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- 2. Zakir Hussain, who beat a syncretic rhythm, no more / सांस्कृतिक धारा का ताल मिलाने वाले जाकिर हुसैन का निधन (PCS)**
- 3. Scribe Patricia Mukhim among 10 awarded for peace building / पत्रकार पेट्रीसिया मुखिम को 10 शांति निर्माताओं में किया गया सम्मानित (PCS)**
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- 5. Sound and Fury / शोर और आक्रोश (GS Paper-II: Polity)**
- 6. Costly gamble / महंगे जुआ (GS Paper-II: France)**
- 7. Green Hydrogen and the Financing Challenge / ग्रीन हाइड्रोजन और वित्तीय चुनौतियां (GS Paper-III: Environment)**
- 8. Impact of La Niña on India's Climate / भारत की जलवायु पर ला नीना का प्रभाव (GS Paper-I: Geography)**
- 9. Procedure for Removing Judges / न्यायाधीशों को हटाने की प्रक्रिया (GS Paper-II: Polity)**

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10. **Legacy of Jawaharlal Nehru Endures Even Now / जवाहरलाल नेहरू की धरोहर आज भी कायम है (GS Paper-I: History of Post Independence India)**
11. **Like all conflicts, the Ukraine war will end in negotiation: Moldova Minister / सभी विवादों की तरह यूक्रेन युद्ध भी बातचीत से ही खत्म होगा: मोल्दोवा के मंत्री (GS Paper-I: World Geography)**
12. **'Switzerland nixing MFN status won't affect EFTA deal' / स्विट्जरलैंड द्वारा MFN का दर्जा समाप्त करने से EFTA डील पर कोई असर नहीं पड़ेगा' (GS Paper-II: India-Switzerland)**
13. **In a First, all-woman shift starts at Tata Steel's iron ore mine / टाटा स्टील की लौह अयस्क खदान में पहली बार सभी महिलाएं काम करेंगी (PCS)**
14. **Many feared dead in French territory Mayotte after cyclone / फ्रांसीसी क्षेत्र मायोट में चक्रवात के बाद कई लोगों के मारे जाने की आशंका (GS Paper-I: Geography)**
15. **New chemical pathway worsens quality of air in harsh winters / सर्दियों में हवा की गुणवत्ता को खराब करने वाली नई रासायनिक प्रक्रिया**



# Modi, Dissanayake take up regional security issues

Sri Lankan President says he will not allow his country's territory to be used to target India; New Delhi converts project loans to grants, agrees to expedite energy, digital cooperation

**GS Paper II: India-Sri Lanka**

**Suhasini Haidar**

NEW DELHI

**S**ri Lankan President Anura Kumara Dissanayake said here on Monday that he would not allow his country's territory to be used against India.

"I assured the Indian leader that Sri Lanka will not permit its territory to be used in any manner inimical to the security of India as well as towards regional stability," Mr. Dissanayake said, speaking to the media along with Prime Minister Narendra Modi at Hyderabad House, the official meeting venue.

India promised Mr. Dissanayake, who is on his maiden visit to New Delhi after sweeping presidential and parliamentary elections, to continue its grants assistance to Sri Lanka and



Sri Lankan President Anura Kumara Dissanayake with Narendra Modi at the Rashtrapati Bhavan on Monday. SHIV KUMAR PUSHPAKAR

help it tide over its economic problems.

The two leaders said they discussed a number of issues, including regional security, digital infrastructure, connectivity and

energy projects, as well as the Tamil issue and rights of fishermen. India announced it would convert loans given to Sri Lanka into grants for railway signalling systems and the

Kankesanthurai port, and extended a \$20.66 million grant to settle payment for projects already completed, which had originally been signed under a 'Letter of Credit' or loan. The two countries agreed to continue their partnership on energy projects, including connecting to a common grid, an India-Sri Lanka "multi-product pipeline" with UAE support, LNG supplies, and completing the Sampur coal power project.

Briefing the media, Foreign Secretary Vikram Misra indicated the statement by the Sri Lankan President could have a bearing on Sri Lanka's clearance for foreign vessels, particularly Chinese ships.

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## Modi, Dissanayake take up regional security issues

मोदी और डिसानायके ने क्षेत्रीय सुरक्षा मुद्दों पर चर्चा की

**Sri Lankan President Anura Kumara Dissanayake** assured that Sri Lanka's territory will not be used against India.

श्रीलंका के राष्ट्रपति अनुरा कुमार डिसानायके ने आश्वासन दिया कि श्रीलंका की भूमि का उपयोग भारत के खिलाफ नहीं किया जाएगा।

- Speaking at Hyderabad House, Mr. Dissanayake stated, "Sri Lanka will not permit its territory to be used in any manner inimical to the **security of India** or **regional stability**."





हैदराबाद हाउस में बोलते हुए, श्री डिसानायके ने कहा, "श्रीलंका किसी भी तरीके से भारत की सुरक्षा या क्षेत्रीय स्थिरता के लिए हानिकारक रूप से अपनी भूमि का उपयोग नहीं करने देगा।"

- This was Mr. Dissanayake's **first visit to New Delhi** after winning **presidential and parliamentary elections**.

यह श्री डिसानायके की नई दिल्ली की पहली यात्रा थी, जब उन्होंने राष्ट्रपति और संसदीय चुनावों में जीत हासिल की।

- India assured **continued grant assistance** to Sri Lanka to help with its **economic issues**.

भारत ने श्रीलंका को उसके आर्थिक मुद्दों में मदद के लिए अनुदान सहायता जारी रखने का आश्वासन दिया।

- The two leaders discussed **regional security, digital infrastructure, connectivity, energy projects**, the **Tamil issue**, and **fishermen's rights**.

दोनों नेताओं ने क्षेत्रीय सुरक्षा, डिजिटल बुनियादी ढांचा, कनेक्टिविटी, ऊर्जा परियोजनाएं, तमिल मुद्दा, और मछुआरों के अधिकार पर चर्चा की।

- India announced the conversion of **loans into grants** for projects like **railway signalling systems** and the **Kankesanthurai port**.

भारत ने रेलवे सिग्नलिंग सिस्टम और कंकसनथुराई बंदरगाह जैसे परियोजनाओं के लिए ऋणों को अनुदानों में बदलने की घोषणा की।

- A **\$20.66 million grant** was extended to settle payments for already completed projects, which were originally signed under a **Letter of Credit or loan**.

पहले से पूरी हो चुकी परियोजनाओं के भुगतान के लिए 20.66 मिलियन डॉलर का अनुदान दिया गया, जो मूल रूप से लेटर ऑफ क्रेडिट या ऋण के तहत हस्ताक्षरित थे।

- Both countries agreed to collaborate on **energy projects**, including:

दोनों देशों ने ऊर्जा परियोजनाओं पर सहयोग करने पर सहमति व्यक्त की, जिसमें शामिल हैं:

- Connecting to a **common grid**.

सामान्य ग्रिड से जुड़ना।

- Developing an **India-Sri Lanka multi-product pipeline** with UAE support.

UAE के सहयोग से भारत-श्रीलंका बहु-उत्पाद पाइपलाइन का विकास।

- **LNG supplies** and completing the **Sampur coal power project**.

एलएनजी आपूर्ति और संपूर कोयला ऊर्जा परियोजना को पूरा करना।

- Foreign Secretary **Vikram Misri** indicated that Mr. Dissanayake's statement could affect **clearance for foreign vessels**, particularly **Chinese ships**.

विदेश सचिव विक्रम मिस्री ने संकेत दिया कि श्री डिसानायके के बयान का विदेशी जहाजों, विशेष रूप से चीन के जहाजों, की मंजूरी पर असर हो सकता है।



# Zakir Hussain, who beat a syncretic rhythm, no more

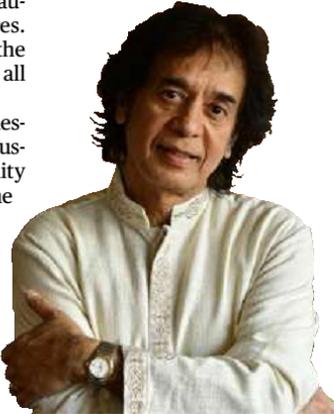
PCS

Anuj Kumar  
NEW DELHI

The tabla fell silent as Ustad Zakir Hussain (1951-2024), one of India's greatest cultural ambassadors, passed away on Monday after a brief illness in a San Francisco hospital.

A genteel virtuoso who transformed the modest instrument into a robust voice for universal peace and humanity, Hussain was known for incredible speed, dexterity, and creativity, mesmerising audiences across cultures. This made him one of the greatest musicians of all time.

As the son of tabla maestro Ustad Alla Rakha, Hussain had a natural affinity towards the thump of the instrument and the composite culture. Having grown up singing devotional hymns to Mother Saraswati, reciting verses of the Koran, and hymns of



the Bible as a daily ritual in his Mahim home in Mumbai, Hussain embodied India's syncretic soul.

In a statement, the family of Hussain, 73, confirmed that one of the world's most transcendent musicians passed away from idiopathic pulmonary fibrosis, a lung disease. He had been hospitalised over two weeks ago. "His prolific work as a teacher, mentor, and educator has left an indelible mark on countless musicians. He

hoped to inspire the next generation to go further. He leaves behind an unparalleled legacy as a cultural ambassador and one of the greatest musicians of all time," the statement said.

The untimely demise sent shock waves across the world. Describing the four-time Grammy Award winner as a "true genius", Prime Minister Narendra Modi said Hussain revolutionised the world of Indian classical music.

"He also brought the tabla to the global stage, captivating millions with his unparalleled rhythm," the PM wrote on X.

The Padma Vibhushan winner is survived by his wife and Kathak exponent, Antonia Minnecola, daughters, Anisa and Isabella Qureshi, his brothers and tabla players, Taufiq and Fazal Qureshi, and his sister, Khurshid Aulia.

TRIBUTES  
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## Zakir Hussain, who beat a syncretic rhythm, no more

### सांस्कृतिक धारा का ताल मिलाने वाले जाकिर हुसैन का निधन

The tabla fell silent as **Ustad Zakir Hussain (1951-2024)**, one of India's greatest cultural ambassadors, passed away on Monday after a brief illness in a **San Francisco hospital**.

1951-2024 में भारत के महान सांस्कृतिक दूत उस्ताद जाकिर हुसैन का सोमवार को संक्षिप्त बीमारी के बाद सैन फ्रांसिस्को के अस्पताल में निधन हो गया।

A **genteel virtuoso**, Hussain transformed the modest instrument into a robust voice for **universal peace and humanity**, mesmerizing audiences across cultures with his **speed, dexterity, and creativity**.

एक शालीन वादक, हुसैन ने तबले को वैश्विक

शांति और मानवता की मजबूत आवाज़ में बदल दिया, अपनी गति, कौशल और रचनात्मकता से विभिन्न संस्कृतियों के दर्शकों को मंत्रमुग्ध किया।

- As the **son of tabla maestro Ustad Alla Rakha**, Hussain had a natural affinity for the instrument and its **composite culture**.

तबला मास्टर उस्ताद अल्ला रक्खा के पुत्र होने के नाते, हुसैन का इस वाद्य यंत्र और इसकी मिश्रित संस्कृति के प्रति स्वाभाविक झुकाव था।

- Growing up, he sang devotional hymns to **Mother Saraswati**, recited **Koranic verses**, and hymns of unity, reflecting his **syncretic upbringing**.  
उन्होंने बचपन में मां सरस्वती की भक्ति स्तुतियां गाईं, कुरान की आयतें और एकता के भजन पढ़े, जो उनके समावेशी पालन-पोषण को दर्शाता है।
- Prime Minister **Narendra Modi** described him as a "**true genius**", stating that he revolutionized **Indian classical music** and brought the tabla to the **global stage**, captivating millions.

प्रधानमंत्री नरेंद्र मोदी ने उन्हें एक "सच्चे प्रतिभा" के रूप में वर्णित किया और कहा कि उन्होंने





भारतीय शास्त्रीय संगीत में क्रांति लाई और तबले को वैश्विक मंच पर लाकर लाखों लोगों को आकर्षित किया।

- Hussain, a **four-time Grammy Award winner**, also received the **Padma Vibhushan** and left behind an unparalleled legacy as a **cultural ambassador**.

चार बार के ग्रैमी पुरस्कार विजेता, हुसैन को पद्म विभूषण से भी सम्मानित किया गया और उन्होंने एक सांस्कृतिक राजदूत के रूप में अद्वितीय विरासत छोड़ी।

- He is survived by his wife, **Kathak exponent Antonia Minnecola**, daughters **Anisa** and **Isabella Qureshi**, and siblings **Taufiq Qureshi**, **Fazal Qureshi**, and **Khurshid Aulia**. उनके परिवार में पत्नी कथक नृत्यांगना एंटोनिया मिनेकोला, बेटियां अनीसा और इसाबेला कुरैशी, और भाई तौफीक कुरैशी, फजल कुरैशी, तथा बहन खुरशीद औलिया शामिल हैं।

## Scribe Patricia Mukhim among 10 awarded for peace building

PCS

**The Hindu Bureau**

NEW DELHI

The 'Women in Security, Conflict Management and Peace' on Monday feted 10 peace builders working with women for their efforts to forge peace in areas of protracted conflict across South Asia. The ceremony was held at the India International Centre.

Journalist Patricia Mukhim, Editor, *The Shillong Times*, was honoured with the Saahas Shrestha: Shero of Courage award.

## Scribe Patricia Mukhim among 10 awarded for peace building

पत्रकार पेट्रीसिया मुखिम को 10 शांति निर्माताओं में किया गया सम्मानित

- The 'Women in Security, Conflict Management, and Peace' on Monday feted **10 peace builders** for their efforts in forging peace in areas of **protracted conflict** across **South Asia**.

सोमवार को 'वीमेन इन सिक्योरिटी, कॉन्फ्लिक्ट मैनेजमेंट एंड पीस' ने दक्षिण एशिया के दीर्घकालिक संघर्ष वाले क्षेत्रों में शांति स्थापित करने के प्रयासों के लिए 10 शांति निर्माताओं को सम्मानित किया।

- The ceremony was held at the **India International Centre**.

यह समारोह इंडिया इंटरनेशनल सेंटर में आयोजित किया गया।

- Journalist **Patricia Mukhim**, Editor of **The Shillong Times**, was honoured with the **Saahas Shrestha: Shero of Courage award**.

पत्रकार पेट्रीसिया मुखिम, जो द शिलॉन्ग टाइम्स की संपादक हैं, को साहस श्रेष्ठ: शेरो ऑफ करेज अवार्ड से सम्मानित किया गया।





# The hidden cost of greenwashing the Indian Railways

GS Paper III:  
Environment

According to a recent report published in this daily, RITES Ltd., the consultancy arm of the Indian Railways, has won two contracts for the repurposing of six broad gauge diesel electric locomotives for export to some African railways. These locomotives will be converted for use on railways that use the Cape Gauge of 1,067 mm as against the 1,676 mm used on the broad gauge of the Indian Railways. While the Indian Railways, in collaboration with its consultancy public sector undertakings such as RITES and IRCON, has exported locomotives to countries in Asia and Africa in the past, this is probably for the first time that second-hand (used) locomotives are proposed to be exported after “gauge conversion”. While there is no doubt that this is a commendable effort in re-engineering that involves virtually rebuilding the locomotives on a narrower platform, the story that lies hidden is a sordid saga of the humongous wasting of costly assets and profligacy unmatched in the annals of railways anywhere in the world, in pursuit of a wholly fictitious goal.

## RTI data and policy justification

The report mentions “soon to be redundant diesel locomotives”. The fact is that even as far back as March 31, 2023, according to information obtained by this writer under the Right to Information (RTI) Act more than a year ago, there were 585 diesel locomotives stabled (kept idling/stored) in various locations across the Indian Railways’ network due to electrification. Further over 60% of those locomotives had a residual life of more than 15 years. Today, the figure is reported to be about 760 locomotives. How and why did the Indian Railways end up in a situation where hundreds of diesel electric locomotives in good working order with years of service still left in them became redundant? The answer lies with the policy of the government to electrify the entire broad gauge network of Indian Railways in mission mode, at a frenetic pace.

Railway electrification in India has long ago transcended mundane considerations such as economic and financial viability and joined the pantheon of universal desiderata such as world peace and universal brotherhood (*Vasudeiva Kutumbakam*). Today, railway electrification is generally justified broadly on two grounds: a saving of foreign exchange by reducing the import of crude oil and reducing environmental pollution, and, as a corollary of the second point, the adaptability to switch over to renewable sources of energy such as solar and wind. In fact in an official pamphlet issued by the Ministry of Railways in February 2021, entitled ‘Mission 100% Electrification - Moving Towards net zero carbon



**K. Balakesari**

formerly of the Indian Railway Service of Mechanical Engineers, was Member Staff, Railway Board

emission’, the objectives of the mission have been spelt out thus: to provide environment friendly, green and clean mode of transport to the people; and to unleash its potential to use of renewable energy, especially solar, by making use of the huge land parcel available along the railway tracks.

Let us examine these justifications in greater detail. The benefit of saving in foreign exchange is true in absolute terms. But viewed in the context of the total consumption of high speed diesel (HSD) oil in the country, the consumption for railway traction is minuscule. According to a study conducted by AC Nielsen and published by the Ministry of Petroleum and Natural Gas (January 2014), when electrification of the Indian Railways was proceeding at a sedate “conventional” pace, 70% of of total diesel oil consumption in the country was by the transport sector. Out of this, the share of the Railways was just 3.24%. In comparison, trucks consumed 28% and agricultural sector consumed 13.2%. The share of the Railways reduced further to about 2% in 2021-22. So, 100% rail electrification will eliminate one of the smallest segments of diesel consumption, leaving the elephants in the room to roam free.

