

## Current Affairs 2<sup>nd</sup> and 3<sup>rd</sup> February 2025 By Saurabh pandey Sir

### Cardamom's Genetic Diversity and New Discoveries

#### 🌿 Cardamom's Relatives

Cardamom, often referred to as the 'Queen of Spices', was previously thought to be the only species in its genus, *Elettaria*.

Recent studies have identified several wild relatives, expanding the known diversity within this genus.

#### 🔍 Research Findings

An international team has discovered six species closely related to *Elettaria cardamomum*.

This discovery enhances the understanding of the spice's genetic diversity.

#### 📖 Published Study

The research findings were published in the journal *Taxon*.

The paper is titled 'The cardamom conundrum resolved: Recircumscription and placement of *Elettaria* in the only pantropically distributed ginger lineage.'

#### 🌐 International Collaboration

The research team included seven members from countries such as Denmark,

India, Colombia, Czech Republic, Singapore, Sri Lanka, and the U.K.

#### 🌱 New Species Identified

Newly identified species include *Elettaria facifera* and *Elettaria tulipifera*.

These species were discovered in Kerala's Periyar Tiger Reserve and Agasthyamalai hills, respectively.

#### 🌿 Commercial Importance

The seed capsules of *Elettaria cardamomum* are vital for the production of

commercial green cardamom.

This highlights the economic significance of the findings.

#### 📖 Historical Context

The genus name *Elettaria* is derived from the old Malayalam term 'elletari'.

This term was referenced in a 17th-century botanical treatise by Hendrik van Rheedee.

Summary: Recent research has unveiled six close relatives of cardamom, broadening its genus and emphasizing its genetic diversity and commercial importance.

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## Colloid Crack Formation Research

### Key Insights

**Q Prediction of Crack Formation:** Researchers can forecast crack development in colloids by analyzing their initial thickness and elasticity.

**□ Role of Additives:** Introducing additives into colloids can delay crack initiation.

**□ Common Colloids:** Frequently studied colloids include clay, milk, blood, and paint.

**□ Blood Characteristics:** Alterations in red blood cell properties influence crack patterns on substrates post-drying.

**⌚ Environmental Effects on Paint:** Daily temperature and humidity fluctuations impact crack formation in building paints.

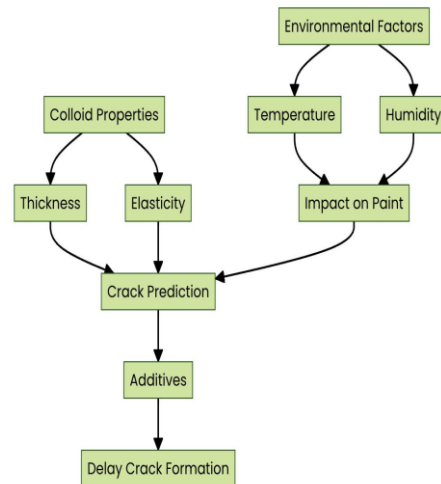
**🔬 Future Experiments:** Upcoming studies will adjust environmental parameters to assess their effects on colloid crack formation.

**🏠 Applications:** The research findings have potential applications in addressing cracking issues across various colloid types.

**Summary:** The study investigates how colloid thickness, elasticity, and environmental conditions affect crack

formation, with additives offering a mitigation strategy.

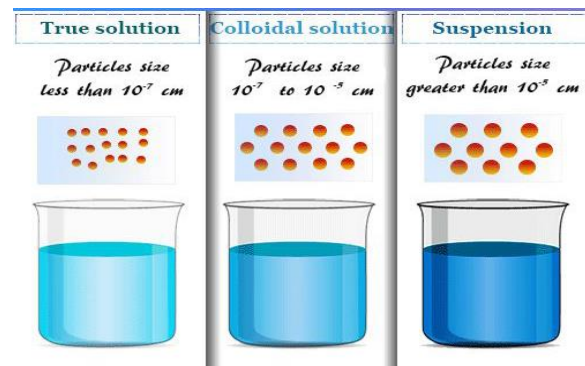
Conceptual Overview:



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### What is colloid??

