16-30 APRIL, 2025

Down To Earth

FORTNIGHTLY ON POLITICS OF DEVELOPMENT, ENVIRONMENT AND HEALTH

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INTELLIGENCE OUTSOURCED

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INDUSTRIAL POLLUTION AND GOVERNANCE
AAETI

COMPREHENSIVE ENVIRONMENTAL FRAMEWORKS

Get Updated on the Latest Regulations, Assessment and Sustainability Tools

COURSE DATE
May 20–23, 2025

REGISTRATION DEADLINE
May 11, 2025

VENUE: Anil Agarwal Environment Training Institute (AAETI), Neemli, Rajasthan

As India races ahead with its development agenda, the environmental landscape is shifting just as rapidly. Updated rules, tighter assessment requirements and advancing sustainability tools are shaping the way industries, consultants, and government authorities approach environmental management. For anyone working in the environmental space, staying updated is no longer optional — it's essential. Whether it's new rules under the EIA system, changing laws for different sectors or new ways of doing audits/assessments - environmental professionals of today need to learn, stay updated and adapt quickly.

To address this need, the Centre for Science and Environment (CSE) is organizing an intensive onsite training programme on environmental frameworks, with a focus on recent regulatory updates and practical tools for environmental planning, reporting, and decision-making. This four-day programme will be held from **May 20–23, 2025** at **CSE's residential campus, Anil Agarwal Environment Training Institute (AAETI), Neemli, Rajasthan.**

The course is designed to provide an in-depth understanding of the evolving environmental regulatory scenario in India. It will address the latest amendments and notifications across key environmental laws, and provide training in the use of assessment tools such as Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), audits and waste management strategies.

KEY LEARNINGS

Upon completion of this course, participants will be equipped with:

- Regulatory insights on key environmental laws, including plastic waste, C&D waste, and the Water Act.
- In-depth understanding of technical tools such as EIA (Environmental Impact Assessment) and SIA (Social Impact Assessment) methodologies.
- Insight into water audit frameworks
- Introduction to major sustainability concepts like waste circularity, ESG, and carbon trading.
- Interaction with regulatory experts and experienced practitioners

TRAINING FEES

↗ **Sponsored:** For Government Officials and Civil Societies

↗ **₹ 28,000** for others

↗ Training fees will include accommodation, meals, and travel between CSE's Delhi office and the training centre. Participants will be responsible for covering their own travel expenses to and from New Delhi.

WHO CAN ATTEND

- Government officials from state and central departments.
- Industry professionals and development corporations
- Environmental consultants and engineers
- Researchers, and university students pursuing environment-related studies.
- Civil society organisations and think tanks..
- Anyone aspiring to work in the field of environmental governance.

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FOR REGISTRATION SCAN THIS QR CODE ▶

Rework the economics

INDIA SHOULD not take action to combat climate change. As I said this to a group of climate change envoys from various European countries, I could notice signs of confusion on their faces. I explained to them my reasons. Development is the most significant challenge that a country like India faces. We know today that this growth should also be inclusive and sustainable. And if we achieve this, we hit a sweet spot—our actions to reduce local pollution and to drive green livelihoods will also reduce greenhouse gas emissions. In this way, our Nationally Determined Contribution (NDC), which puts together the package of actions to reduce emissions, would be based on co-benefits; development, if done right, will also address the urgent crisis of climate change.

We know that it is in our interest to achieve this twin goal. We are vulnerable to climate change impacts. But if we do development differently, it would help us avoid the pitfalls of marginalising actions designed solely for climate change. It would help us deepen the public acceptability for taking steps that may not be easy or convenient. I am not sure if I convinced the group of hardened climate negotiators as their world is narrowly focused on counting greenhouse gases. But let me explain this to you.

India, like many other countries, has to ensure growth. This means providing millions with employment, healthcare, education and housing, and increasing energy supply. This has to be our development priority. But development will require taking action that meets the needs of all. So this calls for a change in strategy. We cannot afford a capital- and resource-intensive pathway that adds to environmental degradation and inequity in society. We have learnt over the past decades that we cannot adopt the western-country approach to first pollute and then clean up. We just do not have the financial wherewithal to keep repairing the damage. We have to reinvent growth and this is what many policies in India have done: they have built inclusive sustainability as an outcome of the development policy. This is the unique opportunity for countries like India—not to pit development against climate action but to subsume it within policies designed for growth.

For instance, we know we cannot "fix" air pollution without redesigning mobility because personal vehicles, however clean, take up road space and add to pollution and congestion. The western world has taken the path to subsidise and electrify personal vehicles, which is leading to disruption in industries as they strive to rework supply chains and re-deploy labour for electric cars. We have the opportunity to think of another route—one that reinvents mobility so that we can move people and not cars. This means investing in electric buses and affordable transport like paratransit and two-wheelers. India's NDC must be about upscaling and integrating low-carbon public transport and not just counting electric cars. The policy is driven by cleaning up local air but has the added benefit of combating climate change.

It is the same with the hard-to-abate industries. We know from experience that our industry will invest in technology that saves cost and increases competitiveness. The cement industry, for instance, switched to using fly ash, not to decarbonise but to use waste as raw material, substitute limestone and reduce costs of energy. The future of low-carbon industrialisation lies in similar win-win solutions, such as the reuse of waste materials from iron ore slag to biomass to refuse-derived fuel from municipal garbage—all designed to reduce the use of coal and other fossil fuels and to improve efficiency.

India cannot afford an economy that is driven only by GDP and not by GNP, or gross nature product, that invests in natural resources for livelihoods, locally

Most importantly, we must re-engineer the idea and design of a green economy. We cannot afford mouthing platitudes of green employment, knowing fully well that the renewable energy or electric vehicle transition, per se, does not mean more livelihoods. In fact, recent news shows that thousands of jobs have been lost in the UK because of the shift from blast to electric arc furnaces. This is why we see the pushback in western countries where much has been said without substance and this has prompted people, worried as they are about climate change, to care more about livelihoods.

India's opportunity is in the reworking of its economics so that local resources can be used for local livelihoods. If we do this, we can sequester carbon in trees and in soil, build resilience in society, withstand extreme weather shocks and also stem migration. We cannot afford an economy that is driven only by the gross domestic product (GDP), which extracts and exports produce, and not by gross nature product (GNP) that invests in natural resources for livelihoods, locally. Our plan for climate change is the one that works for people and so the Planet. DTE @sunitanar

