'The upcoming El Nino event could cost India $1 trillion in losses'

Justin S. Mankin is Associate Professor of Geography at Dartmouth College. Speaking with **Srijana Mitra Das** in **ET Evoke** on World Environment Day, he explains the working of an impending El Nino, its implications for global weather patterns – and the Indian economy:

Q. How exactly does an El Nino event work?

A. El Nino is a phenomenon that occurs in our complicated climate system. It is thought of typically as a pattern of sea surface temperatures that occur in the tropical Pacific — it's a question of how much warmer or cooler than average those sea surface temperatures are. An El Nino occurs when those sea surface temperatures in the eastern tropical Pacific, near Peru, tend to be warmer than average. In a La Nina, those temperatures are cooler than average. That's an amplification of the 'neutral state', when the eastern tropical Pacific has average temperatures which happen to be quite cool. This is linked to the feedback mechanisms that set up El Nino, or the El Nino Southern Oscillation (ENSO), as a phenomenon. This is driven by winds. The prevailing winds along the equator blow from east to west. Those easterlies have this tendency to push all the water near Peru towards the West Pacific. Now, the waters in the West Pacific are really warm because they're surface waters that have been exposed to sunlight — they are dragged by the winds and piled up, making, quite literally, the sea surface higher in the West Pacific than in the East Pacific.

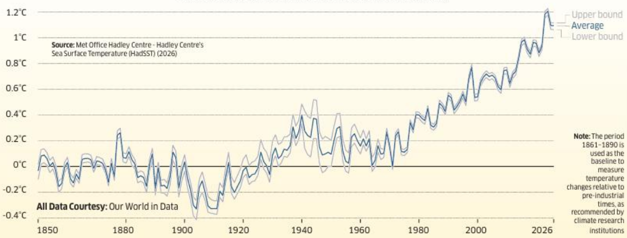
When an El Nino happens, there's a breakdown in the strength of those easterly winds and all that water piled high in the West Pacific sloshes and spreads out over the tropical Pacific and Eastern Pacific Ocean, allowing sea surface temperatures to rise — this is a massive reconfiguration of weather and climate.

In an El Nino, all the heat typically concentrated in one small space gets spread out over the entire expanse of the Pacific Ocean. In doing so, there is a reconfiguration of the way energy is exchanged between the ocean and atmosphere. The ocean is a major heat engine for weather globally. And in that reconfiguration, it adds a lot more energy to the atmosphere.

ET evoke

Hot Water: Annual Sea Surface Temperature Anomalies vis-a-vis the Pre-Industrial Era:

(The difference of average sea surface temperatures worldwide compared to the mean from 1861-1890, in degrees Celsius. This is measured at a depth of 20 centimetres)



As The Ocean Warms Up...
In an El Nino event, easterly winds lose strength to push warmer waters of the West Pacific eastwards – these then spread across a wider sea. As this adds more energy to the environment, heat increases and precipitation changes, causing, for instance, forecasts of a lower or slower monsoon in India this year

It is no coincidence that the hottest years on record tend to be El Nino years — that is because of this phenomena of taking concentrated heat and spreading it out spatially, such that more of the atmosphere is exposed to it.

An El Nino has impacts in different regions around the world via 'teleconnections' which can manifest as warmer than average temperatures or changes in precipitation patterns. In India, the IMD, for instance, has put out an expectation that this year's Indian monsoon will be below average, owing in part to these canonical teleconnections between El Nino and what happens in India in terms of precipitation, either suppressing the monsoon somewhat or delaying its onset in some places.

Q. You've studied the economic impacts of earlier El Ninos – could you tell us about those?

A. We've shown in our previous work that the climate system matters to the economy — and that impact is measurable at the global macroeconomic scale. Climate affects energy, transport, labour productivity and the efficiency with which you mobilise labour and capital to produce goods. Extremely hot weather, such as that which India has been experiencing this spring, slows down workers while floods or delays in the onset of the monsoon can cause agricultural damage. Storms or other weather deviations can impact commodities markets, the production of energy, the mining of metals, agricultural production, the transport of goods and services to market, etc., which then up-aggregate through all other sectors of the economy.

Check Your Pulse Rate: Through altered rainfall, El Nino could impact your daily dishes

Among such impacts, a very salient one for India is the agricultural effects of such a deviation and what this might imply for, say, groundwater pumping and energy costs as people rely more on irrigation to mitigate a delayed or depressed monsoon — that can then create energy cost spikes and diverse political realities.