A colloid is a mixture in which one substance consisting of microscopically dispersed insoluble particles is suspended throughout another substance. Some definitions specify that the particles must be dispersed in a liquid, while others extend the definition to include substances like aerosols and gels.



## India's Nuclear Energy Strategy: Embracing Small Modular Reactors

### Budget Focus 📊

Finance Minister Nirmala Sitharaman emphasized the importance of nuclear power in India's renewable energy goals during the 2024-2025 and 2025-2026 budget speeches.

### Introduction of SMRs ⚙️

Small Modular Reactors (SMRs) are being introduced into India's energy mix. Designed to be smaller, flexible, and easier to construct than traditional reactors.

### Power Output ⚡

Each SMR is expected to generate less than 300 MW. Micro reactors are being explored for outputs of 1-20 MW.

### Construction Advantages 🏗️

SMRs can be manufactured in parts, assembled in factories, and transported to sites. Allows for easier scaling compared to conventional reactors.

### Investment Challenges 💰

SMRs are in the experimental phase, requiring significant capital investment.

No guaranteed profitability; first generation needs low-grade uranium, requiring more frequent refueling.

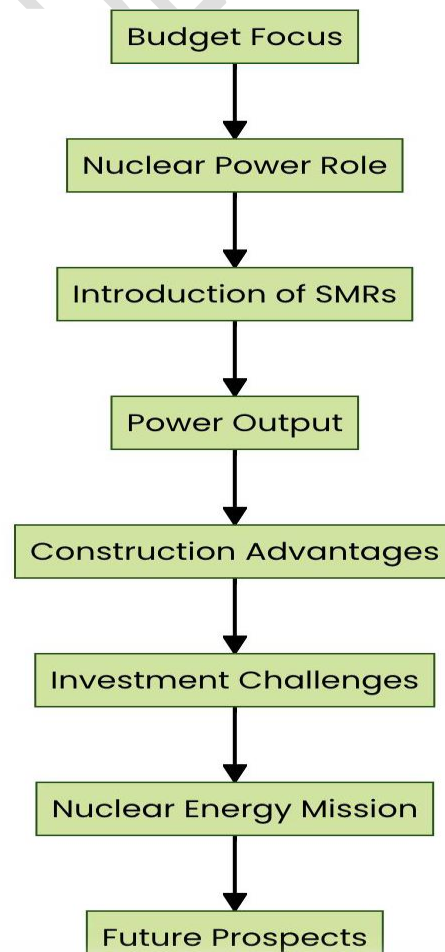
## Nuclear Energy Mission ?

A new 'Nuclear Energy Mission' announced with a budget of ₹20,000 crores.

Aims to study SMRs and operationalize five indigenous units by 2033.

### Future Prospects 🔮

The initiative aims to enhance India's nuclear capabilities while addressing the challenges associated with SMRs.



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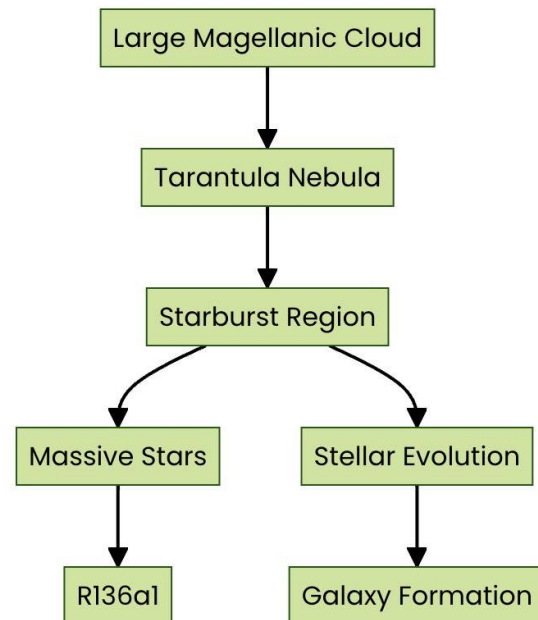


### The Tarantula Nebula: A Stellar Nursery

- The Tarantula Nebula is a significant star-forming region situated in the Large Magellanic Cloud.
- Known as one of the most active starburst regions, it rapidly produces new stars.
- Home to some of the universe's most massive stars, including R136a1.
- Located approximately 161,000 light-years from Earth.
- Named for its resemblance to a tarantula spider in certain images.
- A crucial area for astronomers studying stellar evolution and galaxy formation.
- Extensively observed by telescopes, notably the Hubble Space Telescope.