## Truth about environmental considerations

The claim of environmental benefits is even more untenable in the Indian context. Consider the following facts. Electricity is a secondary source of energy, except when generated by lightning. It needs to be generated by expending a primary source of energy from fossil fuels such as coal, oil and natural gas, nuclear energy or the kinetic energy of water stored at a height (as in hydroelectric projects), or through solar or wind power.

What is the situation in India? Nearly 50% of the electricity generated today in the country is through coal-fired thermal plants and the Indian Railways plays a crucial role in transporting the coal from the pit heads to the thermal power plants. In fact, nearly 50% of the Railways’ total freight earnings of about ₹1.7 lakh crore in 2023-24 (revised estimates) was generated by transporting coal for various purposes of which 80%, i.e., 40% of total freight earnings was generated only by transporting coal to thermal generating plants.

Replacing diesel locomotives with electric locomotives will only result in electric locomotives powered by electricity – about 50% of which is generated by burning coal – being used to move more coal to coal-fired thermal plants to generate more electricity, to transport more coal. Coal is considered the dirtiest fuel, environmentally, on the planet. A complete

switchover by the Indian Railways to electric traction merely shifts the pollution caused by diesel locomotives near the railway tracks to the source of power generation in a more concentrated form, ultimately polluting the same atmosphere. Unless and until about 80% of the total electricity generated in the country comes from non-fossil fuels – and that day seems far off – any claim of 100% electrification of the Indian Railways, making it a “Green Railway”, is in the realm of fantasy. Incidentally, before that situation becomes a reality, the Railways will have to find alternative commodities to coal – which, today, is the single highest freight earner – to avoid a financial meltdown.

This article is not intended to reopen the time-worn debate of electric traction versus diesel traction. The issue is about chasing a mirage of converting the Indian Railways into a “green railway”, and, in the process, rendering a large number of serviceable diesel locomotives redundant. If all the locomotives already stabled are lined up today end to end, they will stretch for a length of almost 16 kilometres, a majority of them heading prematurely to the scrapyard.

## ‘Disaster management, strategic purposes’

Mission 100% electrification of the Railways will also result in a dichotomy in the near term. The Indian Railways today has more than 4,000 diesel locomotives. With the impending 100% electrification of the system, all of them will not become redundant overnight. According to a recent news report in a reputed financial daily, quoting a senior official, 2,500 diesel locomotives are proposed to be retained by the Railways for “disaster management and strategic purposes”. It is beyond comprehension what disaster will require such a large number of diesel locomotives to be set aside, unless this is a ruse to avoid sending locomotives with considerable residual service life prematurely to the scrapyard. Further, it is reported that another nearly 1,000 locomotives will continue in service for the next few years to meet traffic commitments. In other words, a 100% electrified “green” railway will continue to use about 3,500 “dirty diesels” in the foreseeable future, financially sustained to a large extent by transporting a not-so-green commodity: King Coal. That raises the question: what was the ultimate purpose of the tearing hurry to electrify 100%?

The Indian Railways’ Mission 100% electrification is a sterling example of what happens when headline-grabbing slogans promoting vanity projects substitute for well-thought out policies, finally resulting in colossal wastage of tax-payers’ money.

But does anyone care?

The ‘mission 100% electrification’ project is about chasing a mirage of turning into a green railway: a large number of serviceable diesel locomotives will also become redundant

## The Hidden Cost of Greenwashing the Indian Railways

### भारतीय रेलवे के ग्रीनवॉशिंग की छिपी हुई लागत

- RITES Ltd., the consultancy arm of the **Indian Railways**, has recently won two contracts for the repurposing of **six broad gauge diesel-electric locomotives** for export to African railways.

भारतीय रेलवे की सलाहकार इकाई RITES Ltd. ने हाल ही में छह ब्रॉड गेज डीजल-इलेक्ट्रिक





लोकोमोटिव्स को पुनः उपयोग के लिए अफ्रीकी रेलवे में निर्यात करने के लिए दो अनुबंध जीते हैं।

- These locomotives will be converted for use on **Cape Gauge railways of 1,067 mm**, which differs from the **1,676 mm** used on the Indian Railways' **broad gauge**.  
इन लोकोमोटिव्स को **1,067 मिमी के केप गेज रेलवे** पर उपयोग के लिए परिवर्तित किया जाएगा, जो भारतीय रेलवे के **1,676 मिमी ब्रॉड गेज** से भिन्न है।
- While Indian Railways, in collaboration with public sector undertakings like **RITES and IRCON**, has previously exported locomotives to **Asia and Africa**, this marks the **first time** second-hand locomotives are proposed for export after "gauge conversion".  
जहां भारतीय रेलवे ने **RITES और IRCON** जैसे सार्वजनिक उपक्रमों के सहयोग से पहले भी **एशिया और अफ्रीका** में लोकोमोटिव निर्यात किए हैं, यह **पहली बार** है जब "गेज परिवर्तन" के बाद पुराने लोकोमोटिव निर्यात के लिए प्रस्तावित किए गए हैं।
- The process of **re-engineering** involves virtually rebuilding locomotives on a narrower platform, which is commendable. However, the hidden story reveals a **huge waste of costly assets** in pursuit of a **fictitious goal**.  
पुनः अभियांत्रिकी की प्रक्रिया में संकरी प्लेटफॉर्म पर लोकोमोटिव का पुनर्निर्माण शामिल है, जो प्रशंसनीय है। लेकिन छिपी हुई कहानी में **महंगे संसाधनों की भारी बर्बादी** और **काल्पनिक लक्ष्य** का पीछा दिखाया गया है।

## RTI Data and Policy Justification

### आरटीआई डेटा और नीति का औचित्य

- The report mentions "**soon to be redundant diesel locomotives**". As of **March 31, 2023**, **585 diesel locomotives** were kept idling due to electrification, with over **60% having a residual life of over 15 years**.  
रिपोर्ट में "जल्द ही अप्रचलित होने वाले डीजल लोकोमोटिव" का उल्लेख है। **31 मार्च 2023** तक, विद्युतीकरण के कारण **585 डीजल लोकोमोटिव** बेकार खड़े थे, जिनमें से **60% से अधिक** की शेष सेवा अवधि **15 वर्ष से अधिक** थी।
- **As of today, the figure is approximately 760 locomotives**.  
आज तक यह आंकड़ा लगभग **760 लोकोमोटिव** तक पहुंच गया है।
- The Indian Railways' policy to **electrify the entire broad gauge network in mission mode** has led to hundreds of diesel locomotives becoming redundant despite being in good working condition.  
भारतीय रेलवे की **मिशन मोड** में **पूरे ब्रॉड गेज नेटवर्क को विद्युतीकृत** करने की नीति के कारण सैकड़ों डीजल लोकोमोटिव अच्छे कार्यशील स्थिति में होने के बावजूद अप्रचलित हो गए।
- Railway electrification in India has transcended practical considerations like **economic and financial viability** and is now compared to global ideals like **world peace and universal brotherhood (Vasudhaiva Kutumbakam)**.  
भारत में रेलवे का विद्युतीकरण **आर्थिक और वित्तीय व्यवहार्यता** जैसे व्यावहारिक विचारों से आगे बढ़कर अब **विश्व शांति और वसुधैव कुटुंबकम** जैसे आदर्शों से तुलना की जा रही है।





- Railway electrification is **justified on two main grounds**:  
रेलवे के विद्युतीकरण को दो मुख्य आधारों पर उचित ठहराया जाता है:
  - **Saving foreign exchange by reducing crude oil imports.**  
कच्चे तेल के आयात को कम करके **विदेशी मुद्रा बचत**।
  - **Reducing environmental pollution and enabling the shift to renewable energy like solar and wind.**  
**पर्यावरण प्रदूषण को कम करना और सौर तथा पवन जैसी नवीकरणीय ऊर्जा की ओर परिवर्तन को सक्षम बनाना।**
- In a **February 2021** pamphlet by the **Ministry of Railways**, the objectives of **Mission 100% Electrification** include:  
**फरवरी 2021 में रेल मंत्रालय के एक पुस्तिका में मिशन 100% विद्युतीकरण के उद्देश्य शामिल हैं:**
  - Providing an **environment-friendly, green, and clean mode of transport.**  
एक पर्यावरण अनुकूल, हरित, और स्वच्छ परिवहन साधन प्रदान करना।
  - **Leveraging renewable energy, especially solar, by utilizing land along railway tracks.**  
रेलवे पटरियों के साथ उपलब्ध भूमि का उपयोग करके **नवीकरणीय ऊर्जा**, विशेष रूप से सौर ऊर्जा, का लाभ उठाना।

## Reevaluating Justifications

### औचित्यों का पुनर्मूल्यांकन

- While **foreign exchange savings** are valid, the railway's share in **diesel consumption** is **minuscule**.  
हालांकि **विदेशी मुद्रा बचत** सही है, लेकिन डीजल खपत में रेलवे की हिस्सेदारी **बहुत छोटी** है।
- A **2014 AC Nielsen study** showed that the **transport sector consumed 70% of total diesel, with railways accounting for just 3.24%**.  
**2014 एसी नीलसन अध्ययन** में दिखाया गया कि **परिवहन क्षेत्र** ने कुल डीजल खपत का **70%** उपयोग किया, जिसमें रेलवे की हिस्सेदारी **मात्र 3.24%** थी।
- By **2021-22**, the railway's share reduced further to **2%**, making **100% rail electrification** a minor contributor in overall diesel reduction.  
**2021-22 तक**, रेलवे की हिस्सेदारी घटकर **2%** रह गई, जिससे **100% रेल विद्युतीकरण** कुल डीजल खपत में मामूली योगदानकर्ता बन गया।
- **Major diesel consumers like trucks (28%) and the agriculture sector (13.2%) remain significant contributors to diesel usage.**  
**ट्रक (28%) और कृषि क्षेत्र (13.2%)** जैसे प्रमुख डीजल उपभोक्ता अभी भी डीजल उपयोग में महत्वपूर्ण योगदानकर्ता बने हुए हैं।

## Truth about Environmental Considerations

### पर्यावरणीय विचारों के बारे में सच्चाई





- **Electricity** is a secondary source of energy, except when generated by **lightning**. It is produced by expending primary energy sources like **fossil fuels** (coal, oil, natural gas), **nuclear energy**, hydroelectric power, or **solar/wind power**.

बिजली एक द्वितीयक ऊर्जा स्रोत है, सिवाय इसके जब यह बिजली गिरने से उत्पन्न होती है। इसे प्राथमिक ऊर्जा स्रोतों जैसे जीवाश्म ईंधन (कोयला, तेल, प्राकृतिक गैस), नाभिकीय ऊर्जा, जलविद्युत, या सौर/पवन ऊर्जा के उपयोग से उत्पन्न किया जाता है।

- In **India**, nearly **50% of electricity is generated through coal-fired thermal plants**, and the **Indian Railways** plays a vital role in transporting **coal** from pitheads to these plants. भारत में लगभग **50%** बिजली कोयला-आधारित तापीय संयंत्रों के माध्यम से उत्पन्न होती है, और भारतीय रेलवे कोयले को खदानों से इन संयंत्रों तक पहुंचाने में महत्वपूर्ण भूमिका निभाता है।
- In 2023-24, nearly **50% of Railways' freight earnings** (₹1.7 lakh crore) were generated by transporting coal, out of which **80%** (or **40% of total freight earnings**) came from transporting coal to **thermal generating plants**.

2023-24 में रेलवे की कुल माल भाड़ा आय (₹1.7 लाख करोड़) का लगभग **50%** कोयले के परिवहन से प्राप्त हुआ, जिसमें से **80%** (या कुल माल भाड़ा आय का **40%**) तापीय संयंत्रों तक कोयला पहुंचाने से हुआ।

- Replacing diesel locomotives with **electric locomotives** will result in **coal-based electricity** being used to transport more **coal** to **thermal plants**, perpetuating pollution. डीजल इंजनों को इलेक्ट्रिक इंजनों से बदलने पर कोयला-आधारित बिजली का उपयोग अधिक कोयले को तापीय संयंत्रों तक ले जाने के लिए किया जाएगा, जिससे प्रदूषण जारी रहेगा।
- **Coal**, the dirtiest fuel, pollutes the environment at the power generation site instead of near railway tracks, making the **"Green Railway"** claim unrealistic until **80% of electricity is generated from non-fossil fuels**.

कोयला, जो सबसे प्रदूषित ईंधन है, रेलवे ट्रैक के बजाय बिजली उत्पादन स्थलों पर प्रदूषण फैलाता है। जब तक **80%** बिजली गैर-जीवाश्म ईंधन से उत्पन्न नहीं होती, तब तक "ग्रीन रेलवे" का दावा अवास्तविक है।

## 'Disaster Management, Strategic Purposes'

### 'आपदा प्रबंधन, रणनीतिक उद्देश्य'

- The Indian Railways has over **4,000 diesel locomotives**, of which **2,500** are proposed to be retained for **"disaster management and strategic purposes"** post-electrification. भारतीय रेलवे के पास **4,000 से अधिक डीजल इंजन** हैं, जिनमें से **2,500** को "आपदा प्रबंधन और रणनीतिक उद्देश्यों" के लिए रखा जाएगा।
- Nearly **1,000 diesel locomotives** will remain in service for the next few years, despite **100% electrification**, to meet **traffic commitments**. **1,000 डीजल इंजन** अगले कुछ वर्षों तक यातायात आवश्यकताओं को पूरा करने के लिए सेवा में रहेंगे, भले ही **100%** विद्युतीकरण हो।
- This raises questions about the **rush for electrification** when a **large fleet of diesel locomotives** will still be in use and coal remains the **highest freight earner** for the Railways.





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यह प्रश्न उठता है कि जब रेलवे अभी भी बड़ी संख्या में डीजल इंजन का उपयोग करेगा और कोयला सबसे अधिक माल भाड़ा आय का स्रोत बना रहेगा, तब विद्युतीकरण की जल्दबाजी क्यों की गई।

## **Conclusion: Wastage of Public Funds**

### **निष्कर्ष: सार्वजनिक धन की बर्बादी**

- The mission of **100% electrification** of the Indian Railways is an example of **headline-grabbing slogans** substituting for **well-thought-out policies**, resulting in a **wastage of taxpayers' money**.  
भारतीय रेलवे के 100% विद्युतीकरण का मिशन सुधरी हुई नीतियों के बजाय लोकलुभावन नारे देने का उदाहरण है, जिससे करदाताओं के पैसे की बर्बादी हुई।
- Many serviceable **diesel locomotives**, with considerable service life, are being **prematurely scrapped**, leading to **colossal wastage**.  
कई डीजल इंजन, जिनका अभी उपयोग किया जा सकता था, समय से पहले स्कैप किए जा रहे हैं, जिससे भारी बर्बादी हो रही है।





GS Paper II: Polity

## Sound and fury

The Constitution might be a unifier, but the debate exposed polarisation

The parliamentary debate on the Constitution turned out to be yet another occasion of intense diatribe between the ruling alliance and the Opposition. While both sides agreed on the supremacy of the Constitution, now in its 75th year, each accused the other of undermining it. The debate could have been an opportunity to explore a new common ground for a sharply polarised polity, but, unfortunately, that is not how it played out. Speakers from parties in power, led by Prime Minister Narendra Modi, and Opposition speakers led by the Leader of Opposition, Rahul Gandhi, railed against their political opponents and used the Constitution as a facade for their partisan politics. Mr. Gandhi views the Bharatiya Janata Party (BJP) and Mr. Modi as disloyal to the Constitution, and sought to connect it all to the Hindutva ideology. Mr. Modi singled out Mr. Gandhi's family, starting from his great-grandfather and the first Prime Minister, Jawaharlal Nehru, for a no-holds-barred attack – that it has undermined the Constitution through acts of omission and commission. Both sides used facts selectively and the statements of past actors to exaggerate the point that their opponents did more harm to the Constitution than they themselves. Such an approach may work as a propaganda strategy but can do little in terms of constructive engagement on the question.

The Constitution, understood as a living document, provides the foundation and the framework for a fairer social, political and economic order for the country. Constitutionalism is an evolving project, and any discussion on it must account for this dynamism. History is a good teacher, but litigating the past endlessly is not a helpful learning technique. There have been many dark moments in the 75-year history of the Constitution, including the imposition of Emergency, but the brighter and bigger picture is that it still offers the strongest possible ethos for a secular, pluralist and progressive nation. The BJP and the Congress calling each other names is akin to the pot calling the kettle black. Both sides say they are for strengthening the unity of the country, but accuse each other of dividing the country. What emerges from the debate is that there is a lot of blame to go around; what were missing were introspection and self-reflection. Mr. Modi is right in saying that the Constitution is a unifier of the nation, and cited his government's push for a uniform civil code as an example of the commitment to advancing this unity. Uneven demographic and economic trends will require close and unified attention by the political class in the decades ahead to reimagine the constitutional scheme. Sadly, little time was spent on these questions.

Website: [patrioticias.in](http://patrioticias.in)

Telegram Channel: <https://t.me/patrioticIAS>

## Sound and Fury

### शोर और आक्रोश

The Constitution might be a unifier, but the debate exposed polarisation.

संविधान एक एकीकर्ता हो सकता है, लेकिन बहस ने धुवीकरण को उजागर किया।

The parliamentary debate on the Constitution's 75th year turned into an intense verbal duel between the ruling alliance and the Opposition.

संविधान के 75वें वर्ष पर संसदीय बहस सत्ता गठबंधन और विपक्ष के बीच तीव्र वाद-विवाद में बदल गई।

Both sides agreed on the **supremacy of the Constitution** but accused each other of undermining it.