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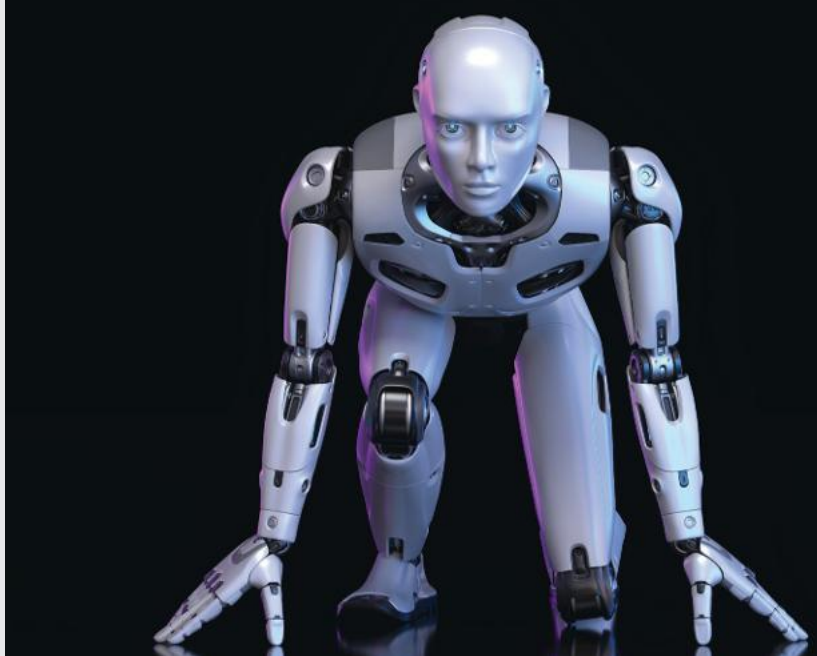

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Cover design: Ajit Bajaj with AI assistance

Engage

PHOTOGRAPH: RAJA MUZAFFAR BHAT

Be proactive in reviving Kashmir's water sources

The article "Scarred by mining" (16-31 December, 2024) deals in detail with riverbed mining and its damaging effects on nature, people and ecology. People like Nirmal Kumar of Tamil Nadu and Ayyappa Masagi of Karnataka are renowned "watermen" in their respective states, who have recharged a number of dead rivulets and waterbodies and restored groundwater to a great extent. Jammu and Kashmir must also have such environmentalists, who can revive the waterbodies and tributaries of the Jhelum to their former glory. The government must invite them as well as experts from other states for suggestions.

As an immediate step, a strict ban must be imposed on mining of riverbeds and keep the sharks of sand and mineral mafias at bay. If the sources of water and wetlands are protected, we can expect greenery, agriculture and fish populations to return. Jammu and Kashmir is a famous tourist attraction, as are its springs, geysers, mountains and lakes. When these natural beauties are lost, tourism is lost in the state. Ecology and environmental protection is the very soul of Kashmir. At present, just for ₹25-30 lakh per day, that too from illegal mining, the state is losing major sources of green cover and inviting flash floods, landslides and soil erosion.

SHYAMALA BHUVANACHANDRAN
VIA EMAIL

PICK OF THE POST BAG

Save the forests of Hyderabad

I want to bring urgent attention to the large-scale deforestation happening in Hyderabad, where hundreds of acres of forests are being cleared despite opposition from environmentalists and local residents. The destruction of the Kancha Gachibowli forest and other green zones is a direct attack on the city's environment, biodiversity and future.

This is not just about trees; it is about rising temperatures, loss of clean air, and irreversible damage to wildlife. With Hyderabad already facing extreme climate conditions, deforestation will worsen air pollution, increase urban heat and disrupt the local ecosystems.

But despite legal interventions and public protests, the destruction continues. The voices of Hyderabad's citizens are being ignored. We need the media to amplify this issue and put pressure on the authorities to act before it is too late. Hyderabad's forests are at a tipping point. Save them. Save our future.

SHIFA
VIA EMAIL

Erratum

In the cover story "Dust to Dust" (1-15 April, 2025), the column "Ramming mass industry is fatal for workers" on *p*31 incorrectly refers to KK Minerals, a ramming mass unit in Jharkhand, as KK Ramming Mass. The column also incorrectly describes ramming mass as a heat insulator. Ramming mass is a mixture of dust particles and granules of quartz stone, which has a high concentration of silica dioxide and is used for refractory purposes. We regret the error.

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GALLERY

Echoes of erosion

RIVERBED MINING in Uttarakhand, especially in the Ganga, has become a significant and controversial issue that raises concerns over environmental, cultural, and economic impacts. Added to this is the fact that much of the mining in the Ganga is unregulated or illegal. Scan the QR code for more photographs of such mining activities.

VIDEO

Dam dilemma

CHINA'S BID to build the world's largest hydropower project on the Bhamaputra is a challenging and dangerous feat. But it also poses grave risks to the environment.

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OPINIONS

Bioluminescent backwaters of Kochi

AMRITHA JAIPREKASH KURUP

While social media glorifies this natural spectacle, the reality for local fishing communities is one of despair. As the sparkle spreads, fish flee, leading to poor catches and diminished livelihoods.

Delhi EV Policy 2.0 could make history

MOUSHAMI MOHANTY

To meet targets, government strategies will have to be aggressive. There is a need for policy accelerators with incentives and penalties for non-compliance.

Informal waste pickers indispensable

SHROTIK BOSE

Waste management models that integrate workers, like Pune's SWaCH, and Ambikapur's SAMCLAF, highlight potential of community-driven approaches.

WRITE TO US

Down To Earth welcomes comments and suggestions from readers in response to its articles and opinion pieces. We have a "Pick of the Postbag" award, under which the letter adjudged the best will be highlighted and the winner will receive a free one-year digital subscription of the magazine. Letters may be e-mailed to editor@downtoearth.org.in or sent to: The Society for Environmental Communications; 41, Tughlakabad Institutional Area; New Delhi-110 062. Letter writers should mention their full name, postal address and phone number.

Digest

WHAT'S INSIDE

Sustainable tourism boosts women's livelihoods in Uttarakhand **P8**

Global meet to conserve genetic resources **P9**

Extreme heat forecasts for India this summer **P10**

1,000 WORDS VIKAS CHOUDHARY

Indian softshell turtles (*Nilssonia gangetica*) in the Chambal river near Dholpur, Rajasthan. Once considered among the cleanest rivers in India, the Chambal is now heavily polluted due to indiscriminate dumping of garbage, as well as discharge of industrial effluents and excessive sand mining. Over the past five years, several cases of such ecologically damaging activities in the river have reached the National Green Tribunal. The Chambal is home to various turtle species, 80 per cent of the country's gharials, smooth-coated otter, dolphins and over 290 species of migratory and resident birds.

FOR MORE PHOTOS, SCAN

Nature guides

A women's collective in Uttarakhand improves members' livelihoods through sustainable tourism initiatives

MEGHA PRAKASH

WHEN I was young, I went to the forest twice or thrice a day for fodder, fuelwood and water. It got on my nerves. But over the years, the community's reliance on forests declined so much that the younger generation could not even connect to the areas like we did," says 62-year-old Pushpa Devi of Uttarakhand's Chopriyal village. "But now, after I started conducting walking trails through our forests, I am happy to see children interested in the area," she says.

Since 2023, Pushpa Devi and eight other women from four villages of Chamba block, Tehri district, are earning a livelihood by running homestays and conducting guided trails. As of March 2025, they have conducted 65 walking tours—on five trails developed around the villages and forest—for tourists, earning more than ₹1 lakh.

