C.V. Raman and His Contributions to Science

Early Life and Education

- **Born:** November 7, 1888, in Tiruchirappalli, Tamil Nadu.
- Raised in an **academic environment** as his father was a teacher of physics and mathematics.
- **Education:**
    - Completed **M.A. in Physics (1907)** from Presidency College, Madras.
    - Engaged in **research in atomic physics and optics**.

Nobel Prize and Bharat Ratna

- **First Asian to receive the Nobel Prize in Physics (1930)** for his work on the **scattering of light**.
- **First recipient of Bharat Ratna (1954)**, India's highest civilian award.

Raman Effect and Molecular Scattering of Light

Discovery of the Raman Effect

- **Collaborated with K.S. Krishnan in 1928** to study light scattering.
- Found that light, after passing through a transparent medium, **changes its wavelength and energy**.
- This phenomenon, called the **Raman Effect**, became a **groundbreaking discovery in physics**.

Comparison with Rayleigh Scattering

- **Rayleigh Scattering (established earlier by Lord Rayleigh):**
    - Explains the blue color of the sky due to scattering of lower-wavelength light by atmospheric gases.
- **Raman's Contribution:**
    - Proposed a more **advanced theory of scattering** where molecules interact with photons, leading to **energy shifts**.

Mechanism of Raman Scattering

- When light interacts with a molecule:
    - The **electromagnetic field of the photon** polarizes the molecule's **electron cloud**, exciting it to a higher energy state.
    - The molecule then **reemits the photon** almost immediately as scattered light.
    - In most cases, the emitted photon has **the same wavelength as the incident photon** (Rayleigh Scattering).
    - However, **in rare cases, the energy of the scattered photon shifts**, leading to **Raman Scattering**:
        - **Stokes Scattering:** Energy is absorbed (redshift).
        - **Anti-Stokes Scattering:** Energy is released (blueshift).

Significance of the Raman Effect

- **Supports the quantum theory of light** by demonstrating light's particle-like behavior.
- **Applications in spectroscopy**: Helps study vibrational, rotational, and low-frequency modes of energy in molecules.

Raman Spectroscopy

- **Definition:** An analytical technique that uses scattered light to measure the vibrational energy modes of a sample.
- **Applications:**
    - Provides **chemical and structural information** of molecules.
    - Identifies substances using **Raman 'fingerprints'**.
    - Used in **both organic and inorganic compound analysis**.
- **Types of Raman Spectroscopy:**
    - Resonance Raman Spectroscopy (RRS)
    - Surface-Enhanced Raman Spectroscopy (SERS)
    - Micro-Raman Spectroscopy
    - Non-Linear Raman Spectroscopic Techniques

Other Scientific Contributions of Sir C.V. Raman

Photon Spin (1932)

- Determined the **spin of photons** with **Suri Bhagavantam**, confirming the **quantum nature of light**.

Raman-Nath Theory

- With **Nagendra Nath**, developed a theoretical description of the **acousto-optic effect** (light scattering by sound waves).
- Enabled **optical communication** components using laser-based **modulators and switching systems**.

Studies on Light and Crystals

- Conducted **experimental and theoretical studies** on:
  - **Diffraction of light by hypersonic and ultrasonic waves**.
  - **Effects of X-rays on infrared vibrations in crystals**.
  - **Crystal dynamics** and their spectroscopic properties (1948).
  - **Structure and optical behavior of materials** like diamonds, feldspar, opal, and pearls (1950s).

Other Interests

- Optics of colloids.
- Electrical and magnetic anisotropy.
- Biological optics – studied flower colors and human vision (1960s).

Honors and Recognitions

- **Nobel Prize in Physics (1930)** – First Asian recipient.
- **Bharat Ratna (1954)** – First recipient, along with **S. Radhakrishnan** and **C. Rajagopalachari**.
- **Lenin Peace Prize (1957)**.
- **Raman Crater on the Moon** named in his honor.

Legacy and National Science Day

- **National Science Day** celebrated on **February 28** every year to honor the discovery of the Raman Effect.
- First celebrated in **1987**, following a proposal by the **National Council for Science and Technology Communication (NCSTC)** in 1986.
- **2024 Theme:***"Empowering Indian Youth for Global Leadership in Science and Innovation for Viksit Bharat."*
- **Main event:** Organized by the Government at **Plenary Hall, Vigyan Bhawan, New Delhi**.