दोनों पक्षों ने संविधान की सर्वोच्चता पर सहमति जताई, लेकिन एक-दूसरे पर इसे कमजोर करने का आरोप लगाया।

The debate missed an opportunity to explore new common ground for a sharply polarised polity.

यह बहस एक तीव्र रूप से धुवीकृत राजनीति के लिए नए सामान्य आधार तलाशने का अवसर चूक गई।

**Prime Minister Narendra Modi and Leader of Opposition Rahul Gandhi** accused each other of using the Constitution as a partisan tool.

प्रधानमंत्री नरेंद्र मोदी और विपक्ष के नेता राहुल गांधी ने एक-दूसरे पर संविधान का उपयोग पक्षपाती उपकरण के रूप में करने का आरोप लगाया।

Rahul Gandhi linked the BJP and Modi to the **Hindutva ideology**, while Modi criticized the Nehru-Gandhi family for undermining the Constitution.

राहुल गांधी ने बीजेपी और मोदी को हिंदुत्व विचारधारा से जोड़ा, जबकि मोदी ने नेहरू-गांधी परिवार की संविधान को कमजोर करने के लिए आलोचना की।

Both sides used **selective facts and past statements** to blame each other for harming the Constitution.

दोनों पक्षों ने चयनात्मक तथ्य और अतीत के बयानों का उपयोग संविधान को नुकसान पहुंचाने का आरोप लगाने के लिए किया।

The Constitution as a Living Document





## जीवंत दस्तावेज़ के रूप में संविधान

- The Constitution provides a framework for a fairer **social, political, and economic order** in the country.  
संविधान देश में सामाजिक, राजनीतिक और आर्थिक व्यवस्था के लिए एक ढांचा प्रदान करता है।
- **Constitutionalism** is an evolving project, and discussions must account for its **dynamism**.  
संवैधानिकता एक विकसित होती परियोजना है, और चर्चाओं को इसकी गतिशीलता को ध्यान में रखना चाहिए।
- History is a good teacher, but **litigating the past endlessly** is not helpful.  
इतिहास एक अच्छा शिक्षक है, लेकिन अतीत की लगातार समीक्षा करना उपयोगी नहीं है।
- Despite **dark moments** like the Emergency, the Constitution remains a beacon for a **secular, pluralist, and progressive nation**.  
आपातकाल जैसे काले क्षणों के बावजूद, संविधान एक धर्मनिरपेक्ष, बहुलवादी और प्रगतिशील राष्ट्र के लिए प्रकाशस्तंभ बना हुआ है।

## Blame Game and Introspection

### आरोप-प्रत्यारोप और आत्मनिरीक्षण

- The **BJP and Congress** accused each other of dividing the country while claiming to strengthen unity.  
बीजेपी और कांग्रेस ने एक-दूसरे पर देश को बांटने का आरोप लगाया, जबकि एकता को मजबूत करने का दावा किया।
- What was missing in the debate was **introspection and self-reflection**.  
बहस में जो गायब था वह था आत्मनिरीक्षण और आत्म-चिंतन।
- Modi's emphasis on the Constitution as a **unifier** is correct, as it supports the government's push for a **Uniform Civil Code (UCC)**.  
मोदी का संविधान को एकीकर्ता के रूप में महत्व देना सही है, क्योंकि यह सरकार के समान नागरिक संहिता (UCC) के प्रयास का समर्थन करता है।
- **Uneven demographic and economic trends demand unified attention from the political class to reimagine the constitutional framework**.  
असमान जनसांख्यिकीय और आर्थिक रुझान संवैधानिक ढांचे की पुनर्कल्पना के लिए राजनीतिक वर्ग का एकीकृत ध्यान मांगते हैं।
- The debate failed to spend time on these **critical future questions**.  
बहस इन महत्वपूर्ण भविष्य के प्रश्नों पर समय देने में विफल रही।





GS Paper II: France

## Costly gambles

Emmanuel Macron is driving France into one crisis after another

**W**hen France's President, Emmanuel Macron, called a snap legislative election in June, he had two political objectives: secure a new mandate for his centrist coalition and arrest the surge of the far-right National Rally, which had just finished first in the European elections. But what he got was a hung parliament with the left-wing New Popular Front (NFP) emerging as the largest bloc. And what he did was to pick Michel Barnier, a conservative leader of the Republican Party, which had finished fourth in the elections, to form the government. It was a disaster foretold. The government collapsed within three months, leaving France without a budget for 2025. And now, as if he learnt nothing from his gambles, Mr. Macron has appointed François Bayrou, leader of the Democratic Movement party, which has just 33 seats in the 577-member National Assembly, as the next Prime Minister. Even if Mr. Macron's coalition, Ensemble, which finished second in the elections, and the Republicans come together, they do not have a majority (289 seats) to pass bills in Parliament. The Socialist Party, which is part of the left-wing alliance, has already said it will not join the new government. This would mean that Mr. Bayrou's government would be at the mercy of Marine Le Pen's far-right National Rally, as Mr. Barnier's government was, for survival.

With rising unemployment and falling domestic consumption, France needs urgent policy interventions. It has seen a jump in fiscal deficit, to 6.1% of GDP, worse than Greece, Spain and Italy, the Eurozone countries hit hard by the 2008-09 debt crisis. France's debt has also ballooned to €3.2 trillion, more than 112% of its GDP. What makes the crisis worse is the absence of a stable government. Mr. Bayrou's immediate task is to get an emergency budget passed in Parliament so that essential services run. But this will entail painful negotiations with the far-right, which is opposed to any more cuts in social spending. This takes the political and economic situation back to square one. Part of the problem is Mr. Macron's refusal to accept shifting political dynamics. An anti-establishment constituency is gaining strength from economic agonies. While the far-right and the left are trying to mobilise the working population from different political platforms, Mr. Macron is trying to preserve the status quo (mis)using his presidential powers. By appointing unpopular leaders who lack a clear mandate as Prime Ministers, he is prolonging the crisis. If he was serious about 'institutional stability', a favourite Macronist mantra, he should have sought to build a coalition with the largest bloc, the Left, and helped them rule based on a consensus-driven political and economic programme.

## Costly gambles महंगे जुआ

**When France's President Emmanuel Macron called a snap legislative election in June, he had two objectives: secure a new mandate for his centrist coalition and arrest the surge of the far-right National Rally, which had finished first in the European elections.**

फ्रांस के राष्ट्रपति इमैनुएल मैक्रों ने जून में अचानक से विधायी चुनाव बुलाया, उनके दो उद्देश्य थे: अपने मध्यमार्गी गठबंधन के लिए नया जनादेश प्राप्त करना और फार-राइट नेशनल रैली के उभार को रोकना, जो यूरोपीय चुनावों में पहले स्थान पर आई थी।

• The election resulted in a **hung parliament, with the left-wing New Popular Front (NFP) emerging as the largest bloc.**

चुनाव का परिणाम त्रिशंकु संसद रहा, जिसमें वामपंथी न्यू पॉपुलर फ्रंट (NFP) सबसे बड़े गुट के रूप में उभरी।

• **Macron picked Michel Barnier, a conservative leader of the Republican Party, which finished fourth in the elections, to form the government.**

मैक्रों ने सरकार बनाने के लिए मिशेल बार्नियर को चुना, जो रिपब्लिकन पार्टी के संरक्षणवादी नेता हैं और जिनकी पार्टी चुनावों में चौथे स्थान पर रही।

• **The government collapsed within three months, leaving France without a budget for 2025.**

सरकार तीन महीनों के भीतर गिर गई, जिससे फ्रांस के पास 2025 का बजट नहीं बचा।

• **Macron then appointed François Bayrou, leader of the Democratic Movement party, which has just 33 seats in the 577-member National Assembly, as the next Prime Minister.**

मैक्रों ने इसके बाद फ्रांस्वा बायरो को नया प्रधानमंत्री नियुक्त किया, जो डेमोक्रेटिक मूवमेंट पार्टी के नेता हैं और जिनकी पार्टी के पास 577-सदस्यीय नेशनल असेंबली में केवल 33 सीटें हैं।

• **Even if Macron's coalition Ensemble and the Republicans come together, they still lack a majority (289 seats) to pass bills in Parliament.**





यहां तक कि अगर मैक्रों का गठबंधन **एंसेंबल** और रिपब्लिकन एक साथ आते हैं, तब भी उनके पास संसद में विधेयक पारित करने के लिए **289 सीटों का बहुमत** नहीं है।

- The **Socialist Party**, part of the left-wing alliance, has already **refused to join** the new government.

वामपंथी गठबंधन का हिस्सा **सोशलिस्ट पार्टी** पहले ही नई सरकार में शामिल होने से **इनकार** कर चुकी है।

- This leaves **François Bayrou's government** dependent on **Marine Le Pen's far-right National Rally** for survival.

इससे **फ्रांस्वा बायरो** की सरकार को **मारिन ले पेन** की **फार-राइट नेशनल रैली** पर निर्भर रहना पड़ेगा।

- France faces **rising unemployment and falling domestic consumption**, necessitating urgent policy interventions.

फ्रांस को **बढ़ती बेरोजगारी** और **घटते घरेलू उपभोग** का सामना करना पड़ रहा है, जिससे तत्काल नीतिगत हस्तक्षेप आवश्यक हो गया है।

- The **fiscal deficit has jumped to 6.1% of GDP, worse than Greece, Spain, and Italy**, the countries hit hardest by the **2008-09 debt crisis**.

वित्तीय घाटा **जीडीपी** के **6.1%** तक बढ़ गया है, जो **ग्रीस, स्पेन और इटली** जैसे देशों से भी खराब स्थिति में है, जिन्हें **2008-09 के ऋण संकट** से सबसे ज्यादा नुकसान हुआ था।

- **France's debt has risen to €3.2 trillion, more than 112% of its GDP.**

फ्रांस का कर्ज **€3.2 ट्रिलियन** तक बढ़ गया है, जो उसकी **जीडीपी** का **112%** से अधिक है।

- Mr. Bayrou's immediate task is to get an **emergency budget passed** in Parliament to ensure **essential services run**, but this will require **negotiations with the far-right**, which opposes further **cuts in social spending**.

श्री बायरो का तत्काल कार्य संसद में **आपातकालीन बजट पारित कराना** है ताकि **आवश्यक सेवाएं चालू रहें**, लेकिन इसके लिए उन्हें **फार-राइट** के साथ **सामाजिक खर्चों में कटौती** का विरोध करने वाली पार्टी से बातचीत करनी होगी।

- Macron's refusal to acknowledge **shifting political dynamics** worsens the crisis, as an **anti-establishment constituency** gains strength due to economic challenges.

मैक्रों का **बदलते राजनीतिक परिदृश्य** को स्वीकार करने से **इनकार** करना संकट को बढ़ा देता है, क्योंकि **एंटी-एस्टैब्लिशमेंट गुट** आर्थिक चुनौतियों से मजबूत हो रहा है।

- By appointing **unpopular leaders** lacking a clear mandate, Macron is prolonging the crisis.

**अलोकप्रिय नेताओं** को नियुक्त करके, जिनके पास स्पष्ट जनादेश नहीं है, मैक्रों संकट को बढ़ा रहे हैं।

- Macron should have considered **building a coalition** with the **largest bloc (the Left)** for a **consensus-driven programme** to ensure **institutional stability**.

मैक्रों को **सबसे बड़े गुट (वामपंथियों)** के साथ **गठबंधन बनाकर एक सहमति आधारित कार्यक्रम** पर विचार करना चाहिए था ताकि **संस्थागत स्थिरता सुनिश्चित** हो सके।





# Green hydrogen and the financing challenge

**GS Paper III: Environment**

**A**s India charts its path to net-zero emissions by 2070, green hydrogen offers a crucial pathway to decarbonise its industrial sectors. India's ambitious target of producing 5 million metric tonnes (MMT) of green hydrogen annually by 2030 signals its bid to establish early leadership in this emerging sector. However, the daunting economics of financing these projects threatens to derail India's green hydrogen ambition.

Based on a recent analysis by BloombergNEF, India is on track to meet only 10% of its stated goal. The sluggish progress is attributable to the substantial disparity between green hydrogen production costs (\$5.30-\$6.70 per kg) and traditional grey/blue production costs (\$1.9-\$2.4 per kg). This wide price differential makes it challenging to drive domestic offtake and attract private investment. It also creates a classic market deadlock – green hydrogen costs can only decrease with scaled production, but scaling requires viable economics.

## The barriers

The economics of green hydrogen production hinge on two factors – the levelised cost of electricity (LCOE) and electrolyzer costs, both driven by the cost of capital. In emerging markets like India, perceived higher risks push up borrowing costs, leading to a high weighted average cost of capital (WACC). As investment costs make up 50-80% of LCOE in renewable energy projects, WACC significantly impacts overall costs.

Studies show that an increase in WACC from 10% to 20% can trigger up to a 73% surge in the levelised cost of hydrogen, even when all other production factors remain constant. Add to this the current high costs of electrolyzers, ranging from \$500-1,400/kW for alkaline and \$1,100-1,800/kW for proton exchange membrane systems, and the financial viability becomes even more challenging.

The global perspective on investments reflects these



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India's success in green hydrogen will depend on leveraging its abundant renewable resources through efficient project execution, access to low-cost capital, and strategic investments

barriers. By May 2024, only 27.6% of the 1,572 announced large-scale clean hydrogen projects valued at \$370 billion had reached final investment decisions. This disparity between plans and financial commitments indicates that the market's structural barriers extend beyond technological readiness. India needs to adopt innovative financing mechanisms and policy frameworks to effectively de-risk investments and attract capital to scale its green hydrogen sector.

On the policy front, several countries are showing the way. The U.K.'s Low Carbon Hydrogen Standard Certification provides a model for building market confidence. Similarly, strategic hydrogen hubs in the U.S., Japan, and Australia reflect a shift from traditional industrial development approaches – rather than letting infrastructure follow demand, these nations are fostering integrated ecosystems where infrastructure, production, innovation, and consumption co-evolve. Adapting this approach, with localised industrial clusters linked to renewable energy sources, could create self-sustaining hydrogen corridors in India that attract investment.

## How to de-risk investments

On financing, India needs a multi-pronged approach to de-risk investments. First, the government must implement a comprehensive policy framework that extends beyond production incentives to address fundamental financing barriers. This includes establishing long-term hydrogen purchase agreements and partial loan guarantees to reduce investor uncertainty. It should also create "regulatory sandboxes" that allow for rapid experimentation with novel business models while maintaining safety standards, similar to how fintech innovation was accelerated in India.

Second, India's financial sector must move beyond traditional project finance paradigms designed for conventional energy

infrastructure. Indian banks and financial institutions must develop products that address hydrogen's distinctive challenges – long development timelines, uncertain demand, and complex value chains. While blended finance and green bonds provide initial momentum, the sector requires innovative approaches like modular project financing that lets facilities scale in phases, reducing initial capital requirements. "Anchor-plus" financing models could help, where a creditworthy industrial anchor customer underwrites the base capacity while additional capacity is financed using flexible instruments as market demand grows. Equipment-leasing structures could transform electrolyzer investments from prohibitive upfront costs into manageable operational expenses, following the successful model of solar and wind sectors.

Third, India's international collaboration must move beyond aspirational agreements to tackle practical market-making challenges. Establishing standardised carbon intensity and hydrogen origin certification can facilitate exports and bolster trust in India's hydrogen supply chain. Key trade corridors, such as the Hydrogen Energy Supply Chain Project between Australia and Japan, show how cross-border partnerships can provide the demand certainty needed for large-scale investments.

In the next few years, early projects in industrial hubs such as Odisha, Maharashtra, and Gujarat that demonstrate viable business models will shape how the sector develops in India. The green hydrogen projects must integrate financial structuring from the outset. The focus must be on delivering hydrogen at prices that suit key industries.

India's success in green hydrogen will depend on leveraging its abundant renewable resources through efficient project execution, access to low-cost capital, and strategic investments.





## Green Hydrogen and the Financing Challenge

### ग्रीन हाइड्रोजन और वित्तीय चुनौतियां

India's target for green hydrogen: India aims to produce **5 million metric tonnes (MMT) of green hydrogen annually by 2030** to support its net-zero emissions target by 2070.

भारत का ग्रीन हाइड्रोजन लक्ष्य: भारत का लक्ष्य 2070 तक नेट-जीरो उत्सर्जन के लक्ष्य को समर्थन देने के लिए 2030 तक प्रति वर्ष 5 मिलियन मीट्रिक टन (MMT) ग्रीन हाइड्रोजन का उत्पादन करना है।

- **Current progress:** A Bloomberg NEF analysis indicates India is on track to meet only **10% of its target** due to high production costs of **\$5.30-\$6.70 per kg** compared to **grey/blue hydrogen** costs of **\$1.9-\$2.4 per kg**.

वर्तमान प्रगति: BloombergNEF के विश्लेषण के अनुसार, भारत अपने लक्ष्य का केवल 10% ही प्राप्त कर पाएगा, क्योंकि ग्रीन हाइड्रोजन की उत्पादन लागत \$5.30-\$6.70 प्रति किलोग्राम है, जो ग्रे/ब्लू हाइड्रोजन की लागत \$1.9-\$2.4 प्रति किलोग्राम की तुलना में बहुत अधिक है।

- **Market challenge:** Scaling production to reduce costs is difficult due to the **high price differential** and lack of private investment.

बाजार की चुनौती: उत्पादन बढ़ाकर लागत को कम करना उच्च मूल्य अंतर और निजी निवेश की कमी के कारण कठिन है।

### Barriers to Green Hydrogen Development

#### ग्रीन हाइड्रोजन विकास में बाधाएं

- **Production cost factors:** Green hydrogen costs depend on **levelised cost of electricity (LCOE)** and **electrolyzer costs**, both influenced by the **cost of capital**.