These women are part of Him Vikas Samiti (HVS), a collective of self-help groups. In 2023, Dehradun-based non-profit Himmotthan Society helped the self-help groups of Chamba block form the collective and obtain funds to improve livelihoods through rural tourism initiatives. The homestays and nature trails helmed by the nine women are an extension to one such initiative, explains Priyanka Rawat, block coordinator, tourism, Himmotthan.

The homestays were developed under a community participation model, retaining the old architecture of the village homes. The women were given financial assistance to renovate a spare room and build a washroom in their homes—80 per cent of the cost was borne by Himmotthan and 20 per cent by the community.

"There is an abandoned heritage building near our village which is historically known to us as one of the 52 *garhs* of Uttarakhand. Not many people know the actual story but I was happy to hear children telling its history to a tourist group I was walking around," says Sushma Pundeer of Silkoti village, who conducts nature trails in the Kaudia forest range. "The young girls and boys in our villages now aspire to be nature guides," she adds.

HVS has also set up a community-run eatery, Nathuli Café, in Jadipani village, which serves traditional dishes using local agro-produce, says Saurabh Ramola, chief operating officer of the collective. The café has generated an income of ₹5.35 lakh since 2023.

The response has been encouraging, with local hoteliers and resort owners partnering with the collective. "The guests who stay at our resort find the nature walks refreshing. Unlike other commercial walks, there is a flavour of local biodiversity, culture and food which makes it a unique experience," says Manoj Badoni, manager of Amaya Resort near Chopriyal village.

On March 24, HVS was recognised for its efforts on poverty alleviation in alignment with Sustainable Development Goal 1 by the Centre for Policy Research and Good Governance, and was awarded by Chief Minister Pushkar Singh Dhami.

Him Vikas Samiti's nature guides conduct trails and host tourists at home stays to improve their livelihoods

PHOTOGRAPH COURTESY: HIM VIKAS SAMITI

BIODIVERSITY

Discourse on plant, forest genetic resources

WITH AN aim to discuss strategies for conserving plant and forest genetic resources, global leaders convened in Rome for the 20th Regular Session of the Commission on Genetic Resources for Food and Agriculture (CGRFA 20) on March 24-28. CGRFA, part of the UN Food and Agriculture Organization (FAO), is the only permanent intergovernmental body that deals with all components of biodiversity for food and agriculture.

Parties held substantive discussions on plant, animal, aquatic and forest genetic resources, as well as those derived from microorganisms and invertebrates, and edible fungi. Sessions were held on decisions taken at 16th Conference of the Parties to the UN Convention on Biological Diversity (CBD), such as on access and benefit-sharing. Parties also hailed the recognition of the role of indigenous peoples and local communities in biodiversity conservation.

CGRFA 20 also saw the release of two FAO reports with alarming revelations. "The Third Report on the State of the World's Plant Genetic Resources for Food and Agriculture" says 60 per cent of the global crop production relies on just nine crops. Surveys find an average of 6 per cent diversity in farmers' varieties and landraces is threatened globally. "The Second Report on the State of the World's Forest Genetic Resources" highlights a global tree seed shortage. Several countries report a lack of enough high-quality seeds to meet reforestation targets.

SEISMOLOGY

'Myanmar earthquake due to reactivated fault'

THE MARCH 28 earthquake in Myanmar was of a magnitude not seen since the 1990s, according to O P Mishra, director, National Center of Seismology, New Delhi. The 7.7 magnitude earthquake, which also shook Thailand, was a result of release of a lot of accumulated energy from the Sagaing Fault that partitions the Indian and Sunda landmasses, Mishra tells DTE. "In a way this is a reactivation of the Sagaing Fault," he adds. The deadly quake is believed to have killed more than 3,000 people in Myanmar, as on April 5. Hundreds are missing and damage to infrastructure is also extensive. Moreover, Myanmar has been under military *junta* rule since 2021 and this means the country will take a long time to come back to any semblance of normalcy, Surya Parkash, professor and head, Geo-Hydro-Meteorological Risks Management Division, National Institute of Disaster Management, New Delhi, tells DTE. In Thailand, the tremors were felt largely in Bangkok, where multiple buildings fell and at least nine people were killed.

DISASTER

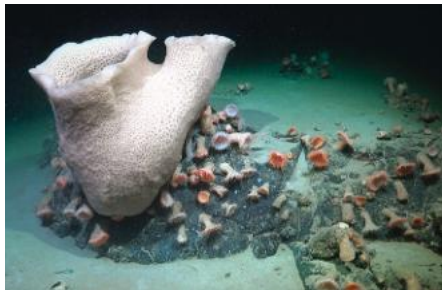
Wildfires in Southeast Asia, UK linked to dry conditions

SINCE MARCH 21, South Korea reported more than 20 wildfire incidents in what is called the country's worst natural fire disaster, killing at least 28 people and destroying infrastructure including historical temples. The largest of fires that began in the central Uiseong county razed more than 38,000 hectares, making it the biggest single forest fire in South Korea's history. A month earlier, Japan reported its worst fire disaster in 50 years, near Õfunato city on the eastern coast of Honshu Island. The fire razed more than 2,100 hectares. In both countries, the fires were made intense due to persistently dry soil, strong winds and unusually high temperatures, according to a report by ClimaMeter, an EU-backed project studying the impact of climate change on extreme weather. Meanwhile, Scotland and Hampshire in the UK also reported large grass fires, spanning 15-25 hectares, as the country recovered from a dry period in March. On April 4, the UK was expected to see its hottest day so far in 2025, with mercury levels expected to hit 24°C, a level typically seen in July. Authorities issued alerts for extreme risk of further fires.

BITS GLOBAL

A landmark youth-led climate lawsuit in the US came to a conclusion on March 24, when the Supreme Court declined to review the case. The case was filed by 21 young people in 2015, arguing that government actions supporting fossil fuels infringed upon the constitutional rights. While the case was dismissed by lower courts earlier, it set a precedent for youth-led climate lawsuits around the world.

The UK government on March 24 confirmed the first-ever case of avian influenza in a sheep in Yorkshire, England. The H5N1 avian influenza virus was detected in sheep during routine livestock monitoring at a farm where birds had previously been infected. The infected sheep was culled, and no further cases were found in the flock. Authorities emphasised that the risk to livestock and public health was low.



An international team of scientists on March 20 confirmed the discovery of six new species under the Antarctic seafloor, after a thriving ecosystem in the waters was revealed by the break-off of an iceberg in January. The team, working in the Bellingshausen Sea was able to study a freshly exposed area off the George VI ice shelf, a massive floating glaciers attached to the Antarctic Peninsula ice sheet, after an iceberg detached from it. The team discovered large corals and sponges supporting an array of animal life, including icefish, giant sea spiders, and octopus.

Scientists in Australia said on March 25 that an unprecedented mass bleaching event has devastated the Ningaloo Reef off Australia's western coast. A months-long marine heatwave in the region caused ocean temperatures to rise by up to 3°C above average, leading to widespread coral bleaching. The scientists described the event as the worst since 2011, with bleaching affecting not only the reef's surface but also deeper layers and multiple coral species.