Q. You argue an El Nino's impacts persist over years – could you elaborate?

A. In our 2023 paper, Christopher Callahan and I showed the economic toll associated with El Nino events persist for multiple years — in fact, given the data, we can't rule out the possibility that these impacts are permanent. We've found El Ninos, even without global warming, are very costly to society economically. For example, we just ran some analyses with the current El Nino forecast, predicted to be sizable with near certainty this year, manifesting in a peak between November 2026 and January 2027 — this El Nino could depress economic growth in India by such a considerable amount as to cost the economy a trillion dollars by, say, 2032. If we calculate the accumulated economic losses associated with this forthcoming El Nino event, we're looking at over a trillion dollars foregone — alongside, the global economic toll could be above $10 trillion. These figures represent economic productivity that would otherwise have been realised if this El Nino did not occur — with it taking place, while India's economy may continue to grow, it will grow at a slower rate than otherwise.

World Environment Day: Be Eco-Logical

Broadly speaking, the impacts at a national level are a function in part of teleconnection strength or whether the weather and climate are most intimately tied to what's happening in the tropical Pacific. This means countries in South America will be affected and India will also be among the most heavily impacted because what El Nino does to Indian weather and climate is to amplify extreme heat and depress the monsoon. Of course, different spatial patterns of sea surface temperature warming in the tropical Pacific have different teleconnections to diverse regions. There isn't one rule of thumb, and so, there's some uncertainty — that physical climate uncertainty will manifest as economic uncertainty. My expectation, given just the magnitude of this El Nino, is that next spring in India will be extremely hot.

> El Ninos are very costly to society, with long-lived impacts – this El Nino, peaking in November '26 to January '27, could take $10 trillion off the global economy

Q. This year's El Nino phenomenon could be among the biggest so far. How will it compound global economic worries, already facing two major wars and climate change?

A. Our research shows we are poorly adapted to our climate system and El Nino's latent form of climate variability impacts economies around the world. It is costly and that reflects how our society is poorly adapted to the climate we have now — this, worryingly, portends how we are really poorly adapted to the climate that's unfolding because in some ways, an El Nino year today looks like the normal climate we will have, say, a decade from now. An El Nino year actually takes the training wheels off global warming and reveals it for all its potential impacts, from floods to droughts, heatwaves, wildfires, etc.

The Answer, My Friend? Renewables enable deeper resilience to shocks

When you project that onto a complex sociopolitical, economic and geopolitical landscape, with societal vulnerabilities and grievances around energy usage and costs, manifesting in wars and political friction, this is just adding more fuel to a fire where we're seeing concentrations of wealth into fewer and fewer hands. My expectation is that global warming will continue to amplify that — then, when you have El Nino events, some models suggesting global warming will increase the prevalence and magnitude of El Ninos, those will amplify the overall impacts and costs of global warming.

Q. What measures should governments of vulnerable economies start adopting now?

A. One of the clear takeaways from my research with Chris Callahan is the impacts of global warming look a lot like those of El Nino, pursuing risk mitigation strategies to manage one is investment in managing the other. This is essentially feeding two birds with one biscuit, so to speak — investments in extreme heat mitigation will serve Indian society both for El Ninos and wider global warming. Extreme heat warning systems do reduce mortality and morbidity burdens. Better forecasting creates lead time to mobilise and place resources in effective communities to prevent those impacts. Investment in better El Nino predictions will also give societies time to allocate resources and mitigation, including for heat events through communication and early warning systems, cooling centres, regulations for outdoor labourers, changing schooling ways, ensuring people can be sufficiently cooled during high heat events.

On the agricultural side, governments must consider irrigation practices and unsustainable groundwater pumping which does occur in many parts of India now. It's essential to also consider drought possibilities and invest in heat-resistant cultivars to ensure yields continue to increase in the face of these extreme heat events and/or delays in the onset of the monsoon.

There are also untold implications for energy aspects like hydropower generation and the reliability of that. In all this, I think if we are interested in building resilience to the status quo, that means migrating our energy system from a carbon-based 20th century model to a decarbonised 21st century model. That involves renewable energy and technology transfer from solar developers, geothermal and wind power developers. Governments must also ensure those technologies reach the hands of communities that can wield them to great effect to ensure energy resilience in the face of this climate variability and its interaction with global warming.