उत्पादन लागत के कारक: ग्रीन हाइड्रोजन की लागत स्तरीयकृत बिजली लागत (LCOE) और इलेक्ट्रोलाइजर लागत पर निर्भर करती है, जो पूंजी की लागत से प्रभावित होती है।

- **Capital costs in India:** Perceived higher risks in emerging markets like India result in **high weighted average cost of capital (WACC)**, which raises overall costs.

भारत में पूंजी लागत: भारत जैसे उभरते बाजारों में उच्च जोखिम धारणा के कारण वेटेड एवरेज कॉस्ट ऑफ कैपिटल (WACC) अधिक हो जाती है, जिससे कुल लागत बढ़ जाती है।

- **Electrolyzer costs:** Current costs range between **\$500-1,400/kW** for alkaline systems and **\$1,100-1,800/kW** for proton exchange membrane systems.

इलेक्ट्रोलाइजर लागत: वर्तमान लागत \$500-1,400 प्रति किलोवाट (क्षारीय प्रणाली) और \$1,100-1,800 प्रति किलोवाट (प्रोटॉन एक्सचेंज मेम्ब्रेन प्रणाली) के बीच है।

### Global Perspective and Lessons

#### वैश्विक दृष्टिकोण और सबक





- **Limited financial commitments:** As of May 2024, only 27.6% of announced clean hydrogen projects (worth \$370 billion) have reached **final investment decisions**.  
सीमित वित्तीय प्रतिबद्धताएं: मई 2024 तक, केवल 27.6% घोषित स्वच्छ हाइड्रोजन परियोजनाओं (मूल्य \$370 बिलियन) ने अंतिम निवेश निर्णय प्राप्त किया है।
- **Examples from other countries:**
  - The **U.K.'s Low Carbon Hydrogen Standard Certification** builds market confidence.
  - **Hydrogen hubs** in the **U.S., Japan, and Australia** integrate production, innovation, and consumption to develop ecosystems.  
अन्य देशों के उदाहरण:
    - यू.के. का लो कार्बन हाइड्रोजन स्टैंडर्ड सर्टिफिकेशन बाजार में विश्वास बनाता है।
    - यू.एस., जापान, और ऑस्ट्रेलिया में हाइड्रोजन हब उत्पादन, नवाचार और खपत को एकीकृत करते हैं।
- **Adopting hydrogen corridors:** India can develop **localized industrial clusters** linked to renewable energy sources to create **self-sustaining hydrogen corridors**.  
हाइड्रोजन कॉरिडोर अपनाना: भारत स्थानीय औद्योगिक समूहों को नवीकरणीय ऊर्जा स्रोतों से जोड़कर स्वतंत्र हाइड्रोजन गलियारे विकसित कर सकता है।

## How to De-risk Investments

### निवेश जोखिम को कम करने के उपाय

- **Comprehensive policy framework:** India must implement long-term **hydrogen purchase agreements and partial loan guarantees** to reduce investor uncertainty.  
समग्र नीतिगत ढांचा: भारत को निवेशकों की अनिश्चितता को कम करने के लिए दीर्घकालिक हाइड्रोजन खरीद समझौतों और आंशिक ऋण गारंटी लागू करनी चाहिए।
- **Regulatory sandboxes:** These allow for **rapid experimentation** with new business models, similar to India's approach in **fintech innovation**.  
नियामक सैंडबॉक्स: यह नए व्यावसायिक मॉडलों के साथ तेजी से प्रयोग की अनुमति देता है, जैसे भारत ने फिनटेक नवाचार में किया।
- **Innovative financing models:** Indian banks need to adopt methods like:
  - **Modular project financing:** Scaling facilities in phases to reduce initial costs.
  - **Anchor-plus financing:** Backed by a creditworthy industrial anchor customer.
  - **Equipment leasing:** Transforming upfront electrolyzer costs into manageable operational expenses.  
नवाचार वित्तीय मॉडल: भारतीय बैंकों को निम्नलिखित तरीकों को अपनाना चाहिए:
    - **मॉड्यूलर परियोजना वित्त:** चरणों में सुविधाओं को बढ़ाना।
    - **एंकर-प्लस वित्तपोषण:** एक भरोसेमंद औद्योगिक ग्राहक द्वारा समर्थित।
    - **उपकरण लीजिंग:** इलेक्ट्रोलाइजर की अग्रिम लागत को प्रबंधनीय परिचालन खर्चों में बदलना।





## International Collaboration

### अंतरराष्ट्रीय सहयोग

- **Standardized certifications:** Establishing **carbon intensity** and **hydrogen origin certifications** can facilitate exports and build trust in India's supply chain.  
मानकीकृत प्रमाणपत्र: कार्बन तीव्रता और हाइड्रोजन उत्पत्ति प्रमाणपत्र स्थापित करना निर्यात को सुगम बना सकता है और भारत की आपूर्ति श्रृंखला में विश्वास बना सकता है।
- **Cross-border partnerships:** Key trade corridors, like the **Hydrogen Energy Supply Chain Project** between **Australia and Japan**, can provide demand certainty.  
सीमापार साझेदारी: ऑस्ट्रेलिया और जापान के बीच हाइड्रोजन ऊर्जा आपूर्ति श्रृंखला परियोजना जैसे व्यापार गलियारे मांग की निश्चितता प्रदान कर सकते हैं।

## Focus on Early Projects

### प्रारंभिक परियोजनाओं पर ध्यान केंद्रित करें

- **Industrial hubs:** Early projects in **Odisha, Maharashtra, and Gujarat** must demonstrate viable business models to shape India's green hydrogen sector.  
औद्योगिक केंद्र: ओडिशा, महाराष्ट्र, और गुजरात में प्रारंभिक परियोजनाओं को व्यावहारिक व्यावसायिक मॉडल प्रदर्शित करना चाहिए।
- **Pricing focus:** Projects must deliver hydrogen at **competitive prices** to key industries.  
मूल्य निर्धारण पर ध्यान: परियोजनाओं को प्रमुख उद्योगों को प्रतिस्पर्धी मूल्य पर हाइड्रोजन उपलब्ध कराना चाहिए।
- **Strategic execution:** India's success will depend on **efficient project execution, low-cost capital**, and **strategic investments** in renewable resources.  
रणनीतिक निष्पादन: भारत की सफलता कुशल परियोजना निष्पादन, कम लागत वाली पूंजी, और नवीकरणीय संसाधनों में रणनीतिक निवेश पर निर्भर करेगी।

#### Grey Hydrogen:

- **Production:** It is produced from **natural gas** or **methane** through a process called **Steam Methane Reforming (SMR)**.
- **Environmental Impact:** During this process, **carbon dioxide (CO<sub>2</sub>)** is released into the atmosphere, making it the least environmentally friendly form of hydrogen.
- **Cost:** Grey hydrogen is relatively cheap, with production costs between **\$1.9-\$2.4 per kg**.
- **Example:** It is widely used in industries like **refining petroleum** and **fertilizer production**.
- **Hindi Translation:** ग्रे हाइड्रोजन प्राकृतिक गैस या मीथेन से स्टीम मेथेन रिफॉर्मिंग प्रक्रिया द्वारा उत्पादित की जाती है, जिसमें बड़ी मात्रा में कार्बन डाइऑक्साइड वायुमंडल में छोड़ दी जाती है। यह लागत में सस्ती होती है।





### **Blue Hydrogen:**

- **Production:** Blue hydrogen is also produced from **natural gas** or **methane** using **Steam Methane Reforming (SMR)**.
- **Environmental Impact:** Unlike grey hydrogen, the **carbon emissions** produced during its production are **captured and stored** through **Carbon Capture, Utilization, and Storage (CCUS)** technology. This reduces its environmental impact.
- **Cost:** It is slightly more expensive than grey hydrogen due to the additional carbon capture technology, but still cheaper than green hydrogen.
- **Example:** Blue hydrogen serves as a **transitional fuel** in the global shift toward cleaner energy.
- **Hindi Translation:** ब्लू हाइड्रोजन भी प्राकृतिक गैस या मीथेन से उत्पन्न की जाती है, लेकिन इसमें उत्पन्न कार्बन डाइऑक्साइड को **कार्बन कैप्चर तकनीक** द्वारा पकड़कर संग्रहीत किया जाता है। यह ग्रे हाइड्रोजन की तुलना में पर्यावरण के लिए कम हानिकारक होती है।

### **Comparison with Green Hydrogen:**

- **Green Hydrogen** is produced using **renewable energy sources** like solar or wind through **electrolysis of water**. It is the cleanest form but has **high production costs** of **\$5.3-\$6.7 per kg**, as mentioned in the Bloomberg NEF analysis.
- Hindi: ग्रीन हाइड्रोजन अक्षय ऊर्जा जैसे सौर या पवन ऊर्जा से जल के इलेक्ट्रोलिसिस द्वारा बनाई जाती है।



# How does La Niña affect India's climate?

How do the La Niña and El Niño influence global atmospheric circulation and weather patterns? What is a Triple Dip La Niña? If a La Niña was to form now, how would it affect the current Indian winters and subsequent summers and monsoons as well?

GS Paper I: Geography

## EXPLAINER

**Mohammad Rafiuddin**  
**Shikhar Tiwari**  
**Rishikesh P.**

### The story so far:

While the La Niña was expected to emerge by July this year, it is yet to. The India Meteorological Department now expects a La Niña to set in by late 2024 or early 2025, plus a milder winter due to this delay.

### What is La Niña?

La Niña, a phase of the El Niño Southern Oscillation (ENSO), occurs when the region of the Pacific Ocean between Indonesia and South America is cooler than usual. Its counterpart, El Niño, represents a warming of the same region. These two phases significantly influence global atmospheric circulation and weather patterns. During La Niña years, India receives normal or above-normal rainfall during the monsoon season. Yet the same phenomenon causes droughts in Africa and intensifies hurricanes over the Atlantic Ocean. Conversely, the El Niño brings extreme summers and droughts in India while increasing rainfall in the southern U.S.

This decade began with three consecutive La Niña events (2020-2022), a rare occurrence known as Triple Dip La Niña, followed by an El Niño in 2023. Climate change may increase the frequency and intensity of both La Niña and El Niño events, as rising sea and land temperatures disrupt the Pacific's balance. This could also amplify extreme La Niña events, which generally lead to harsh winters in India.

### Will a La Niña emerge this winter?

2024 is different; the La Niña has not emerged as expected. Historically, the La Niña has usually formed during the monsoon or the pre-monsoon period, and it has formed only twice between

## Weather fluctuations

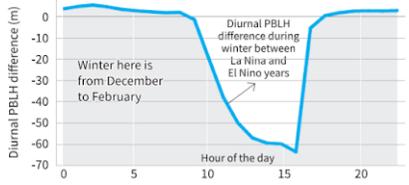
La Niña, a phase of the El Niño Southern Oscillation (ENSO), occurs when the region of the Pacific Ocean between Indonesia and South America is cooler than usual. Its counterpart, El Niño, represents a warming of the same region.



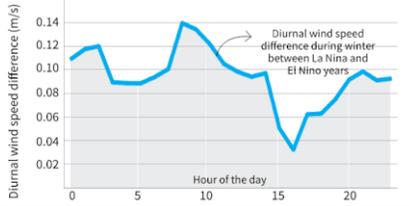
October and December since 1950. Global forecasts had also predicted its emergence this monsoon. But in December, there remains only a 57% chance of it forming in 2024. It will be weak if it still does but it could affect global weather.

The onset of La Niña or El Niño can be declared on the basis of many indices. For instance, the oceanic Niño index (ONI) compares the three-month average sea surface temperatures in the East-Central Tropical Pacific with the 30-year average. When the difference between the two is 0.5° C or higher, it is an El Niño, and when it is -0.5° C or lower, it is a La Niña. Currently, it is around -0.3° C. To be classified as a full-fledged La Niña or El Niño, ONI values need to exceed the thresholds at least five times

**FIGURE 1:** Planetary Boundary Layer Height (PBLH) is slightly lower during La Niña. But the difference is only noticeable during daytime. This could lead to more trapping of pollutants near the surface



**FIGURE 2:** Wind speed is higher throughout the day during La Niña compared with El Niño. This could counter the impact of lower temperatures and help in lowering pollutant concentration levels



consecutively.

### What is the meteorology?

Cities in southern India like Bengaluru and Hyderabad are experiencing a colder than usual winter this year, while north India is witnessing a delayed winter with above-normal temperatures. Some reports have linked the southern chill to a La Niña, but the current ONI values suggest otherwise. Had a La Niña developed already, north India would likely be experiencing a colder winter than usual.

An analysis of meteorological data over 35 years by researchers at the Council on Energy Environment and Water, New Delhi, has revealed that while La Niña winters feature colder nights compared to El Niño, daytime temperatures tend to be

higher. Meteorological parameters like wind speed and planetary boundary layer height (PBLH) – the lowest atmospheric layer directly influenced by land-atmosphere interactions – also vary during ENSO phases, affecting air quality.

The team found the average wind speed is higher throughout the day during La Niña winters. Faster winds help reduce air pollution by transporting pollutants away. They also found that the average PBLH is slightly lower during La Niña winters. If La Niña sets in, lower temperatures in north India may lead people to burn more biomass for heating, worsening air pollution. A lower PBLH could also trap more pollutants near the ground. But higher wind speeds could disperse the pollutants, potentially leading to better air quality.

### What about La Niña and monsoons?

El Niño summers are relatively harsher, as was the case in April this year, when India experienced intense, record-breaking heat waves. If a La Niña arrives and persists into the summer of 2025, it may offer relief from high heat. Additionally, an El Niño often disrupts monsoons, with India historically receiving below-average rainfall during at least half of all El Niño years since 1871. But the same figures also indicate evolving patterns since 1980.

Both north and south India, for instance, have received less rainfall during more intense El Niño events while central India has been barely affected. A La Niña, on the other hand, promotes robust monsoons as evidenced by the “normal” or “above-normal” rainfall in the La Niña years of 2020, 2021, and 2022. There were “below normal” rains in the El Niño year of 2023.

Thus it would be a welcome development if a La Niña forms now or early next year and continues until the monsoon season.

Mohammad Rafiuddin is programme associate, and Shikhar Tiwari and Rishikesh P are consultants – all at the Council on Energy, Environment and Water (CEEW).

## THE GIST

During La Niña years, India receives normal or above-normal rainfall during the monsoon season. Yet the same phenomenon causes droughts in Africa and intensifies hurricanes over the Atlantic Ocean.

An analysis of meteorological data over 35 years by researchers at the Council on Energy Environment and Water, New Delhi, has revealed that while La Niña winters feature colder nights compared to El Niño, daytime temperatures tend to be higher.

El Niño summers are relatively harsher, as was the case in April this year, when India experienced intense, record-breaking heat waves. If a La Niña arrives and persists into the summer of 2025, it may offer relief from high heat.

## Impact of La Niña on India's Climate

## भारत की जलवायु पर ला नीना का प्रभाव

La Niña, a phase of the El Niño Southern Oscillation (ENSO), occurs when the region of the Pacific Ocean between Indonesia and South America is cooler than usual.