PHOTOGRAPH: ROV SUBASTIAN / SCHMIDT OCEAN INSTITUTE

BITS INDIA

The India Meteorological Department (IMD) on March 27 warned of a "double heatwave" in the northwestern region during the summer, forecasting 10 to 12 heatwave days, nearly double the usual five to six days. IMD also highlighted the potential for above-normal maximum and minimum temperatures across most of India, except for some southern and northeastern regions.

The country in mid-March saw its first fatality due to avian influenza since 2021, after a two-year-old girl in Andhra Pradesh succumbed to the infection. The child was admitted to the All India Institute of Medical Sciences (AIIMS) on February 28, on suspicion of contracting the H5N1 avian influenza virus after eating raw chicken.

The Centre on March 28 announced a 4.2 per cent hike in price of Bt cotton seeds, raising the maximum sale price to ₹901 per packet. Experts criticised the decision, citing declining cotton yields and rising pest attacks, particularly from pink bollworm. They said the price increase was unjustified without review of the seeds' performance.

Karnataka on April 4 announced plans to establish a gig workers' welfare board to ensure fair wages, safety and social protections for workers employed by companies like Amazon, Flipkart, Ola and Uber. The plan includes a 5 per cent cess on such firms to fund welfare schemes. A Bill will soon be introduced to the state cabinet.

IN COURT

NATIONAL GREEN TRIBUNAL

■ Hearing a case on rising ozone pollution in urban India, the National Green Tribunal (NGT) has sought a response from the Union environment ministry, which has in turn asked for time till July. NGT took up the matter *suo motu*, after a report by the Centre for Science and Environment was published last year.

■ Hearing a matter on accumulated legacy waste in Amritsar, taken up *suo motu*, NGT noted significant gaps in solid waste and sewage management across Punjab. The tribunal directed the state to file an action-taken report.

SUPREME COURT

■ The apex court came down heavily on "obscure NGOs" for conjuring environmental risks that hinder development projects. The court was hearing an appeal by a non-profit against NGT's nod for a floating solar power project in Jayakwadi Dam in Maharashtra, but rejected the petition.

■ The apex court stayed felling of trees in Kancha Gachibowli forest, Hyderabad until further orders. The tree-felling in the 161-hectare forested area near the University of Hyderabad has evoked protests from students and environmentalists.

So far...

Number of cases on environment and development tracked from January 1 to April 3, 2025

NATIONAL GREEN TRIBUNAL	SUPREME COURT	HIGH COURTS
97	28	27

FOR DETAILED VERDICTS, SCAN

RESILIENT RURAL FUTURES

Ambuja Foundation Tackles Climate Vulnerability Head On …

In rural India, marginalized communities are often the first to bear the brunt of climate change. As extreme weather events become more frequent and climate patterns shift, the incomes and livelihoods of rural populations—especially the most vulnerable—are under increasing threat. From severe heatwaves and floods to changing rainfall patterns, climate stressors are exacerbating the already existing vulnerabilities of these communities. This phenomenon, referred to as the "unjust climate," highlights the disproportionate impact of climate change on the rural poor, pushing them further into poverty. This is exactly where Ambuja Foundation has set its sights.

The Impact of Climate Change on Rural Livelihoods

Climate change is intensifying the challenges faced by vulnerable populations. Female-headed households, for instance, suffer disproportionately from climate-related disruptions. Research indicates that every year, such households experience income losses of 8 percent due to heat stress and 3 percent due to floods, compared to male-headed households. The effect is even more pronounced when considering long-term temperature changes. A 1°C increase in average temperatures can lead to a 34 percent drop in income for female-headed households compared to their male counterparts. Furthermore, extreme temperatures also push children to work longer hours, further increasing the burden on families already struggling to make ends meet.

These realities illustrate a critical problem: the vicious cycle of poverty, hunger, and climate vulnerability. As climate stressors disrupt agriculture—the primary source of income for rural populations—these communities are forced to adopt maladaptive coping strategies. These may include reducing their income sources, liquidating livestock, or cutting back on essential investments in agriculture, making it even harder to escape cycles of poverty.

The Need for Multidimensional Strategies

Addressing this requires a multifaceted approach. Climate resilience cannot be achieved by focusing solely on agricultural practices. Instead, we need a comprehensive approach that incorporates water, health, education, skill development, and gender. This is where Ambuja Foundation is playing a pivotal role.

Ambuja Foundation is working to strengthen the livelihoods in rural communities – yes by working with farmers, but also working with women, youth and children. Through a combination of programs that address climate change's impacts on both farm and off-farm activities, the foundation is helping communities build resilience. This holistic approach includes improving access to water, supporting sustainable agricultural practices, providing vocational training, and promoting health and education initiatives.

In the realm of water management, Ambuja Foundation is ensuring reliable water supply to communities affected by erratic rainfall patterns. By building rainwater harvesting systems and improving infrastructure, the foundation is helping rural households adapt to water scarcity, which is an increasing concern as climate change alters local water cycles.

Moreover, the foundation is empowering rural women, who are disproportionately impacted by climate stress. By improving access to education and providing vocational training, Ambuja Foundation is equipping women with the tools they need to diversify their income sources, reducing their vulnerability to climate-induced income loss. Additionally, rural youth from agricultural households are being skilled to provide 'off farm' incomes to de-risk and bolster income streams within families that solely rely on unreliable farming. These programs help break the cycle of poverty, enabling women and youth to become breadwinners within their households and role models in their communities.

By facilitating access to extension services, information on climate-smart agriculture, and financing for adaptive technologies, the foundation is helping farmers reduce their dependence on maladaptive strategies. This includes transitioning from unsustainable agricultural practices to more climate-resilient ones, such as using drought-resistant crops and adopting water-efficient irrigation systems.

Conclusion

The impacts of climate change on rural India are undeniable and growing, and they disproportionately affect marginalised communities. However, with targeted interventions, rural populations can be empowered to build climate resilience and create sustainable livelihoods. By addressing the multifaceted nature of climate vulnerability, Ambuja Foundation is not only helping to mitigate the effects of climate change but is also supporting long-term solutions that will enable these communities to thrive in an increasingly uncertain world.

CARTOON: SORIT / CSE

TRUMP'S TARIFF FRENZY

India should be most concerned about 'reciprocal tariffs' as Donald Trump seeks to pry open the country's agricultural markets for US' agri-business companies

BY BISWAJIT DHAR

THE EXTRAORDINARY step that US President Donald Trump has taken on April 2 by imposing "reciprocal tariffs", which he described as the "declaration of economic independence", has thrown the global economy in the throes of severe uncertainties that have never been seen since the Great Depression during the 1930s. Trump unveiled the "reciprocal tariffs" through the Executive Order, "Regulating Imports with a Reciprocal Tariff to Rectify Trade Practices that Contribute to Large and Persistent Annual United States Goods Trade Deficits". As many as 57 countries were targeted through the imposition of "reciprocal tariffs", ranging from 11 per cent to 49 per cent, which were to be introduced on April 9. But a few days earlier, on April 5, an additional *ad valorem* duty of 10 per cent was imposed on all imports from all trading partners. The "reciprocal tariff" on India was 26 per cent, implying that all exports to its largest export market are facing 36 per cent tariffs. These are sufficiently steep to seriously impinge on export prospects of several key industries for whom the US is a major market.