Views expressed are personal

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https://economictimes.indiatimes.com/et-evoke?from=mdr

Weather's Weft & Weave: Cotton, a climate-impacted crop

> An El Nino year is actually like the 'normal' climate we will have a decade later – investing in El Nino impact mitigation is essentially investing in climate management, feeding two birds with one biscuit

Drier Tides Coming: Groundwater extraction in India is not sustainable

Cold Storages Choke as Gulf Shipments Diverted to India

Logistics bottlenecks affect exports and storage cycles: Traders

Shambhavi Anand

New Delhi: Cold storages are overflowing with imported apples, avocados, dry fruits, and other perishables, with traditional suppliers to the Gulf diverting shipments to India amid the widespread shipping turmoil caused by the Iran war.

Traders said the logistics disruption has also hit exports of Indian produce, adding that it has disturbed the timing and seasonality of cold storage operations.

"We hardly have any avocados coming in from Kenya due to high import duty; however, this year, Kenyan avocados meant for Middle Eastern markets landed on Indian ports as the original destination ports were closed," said Ajay TG, general manager, Westfalia Fruit India, a global avocado supplier.

In April and May, avocados meant for India couldn't reach its shores as there were hardly any vessels coming in due to the closure of the Strait of Hormuz, sparking a shortage.

The problem is more persistent at ports, said industry executives.

In addition, rising fuel cost is affecting cargo movement within the country, squeezing demand for dry fruits amid a slowdown in consumption in secondary markets such as traditional sweet manufacturing due to higher product prices.

"The consumption in the secondary market, especially dry fruits used in sweets, has slowed down," said Sumit Saran, director of SS Associates, which imports dry fruits, apples, and avocados.

The crunch is worsened by a lack of storage space, with nearly 70% of India's cold storage capacity reserved for potatoes. With ports getting clogged, exporters were forced to hold their products outside these facilities.

Perishables had to find places in cold storages on ad hoc basis, said Mukesh Aggarwal at the Federation of Cold Storage Associations of India, adding that the issues were more pronounced in March and April.

India has around 8,800 cold storage facilities with a combined capacity of about 40.2 million metric tonnes as of 2025, according to industry estimates.

Livestock Industry Demands 1.5 MT Soymeal Imports Amid Price Surge

Industry cites soaring feed costs and falling soybean output

Jayashree Bhosale

Pune: India's livestock industry has urged the government to allow imports of 1.5 million tonnes of soybean meal after domestic prices of the key poultry feed ingredient surged nearly 50% over the past two months, raising costs for farmers and squeezing margins across the sector.

In a letter to the Centre, the Compound Livestock Feed Manufacturers Association of India (CLMFA) said soaring soybean and maize prices are hurting livestock producers.

The price spike has also made Indian supplies uncompetitive in global markets, curbing exports and prompting higher imports of non-genetically modified (non-GM) soybeans from Africa.

"We have requested the government to allow import of 15 lakh tonnes of soybean meal under the tariff rate quota (TRQ) route as poultry farmers are facing losses due to high feed prices, particularly soybean and maize," said Divya Kumar Gulati, president of CLMFA.

Soybean meal prices have risen about 45% in the past two months as domestic soybean production in 2025-26 is estimated to have fallen to 105 lakh tonnes from 125 lakh tonnes a year earlier, a decline of around 16%.

Prices, however, have eased in recent days, falling from ₹63-64 per kg to ₹57-58 per kg.

Southwest Monsoon Arrives in Kerala: IMD

New Delhi: The southwest monsoon set in over Kerala on Thursday, the India Meteorological Department (IMD) said, marking the onset of the four-month rainy season that is crucial for agriculture and the economy. The monsoon typically reaches Kerala around June 1 and signals the beginning of the June-September southwest monsoon season. "The southwest monsoon has further advanced into the remaining parts of the southwest and southeast Arabian Sea, some parts of the west-central and east-central Arabian Sea, the entire Lakshadweep Islands, Kerala and Mahe, parts of Karnataka and Tamil Nadu, the remaining parts of the Comorin area, southeast Bay of Bengal, and more parts of the southwest, west-central, east-central and northeast Bay of Bengal today, June 4, 2026," the IMD said.

The weather office had earlier forecast the onset of the monsoon over Kerala on May 26, but its arrival was delayed. Last week, the IMD revised its seasonal rainfall forecast, projecting below-normal rainfall for the country. It expects India to receive rainfall amounting to 90% of the Long Period Average (LPA) during the 2026 monsoon season. **PTI**