Summary: The Tarantula Nebula is a prominent star-forming region in the Large


Magellanic Cloud, notable for its massive stars and rapid star formation





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### Citizenship in India: Evolution and Controversies

#### Evolution of Citizenship Laws

 **Citizenship Act, 1955:** Initially based on the 'jus soli' principle, allowing citizenship by birth in India until June 1987.

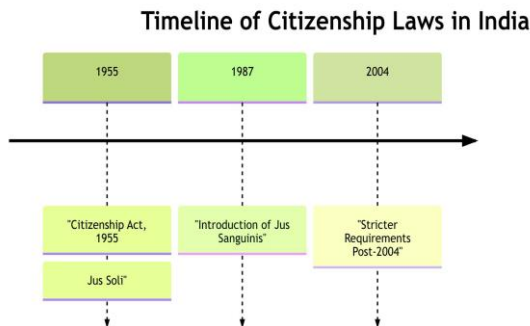
 **Shift to Jus Sanguinis:** From 1987, citizenship required at least one parent to be an Indian citizen for children born in India, applicable until December 2004.

 **Post-2004 Requirements:** Citizenship necessitates both parents to be citizens or one parent to be a citizen while the other is not an illegal



immigrant, primarily targeting illegal immigrants from Bangladesh.

Citizenship Evolution Timeline:



## Citizenship Amendment Act, 2019 (CAA)

† Accelerated Citizenship: Provides expedited citizenship for specific religious minorities (Hindus,

Christians, Sikhs, Jains, Buddhists, Parsis) from Pakistan, Afghanistan, and Bangladesh who entered India before December 31, 2014.

 **Supreme Court Review:** The constitutional validity of the CAA is currently under review by the

Supreme Court.

**CITIZENSHIP ACT & AMENDMENT**

A LOOK AT WHAT THE BILL AIMS TO DO IN VIEW OF THE ACT, AND THE RESPONSE IT RECEIVED

FOR SELECT FEW	CHANGE IN ELIGIBILITY
Citizenship Amendment Bill seeks to amend the Citizenship Act 1955 in order to make illegal migrants — Hindus, Sikhs, Buddhists, Jains, Parsis and Christians from Afghanistan, Bangladesh and Pakistan — eligible for citizenship after six years of stay in India instead of 12 even if they don't possess proper document.	Under the Citizenship Act, the applicant must have resided in India during the last 12 months, and for 11 of the last 14 years to get citizenship. The Bill relaxes this 11-year requirement to five years for persons belonging to the 6 religions and 3 countries. It also makes those who entered India till 2014 eligible.

**CRITICISM RECEIVED SO FAR**

The Bill has come under severe criticism with critics saying that the Bill violates Clause 6 of the Assam Accord, which stipulates "constitutional, legislative and administrative safeguards" for the preserving the culture and identity of Assamese people. Critics have also said that the extensive exercise of updating the National Register of Citizens (NRC) will become null and void due to this exercise.

- It inserts **December 31, 2014, as the cut-off date** for members of the Hindu, Buddhist, Christian, Parsi, Jain and Sikh communities from Pakistan, Bangladesh and Afghanistan **to be eligible to get Indian citizenship**

- It will not apply to the **tribal areas of Assam, Meghalaya, Mizoram and Tripura** as included in the Sixth Schedule of the Constitution and to **Arunachal Pradesh, Mizoram and Nagaland, which are protected by the Inner Line Permit**

- All cases against a non-Muslim illegal migrant** before any authority, including foreigners tribunals or courts, **shall stand abated**

- It will enable a person who does not have proof of birth of his parents in support of his being of Indian origin to apply for citizenship by **naturalisation on completion of six years residency**

- It reduces the **mandatory requirement of 12 years stay to five years** to be eligible for citizenship

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## Uniform Civil Code (UCC)

Uttarakhand has taken a bold step by implementing a Uniform Civil Code (UCC) that mandates the registration of live-in relationships, sparking widespread debate and concern over privacy rights and personal autonomy. This regulation not only affects residents of Uttarakhand but extends to individuals across India, requiring comprehensive documentation for both the initiation and termination of such relationships.