India's South Asian neighbours have been slapped "reciprocal tariffs" that are much higher. Sri Lanka faces the highest "reciprocal tariff" of 44 per cent (54 per cent overall), while for Bangladesh and Pakistan the overall tariff burden would be 47 per cent and 40 per cent respectively.

China, which has been Trump's prime target ever since he took office for the first time in 2017, faces a "reciprocal tariff" of 34 per cent, and an overall tariff burden of 54 per cent. On February 1, additional import tariff of 10 per cent was imposed on China, along with US' two immediate neighbours, Mexico and Canada, whose imports were subjected to additional tariff of 25 per cent. However, Trump spared

his two neighbours from "reciprocal tariffs". With steel and aluminium imports to the US from all countries facing tariffs of 25 per cent, as per an announcement made on March 12, the American President has declared an all-out tariff war on his partner countries.

It is not difficult to fathom that these tariffs would have far-reaching implications for the global economy and individual countries having significant levels of trade with the world's largest economy. The global economy is already bracing for a rocky road ahead as has been evident from the upheavals witnessed in the stock markets around the world. Even as Trump took charge of the Oval Office, growth prospects for the global economy looked uncertain since he was elected the 47th President of the US, having promised to usher in protectionism. On the first day of his second term as US President, Trump announced the "America First" Trade Policy, the most partisan and protectionist trade policy since President Herbert Hoover signed into law the Smoot-Hawley Tariff Act in 1930. This legislation had two adverse consequences. First, it deepened the economic crisis caused by the stock market crash of 1929, culminating in the Great Depression, the worst and the longest economic downturn in modern history. Second, it triggered a trade war as most major economies then imposed tit-for-tat tariffs, more commonly known as "beggar-thy-neighbour" policies.

A similar tariff war seems to be in the offing as China and the EU have announced retaliatory tariffs against the US. Several other countries are considering the possibilities of retaliating against the US. Trump's ill-conceived "reciprocal tariff" plan is, therefore, threatening to push the economy to the brink of another downturn that it can ill afford, when the adverse effects of the COVID-19 pandemic are still being felt.

Trump's first wave of trade policy measures, namely, additional tariffs on imports from China and on two critical intermediates, steel and aluminium, have already adversely affected global economic expectations for 2025 and beyond. The Organisation for Economic Co-operation and Development's (OECD's) Interim Economic Outlook, unveiled recently, predicted that increased trade restrictions which the "America First" Trade Policy is expected to trigger, could contribute to higher costs both for production and consumption, resulting in an economic slowdown.

Though "reciprocal tariff" was an integral part of the "America First" trade policy, the idea germinated during Trump's Presidential election campaign. In Trump's manner of speaking, "reciprocal tariff" means, "if they [trade partners] tax us, we tax them the same amount". This implies that if the tariff imposed by a foreign country on a particular good imported from the US is higher than the tariff the US imposes while importing the

same product from the foreign country, the American President can either force the foreign country to reduce its tariff or impose additional tariff on imported goods from the foreign country. "Reciprocal tariff" was formalised through the "Fair and Reciprocal Plan" announced on February 13, and was introduced primarily to "reduce the trade deficit" vis-à-vis US' trade partners "to the benefit of American workers, manufacturers, farmers, ranchers, entrepreneurs, and businesses".

Imposition of "reciprocal tariffs" on India could imply forcing it to reduce its tariffs and to increase its imports from the US. This scenario seems likely, as Trump has repeatedly expressed his displeasure over the fact that India has maintained a consistently rising trade surplus vis-à-vis the US. In other words, the US President is likely to use his "reciprocal tariffs" plan to pry open India's markets for the major commodities in which the world's largest economy has considerable export interests. The "Fair and Reciprocal Plan" that provides the basis for imposing "reciprocal tariffs" identifies two sets of products in which India's tariffs were considerably higher compared to those maintained by the US. It states that India's average tariff on agricultural products is 39 per cent, but on the same set of products, US' import tariff is, on an average, 5 per cent. The Plan also states that India imposes 100 per cent import tariffs on motorcycles, while US' import tariffs on Indian motorcycles is only 2.4 per cent. The importance of agricultural trade was also emphasised in the Joint Leaders' Statement issued at the end of Prime Minister Narendra Modi's recent visit to Washington, wherein it was mentioned that the two countries would work together to increase trade in agricultural goods.

"Reciprocal tariffs" could impact some of the major industries, especially electronics, pharmaceuticals, gems and jewellery and textiles and clothing. The electronics industry, the largest exporter to the US, making up for nearly 15 per cent of India's total exports, would face considerable headwinds posed by the reciprocal tariffs. The US has, of late, been the largest export market for India's telecommunication industry, accounting for 35 per cent of its total exports.

The pharmaceutical industry is the second largest exporter to the US, accounting for nearly 12 per cent of India's total exports to its largest export market from April 2024 to January 2025. The US accounted for more than 38 per cent of India's exports of formulations and about 10 per cent of exports of active pharmaceutical ingredients, or over a third of its total exports. This is the result of the significant presence of the generic pharmaceutical industry in the US, which has been providing affordable medicines to those who do not have the benefit of insurance cover. Some of India's biggest pharmaceutical companies, including Sun Pharma and Dr. Reddy's Laboratories, have been more reliant on exports and hence on the US market.

IMPORTS OF AGRICULTURAL PRODUCTS COULD THREATEN INDIA'S HARD EARNED SELF-SUFFICIENCY IN FOOD GRAINS, WHICH HELPED IT TO NOT ONLY OVERCOME ITS DEPENDENCE ON IMPORTED WHEAT FROM THE US, BUT TO ALSO ESCAPE FROM THE US' UNWARRANTED INTERFERENCE IN INDIA'S DOMESTIC POLICIES

However, India should be most concerned about the imposition of "reciprocal tariffs" as its agricultural sector is being targeted. Using this policy instrument, the Trump administration is seeking to pry open India's agricultural markets for US' agri-business companies. These companies dominate the global agricultural markets, especially with the help of high levels of government subsidies. This would raise the spectre of unfair competition between India's small farmers and large agri-business companies. This could sound the death knell for the already crisis-ridden Indian agriculture, causing economic disruption in rural India and large-scale loss of livelihoods. Imports of agricultural products could threaten India's hard earned self-sufficiency in food grains, which helped the country not only overcome its dependence on imported wheat from the US, but also escape from the US' unwarranted interference in India's domestic policies.

