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Emerging markets have no easy escape from dollar squeeze

Jamie McGeever
ORLANDO

A strong U.S. dollar and high Treasury yields are posing significant challenges for emerging economies, and policymakers have no easy way to counter this powerful one-two punch.

With American exceptionalism casting a shadow over the rest of the world, many emerging markets (EM) are facing weaker currencies, increased costs to service dollar-denominated debt, depressed capital flows or even capital flight, dampened local asset prices and slowing growth.

Added to that is the uncertainty and nervousness surrounding the incoming U.S. government's proposed tariff policies.

History has shown that when trends like these take hold in emerging markets, they can create vicious cycles that accelerate rapidly and prove difficult to break. Unfortunately, there may be no simple road map for avoiding this.

Just look at China and Brazil. The monetary and fiscal paths being pursued by these two EM heavyweights could not be more different. Beijing is pledging to ease monetary and fiscal policy to reflate its economy; Brasilia is promising much higher interest rates and seeking to get its fiscal house in order.

Their divergent paths and ongoing struggles suggest that no matter where EM economies are in terms of growth, inflation and fiscal health, they are likely to face a difficult road ahead in the coming years.

A dip in savings: EM policymakers may soon be forced to dip into their forex stash. REUTERS

Brazil and China are clearly in very different places, not least with regard to inflation. Brazil has lots of it, prompting the aggressive actions and guidance from the central bank. China, on the other hand, is battling deflation, and is starting to finally slash interest rates.

But even though the two countries' tactics are diametrically opposed, the outcomes have thus far been similar: sluggish growth and weak currencies, a picture most emerging countries will recognize. Brazil's real has never been weaker and the tightly managed yuan is close to the troughs last visited 17 years ago.

As Reuters exclusively reported, China is mulling whether to let the yuan weaken in response to looming U.S. tariffs, and analysts at Capital Economics warn that it could tumble as low as 8.00 per dollar. But allowing the yuan to depreciate is not without risk. Doing so could accelerate capital outflows, and spark 'beggar thy neighbor' FX devaluations across the globe.

A race to the bottom for EM currencies would be very problematic for the countries involved, as the dollar is now a bigger driver of EM flows than interest rate differentials.

Tighter conditions

EM countries also face headwinds from higher U.S. bond yields.

While the pile of hard currency sovereign and corporate debt is small compared to local currency debt, it is rising. Total emerging market debt is now approaching $30 trillion, or around 28% of the global bond market. That figure was 2% in 2000.

And the squeeze from higher borrowing costs is being felt in real time. Emerging market financial conditions are the tightest in nearly five months, according to Goldman Sachs, with the spike in recent months due almost entirely to the rise in rates.

Real interest rates are a lot higher now than they were during Trump's first presidency. But many countries may still struggle to cut them, as doing so "could create financial stability concerns by putting pressure on exchange rates," JP Morgan analysts warn.

On the positive side, emerging countries do have substantial FX reserves to fall back on, especially China. Most of the world's $12.3 trillion FX reserves are held by emerging countries, with $3.3 trillion in China's hands alone. EM policymakers may soon be forced to dip into this stash.

(The opinions expressed here are those of the author, a Reuters columnist)

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

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.

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. 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 largish 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.

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

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' 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

What is the procedure for removing judges?

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

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

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- 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.

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?

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?

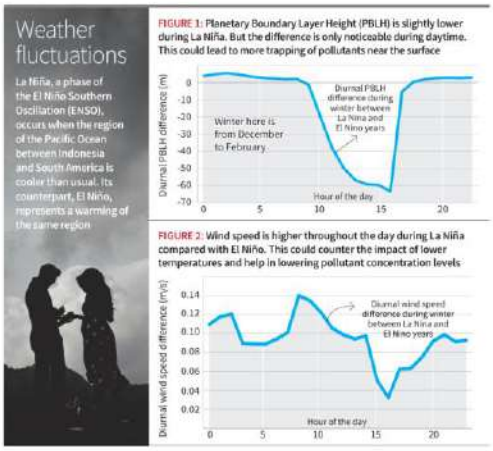
La Niña, a phase of the El Niño Southern Oscillation (ENSO), occurs when the region of the Pacific Ocean between Indonesia and South America is cooler than usual. Its counterpart, El Niño, represents a warming of the same region. These two phases significantly influence global atmospheric circulation 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 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 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 Nino 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.

Green hydrogen and the financing challenge

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As 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 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.

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.

The hidden cost of greenwashing the Indian Railways

K. Balakesari

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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 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.

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

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?

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'

Sayantan Datta

In winter, the temperature in Dras in Ladakh drops to -20° 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° 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: $PM_{10-2.5}$ and $PM_{2.5}$. $PM_{10-2.5}$ refers to particles whose diameter ranges between 2.5 and 10 micrometres (µm, equal to one millionth of a metre), and $PM_{2.5}$ refers to particles that are less than 2.5µm in diameter.

$PM_{2.5}$ 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.

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

Pollution and temperature

In 2009, authorities from the Division of Air Quality in Alaska declared Fairbanks to be a "$PM_{2.5}$ nonattainment area": that is, the amount of $PM_{2.5}$ in the city exceeded the limit of 35µg 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 $PM_{2.5}$ 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 $PM_{2.5}$ 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 °C) made the PM particles less acidic. This in turn increased the production of hydroxymethanesulphonate – another component of $PM_{2.5}$ – 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 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 (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 particles in Fairbanks changes rapidly during the winter from low to high, making the conditions more favourable for the formation of hydroxymethanesulphonate.

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

The rapid shift in the acidity of $PM_{2.5}$ in many places is largely the handiwork of the relative concentration of two ions: sulphate (SO_4^{2-}) and ammonium (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 $PM_{2.5}$ 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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