## Privacy Concerns and Legal Implications

The requirement for registration has ignited debates surrounding privacy, particularly in light of Article 21 of the Indian Constitution, which guarantees the right to privacy. Here are the key concerns:

**Violation of Privacy Rights:** Experts argue that mandating registration infringes on individuals' privacy, a

view echoed by Alok Prasanna Kumar, co-founder of Vidhi Centre for Legal Policy.

**Judicial Precedents:** The nine-judge Bench decision in Justice K.S. Puttaswamy versus Union of India affirmed that privacy encompasses both informational and decisional autonomy, making this law problematic.

**State Intrusion:** Critics contend that any state intervention in personal relationships is a disproportionate intrusion into individuals' private lives, undermining their autonomy.

The implications are profound, as they question the balance between state regulation and individual freedoms.

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## Junk DNA: A Comprehensive Overview

### Definition

Junk DNA refers to non-coding regions of DNA that do not encode proteins.

### Q Historical Context

The term originated in the 1970s when scientists believed these regions had no function.

### □ Current Understanding

Research indicates that some junk DNA may play roles in gene regulation and

chromosomal structure.

### Percentage of Genome

Approximately 98% of the human genome is considered junk DNA.

### □ Evolutionary Perspective

Junk DNA may serve as a reservoir for genetic variation and evolution.

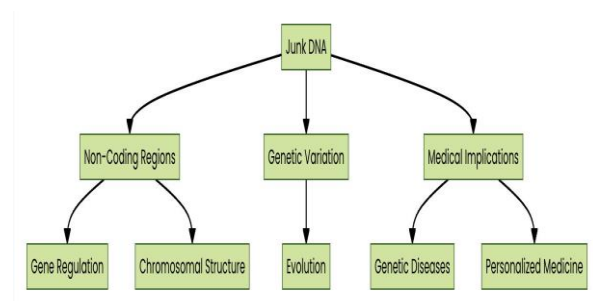
### Controversy

The classification of junk DNA is debated, as new functions for these regions are continually being discovered.

### 🌐 Implications for Medicine

Understanding junk DNA could have implications for genetic diseases and personalized medicine.

**Summary:** Junk DNA, once thought to be non-functional, is now recognized for its potential roles in gene regulation and evolution.



## Introduction to DeepSeek-R1

The emergence of DeepSeek-R1 has sent ripples through the technology sector, particularly among companies previously convinced that only hefty investments in Graphics Processing Units (GPUs) could secure their place in the competitive AI landscape.

This new large language model (LLM) from China, developed with a surprisingly modest budget of \$6 *million*, has considerable implications for how AI models are constructed and utilized across the globe.

It's an astounding feat that challenges the traditional belief that only extensive funding could yield cutting-edge AI solutions.

The model is poised to compete directly with established giants like OpenAI's ChatGPT, altering perceptions regarding the necessity of exorbitant investments for success in AI.

### Cost-Effectiveness and Accessibility

One of the most striking revelations about DeepSeek-R1 is its ability to deliver high-performance results at a fraction of the cost associated with developing similar models. This characteristic has the potential to reshape the landscape of AI development, especially for Indian firms.

**Budget Constraints:** Many startups in India previously viewed foundational models as out of reach due to the prohibitive costs involved in development.

**Competitive Edge:** With cost-effective solutions now available, Indian companies might leverage DeepSeek-R1 to enhance their AI capabilities without financial strain.

**Open Source Advantage:** The model's availability on open-source platforms increases accessibility, allowing developers to experiment and innovate freely.

### Implications for the Indian AI Ecosystem

The advent of DeepSeek-R1 represents a pivotal moment for India's AI landscape. With the potential to cultivate local expertise and develop sovereign AI solutions, this model aligns perfectly with government initiatives aimed at fostering technological independence.

**Local Innovation:** The Indian government is prioritizing the development of homegrown models, creating an environment where local talent can thrive.

**AI Sovereignty:** The ability to create foundational models is crucial for India to maintain its agency in the global AI arena.

**Government Support:** Initiatives like the India AI Mission are set to provide resources and infrastructure necessary for startups to innovate.