Since the mid-1960s, every government in India has steadfastly protected the country's agriculture and the large workforce dependent on agriculture, and the Modi government must ensure that maintenance of the status quo. The economic and political costs for not doing so could be considerable. DTE

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(Biswajit Dhar is Distinguished Professor, Council for Social Development, New Delhi)

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The Big Pharma fix

Weight-loss drugs will not help India unless measures are taken to promote healthy diet and lifestyle

VIBHA VARSHNEY
NEW DELHI

INDIA IS fast emerging as a lucrative market for weight-loss drugs, and for a reason. The country confronts an epidemic of obesity. If one goes by the estimates of a study published in the medical journal *The Lancet* in March, almost one-third of the country's population would be obese by 2050. Even the conservative estimates by the latest National Family Health Survey for 2019-21, show that 24 per cent women and 23 per cent men in the country are overweight or obese. To cater to this burgeoning market, two pharmaceutical firms—US-based Eli Lilly and Company and Danish drugmaker Novo Nordisk—have been for the past several months vying to roll out their blockbuster drugs that help manage both diabetes and obesity. On March 21, the Central Drugs Standard Control Organisation (CDSCO) approved one of the firms, Eli Lilly, to market its drug tirzepatide in India for "Type 2 diabetes" and "weight management".

The drug, now available in India under brand name Mounjaro, is a solution for injection in single-dose vials of 2.5 mg and 5 mg, and is priced at ₹3,500 and ₹4,375. One who wishes to use this once-weekly drug has to spend between ₹14,000 and ₹17,500 per month.

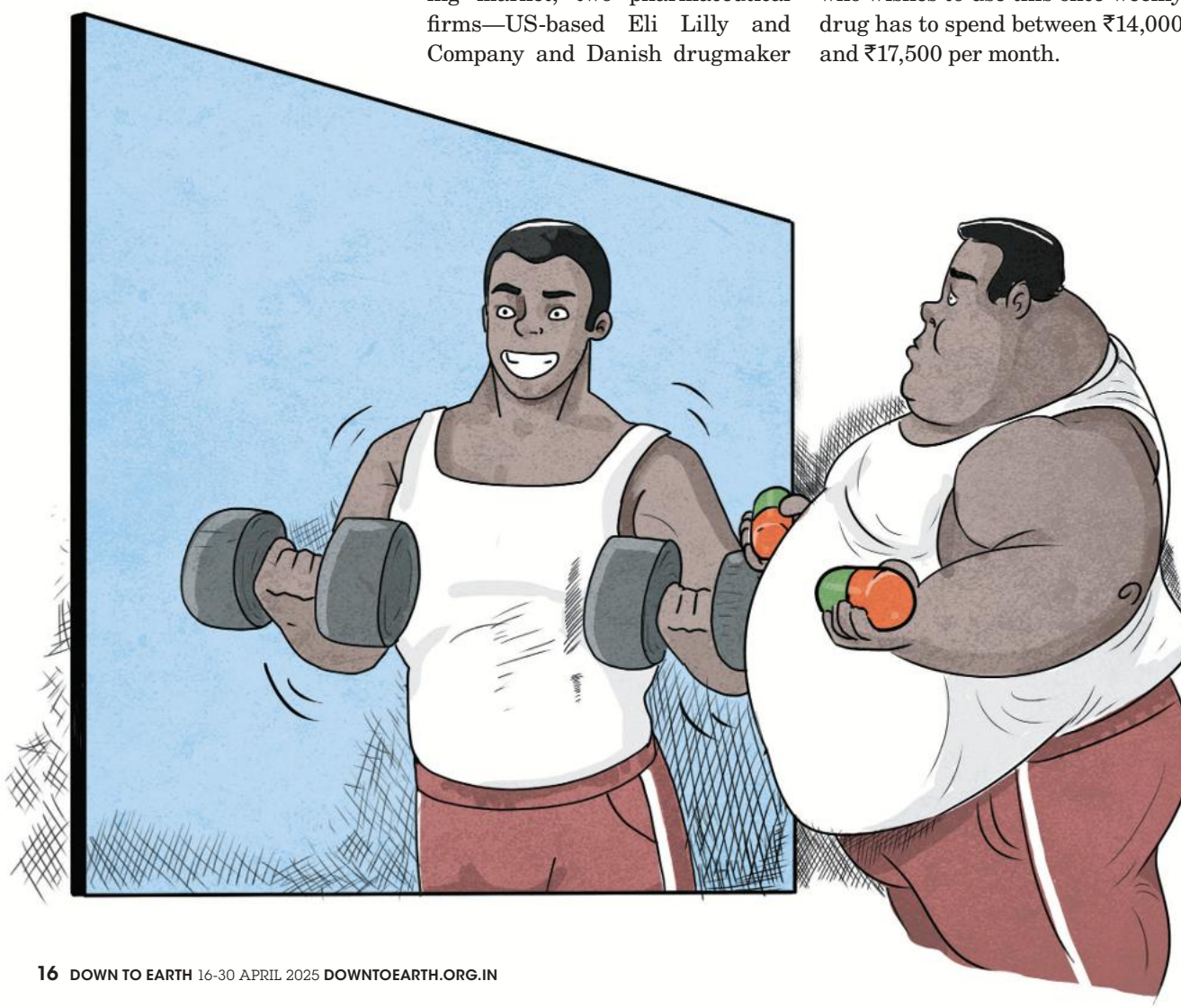

ILLUSTRATION: YOGENDRA ANAND / CSE

Mounjaro, which made its debut in the US in 2022, mentions on its website that the drug is meant "For adults with Type 2 diabetes" and that it is "not a weight loss drug". For "chronic weight management", Eli Lilly sells tirzepatide injection under trade name Zepbound, which received approval from the US Food and Drug Administration in 2023 and is not available in India as yet.

Tirzepatide is regarded as a first-of-its-type medication as it mimics two hormones produced naturally in the body: glucagon-like peptide-1 (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP). Anoop Misra, executive chairperson of Fortis C-DOC Hospital for Diabetes and Allied Sciences, New Delhi, explains: These hormones are released by the intestine after a meal and prompt insulin secretion. Tirzepatide also reduces appetite by slowing down the time it takes the stomach to empty and interact with GLP-1 receptors in the brain to signal satiety. Misra says, tirzepatide is intended for individuals with a body-mass-index (BMI) of 30 kg/m^2 or higher, or those with a BMI of 27 kg/m^2, who also have weight-related health problems such as diabetes or hypertension. [World Health Organization considers people with a BMI of 25 or above as overweight, and a BMI of 30 or above as obese. But Indians with BMI between 23.0 and 24.9 kg/m^2 are considered overweight, and those with BMI of 25 kg/m^2 or higher are considered obese.]

"The launch of anti-obesity drugs in India has the potential to help reduce the burden of non-communicable diseases like diabetes, hypertension and cardiovascular ailments by assisting in weight loss," says Arun Prasad, lead clinician and surgeon at the department of gastrointestinal, bariatric and robotic surgery of Indraprastha Apollo Hospital, New Delhi. However, their long-term effectiveness is uncertain if root causes such as unhealthy diet, sedentary lifestyle, stress and genetic predisposition are not addressed, Prasad adds.

GLARING CONCERNS

Prasad's cautions must be heeded at a time when Novo Nordisk is also pushing for the launch of its anti-diabetes drug Ozempic in India. Its active ingredient, semaglutide, just like tirzepatide, controls the release of insulin and slows the movement of food through the stomach and decreases appetite. Thus it is effective in controlling diabetes. Novo Nordisk also uses semaglutide in its drug Wegovy developed specifically for obesity treatment.