ला नीना, एल नीनो दक्षिणी दोलन (ENSO) का एक चरण है, जब इंडोनेशिया और दक्षिण अमेरिका के बीच के प्रशांत महासागर का क्षेत्र सामान्य से ठंडा हो जाता है।

- Its counterpart, **El Niño**, represents a **warming** of the same region. इसका विपरीत रूप, **एल नीनो**, इसी क्षेत्र के गर्म होने को दर्शाता है।





- These two phases significantly influence **global atmospheric circulation** and **weather patterns**.  
ये दोनों चरण वैश्विक वायुमंडलीय परिसंचरण और मौसम पैटर्न को महत्वपूर्ण रूप से प्रभावित करते हैं।
- **During La Niña years, India receives normal or above-normal rainfall** during the **monsoon season**.  
ला नीना वर्षों में, भारत को मानसून के दौरान सामान्य या उससे अधिक वर्षा होती है।
- Conversely, **El Niño brings extreme summers and droughts in India**, while increasing rainfall in the **southern U.S.**  
इसके विपरीत, एल नीनो भारत में अत्यधिक गर्मी और सूखे लाता है, जबकि दक्षिणी अमेरिका में वर्षा बढ़ाता है।

## La Niña and Global Weather Patterns

### ला नीना और वैश्विक मौसम पैटर्न

- **During La Niña, Africa faces droughts, and hurricanes over the Atlantic Ocean intensify.**  
ला नीना के दौरान, अफ्रीका में सूखे की स्थिति होती है और अटलांटिक महासागर में तूफान तीव्र हो जाते हैं।
- The decade began with **three consecutive La Niña events (2020-2022)**, a rare phenomenon called a **Triple Dip La Niña**.  
यह दशक 2020-2022 के बीच लगातार तीन ला नीना घटनाओं से शुरू हुआ, जिसे ट्रिपल डिप ला नीना कहा जाता है।
- It was followed by an **El Niño in 2023**.  
इसके बाद 2023 में एल नीनो आया।
- **Climate change** may increase the **frequency and intensity** of both La Niña and El Niño events, amplifying **extreme La Niña events**.  
जलवायु परिवर्तन ला नीना और एल नीनो घटनाओं की आवृत्ति और तीव्रता को बढ़ा सकता है, जिससे अत्यधिक ला नीना की संभावना बढ़ती है।
- Extreme La Niña events generally lead to **harsh winters** in India.  
अत्यधिक ला नीना घटनाएँ आमतौर पर भारत में कठोर सर्दी लाती हैं।

## Will a La Niña Emerge This Winter?

### क्या इस सर्दी में ला नीना आएगा?

- **2024** is different; the **La Niña has not emerged as expected**.  
2024 अलग है; ला नीना अपेक्षित रूप से विकसित नहीं हुआ है।
- La Niña has **usually formed during the monsoon or pre-monsoon periods**.  
ला नीना आमतौर पर मानसून या पूर्व-मानसून अवधि के दौरान बनता है।
- It has only formed **twice between October and December since 1950**.  
यह केवल 1950 से अक्टूबर और दिसंबर के बीच दो बार बना है।





- In **December 2024**, there is **only a 57% chance** of La Niña forming, and if it does, it will be **weak**.  
दिसंबर 2024 में ला नीना के बनने की सिर्फ 57% संभावना है, और यदि ऐसा होता है, तो यह कमज़ोर रहेगा।
- The **Oceanic Niño Index (ONI)** compares the **three-month average sea surface temperatures** in the **East-Central Tropical Pacific** with the **30-year average**.  
ओशनिक नीनो इंडेक्स (ONI) पूर्व-मध्य उष्णकटिबंधीय प्रशांत के तीन महीने के औसत समुद्र सतह तापमान की तुलना 30-वर्षीय औसत से करता है।
- If the difference is **-0.5°C or lower**, it is **La Niña**; currently, it is around **-0.3°C**.  
यदि यह अंतर **-0.5°C** या उससे कम हो, तो यह **ला नीना** कहलाता है; वर्तमान में यह लगभग **-0.3°C** है।

## Meteorological Impact of La Niña

### ला नीना का मौसम संबंधी प्रभाव

- **Southern Indian cities** like **Bengaluru** and **Hyderabad** are experiencing a **colder-than-usual winter**, while **north India** is witnessing a **delayed winter** with **above-normal temperatures**.  
दक्षिण भारतीय शहर जैसे बेंगलुरु और हैदराबाद सामान्य से ज्यादा ठंडे सर्दियों का अनुभव कर रहे हैं, जबकि उत्तर भारत में सर्दी देर से आ रही है और तापमान सामान्य से अधिक है।
- La Niña winters generally feature **colder nights** but **higher daytime temperatures**.  
ला नीना सर्दियाँ आमतौर पर ठंडी रातें और उच्च दिन के तापमान की विशेषता होती हैं।
- **Higher wind speeds** during La Niña help reduce **air pollution** by dispersing pollutants.  
ला नीना के दौरान तेज़ हवाएँ प्रदूषकों को फैलाकर वायु प्रदूषण को कम करने में मदद करती हैं।
- A **lower planetary boundary layer height (PBLH)** during La Niña can **trap pollutants** near the ground.  
ला नीना के दौरान पृथ्वी की सीमा परत की ऊँचाई (PBLH) कम होती है, जो प्रदूषकों को सतह के पास फंसा सकती है।

## La Niña and Indian Monsoons

### ला नीना और भारतीय मानसून

- **El Niño summers** bring **record-breaking heat waves**, as seen in **April 2023**.  
एल नीनो ग्रीष्म ऋतु रिकॉर्ड-तोड़ गर्मी लाती है, जैसा कि अप्रैल 2023 में देखा गया।
- If **La Niña arrives** and persists into **2025**, it may **relieve the high heat** during summers.  
यदि ला नीना आता है और 2025 तक बना रहता है, तो यह गर्मियों की तीव्र गर्मी से राहत दे सकता है।
- **El Niño disrupts monsoons**, causing **below-average rainfall**. Historically, this has been seen in **half of all El Niño years since 1871**.  
एल नीनो मानसून को बाधित करता है, जिससे औसत से कम वर्षा होती है। यह ऐतिहासिक रूप से 1871 से आधे एल नीनो वर्षों में देखा गया है।





- La Niña promotes robust monsoons, as evidenced by normal or above-normal rainfall in 2020, 2021, and 2022.  
ला नीना मजबूत मानसून को बढ़ावा देता है, जैसा कि 2020, 2021 और 2022 में सामान्य या उससे अधिक वर्षा के रूप में देखा गया।
- In the El Niño year of 2023, India received below-normal rains.  
2023 के एल नीनो वर्ष में भारत में औसत से कम वर्षा हुई।
- Thus, the formation of La Niña by early next year could support a strong monsoon in 2025.  
इसलिए, अगले वर्ष की शुरुआत में ला नीना का बनना 2025 के मजबूत मानसून को समर्थन दे सकता है।

# What is the procedure for removing judges?

Why have some Rajya Sabha members called for the removal of Allahabad High Court Judge, Justice Yadav?

GS Paper II: Polity

Rangarajan. R

The story so far:

Fifty-five MPs of the Rajya Sabha have submitted a motion, for removing Allahabad High Court Judge, Justice Shekhar Kumar Yadav, to Chairman of the Rajya Sabha.

What is the procedure for removal?

Articles 124 and 217 of the Constitution provide that a judge of the Supreme Court/High Court shall be removed by the President, on the grounds of 'proved misbehaviour' or 'incapacity' after a motion is passed in each House of Parliament by a majority of the total membership of that House and by a majority of not less than two thirds of the members of that House present and voting (special majority) in the same session. The Constitution does not define the terms 'proved misbehaviour' or 'incapacity.' The Supreme Court has

opined in various cases that wilful misconduct in office, corruption, lack of integrity or any other offence involving moral turpitude would constitute misbehaviour. Incapacity here means a medical condition that may include physical or mental incapacity.

The detailed procedure for removal is provided in the Judges (Inquiry) Act, 1968. It stipulates that a notice of motion for removal should be signed by not less than 50 members in the Rajya Sabha and 100 members in the Lok Sabha. The Chairman or Speaker may after due consideration and consultation admit or refuse to admit the motion. If admitted, a three-member committee will be constituted consisting of Supreme Court/High Court judges and a distinguished jurist. If the Committee, after investigation, absolves the judge of any misbehaviour or incapacity, the motion pending shall not be proceeded with. If found guilty of misbehaviour or

suffering from incapacity, the committee report will be taken up in the Houses of Parliament which would then need to pass the motion with special majority.

What is the current issue?

Justice Yadav made communally-charged remarks while speaking at an event organised by the Vishwa Hindu Parishad. He is reported to have said the country would be run according to the wishes of the majority. The 'Reinstatement of Values of Judicial Life' adopted by the Supreme Court in 1997, and followed by all the High Courts, mandates that behaviour and conduct of members of the higher judiciary must reaffirm people's faith in the impartiality of the judiciary. The judges should not commit any act of omission or commission that is unbecoming of the high office they occupy. Notably, though the Judges (Inquiry) Bill, 2006 was not passed by the Parliament, it defined 'misbehaviour' to

include violation of code of conduct for the judges. This bill proposed imposition of 'minor measures,' like issuing warnings, public or private censure, withdrawal of judicial work for a limited time etc., for misconduct that does not warrant removal.

What is required?

The Blackstone's ratio in criminal jurisprudence that 'it is better that ten guilty persons escape than that one innocent suffer' can be applied even when it comes to the removal of judges. The stringent process with the requirement of special majority in both houses has resulted in the non-removal of judges even after having been found guilty of misbehaviour by the inquiry committee. This is nevertheless essential to protect the independence of judges while discharging their duties. The Chairman of the Rajya Sabha, against whom himself a notice of motion for removal has been submitted, is unlikely to admit the present motion. The Supreme Court has issued a notice seeking details of the controversial speech made by Justice Yadav. The Judge is likely to appear before the Supreme Court Collegium to explain his stand. It is cardinal that Judges display behaviour that behoves the high constitutional office they hold.

Rangarajan R is a former IAS officer and author of 'Polity Simplified'. Views expressed are personal.

## THE GIST

Articles 124 and 217 of the Constitution provide that a judge of the Supreme Court/High Court shall be removed by the President, on the grounds of 'proved misbehaviour' or 'incapacity' after a motion is passed in each House of Parliament.

Justice Yadav made communally-charged remarks while speaking at an event organised by the Vishwa Hindu Parishad.

The stringent process with the requirement of special majority in both houses has resulted in the non-removal of judges even after having been found guilty of misbehaviour by the inquiry committee.

## Procedure for Removing Judges

### न्यायाधीशों को हटाने की प्रक्रिया

Articles 124 and 217 of the Constitution provide that a judge of the Supreme Court/High Court shall be removed by the President, on the grounds of 'proved misbehaviour' or 'incapacity' after a motion is passed in each House of Parliament by a majority of the total membership of that House and by a majority of not less than two-thirds of the members of that House present and voting (special majority) in the same session.

संविधान के अनुच्छेद 124 और 217 के अनुसार, राष्ट्रपति द्वारा सुप्रीम





कोर्ट/हाईकोर्ट के न्यायाधीश को 'सिद्ध दुर्व्यवहार' या 'अक्षम्यता' के आधार पर हटाया जा सकता है, यदि संसद के प्रत्येक सदन में कुल सदस्यता का बहुमत और उपस्थित एवं मतदान करने वाले सदस्यों का कम से कम दो-तिहाई बहुमत (विशेष बहुमत) उसी सत्र में प्रस्ताव पारित करे।

- The Constitution **does not define** the terms 'proved misbehaviour' or 'incapacity.' संविधान में 'सिद्ध दुर्व्यवहार' या 'अक्षम्यता' शब्दों की परिभाषा नहीं दी गई है।
- The **Supreme Court** has opined in various cases that **wilful misconduct in office, corruption, lack of integrity**, or any other offence involving **moral turpitude** would constitute misbehaviour. **Incapacity** refers to a medical condition that may include **physical or mental incapacity**.  
सुप्रीम कोर्ट ने विभिन्न मामलों में माना है कि कार्यालय में जानबूझकर कदाचार, भ्रष्टाचार, ईमानदारी की कमी या किसी अन्य अपराध जिसमें नैतिक पतन शामिल हो, उसे दुर्व्यवहार माना जाएगा। अक्षम्यता का तात्पर्य एक चिकित्सीय स्थिति से है जिसमें शारीरिक या मानसिक अक्षम्यता शामिल हो सकती है।
- The detailed procedure is provided in the **Judges (Inquiry) Act, 1968**.  
विस्तृत प्रक्रिया न्यायाधीश (जांच) अधिनियम, 1968 में दी गई है।
- A **notice of motion** for removal should be signed by **not less than 50 members** in the **Rajya Sabha** and **100 members** in the **Lok Sabha**.  
हटाने के प्रस्ताव का नोटिस राज्यसभा में कम से कम 50 सदस्य और लोकसभा में 100 सदस्य द्वारा हस्ताक्षरित होना चाहिए।
- The **Chairman or Speaker** may **admit or refuse** to admit the motion after due consideration and consultation.  
सभापति या अध्यक्ष विचार-विमर्श के बाद प्रस्ताव को स्वीकार या अस्वीकार कर सकते हैं।
- If admitted, a **three-member committee** is formed, consisting of **Supreme Court/High Court judges** and a **distinguished jurist**.  
यदि प्रस्ताव स्वीकृत हो, तो तीन-सदस्यीय समिति का गठन किया जाता है, जिसमें सुप्रीम कोर्ट/हाईकोर्ट के न्यायाधीश और एक विशिष्ट न्यायविद शामिल होते हैं।
- If the Committee, after investigation, absolves the judge of **any misbehaviour or incapacity**, the motion shall not proceed further.  
यदि समिति जांच के बाद न्यायाधीश को किसी दुर्व्यवहार या अक्षम्यता से मुक्त करती है, तो प्रस्ताव को आगे नहीं बढ़ाया जाएगा।
- If found **guilty**, the report is taken up in both Houses of Parliament, which then need to pass the motion with a **special majority**.  
यदि न्यायाधीश को दोषी पाया जाता है, तो रिपोर्ट संसद के दोनों सदनों में पेश की जाती है, जिसे विशेष बहुमत से पारित किया जाना आवश्यक है।





## Why Have Some Rajya Sabha Members Called for the Removal of Justice Yadav?

### राज्यसभा के कुछ सदस्यों ने न्यायमूर्ति यादव को हटाने की मांग क्यों की है?

- Justice Yadav made **communally-charged remarks** while speaking at an event organized by the **Vishwa Hindu Parishad**.  
न्यायमूर्ति यादव ने विश्व हिंदू परिषद द्वारा आयोजित एक कार्यक्रम में सांप्रदायिक टिप्पणी की थी।
- He reportedly said the country would be run according to the **wishes of the majority**.  
उन्होंने कथित तौर पर कहा कि देश को बहुसंख्यक समुदाय की इच्छानुसार चलाया जाएगा।
- The **'Reinstatement of Values of Judicial Life'** adopted by the Supreme Court in 1997 mandates that judges' behaviour must **reaffirm people's faith** in the **impartiality of the judiciary**.  
'न्यायिक जीवन के मूल्यों की पुनर्स्थापना', जिसे 1997 में सुप्रीम कोर्ट ने अपनाया था, यह अनिवार्य करता है कि न्यायाधीशों का व्यवहार न्यायपालिका की निष्पक्षता में लोगों का विश्वास बनाए रखना चाहिए।
- Judges should not commit any act of **omission or commission** that is **unbecoming of the high office** they occupy.  
न्यायाधीशों को ऐसा कोई कार्य नहीं करना चाहिए जो उनके उच्च पद के लिए अनुचित हो।
- The **Judges (Inquiry) Bill, 2006**, though not passed, proposed defining **'misbehaviour'** to include **violation of the code of conduct** for judges.  
हालांकि, न्यायाधीश (जांच) विधेयक, 2006 पारित नहीं हुआ, फिर भी इसमें दुर्व्यवहार की परिभाषा में न्यायाधीशों के आचार संहिता का उल्लंघन शामिल था।
- The bill suggested **'minor measures'** like **warnings, public or private censure, and withdrawal of judicial work** for limited misconduct.  
इस विधेयक में 'छोटे उपायों' जैसे चेतावनी, सार्वजनिक या निजी निंदा और सीमित समय के लिए न्यायिक कार्य वापस लेना का सुझाव दिया गया था।

## What is Required?

### क्या आवश्यक है?

- Blackstone's ratio** in criminal jurisprudence states that **'it is better that ten guilty persons escape than that one innocent suffer.'**  
ब्लैकस्टोन का अनुपात आपराधिक न्यायशास्त्र में कहता है कि 'यह बेहतर है कि दस दोषी बच जाएं बजाय इसके कि एक निर्दोष को सजा मिले।'
- This stringent process with **special majority** ensures that judges are not removed arbitrarily and protects the **independence of the judiciary**.  
यह कड़ी प्रक्रिया और विशेष बहुमत सुनिश्चित करता है कि न्यायाधीशों को मनमाने तरीके से नहीं हटाया जाए और न्यायपालिका की स्वतंत्रता सुरक्षित रहे।
- The **Chairman of the Rajya Sabha**, who also has a motion for removal submitted against him, is **unlikely to admit** the present motion.





राज्यसभा के सभापति, जिनके खिलाफ भी हटाने का प्रस्ताव प्रस्तुत है, के वर्तमान प्रस्ताव को स्वीकार करने की संभावना कम है।

- The **Supreme Court** has issued a notice seeking details of Justice Yadav's **controversial speech**.

सुप्रीम कोर्ट ने न्यायमूर्ति यादव के विवादास्पद भाषण के विवरण की मांग करते हुए नोटिस जारी किया है।

- Justice Yadav is likely to appear before the **Supreme Court Collegium** to explain his stand.

न्यायमूर्ति यादव संभवतः अपना पक्ष समझाने के लिए सुप्रीम कोर्ट कॉलेजियम के समक्ष पेश होंगे।

- It is **cardinal** that judges display behaviour **befitting the high constitutional office** they hold.

यह अनिवार्य है कि न्यायाधीश ऐसा व्यवहार प्रदर्शित करें जो उनके महत्वपूर्ण संवैधानिक पद के योग्य हो।



Defence Minister Rajnath Singh pays homage at the **National War Memorial** on the occasion of **Vijay Divas**, marking India's victory in the **1971 Bangladesh Liberation War**, in New Delhi on Monday. **Chief of Defence Staff Gen. Anil Chauhan**, **Chief of the Army Staff Gen. Manoj Pande**, **Vice-Chief of the Navy Vice-Admiral Krishna Swaminathan** and **IAF chief Air Chief Marshal A.P. Singh** are seen. PTI

**GS Paper I: Post Independence**



# Why the legacy of Jawaharlal Nehru endures even now

The belittling of Nehru is odd, because the standing of the current Prime Minister is not validated by writing out a previous PM from the annals of history. The future will judge both leaders on their own merit

**GS Paper I: History of Post Independence India**

**Neera Chandhoke**

*At the end of a two-day debate on the Indian Constitution in Parliament, Prime Minister Narendra Modi critiqued previous Congress governments stating that former Prime Minister Jawaharlal Nehru started the "subversion" of the Constitution with his amendment to the fundamental right to expression. The External Affairs Minister S. Jaishankar, in another venue, similarly critiqued Nehru saying that the current government was trying to correct the 'Nehru foreign policy'. This article, dated December 4, 2021, by Neera Chandhoke tries to explain why Nehru is more important than ever now.*

**A**n otherwise ordinary 'first' speech given by India's fourteenth President, Ram Nath Kovind, would have gone unremarked, except for one notable omission. The name of Pandit Jawaharlal Nehru, arguably the foremost leader of the freedom struggle, and India's first Prime Minister, was spectacularly missing from the inventory of prominent Indians listed by the President. Though the government under Prime Minister Narendra Modi has gone to extraordinary lengths to eliminate references to the architect of democratic India, we expect the head of state to stand above partisan party politics. There is cause for disappointment.