## **Future Prospects and Challenges**

While the emergence of DeepSeek-R1 heralds a new era of possibilities in AI, it is essential to recognize the challenges that lie ahead. The balance between cost and model performance will continue to be a point of contention.

**Performance Concerns:** Questions regarding the reliability and effectiveness of lower-cost models will persist, necessitating ongoing scrutiny.

**Market Saturation:** As more players enter the AI space, distinguishing between quality models will become increasingly important.

**Cultural Nuances:** Developing models that cater to the unique linguistic and cultural fabric of India will be crucial for success.

### **1. What is DeepSeek-R1?**

DeepSeek-R1 is an advanced large language model (LLM) developed in China, capable of competing with established models like OpenAI's ChatGPT while operating on a significantly lower budget.

### **2. How does DeepSeek-R1 change the AI landscape?**

Its introduction challenges the notion that only high-cost investments in GPUs can lead to successful AI development, making advanced AI technologies more accessible to startups and smaller companies.

### **3. Can Indian companies leverage DeepSeek-R1 effectively?**

Yes, the cost-effectiveness of DeepSeek-R1 allows Indian firms to enhance their AI capabilities without the financial burden of traditional models, fostering innovation and growth in the sector.

### **4. What role does the Indian government play in AI development?**

The Indian government is focused on creating a supportive environment for local AI development, including initiatives like the India AI Mission, which aims to provide resources and infrastructure.

### **5. Are there concerns regarding the performance of cost-effective AI models?**

While DeepSeek-R1 offers a promising alternative, questions regarding its reliability and overall performance compared to more expensive models remain a subject of discussion.

### **6. How can AI models be tailored to India's cultural context?**



It is essential to develop models that understand and cater to India's diverse linguistic and cultural landscape, ensuring that AI technologies are relevant and effective for local users.

## 7. What implications does this have for the global AI race?

The emergence of cost-effective models like DeepSeek-R1 indicates that countries like India can compete in the global AI arena, potentially reshaping the power dynamics in technology innovation.

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### Michibiki 6

- 🚀 Japan's space agency successfully launched a navigation satellite.
- 📅 The launch took place on a Sunday.
- ✨ The satellite is named Michibiki 6.
- 🌐 The launch aims to enhance Japan's location positioning system.
- 🏗️ The H3 rocket lifted off from the Tanegashima Space Center.
- The H3 rocket is Japan's new flagship rocket.
- 📍 The launch is part of Japan's efforts for improved precision in navigation

## H3 Rocket

- The H3 is Japan's next-generation heavy-lift launch vehicle. It is now being developed to be a successor to the H-IIA rocket currently in operation so that Japan can continuously have access to space.
- We are aiming to create an operational world where Japanese industrial base can be underpinned by steadily launching the H3 six times or so annually for 20 years.
- To achieve this aim, the H3 needs to receive orders to launch not only government satellites but also commercial satellites of private companies from the launch service market.
- To attract commercial satellite amid new launch vehicles being developed around the world, we need to create a new rocket which can draw attention as an easy-to-use launcher from the world as well as from Japan.

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## The Gleason grade

The Gleason grade is a system used to evaluate prostate cancer in men. It's based on the appearance of prostate cancer cells in a biopsy sample, and is used to help predict the cancer's prognosis and guide treatment.

## How it's determined

- A pathologist examines tissue samples from a prostate biopsy under a microscope. The pathologist grades each pattern of cancer cells found in the biopsy.

- The Gleason score is the sum of the grades of the two most common patterns.

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### Ancient Mars Climate: New Insights

#### Key Findings

**New Explanation:** Researchers propose a novel theory for ancient Mars' climate.

**Temperature Fluctuations:** Mars experienced cycles of "hot again, cold again."

**Water Presence:** Evidence suggests ancient Mars had water, hinting at potential habitability.

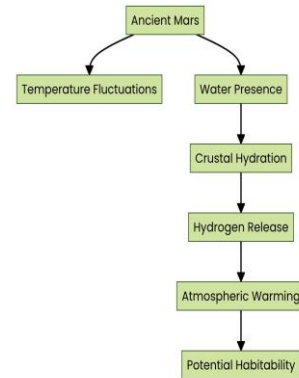
**Crustal Hydration:** Identified as a crucial process where water was absorbed by the Martian crust.