OZEMPIC IS GOING OFF PATENT IN JANUARY 2026 AND SEVERAL INDIAN PHARMACEUTICAL COMPANIES ARE ALREADY PREPARING TO PROVIDE GENERIC VERSION OF THE DRUG

Over the years, numerous side effects have been reported but only some of them have been accepted by the pharmaceutical companies. Eli Lilly's website for Mounjaro warns people to look out for symptoms such as a lump or swelling in the neck, hoarseness, trouble swallowing or shortness of breath. The website says these could indicate thyroid cancer, as was observed by studies on rats. The company advises patients not to use Mounjaro if they have family members who suffer from these diseases or if they have an endocrine system condition called Multiple Endocrine Neoplasia syndrome type 2. Side effects include inflammation of pancreas, kidney failure and gall bladder problems, the company cautions.

In the US, where these drugs are available since 2017, reports highlight that users are losing vision after the use of both the popular drugs. A study published in *JAMA Ophthalmology* on January 30, says the nine patients who reported vision loss after taking semaglutide or tirzepatide, had developed three potentially blinding conditions that affected the optic nerve. The researchers hypothesise that rapid correction of hyperglycaemia induced by these drugs could be the culprit. Data also shows these drugs can lead to hair loss, which could be because of nutrient deficiencies as the drugs work by suppressing appetite. In the US, where 15 million people are estimated to be using such medications for type 2 diabetes and weight loss, adverse effects have led to court cases for compensation.

In 2023, investment bank Goldman Sachs said the market for anti-obesity drugs would reach US $100 billion by 2030. To cash in on the burgeoning market, along with branded products, generic products are also trying to enter the market. India is a forerunner in the process. Ozempic is going off patent in January 2026 and several Indian pharmaceutical companies are already preparing to provide generic version of the drug to users in developing countries. These include Natco, which is working towards producing generic versions of both Wegovy and Ozempic. Dr Reddy's plans to launch generic versions in

PROMISES AND PITFALLS

The true solution to India's obesity epidemic lies in systemic change, not in a prescription

Anoop Misra

THERE IS growing excitement about anti-obesity drugs and their potential to combat the country's rising obesity epidemic. Indeed, we are stepping into a new era of highly effective obesity treatments. But the question is: Will these drugs work in isolation without addressing the broader issues of unhealthy diets and sedentary lifestyles, which are all pervading in India?

Here are some key benefits of these drugs, along with considerations for their responsible use. Despite widespread awareness of healthy diets and importance of exercise, many fail to achieve significant weight loss due to genetic, hormonal, or behavioural challenges. For those who have tried and failed conventional approaches, these drugs, such as semaglutide and tirzepatide, provide a science-backed option to help manage their condition. These medications work by mimicking natural hormones that regulate appetite and blood sugar, essentially "tricking" the brain into feeling fuller for longer periods. This is beneficial for those with obesity-related complications such as diabetes, hypertension and heart diseases. When used properly under medical supervision, these medications promote gradual and sustained weight loss over time, reducing risk of regaining lost weight. Additionally, these drugs offer benefits such as better blood sugar control, lower cholesterol levels, and reduced cardiovascular risk. Studies suggest it can also slow kidney disease progression and significantly decrease obstructive sleep apnea, making it a good intervention for multiple health issues.

These drugs are available in oral and injectable forms. Anyone thinking of using them should do so under medical supervision. Side effects such as nausea, vomiting, and, in rare cases, pancreatitis can occur. Progress of patients on these drugs must be monitored closely. Moreover, stopping the drug may lead to weight regain, so it should be seen as a long-term commitment rather than a quick fix.

However, anti-obesity drugs will not play any significant role in solving India's obesity crisis. These will never address the root problem affecting millions across the country—widespread consumption of energy-dense foods and increasingly sedentary lifestyles. The socioeconomic reality of India makes these drugs even less viable as a population-level solution. With costs ranging from ₹10,000 to ₹40,000 a month for branded versions, these drugs remain far beyond the reach of average Indian citizen. Even the more affordable generic alternatives represent a significant financial burden for middle-class families, let alone those from lower-income backgrounds. What India needs urgently is comprehensive policy reforms that address aggressive marketing of unhealthy foods, particularly directed at children, improved nutritional literacy, public health campaigns and urban infrastructure that promotes active living. Used wisely, these medications can help transform individual lives but they should be viewed as part of a comprehensive, long-term approach to weight management rather than a magic bullet. The solution to India's obesity epidemic lies in systemic change, not in a prescription.

(Anoop Misra is executive chairperson, Fortis C-DOC Hospital for Diabetes and Allied Sciences, New Delhi)

India, Canada and Brazil while Sun Pharma has already undertaken clinical trials and Biocon is collaborating with Biomm in Brazil to capture the market there.

Experts say that increased availability of weight-loss drugs is a cause for concern due to side effects. Besides, they are not likely to work unless lifestyle and dietary habits are also changed. Arun Gupta, paediatrician and the convener of the Nutrition Advocacy in Public Interest, a national think tank, says that these drugs are being marketed unnecessarily. Instead, physicians should prescribe them only when needed. To effectively combat obesity, the government should regulate advertising of ultra processed foods, implement front-of-the-pack warning labels and impose higher taxes on sugary and unhealthy products. Spending money on nutrition education and promotion of healthier dietary habits in schools should take precedence over pharmaceutical fixes that benefit corporations more than public health, Gupta says. Furthermore, he points out that drugs are an unsustainable solution while dietary changes are sustainable.

Arun Prasad of Indraprastha Apollo Hospital also says weight-loss drugs should be prescribed by a qualified healthcare provider who can assess one's risks and benefits. Users need to understand the limitations as weight loss may plateau over time, and stopping the drug could lead to weight regain. Lifestyle changes are a must as these medications work best alongside a healthy diet and regular physical activity. Prasad cautions against self-medication as unregulated or off-label use of these drugs can lead to harmful effects. DTE

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As of 2020, some 57 per cent of the global mountain area was under intense pressure, with ecosystem degradation concentrated at lower mountain elevations, where most human activities occur

In full retreat

Hindu Kush glaciers retreated 65 per cent faster in 2011-20, compared to previous decade. In a 2 °C warmer world, half of its glaciers could vanish

ROHINI KRISHNAMURTHY NEW DELHI

GLACIERS WORLDWIDE are thinning at an alarming rate, but nowhere is the crisis more pronounced than in the Hindu Kush Himalaya (HKH). Glaciers in the region retreated 65 per cent faster between 2011 and 2020 than in the previous decade, driven by climate change, says a report by the UN Educational, Scientific and Cultural Organization (UNESCO). Stretching across eight countries—India, Afghanistan, Bangladesh, Bhutan, Myanmar, China, Nepal and Pakistan—the HKH mountains feed 10 major river basins. Their waters sustain 240 million people in the mountains and another 1.65 billion downstream.