A few days after Mr. Kovind's speech, the Bharatiya Janata Party (BJP) published a lavish booklet to celebrate the birth centenary of Deen Dayal Upadhyaya. In the section on great leaders of India, 'Mahapurush', the names of Nehru as well as Mahatma Gandhi are conspicuous by their absence. Almost 10 lakh senior school students in Uttar Pradesh are forced to study the booklet, appear for an exam, and be rewarded if they perform well. Many of the 'great men' listed in the booklet have never taken part in the freedom struggle, and never been jailed for combating colonialism, unlike Nehru and the Mahatma. But their names occupy pride of place in oral and written histories authored by the BJP. Leaders who fought for Independence are simply written off.

## The historical perspective

The belittling of Pandit Nehru is odd, because the standing of the current Prime Minister is not validated by writing out a previous Prime Minister from the annals of history. The future will judge both leaders on their own merit, their success or their failure in managing a complex and plural society, their credentials as democrats, and their political, economic, and strategic visions. Both have a place in modern India. What that place is, will be decided by history. The current dispensation should take the art of history writing seriously and not reduce it to pamphleteering. History is important for collective self-understanding, because it enables us to understand where we have come from, and how we got from 'there' to 'here'. Without competent histories that allow us to understand our collective past and present, and help us generate visions for the future, entire generations will lose their bearings.

What the philosopher Jürgen Habermas calls the 'public use of history'



**In remembrance:** School students pay homage to former Prime Minister Pandit Jawaharlal Nehru on his 135th birth anniversary, in Kolkata on November 14, An

should be, for this reason, subjected to strong evaluations. Since the craft has a bearing on the human condition, we ought to distinguish between histories that inspire a democratic, critical sensibility to contain and challenge authoritarianism, from those that feed appetites for absolute power. History, of course, must narrate tales of tyrants and despots, so that we take care not to repeat the errors of the past. But it must also chronicle tales of the triumph of the human spirit, and inspire us to struggle against totalitarianism and suppression of individual freedom.

For the ruling class, history should be important, because it reminds them that absolute power, often won at the expense of human freedom, does not endure. Unexpected moments arise in the life of a society when its members clamour for change, when existing gods are brought down, and new ones erected in their place, condemned to wait for their own

downfall. All of us should be wary of changing tides of fortune.

Fortune, wrote the 16th century political theorist of Florence, Niccolò Machiavelli, is unpredictable and inexplicable. She is an active sharer in man's making of history, she produces the unforeseen, and she will never be dominated, but will dominate men. That is why Machiavelli advised the Prince of Florence to study history. The public role of history is to remind rulers that fortune is fickle. After all, Nehru, who once led India to freedom, is vilified in his own country by the benighted cyberspace industry. This is short-sighted, because to unremember the man is to forget that there is an alternative to narrow and energy-consuming nationalism.

Despite all attempts, Nehru continues to be remembered by many for his contribution to the institutionalisation of democracy, establishing institutions of excellence, and his conviction that

poverty and inequality in India cannot be tackled by the market. There is, however, more to a good society: solidarity with struggling people within and outside the country.

Nehru, as one of the most distinguished leaders of Third World solidarity, reached out to the rest of the colonised world, and forged a joint front against colonialism and a reinvented imperialism. He was, by temperament and experience, a cosmopolitan. His frequent visits to Europe, his deep familiarity with the past, and his understanding of the contemporary ideologies of the day, from liberalism to Fabian socialism, to communist internationalism, had convinced him that the future of India was incomplete without the liberation of other colonies.

## Role of intellectual journeys

Nehru's commitment to the independence of the Third World had been shaped by intellectual journeys through history, as well as participation in a number of international conferences such as the Congress of Oppressed Nationalities in Brussels in 1927. He played a prominent role in the 1955 Bandung Conference, which set the stage for the emergence of a new bloc, and a new ideology in global affairs. Representatives of 29 countries from the global South, comprising well over a billion people, met to consider and debate on how they could help each other to neutralise the harmful effects of colonialism, and bring economic and social well-being to their people. Towering over leaders who had won their political spurs by piloting their countries to independence were Nehru, Kwame Nkrumah, the Prime Minister of Ghana, Gamal Abdel Nasser, the President of Egypt, Zhou Enlai, the Premier of China, and Ho Chi Minh, the Prime Minister of Vietnam. The agenda included every topic over which the colonised and the newly decolonised world had agonised for decades – religion, colonialism, sovereignty, and world peace. The Bandung meeting sparked off reflections on the distinct attractions of non-alignment, and of the strengths that a movement of the non-aligned could acquire in global forums.

## A deep cosmopolitanism

Interestingly, if one strand of anti-colonial nationalism focussed on the idea and the imaginaries of the nation, the second moved away from processes of closed identity formation towards other ways of being in the world. Nehru's cosmopolitanism acknowledged that our political identities are forged in and through conversations not only with people who are like us, but people who belong to other cultures, other countries, other societies, and other traditions, but who are like us in many ways.

Contemporary history has not treated this statesman kindly. This is a great pity because today's generation might know what globalisation is, but not what cosmopolitanism is about. Even as our society globalises at a frenetic pace, it has turned inwards and become claustrophobic. History must remember Nehru, he taught us to look outwards, to express solidarity, and to become, in the process, cosmopolitans. We must remember him because we have lost out on something that is rather important, teaching our children that our imaginations and our energies should be harnessed to the cause of the oppressed over the world, that closed-in societies lead to stagnation if not to certain death, and that such societies circumscribe imaginings and truncate visions.

We have, perhaps, become lesser human beings.

Neera Chandhoke is a former Professor of Political Science, Delhi University





## Legacy of Jawaharlal Nehru Endures Even Now

### जवाहरलाल नेहरू की धरोहर आज भी कायम है

An otherwise ordinary first speech given by India's fourteenth President, Ram Nath Kovind, would have gone unremarked, except for one notable omission. The name of Pandit Jawaharlal Nehru, arguably the foremost leader of the freedom struggle, and India's first Prime Minister, was spectacularly missing from the inventory of prominent Indians listed by the President.

भारत के चौदहवें राष्ट्रपति, राम नाथ कोविंद द्वारा दिया गया एक सामान्य सा भाषण, एक उल्लेखनीय चूक के कारण ध्यान आकर्षित कर गया। पंडित जवाहरलाल नेहरू, जो स्वतंत्रता संग्राम के महान नेता और भारत के पहले प्रधानमंत्री थे, उनका नाम राष्ट्रपति द्वारा सूचीबद्ध प्रमुख भारतीयों में से गायब था।

- Though the government under Prime Minister **Narendra Modi** has gone to extraordinary lengths to eliminate references to Nehru, we expect the head of state to stand above partisan politics.  
हालांकि प्रधानमंत्री नरेंद्र मोदी के नेतृत्व में सरकार ने नेहरू के संदर्भों को समाप्त करने के लिए असाधारण प्रयास किए हैं, फिर भी हमें राज्य के प्रमुख से उम्मीद है कि वे दलगत राजनीति से ऊपर रहेंगे।
- A few days after Mr. Kovind's speech, the **Bharatiya Janata Party (BJP)** published a large booklet to celebrate the birth centenary of **Deen Dayal Upadhyaya**.  
राम नाथ कोविंद के भाषण के कुछ दिनों बाद, भारतीय जनता पार्टी (भा.ज.पा.) ने दीक्षा दीन दयाल उपाध्याय की शताब्दी का उत्सव मनाने के लिए एक बड़ा पुस्तिका प्रकाशित की।
- In the section on great leaders of India, 'Mahapurush', the names of **Nehru** and **Mahatma Gandhi** are conspicuous by their absence.  
भारत के महान नेताओं की श्रेणी में 'महापुरुष' खंड में नेहरू और महात्मा गांधी के नाम गायब हैं।
- Almost **10 lakh senior school students** in **Uttar Pradesh** are forced to study the booklet, appear for an exam, and be rewarded if they perform well.  
उत्तर प्रदेश में लगभग **10 लाख वरिष्ठ स्कूल के छात्र** को यह पुस्तिका पढ़ने, परीक्षा देने और अच्छे प्रदर्शन पर इनाम मिलने के लिए मजबूर किया जाता है।
- Nehru's cosmopolitanism acknowledged that our political identities are forged in and through conversations not only with people who are like us, but people who belong to other cultures, other countries, other societies, and other traditions, but who are like us in many ways.  
नेहरू का कॉस्मोपोलिटनिज़्म मानते थे कि हमारी राजनीतिक पहचान केवल हमारे जैसे लोगों से





नहीं, बल्कि उन लोगों से वार्तालाप के माध्यम से बनती है, जो अन्य संस्कृतियों, देशों, समाजों और परंपराओं के हैं, लेकिन जो कई मायनों में हमारे जैसे हैं।

- **Nehru** played a prominent role in the **1955 Bandung Conference**, which set the stage for the emergence of a new bloc and a new ideology in global affairs.

नेहरू ने 1955 के बैंडुंग सम्मेलन में प्रमुख भूमिका निभाई, जिसने वैश्विक मामलों में एक नए गुट और नई विचारधारा के उद्भव का मार्ग प्रशस्त किया।

- **Bandung Conference** included representatives from **29 countries** of the global South, comprising well over a billion people, to debate on how they could help each other neutralize colonialism.

बैंडुंग सम्मेलन में 29 देशों के प्रतिनिधि शामिल थे, जिनमें एक अरब से अधिक लोग थे, जिन्होंने यह बहस की कि वे एक दूसरे की मदद कैसे कर सकते हैं और उपनिवेशवाद को कैसे नष्ट कर सकते हैं।

- **Nehru**, as one of the most distinguished leaders of **Third World solidarity**, reached out to the rest of the colonized world, and forged a joint front against colonialism and reinvented imperialism.

नेहरू, जो तीसरी दुनिया के एकजुटता के सबसे distinguished नेता थे, उन्होंने बाकी उपनिवेशित दुनिया से संपर्क किया और उपनिवेशवाद और पुनर्निर्मित साम्राज्यवाद के खिलाफ एक संयुक्त मोर्चा तैयार किया।

- **Jürgen Habermas** calls the 'public use of history' should be subjected to strong evaluations.

जुर्गेन हैबरमास कहते हैं कि इतिहास का 'सार्वजनिक उपयोग' कड़ी मूल्यांकन के अधीन होना चाहिए।

- Nehru's intellectual journeys through history, participation in international conferences such as the **Congress of Oppressed Nationalities in Brussels in 1927**, shaped his commitment to Third World independence.

इतिहास में नेहरू की बौद्धिक यात्रा, ब्रुसेल्स में 1927 में आयोजित 'द कांग्रेस ऑफ ओप्रेसड नेशनलिटीज़' जैसी अंतरराष्ट्रीय सम्मेलनों में भागीदारी, तीसरी दुनिया की स्वतंत्रता के प्रति उनकी प्रतिबद्धता को आकार देती है।

- Nehru's cosmopolitanism acknowledged that political identities are shaped by conversations with people from other cultures, countries, and societies.

नेहरू का कॉस्मोपोलिटनिज़म मानते थे कि राजनीतिक पहचान उन लोगों के साथ बातचीत के माध्यम से आकार लेती है, जो अन्य संस्कृतियों, देशों और समाजों के हैं।

- History must remember Nehru because he taught us to look outwards, express solidarity, and become cosmopolitans.

इतिहास को नेहरू को याद रखना चाहिए क्योंकि उन्होंने हमें बाहर की ओर देखना, एकजुटता व्यक्त करना और कॉस्मोपोलिटन बनने का सिखाया।



# Like all conflicts, the Ukraine war will end in negotiation: Moldova Minister

GS Paper I: World Geography

NEW DELHI

Wars usually end on negotiating tables and the war in Ukraine will also end through negotiations, said the Foreign Minister of Moldova Mihail Popsoi on Monday.

Speaking to *The Hindu* exclusively, Mr. Popsoi called out Russia for stationing troops in the Transnistria region of Moldova and said his country has diversified its energy choices and is getting ready to join the European Union. He expressed hope that the intractable positions of Ukraine and Russia will make way for more nuanced and flexible positions and a way out from the territorial logjam will emerge soon.



Mihail Popsoi

“Now of course there is a lot of acrimony that have occurred and in this condition, it is difficult to sit on the same table with an adversary that has imposed so much suffering on you and your society. But all wars end at a negotiating table and I think all parties understand that,” said Mr.

Popsoi, adding, “eventually it will happen.”

Mr. Popsoi said the loss of human lives in the Ukrainian war front is “truly unimaginable” and argued for an end to the conflict in “not too distant future.”

In June, when Switzerland organised a peace summit for the war in Ukraine, it drew a strong reaction from Russia which refused to recognise the meeting as legitimate as Moscow reportedly perceived that the conference was favouring Ukraine. Such failed attempts highlighted the difficulties involved in bringing the two sides to the negotiating table.

The Minister said Moldova has reoriented its economy and energy bas-

ket and moved away from Russian energy. “The Republic of Moldova has diversified its energy supply. It has been very difficult but for us it was an existential threat,” said Mr. Popsoi explaining how Moldova has calibrated its relationship with Russia in the backdrop of the ongoing conflict in Ukraine.

“We understand that a decision to solve the conflict will be difficult. Peace is something we all need because it will have important positive ramifications for everyone and whatever leverage we can use to contribute of course they will be very welcome,” said Mr. Popsoi, urging major stakeholders in the international order to come forward to solve the conflict.

## Like all conflicts, the Ukraine war will end in negotiation: Moldova Minister

## सभी विवादों की तरह यूक्रेन युद्ध भी बातचीत से ही खत्म होगा: मोल्दोवा के मंत्री

Wars usually end on negotiating tables and the war in Ukraine will also end through negotiations, said the Foreign Minister of Moldova Mihail Popsoi on Monday.

युद्ध सामान्यतः वार्ता की मेज़ पर समाप्त होते हैं, और यूक्रेन में चल रहा युद्ध भी वार्ता के द्वारा समाप्त होगा, सोमवार को मोल्दोवा के विदेश मंत्री मिहाइल पोपसोई ने कहा।

- Speaking to *The Hindu* exclusively, Mr. Popsoi called out Russia for stationing troops in the **Transnistria** region of Moldova.





*The Hindu* से विशेष बातचीत में, श्री पोपसोई ने मोल्दोवा के ट्रांसनिस्त्रिया क्षेत्र में रूस द्वारा सैनिकों की तैनाती पर निशाना साधा।

- He said his country has **diversified its energy choices** and is getting ready to join the **European Union**.

उन्होंने कहा कि उनके देश ने अपनी ऊर्जा विकल्पों में विविधता लाई है और यूरोपीय संघ में शामिल होने की तैयारी कर रहा है।

- He expressed hope that the **intractable positions** of Ukraine and Russia will make way for more nuanced and **flexible positions** and a way out from the **territorial logjam** will emerge soon.

उन्होंने उम्मीद जताई कि यूक्रेन और रूस की अडिग स्थिति रास्ता बनाएगी अधिक परिष्कृत और लचीली स्थिति के लिए, और क्षेत्रीय गतिरोध से जल्दी एक रास्ता निकलेगा।

- "Now of course there is a lot of **acrimony** that have occurred and in this condition, it is difficult to sit on the same table with an adversary that has imposed so much suffering on you and your society. But all wars end at a negotiating table and I think all parties understand that," said Mr. Popsoi, adding, "eventually it will happen."

"अब निश्चित रूप से बहुत सारी नफरत हुई है और इस स्थिति में, एक शत्रु के साथ एक ही मेज़ पर बैठना कठिन है, जिसने आपके और आपके समाज पर इतना सहन थोप दिया है। लेकिन सभी युद्ध एक वार्ता की मेज़ पर समाप्त होते हैं और मुझे लगता है कि सभी पक्ष इसे समझते हैं," श्री पोपसोई ने कहा, और जोड़ा, "आखिरकार यह होगा।"

- Mr. Popsoi said the loss of **human lives** in the Ukrainian war front is "**truly unimaginable**" and argued for an end to the conflict in "**not too distant future**."

श्री पोपसोई ने कहा कि यूक्रेन के युद्ध मोर्चे पर मानव जीवन की हानि "वास्तव में अकल्पनीय" है और उन्होंने इस संघर्ष के समापन का पक्ष लिया "इतना दूर न हो, जल्द ही"।

- In June, when **Switzerland** organised a peace summit for the war in Ukraine, it drew a strong reaction from **Russia** which refused to recognise the meeting as legitimate as Moscow reportedly perceived that the conference was favouring Ukraine.

जून में, जब **स्विट्ज़रलैंड** ने यूक्रेन के युद्ध के लिए एक शांति सम्मेलन आयोजित किया, तो रूस से कड़ा विरोध सामने आया, जिसने बैठक को वैध मानने से इनकार कर दिया क्योंकि मॉस्को ने रिपोर्ट के अनुसार यह माना कि सम्मेलन यूक्रेन के पक्ष में था।

- Such failed attempts highlighted the difficulties involved in bringing the two sides to the negotiating table.

इस प्रकार के असफल प्रयासों ने दोनों पक्षों को वार्ता की मेज़ पर लाने में शामिल कठिनाइयों को उजागर किया।

- The Minister said Moldova has **reoriented its economy** and energy basket and moved away from **Russian energy**.

मंत्री ने कहा कि मोल्दोवा ने अपनी अर्थव्यवस्था और ऊर्जा बैस्केट को फिर से रूस की ऊर्जा से दूर कर लिया है।

- "The Republic of Moldova has diversified its **energy supply**. It has been very difficult but for us it was an **existential threat**," said Mr. Popsoi explaining how Moldova has calibrated its relationship with Russia in the backdrop of the ongoing conflict in Ukraine.