**Hydrogen Release:** This process gradually released hydrogen, warming the atmosphere.

**Building on Theories:** The study expands on existing theories about Mars' climate and habitability.

**Chemical Processes:** Emphasizes the role of chemical reactions in understanding planetary climates.

Conceptual Diagram:



**Summary:** Researchers have identified crustal hydration as a key mechanism that allowed ancient Mars to maintain warmth and possibly support water and life.

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### Microbes consume carbon monoxide

Researchers have identified microbes that consume large quantities of carbon monoxide.

🔍 The study provides insights at an atomic level regarding this process.

🧫 Microbes utilize a specific enzyme known as carbon monoxide dehydrogenase.

🌐 This enzyme allows microbes to extract energy from carbon monoxide, which is toxic but widely present.

⚡ The research demonstrates how the enzyme powers microbial cells using atmospheric carbon monoxide.

🏠 This is the first study to reveal the mechanism of how this enzyme

operates in consuming carbon monoxide.

🌱 The findings contribute to understanding how microbes can help reduce carbon monoxide levels in the environment.

Summary: Researchers have uncovered how microbes use the enzyme carbon monoxide dehydrogenase to consume and reduce atmospheric carbon monoxide levels.

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## **Moon's Geological Activity: New Insights**

### **New Discoveries on the Moon**

Dormancy Assumption: Researchers have long believed that the moon's far side has been geologically inactive for billions of years.

Dynamic Surface: Recent studies suggest that the lunar surface may be more dynamic than previously thought.

Ridge Age Discrepancy: Small ridges on the moon's far side are found to be younger than those on the near side.

New Findings: A total of 266 previously unknown small ridges have been discovered on the moon's far side.

Formation Timeline: These ridges likely formed between 3.2 to 3.6 billion years ago

## **Border Tensions: A Deeper Look into India-Bangladesh Fencing**

### **Issues**

#### **Introduction**

The India-Bangladesh border, an intricate tapestry of geography and politics, stands at a formidable 4,096 kilometers. This lengthy boundary is not merely a line on a map; it's a dynamic zone where security, diplomacy, and local lives intersect. Recent tensions over border fencing have brought this issue into sharp relief, forcing both nations to reassess their commitments and strategies.

#### **Length and Current Status of the Border Fencing**

The India-Bangladesh border is the longest of any neighboring country for India, and about 78% of this border is now fenced. Recent statistics reveal that approximately 3,196.705 km of the border has been secured, though the implementation varies significantly across states and terrains.

#### **Fencing Coverage Breakdown:**

Assam: Over 80% fenced

Meghalaya: 82.8% of 443 km fenced

South Bengal: Only 44% of 913 km fenced due to challenging riverine geography

The disparities in fencing completion are attributed to both geographical challenges and local resistance, with many communities expressing concerns over land accessibility.

### **Protocols Governing Border Fencing**

The historical Joint India-Bangladesh Guidelines for Border Authorities, established in 1975, dictate that no armed personnel should be stationed within 150 yards of the boundary line until final demarcation is completed. This agreement is crucial for maintaining peace but has recently become a point of contention.

#### **Key Issues:**

Claims of non-compliance by both sides regarding fencing agreements. Technological measures employed in unfenced areas, such as drones and surveillance cameras.

The necessity for mutual agreement on fencing within sensitive zones has led to disputes, particularly after the political upheaval in Bangladesh in August 2024.

### **Diplomatic Relations and Recent Developments**

The relationship between India and Bangladesh has been tested, as illustrated by the recent summoning of diplomats from both nations to address border fencing disputes.

With the West Bengal Cabinet approving land allocation for fencing, it appears both governments acknowledge the need for enhanced security despite political rhetoric suggesting otherwise.

Recent high-level talks focus on issues surrounding the 150-yard rule, with both countries expressing a willingness to resolve conflicts through dialogue.

### **Conclusion**

The complexities surrounding the India-Bangladesh border fencing issue highlight the intricate balance of diplomacy, security, and local populations' needs. As both countries navigate these challenges, the commitment to dialogue and cooperation will be essential in ensuring a secure and peaceful border.

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