"मोल्दोवा गणराज्य ने अपनी ऊर्जा आपूर्ति में विविधता लाई है। यह बहुत कठिन रहा है लेकिन





हमारे लिए यह एक अस्तित्व संकट था," श्री पोपसोई ने बताया कि मोल्दोवा ने यूक्रेन में चल रहे संघर्ष के संदर्भ में रूस के साथ अपने रिश्तों को कैसे संतुलित किया है।

- "We understand that a decision to solve the conflict will be difficult. **Peace** is something we all need because it will have important **positive ramifications** for everyone and whatever leverage we can use to contribute of course they will be very welcome," said Mr. Popsoi, urging major stakeholders in the international order to come forward to solve the conflict.

"हम समझते हैं कि संघर्ष को सुलझाने का निर्णय कठिन होगा। शांति कुछ है जिसकी हमें सभी को आवश्यकता है क्योंकि इसके सकारात्मक प्रभाव सभी के लिए महत्वपूर्ण होंगे और हम जो भी प्रभाव डाल सकते हैं, वह निश्चित रूप से स्वागत योग्य होंगे," श्री पोपसोई ने कहा, और अंतरराष्ट्रीय व्यवस्था में प्रमुख हितधारकों से संघर्ष को हल करने के लिए आगे आने का आग्रह किया।

## 'Switzerland nixing MFN status won't affect EFTA deal'

GS Paper II: India-Switzerland

NEW DELHI

India's top trade official said on Monday that Switzerland's decision to suspend the Most Favoured Nation (MFN) treatment for India under the two countries' double-taxation avoidance agreement (DTAA) from January 1, shall not affect the free trade agreement recently reached between the European Free Trade Association (EFTA) nations and India.

"So far as the double tax avoidance agreement, that is under the Department of Revenue... but from the EFTA perspective, it is not going to have any impact on whatever commitments have been undertaken in



Sunil Barthwal

the EFTA," Commerce Secretary Sunil Barthwal said in response to a query from *The Hindu*.

India's Trade and Economic Partnership Agreement (TEPA) signed with the four-nation EFTA nations, that include Switzerland, is unique for its inclusion of a binding \$100 billion investment commitment by companies in

those countries into India over the next 15 years, with one million direct jobs to be created. Mr. Barthwal indicated that these investment commitments won't be affected by the MFN move by the Swiss. While the Ministry of External Affairs has indicated that the double taxation treaty with the EFTA-bloc nations shall be renegotiated in light of the EFTA-India TEPA, the Commerce Secretary said he was not aware of this aspect as of now.

On concerns about steel imports pushed by some industry groups, he said the Directorate General of Trade Remedies is probing the issue, and will consult all stakeholders, including small businesses, before making a recommendation.

nations and India.

भारत के शीर्ष व्यापार अधिकारी ने सोमवार को कहा कि स्विट्ज़रलैंड का भारत के लिए दो देशों के डबल-टैक्सेशन एवॉइडेंस एग्रीमेंट (DTAA) के तहत 1 जनवरी से मोस्ट फेवर्ड नेशन (MFN) का दर्जा निलंबित करने का निर्णय यूरोपीय मुक्त व्यापार संघ (EFTA) देशों और भारत के बीच हाल ही में हस्ताक्षरित मुक्त व्यापार समझौते पर कोई असर नहीं डालेगा।

## 'Switzerland nixing MFN status won't affect EFTA deal'

'स्विट्ज़रलैंड द्वारा MFN का दर्जा समाप्त करने से EFTA डील पर कोई असर नहीं पड़ेगा'

India's top trade official said on Monday that Switzerland's decision to suspend the Most Favoured Nation (MFN) treatment for India under the two countries' double-taxation avoidance agreement (DTAA) from January 1, shall not affect the free trade agreement recently reached between the European Free Trade Association (EFTA)





- Commerce Secretary **Sunil Barthwal** clarified that the MFN suspension under the **double tax avoidance agreement** will not impact the commitments made under the **EFTA-India free trade agreement**.

वाणिज्य सचिव **सुनील बाथवाल** ने स्पष्ट किया कि **डबल टैक्स अवायर्डेंस एग्रीमेंट** के तहत **MFN** निलंबन से **EFTA-भारत मुक्त व्यापार समझौते** के तहत किए गए वार्दों पर कोई असर नहीं पड़ेगा।

- "So far as the double tax avoidance agreement, that is under the **Department of Revenue**... but from the **EFTA perspective**, it is not going to have any impact on whatever commitments have been undertaken in the EFTA," said Mr. Barthwal in response to a query from *The Hindu*.

"जहां तक **डबल टैक्स अवायर्डेंस एग्रीमेंट** का सवाल है, वह **राजस्व विभाग** के तहत है... लेकिन **EFTA के दृष्टिकोण से**, इसका **EFTA में किए गए किसी भी वचन पर कोई असर नहीं पड़ेगा**," श्री **बाथवाल** ने *The Hindu* के एक प्रश्न के उत्तर में कहा।

- India's **Trade and Economic Partnership Agreement (TEPA)** signed with the **four-nation EFTA nations**, that include **Switzerland**, is unique for its inclusion of a **binding \$100 billion investment commitment** by companies in those countries into India over the next 15 years, with **one million direct jobs** to be created.

भारत का **व्यापार और आर्थिक साझेदारी समझौता (TEPA)**, जो **चार-राष्ट्र EFTA देशों** के साथ हस्ताक्षरित है, **स्विट्ज़रलैंड** को भी शामिल करता है, यह अपनी विशेषता के लिए जाना जाता है, जिसमें इन देशों की कंपनियों द्वारा अगले 15 वर्षों में भारत में **बाध्यकारी \$100 बिलियन निवेश प्रतिबद्धता और एक मिलियन प्रत्यक्ष नौकरियों का सृजन** शामिल है।

- Mr. Barthwal indicated that these **investment commitments** won't be affected by the **MFN move** by the Swiss.

श्री **बाथवाल** ने संकेत दिया कि ये **निवेश प्रतिबद्धताएँ** **स्विस** द्वारा किए गए **MFN कदम** से प्रभावित नहीं होंगी।

- While the **Ministry of External Affairs** has indicated that the **double taxation treaty** with the **EFTA-bloc nations** shall be renegotiated in light of the **EFTA-India TEPA**, the Commerce Secretary said he was not aware of this aspect as of now.

जबकि **विदेश मंत्रालय** ने संकेत दिया है कि **EFTA-ब्लॉक देशों** के साथ **डबल टैक्सेशन संधि** को **EFTA-भारत TEPA** के मद्देनजर फिर से बातचीत की जाएगी, वाणिज्य सचिव ने कहा कि वह अभी तक इस पहलू से अवगत नहीं हैं।

- On concerns about **steel imports** pushed by some industry groups, Mr. Barthwal said the **Directorate General of Trade Remedies** is probing the issue, and will consult all stakeholders, including **small businesses**, before making a recommendation.

कुछ उद्योग समूहों द्वारा **स्टील आयात** को लेकर उठाए गए चिंताओं पर श्री **बाथवाल** ने कहा कि **व्यापार उपायों के महानिदेशालय** इस मुद्दे की जांच कर रहा है, और सिफारिश करने से पहले **छोटे व्यवसायों** सहित सभी हितधारकों से परामर्श करेगा।



## In a first, all-woman shift starts at Tata Steel's iron ore mine

PCS

Lalatendu Mishra

MUMBAI

Tata Steel Ltd. said it operationalised an all-woman shift at its Noamundi Iron Mine starting Monday reinforcing its commitment to women's empowerment.

"This initiative, India's first, underscores the company's unwavering commitment to creating an equitable workplace and empowering women in traditionally male-dominated industries," the company said in a statement.

This shift will comprise women employees for all the mining activities of the shift, including heavy earth moving machinery (HEMM), shovel, loader, drill, dozer operators and



shift supervision.

The shift was flagged off by Shyam Sundar Prasad, deputy director general of mines safety in the SE region, Ranchi, Jharkhand.

**'A landmark'**

"This all-woman shift represents a landmark achievement not only for Tata Steel but also for the

Indian mining industry. It is a testament to the resilience and capability of women breaking stereotypes," D.B. Sundara Ramam, vice-president, raw materials, Tata Steel, said,

The journey began in 2019 with the launch of Tata Steel's flagship diversity initiative, "Women@Mines," making it the first firm in India to deploy women in all shifts at mines following the Centre's decision to relax Mines Act, 1952.

Building on this, the company introduced the 'Tejaswini' initiative, aimed at recruiting and training women from local communities to operate HEMM and participate in the mining ecosystem.

## In a first, all-woman shift starts at Tata Steel's iron ore mine

### टाटा स्टील की लौह अयस्क खदान में पहली बार सभी महिलाएं काम करेंगी

Tata Steel Ltd. said it operationalised an all-woman shift at its Noamundi Iron Mine starting Monday reinforcing its commitment to women's empowerment.

टाटा स्टील लिमिटेड ने सोमवार से अपने नोआमुंडी लौह खदान में महिलाओं का पूर्ण-शिफ्ट शुरू किया, जो महिला सशक्तिकरण के प्रति अपनी प्रतिबद्धता को सुदृढ़ करता है।

- This initiative, India's first, underscores the company's unwavering commitment to creating an equitable workplace and empowering women in traditionally male-dominated industries.

यह पहल, भारत की पहली पहल, कंपनी की न्यायसंगत कार्यस्थल बनाने और पारंपरिक रूप से पुरुष-प्रधान उद्योगों में महिलाओं को सशक्त बनाने की अडिग प्रतिबद्धता को रेखांकित करती है।

- The shift will comprise women employees for all the mining activities of the shift, including **heavy earth moving machinery (HEMM)**, shovel, loader, drill, dozer operators and shift supervision.

यह शिफ्ट सभी खनन गतिविधियों के लिए महिलाओं को शामिल करेगी, जिसमें भारी पृथ्वी आंदोलक मशीनरी (HEMM), शॉवल, लोडर, ड्रिल, डोजर ऑपरेटर और शिफ्ट पर्यवेक्षण शामिल हैं।

- The shift was flagged off by **Shyam Sundar Prasad**, deputy director general of mines safety in the SE region, **Ranchi, Jharkhand**.

इस शिफ्ट की शुरुआत **श्याम सुंदर प्रसाद**, दक्षिण-पूर्व क्षेत्र के खदान सुरक्षा के उप-मुख्य निदेशक, **रांची, झारखंड** द्वारा की गई।

**'A landmark'**

**'एक मील का पत्थर'**

- "This all-woman shift represents a **landmark achievement** not only for Tata Steel but also for the **Indian mining industry**. It is a testament to the **resilience** and **capability** of women breaking stereotypes," said **D.B. Sundara Ramam**, vice-president, raw materials, Tata Steel.





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"यह सभी महिलाओं का शिफ्ट न केवल टाटा स्टील के लिए बल्कि भारतीय खनन उद्योग के लिए भी एक मील का पत्थर उपलब्धि है। यह महिलाओं की सहनशीलता और क्षमता का प्रमाण है जो स्टीरियोटाइप्स को तोड़ रही हैं," डी.बी. सुंदर रामम, उपाध्यक्ष, कच्चे माल, टाटा स्टील ने कहा।

- The journey began in **2019** with the launch of Tata Steel's flagship diversity initiative, "**Women@Mines**," making it the first firm in India to deploy women in all shifts at mines following the Centre's decision to relax **Mines Act, 1952**.

यह यात्रा **2019** में टाटा स्टील की प्रमुख विविधता पहल, "**Women@Mines**", के लॉन्च के साथ शुरू हुई, जिससे यह भारत की पहली कंपनी बन गई, जिसने केंद्र सरकार के **माइंस एक्ट, 1952** को ढीला करने के बाद खदानों में सभी शिफ्टों में महिलाओं को तैनात किया।

- Building on this, the company introduced the '**Tejaswini**' initiative, aimed at recruiting and training women from local communities to operate **HEMM** and participate in the mining ecosystem.

इसी पर आधारित, कंपनी ने '**तेजस्विनी**' पहल शुरू की, जिसका उद्देश्य स्थानीय समुदायों की महिलाओं को **HEMM** ऑपरेट करने के लिए भर्ती करना और प्रशिक्षित करना था, ताकि वे खनन पारिस्थितिकी तंत्र में भाग ले सकें।



## Many feared dead in French territory Mayotte after cyclone

**GS Paper I: Geography**

**Agence France-Presse**

SAINT-DENIS DE LA REUNION

Rescuers raced against time on Monday to reach survivors and supply urgent aid after the devastating cyclone Chido ripped through the French Indian Ocean territory of Mayotte, destroying homes across the islands, with hundreds feared dead.

Images from Mayotte, which like other French overseas territories is an integral part of France and ruled from Paris, showed homes reduced to piles of rubble.

The crisis, which erupted at the weekend the day after President Emmanuel Macron appointed Francois Bayrou as the sixth Prime Minister of his mandate, poses a major challenge for a government still only operating in a caretaker capacity.

### Clinics in tatters

The cyclone left health services in tatters, with the main hospital extremely damaged and health centres knocked out of operation, Health Minister Genevieve Darrieussecq told broadcaster France 2.

Mr. Macron was due to chair a crisis meeting in Paris at 2230 IST, the Elysee said.

The "exceptional" cyclone was super-charged by particularly warm Indian Ocean waters, meteorologist Francois Gourand of the Meteo France weather service said.

### Trapped in debris

With roads closed, officials fear that many could still be trapped under rubble in inaccessible areas.

The overwhelming majority of Mayotte's population is Muslim and religious tradition dictates bodies must be buried rapidly, meaning some may never be counted.

Mayotte is France's poorest region with an estimated third of the population living in shanty towns.

Mayotte officially has 320,000 inhabitants, "but it is estimated that there are 100,000 to 200,000 more people, taking into account illegal immigration," added the source.

Chido was packing winds of at least 226 km per hour when it slammed into Mayotte, which lies to the east of Mozambique.



French gendarmes and locals clear a road blocked by a tree after Cyclone Chido hit the French Indian Ocean territory of Mayotte. AFP

## Many feared dead in French territory Mayotte after cyclone

## फ़्रांसीसी क्षेत्र मायोट में चक्रवात के बाद कई लोगों के मारे जाने की आशंका

Rescuers raced against time on Monday to reach survivors and supply urgent aid after the devastating cyclone Chido ripped through the French Indian Ocean territory of Mayotte, destroying homes across the islands, with hundreds feared dead.

रविवार को, बचावकर्मियों ने समय के खिलाफ दौड़ते हुए जीवित बचे लोगों तक पहुंचने और आपातकालीन सहायता पहुंचाने की कोशिश की, जब तबाह करने वाला चिडो तूफान फ़्रांसीसी भारतीय महासागर क्षेत्र मायोट में पहुंचा, जिससे द्वीपों के घर नष्ट हो गए और सैकड़ों लोगों के मारे जाने की आशंका जताई गई।

- Images from Mayotte, which like other French overseas territories is an integral part of France and ruled from Paris, showed homes reduced to piles of rubble. मायोट से आई तस्वीरों में, जो अन्य फ़्रांसीसी विदेशी क्षेत्रों की तरह फ़्रांस का अभिन्न हिस्सा है और पेरिस से शासित है, घरों को मलबे के ढेर में तब्दील होते हुए दिखाया गया।

- The crisis, which erupted at the weekend the day after President Emmanuel Macron appointed Francois Bayrou as the sixth Prime Minister of his mandate, poses a major challenge for a government still only operating in a caretaker capacity.

यह संकट, जो सप्ताहांत में उस दिन फूट पड़ा जब राष्ट्रपति इमैनुएल मैक्रों ने अपने कार्यकाल के छठे प्रधानमंत्री के रूप में फ़्रांस्वा बैरू को नियुक्त किया, एक ऐसी सरकार के लिए बड़ी चुनौती है जो अभी भी केवल संभालने वाली क्षमता में काम कर रही है।

### Clinics in tatters

क्लिनिक खंडहर में

- The cyclone left health services in tatters, with the main hospital extremely damaged and health centres knocked out of operation, Health Minister Genevieve





**Darrieusseccq** told broadcaster **France 2**.

तूफान ने स्वास्थ्य सेवाओं को खंडहर में तब्दील कर दिया, मुख्य अस्पताल गंभीर रूप से क्षतिग्रस्त हो गया और स्वास्थ्य केंद्रों को बंद कर दिया गया, स्वास्थ्य मंत्री जेनेवीव डैरीउस्सेक ने प्रसारक फ्रांस 2 से कहा।

- **Mr. Macron** was due to chair a crisis meeting in **Paris** at **2230 IST**, the **Elysee** said. श्री मैक्रों को पेरिस में **2230 IST** पर एक संकट बैठक की अध्यक्षता करनी थी, एलीसी ने कहा।
- The “exceptional” cyclone was super-charged by particularly warm **Indian Ocean waters**, meteorologist **Francois Gourand** of the **Meteo France** weather service said. “असाधारण” तूफान विशेष रूप से गर्म भारतीय महासागर के पानी से प्रबल हुआ था, मौसम विज्ञानी फ्रांसीस गुरींद ने मेटियो फ्रांस मौसम सेवा से कहा।

### Trapped in debris

#### मलबे में फंसे लोग

- With roads closed, officials fear that many could still be trapped under rubble in **inaccessible areas**. सड़कों के बंद होने के साथ, अधिकारी डरते हैं कि कई लोग अभी भी अप्रवेश्य क्षेत्रों में मलबे के नीचे फंसे हो सकते हैं।
- The overwhelming majority of **Mayotte’s population** is **Muslim** and religious tradition dictates bodies must be buried rapidly, meaning some may never be counted. मायोट की आबादी का अधिकांश हिस्सा मुस्लिम है और धार्मिक परंपरा के अनुसार शवों को जल्दी दफन करना अनिवार्य है, जिसका मतलब है कि कुछ शवों का कभी हिसाब नहीं होगा।
- **Mayotte** is **France’s poorest region** with an estimated third of the population living in **shanty towns**. मायोट फ्रांस का सबसे गरीब क्षेत्र है, जहाँ अनुमानित रूप से जनसंख्या का एक तिहाई झुग्गी बस्तियों में रहती है।
- **Mayotte** **officially has 320,000 inhabitants**, “but it is estimated that there are 100,000 to 200,000 more people, taking into account **illegal immigration**,” added the source. मायोट की आधिकारिक जनसंख्या 320,000 है, “लेकिन यह अनुमानित है कि वहां 100,000 से 200,000 लोग और हैं, जो अवैध आप्रवासन को ध्यान में रखते हुए,” स्रोत ने जोड़ा।
- **Chido** was packing winds of at least **226 km per hour** when it slammed into **Mayotte**, which lies to the **east of Mozambique**. चिडो में 226 किमी प्रति घंटे की तेज़ हवाएँ थीं जब यह मायोट में टकराया, जो मोजांबिक के पूर्व में स्थित है।





# New chemical pathway worsens quality of air in harsh winters

Shahzad Gani, of the Centre for Atmospheric Sciences in IIT Delhi, said the new study indexes a 'major shift' in our understanding of how the formation of secondary aerosols like hydroxymethanesulphonate 'can happen in fine particles even in extremely cold, dark conditions'

**Savantana Datta**

**I**n winter, the temperature in Dras in Ladakh drops to  $-20^{\circ}\text{C}$ , making it the coldest place in India. On the other side of the world, Fairbanks, the capital city of Alaska, holds a similar record in the U.S., its temperature hovering around  $-22.4^{\circ}\text{C}$  in winter. But the two cities have drastically different air quality. Unlike Dras, where the air is remarkably healthy, Fairbanks is among the U.S.'s worst-performing cities. One estimate ranked it tenth in a list of the country's most air-polluted cities. Another ranked it first for particle pollution.

Particle pollution, also called 'particulate matter' (PM), is a mix of solid particles and liquid droplets suspended in the air. PM can be classified into two broad categories:  $\text{PM}_{10.2.5}$  and  $\text{PM}_{2.5}$ .  $\text{PM}_{10.2.5}$  refers to particles whose diameter ranges between 2.5 and 10 micrometres ( $\mu\text{m}$ , equal to one millionth of a metre), and  $\text{PM}_{2.5}$  refers to particles that are less than  $2.5\mu\text{m}$  in diameter.

$\text{PM}_{2.5}$  particles are also called ultrafine particles. They are considered to be particularly dangerous: they enter the lungs through the nose and throat; once in, they reduce lung function, aggravate asthma, and – for people with lung or heart disease – pave the way for premature death.

## Pollution and temperature

In 2009, authorities from the Division of Air Quality in Alaska declared Fairbanks to be a "PM<sub>2.5</sub> nonattainment area": that is, the amount of  $\text{PM}_{2.5}$  in the city exceeded the limit of  $35\mu\text{g}$  per cubic metre of air. The main sources of these pollutants were identified to be emissions from wood stoves, the burning of distillate fuel oil, industrial sources, and automobiles, all of which also emit a large amount of sulphur dioxide.

To bring  $\text{PM}_{2.5}$  levels below the permissible limits, the Division in a 2022 directive banned the use of fuel with sulphur concentrations exceeding 1,000 parts per million in Fairbanks. Now, a study led by researchers from the University of Alaska Fairbanks and the Georgia Institute of Technology, both in the U.S., has found that the ban may not be entirely effective because the chemistry of  $\text{PM}_{2.5}$  particles changes in cold weather.

In their study, published in the journal *Science Advances* on September 4, the researchers found that lower sulphate concentrations in the air combined with low temperatures (around  $-35^{\circ}\text{C}$ ) made the PM particles less acidic. This in turn increased the production of hydroxymethanesulphonate – another component of  $\text{PM}_{2.5}$  – in the air.

Rodney J. Weber, a professor at the School of Earth and Atmospheric Sciences, Georgia Institute of Technology, and one of the corresponding authors of the study, told this reporter that the study's findings have implications for the "effectiveness of emission controls to reduce pollution levels."

## Aerosol chemistry

In a 2022 study, James Campbell, the lead author of the current study and a doctoral scholar at the University of Alaska Fairbanks, showed that a large amount of hydroxymethanesulphonate



An aerial view of the smog-covered city of Bishkek, Kyrgyzstan, in January 2023. COLLAB MEDIA

formed during winters in Fairbanks when formaldehyde and sulphur dioxide reacted in the presence of liquid water.

Campbell's finding was surprising because hydroxymethanesulphonate formation has been traditionally thought to occur in clouds and fog, not in aerosols, because the former have more liquid water.

Hydroxymethanesulphonate formation also requires more acidic conditions, whereas the sulphite ions ( $\text{SO}_3^{2-}$ ) required for its formation are present in adequate amounts only when the air is less acidic. The higher density of water droplets in clouds and fog absorbs more water-soluble gases, rendering them less acidic than most aerosols, the authors wrote in their paper.

What, then, explained the formation of large amounts of hydroxymethanesulphonate particles in Fairbanks during the winter?

To investigate, the researchers combined measurements obtained previously from the Alaskan Layered Pollution and Chemical Analysis (ALPACA) project with thermodynamic modelling. For the latter, they used computational models to calculate the amount of various ions and gases in aerosol particles in a given air mass.

At very low temperatures, water typically freezes to ice. But sometimes, in a process called supercooling, the temperature of a liquid can drop well below its freezing point without it turning solid.

The researchers wrote in their paper that aerosol particles exist in a supercooled state during Fairbanks winters. As a result, they contain liquid water, which allows hydroxymethanesulphonate to form within these particles. The researchers also reported that the acidity of aerosol

**Since Fairbanks sees very low temperatures, fewer ammonium ions jump to the gaseous state. As concentration of ammonium ions in the aerosol builds, its acidity falls, making it ideal for hydroxymethanesulphonate production**

particles in Fairbanks changes rapidly during the winter from low to high, making the conditions more favourable for the formation of hydroxymethanesulphonate.

The rapid shift in the acidity of  $\text{PM}_{2.5}$  in many places is largely the handiwork of the relative concentration of two ions: sulphate ( $\text{SO}_4^{2-}$ ) and ammonium ( $\text{NH}_4^+$ ). Sulphate ions increase the acidity of aerosol particles while the latter, a base, neutralise the acidity.

Two ammonium ions are required to neutralise the acidity contributed by each sulphate ion.

If there were to be an equal number of sulphate and ammonium ions in an aerosol particle, it would be more acidic. But since the 2022 ban on high-sulphur fuel in Fairbanks, the concentration of ammonium ions in  $\text{PM}_{2.5}$  particles increased relative to that of sulphate ions. This lowered the acidity.

Further, ammonium in aerosols can exist in its gaseous form, ammonia, and in its ionic form dissolved in the liquid water in the aerosol. In normal conditions, the two forms exist in equilibrium, where the rates of conversion of ammonium to ammonia and ammonia to ammonium are equal.

But since Fairbanks's winters register very low temperatures, fewer ammonium ions are able to jump to the gaseous state. And as the concentration of ammonium

ions within the aerosol particle builds up, its acidity drops further, making it a fertile site for hydroxymethanesulphonate production.

## Relevance to the Global South

According to Prof. Weber, the Georgia Tech atmospheric scientist, the study's results are "broadly applicable to cold regions but also provide new insights into aerosol thermodynamics."

Shahzad Gani, an assistant professor at the Centre for Atmospheric Sciences in IIT Delhi, told this reporter the study indexes a "major shift" in our understanding of how "secondary aerosol formation can happen in fine particles even in extremely cold, dark conditions." Secondary aerosol refers to molecules like hydroxymethanesulphonate that are formed from parent molecules in chemical reactions.

"These findings have important implications for understanding how air quality-relevant aerosols form in extremely cold urban and industrial regions," he added.

At the same time, he clarified the study's relevance to "many areas of the Global South is limited, except for some high-altitude regions like the Andes or Himalayas." He said he is looking forward to future research in other cold regions that could help validate the findings of the study and expand its implications to the Global South.

Meanwhile, he added, the study compels scientists to confront how temperature changes might affect chemical pathways related to air quality and climate, especially in a world that is being rapidly reshaped by global warming.

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## New chemical pathway worsens quality of air in harsh winters

### सर्दियों में हवा की गुणवत्ता को खराब करने वाली नई

### रासायनिक प्रक्रिया

- Shahzad Gani, of the Centre for Atmospheric Sciences in IIT Delhi, said the new study indexes a 'major shift' in our understanding of how the formation of secondary aerosols like hydroxymethanesulphonate 'can happen in fine particles even in extremely cold, dark conditions.'
  - शाहज़ाद गनी, IIT दिल्ली के सेंटर फॉर एटमॉस्फेरिक साइंसेज़, ने कहा कि यह नई अध्ययन हमारे समझ में एक 'महत्वपूर्ण बदलाव' दिखाती है कि कैसे हाइड्रोक्सीमेथेनसल्फोनेट जैसे माध्यमिक एरोसोल बर्फीले, अंधेरे मौसम में भी नन्हे कणों में बन सकते हैं।
- In winter, the temperature in Dras in Ladakh drops to  $-20^{\circ}\text{C}$ , making it the coldest place in India. On the other side of the world, Fairbanks, the capital city of Alaska, holds a similar record in the U.S., its temperature hovering around  $-22.4^{\circ}\text{C}$  in winter.
  - सर्दियों में, लद्दाख के द्रास का तापमान  $-20^{\circ}\text{C}$  तक गिरता है, जो इसे भारत का सबसे ठंडा स्थान बनाता है। दूसरी ओर, दुनिया के दूसरी तरफ, फेयरबैंक्स (अलास्का की राजधानी), अमेरिका में सर्दियों में  $-22.4^{\circ}\text{C}$  के आसपास तापमान के साथ समान रिकॉर्ड रखता है।
- But the two cities have drastically different air quality. Unlike Dras, where the air is remarkably healthy, Fairbanks is among the U.S.'s worst-performing cities. One estimate ranked it tenth in a list of the country's most air-polluted cities. Another ranked it first for particle pollution.
  - लेकिन दोनों शहरों की हवा की गुणवत्ता में काफी अंतर है। द्रास की हवा जहां असाधारण रूप से स्वस्थ है, वहीं फेयरबैंक्स अमेरिका के सबसे खराब प्रदूषण वाले शहरों में से एक है। एक अनुमान में इसे देश के सबसे प्रदूषित शहरों की सूची में दसवां स्थान मिला। एक अन्य ने इसे कण प्रदूषण के लिए पहले स्थान पर रखा।
- Particle pollution, also called 'particulate matter' (PM), is a mix of solid particles and liquid droplets suspended in the air. PM can be classified into two broad categories: PM10-2.5 and PM2.5.
  - कण प्रदूषण, जिसे 'कण पदार्थ' (PM) भी कहा जाता है, ठोस कणों और तरल बूंदों का मिश्रण है जो हवा में निलंबित रहता है। PM को दो व्यापक श्रेणियों में बांटा जा सकता है: **PM10-2.5** और **PM2.5**।
- PM2.5 particles are also called ultrafine particles. They are considered to be particularly dangerous: they enter the lungs through the nose and throat; once in, they reduce lung function, aggravate asthma, and — for people with lung or heart disease — pave the way for premature death.





- **PM2.5** कणों को **अल्ट्राफाइन कण** भी कहा जाता है। ये विशेष रूप से खतरनाक माने जाते हैं: ये नाक और गले के माध्यम से फेफड़ों में प्रवेश करते हैं; एक बार अंदर जाने के बाद, ये फेफड़ों की कार्यक्षमता को घटाते हैं, अस्थमा को बढ़ाते हैं, और – फेफड़ों या हृदय रोग वाले व्यक्तियों के लिए – जल्द मौत का रास्ता खोलते हैं।
- In 2009, authorities from the Division of Air Quality in Alaska declared Fairbanks to be a “PM2.5 nonattainment area”: that is, the amount of PM2.5 in the city exceeded the limit of 35µg per cubic metre of air.
  - 2009 में, **अलास्का के वायु गुणवत्ता विभाग** ने **फेयरबैंक्स** को “**PM2.5 नॉनअटेनेमेंट एरिया**” घोषित किया: अर्थात्, शहर में **PM2.5** की मात्रा 35µg प्रति घन मीटर से अधिक थी।
- The main sources of these pollutants were identified to be emissions from wood stoves, the burning of distillate fuel oil, industrial sources, and automobiles, all of which also emit a large amount of sulphur dioxide.
  - इन प्रदूषकों के प्रमुख स्रोतों के रूप में **लकड़ी चूल्हों, डिस्टिलेट फ्यूल ऑयल** जलाने, औद्योगिक स्रोतों, और **ऑटोमोबाइल** से उत्सर्जन को पहचाना गया, जो सभी **सल्फर डाइऑक्साइड** की बड़ी मात्रा का उत्सर्जन करते हैं।
- To bring PM2.5 levels below the permissible limits, the Division in a 2022 directive banned the use of fuel with sulphur concentrations exceeding 1,000 parts per million in Fairbanks.
  - **PM2.5** स्तरों को अनुमत सीमा से नीचे लाने के लिए, विभाग ने **2022** के एक निर्देश में फेयरबैंक्स में सल्फर सांद्रता 1,000 भाग प्रति मिलियन से अधिक वाले ईंधन के उपयोग पर प्रतिबंध लगा दिया।
- Now, a study led by researchers from the University of Alaska Fairbanks and the Georgia Institute of Technology, both in the U.S., has found that the ban may not be entirely effective because the chemistry of PM2.5 particles changes in cold weather.
  - अब, **अलास्का फेयरबैंक्स विश्वविद्यालय** और **जॉर्जिया इंस्टिट्यूट ऑफ टेक्नोलॉजी** के शोधकर्ताओं द्वारा किए गए एक अध्ययन में यह पाया गया है कि यह प्रतिबंध पूरी तरह से प्रभावी नहीं हो सकता क्योंकि **PM2.5 कणों** की रासायनिक संरचना ठंडे मौसम में बदल जाती है।
- In their study, published in the journal Science Advances on September 4, the researchers found that lower sulphate concentrations in the air combined with low temperatures (around -35 °C) made the PM particles less acidic. This in turn increased the production of hydroxymethanesulphonate — another component of PM2.5 — in the air.
  - **4 सितंबर** को **जर्नल साइंस एडवांसेज़** में प्रकाशित अपने अध्ययन में, शोधकर्ताओं ने पाया कि वायु में कम सल्फेट सांद्रता और ठंडे तापमान (लगभग **-35 °C**) ने PM कणों को कम अम्लीय बना दिया। इसके परिणामस्वरूप, **हाइड्रोक्सीमेथेनसल्फोनेट** (जो PM2.5 का एक और घटक है) का उत्पादन हवा में बढ़ गया।
- Rodney J. Weber, a professor at the School of Earth and Atmospheric Sciences, Georgia Institute of Technology, and one of the corresponding authors of the study, told this reporter that the study’s findings have implications for the “effectiveness of emission controls to reduce pollution levels.”





- रोडनी जे. वेबर, जो जॉर्जिया इंस्टिट्यूट ऑफ टेक्नोलॉजी में पृथ्वी और वायुमंडलीय विज्ञान स्कूल के प्रोफेसर हैं और इस अध्ययन के सह-लेखक हैं, ने इस रिपोर्टर से कहा कि अध्ययन के निष्कर्षों का "प्रदूषण स्तरों को घटाने के लिए उत्सर्जन नियंत्रण की प्रभावशीलता" पर प्रभाव पड़ता है।
- A 2022 study showed that a large amount of hydroxymethanesulphonate formed during winters in Fairbanks when formaldehyde and sulphur dioxide reacted in the presence of liquid water.
  - 2022 के एक अध्ययन में दिखाया गया कि फेयरबैंक्स में सर्दियों के दौरान एक बड़ी मात्रा में हाइड्रोक्सीमेथेनसल्फोनेट तब बनता है जब फॉर्मलाडिहाइड और सल्फर डाइऑक्साइड तरल पानी की उपस्थिति में प्रतिक्रिया करते हैं।
- Hydroxymethanesulphonate formation has been traditionally thought to occur in clouds and fog, not in aerosols, because the former have more liquid water.
  - पारंपरिक रूप से, हाइड्रोक्सीमेथेनसल्फोनेट का निर्माण बादल और कोहरा में होता है, न कि एरोसोल्स में, क्योंकि बादल और कोहरे में ज्यादा तरल पानी होता है।
- The study reported that aerosol particles exist in a supercooled state during Fairbanks winters, allowing hydroxymethanesulphonate to form within these particles.
  - अध्ययन ने रिपोर्ट किया कि फेयरबैंक्स की सर्दियों में एरोसोल कण एक सुपरकूल्ड अवस्था में होते हैं, जिससे हाइड्रोक्सीमेथेनसल्फोनेट इन कणों के अंदर बनता है।
- According to Prof. Weber, the Georgia Tech atmospheric scientist, the study's results are "broadly applicable to cold regions but also provide new insights into aerosol thermodynamics."
  - प्रोफेसर वेबर के अनुसार, जॉर्जिया टेक के वायुमंडलीय वैज्ञानिक, अध्ययन के परिणाम "ठंडे