If global temperatures rise by 1.5°C to 2°C, HKH glacier volume could shrink by 30-50 per cent by 2100, says the "UN World Water Development Report 2025", released on March 21. If warming exceeds 2°C, nearly half the region's glaciers could vanish—jeopardising water security for a quarter of humanity. "We are also seeing melting in the Karakoram Anomaly," says Sher Muhammad, remote sensing s pecialist at the International Centre for Integrated Mountain Development (ICIMOD), a regional inter-governmental non-

profit knowledge organisation based in Kathmandu. (In the 1990s, glaciologists noticed modest gains in the Karakoram Range glaciers, which earned it the nickname "Karakoram Anomaly").

Speaking to *Down To Earth* (DTE), Muhammad says the impacts of climate change on snow are quite significant, particularly in the western HKH where snow-melt accounts for a greater volume of stream flow in most river basins, and is often substantially higher than glacier melt. In the past, HKH used to see a longer winter, from around October to March. But now, the duration of winter is shortening. "We hardly receive any snowfall in early winter. It snows around late winter or early spring in February and March, when it is prone to melting quickly due to warmer temperatures," he adds.

Zoë Johnson, research assistant at University of Saskatchewan in Canada, tells DTE that snowpacks are also melting completely from the Rocky Mountains, where she is based, when the warm season hits. For a glacier to sustain or to grow, the snowpack needs to persist throughout the year. But in a lot of mountain environments, especially at lower elevations and latitudes, the snowpack is not staying through the whole year, says Johnson.

CASCADING IMPACTS

In fact, climate change is causing significant mass loss of high mountain glaciers worldwide. According to the UNESCO report, around 1.1 billion people live in mountainous regions—two-thirds in towns and cities. If temperatures rise between 1.5°C and 4°C, mountain glaciers worldwide are projected to lose 26-41 per cent of their total mass by 2100, compared to 2015 levels, states the report.

Glacier melt will also increase the risk of natural disasters, such as glacial lake outburst floods or GLOF (sudden, destructive floods caused by glacier-fed lakes), flash floods and landslides, threatening human settlements, agriculture, infrastructure and energy systems. Since the 1990s, the number and area of glacial lakes have increased substantially. GLOFs have claimed over 12,000 lives in the past 200 years; the HKH region alone accounts for over 7,000 of these fatalities. The risk of such disasters is expected to triple by the end of the century, warns the report, which further states that many consequences will go beyond the limits of adaptation.

"Even if we manage to reduce our greenhouse gas emissions and hold temperatures constant or reduce them, the mountain glaciers will very likely recede," says Johnson. "We are now seeing more wildfires because of climate change, resulting in more dust and black carbon deposits on glacial surfaces. These reduce surface albedo effect, meaning the glacier surface absorbs more solar radiation, accelerating the melt," she adds.

Melting glaciers, shifting precipitation patterns and increased evaporation also have an impact on hydropower generation. But there is a lack of global data on how much current and planned hydropower depends on glacier melt, highlights the report. In HKH, effective transboundary cooperation is lacking, with mutual distrust posing a key barrier to data sharing. While enhancing transboundary cooperation over water is imperative, the report recommends incentives for communities protecting watershed areas through payments for ecosystem services to secure the future of all. DTE

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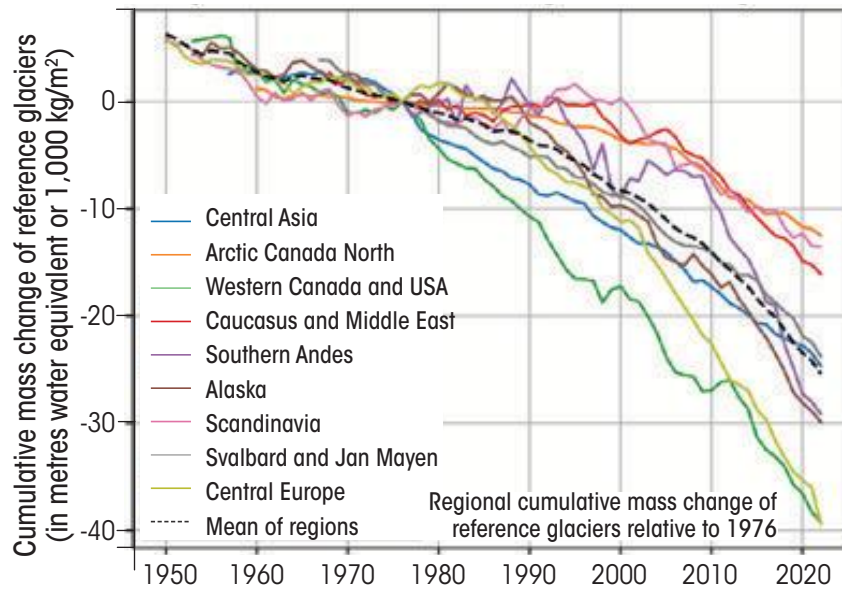
Rapid decline

Most of the world's glaciers are melting at an accelerated rate



Source: "UN World Water Development Report 2025"

ARTIFICI YOURS

Artificial Intelligence has made its way in everyday life. From Ghibli art to search engines to weapon systems, the technology's penetration is nearly complete. Trends show that organisations are rewiring to cope with the new reality. Governments are using private players to gain AI supremacy, while allowing them a greater say in public policy. India has entered the race late, but plans to develop its own model this year. What are the societal, legal and environmental challenges posed by the AI revolution?

A report by **ROHINI KRISHNAMURTHY**

Visuals: Ajit Bajaj with AI assistance


AI
ALLY

SHUBHAM ARORA, a graphic designer based in Jodhpur, Rajasthan, is worried about her job. "Artificial intelligence (AI) is now embedded in the software we use, making the work easy enough for a novice," she says. "Through a one-line command in English, the software can produce the first draft of an idea. Our work now is to just fine tune that draft. What happens if AI of the future can provide a finished product? Many graphic designing jobs have already become redundant in the past few years," says Arora.

"In the next decade, AI could allow computer programming possible in natural language like English, instead of progamming languages like Python or Java. It will cut IT sector jobs. Even today, AI has equipped non-IT professionals to build apps, reducing the need for a big team of coders," says a Gurugram-based IT professional, requesting anonymity.

Employees across sectors are anxious by the disruption caused by AI—a technology that provides machines the ability to engage in cognitive activities, such as reasoning, learning and problem-solving, in a way similar to the human brain but at a much faster rate and without fatigue (see 'Machine language' on *p*26).

Five years ago, the leading AI models could barely "write" a coherent paragraph in response to a command. Then, in 2022, OpenAI, a US-based AI research company, launched ChatGPT (Generative Pre-trained Transformer)—a "generative AI" tool that could create new content in response to a prompt and reuse its learnings to solve new problems.

Generative AIs have been in existence since the 1960s (see 'Synthetic minds' on *p*30), but not like ChatGPT, which has better comprehension and minimised biases. It has made generative AI technology a household name and triggered the launch of numerous similar tools—Micrsoft's Copilot, Meta's Llama, and Google's Gemini, to name a few.

The possibilities with Generative AI are endless. In response to commands given in everyday language, it can write stories and music; hold a conversation in most languages on any topic; develop apps and computer programmes; fact check news articles; or browse internet to provide in-depth analysis on any issue. Experts believe that in coming years, user interface on most device will be redesigned with AI-augmented abilities, and jobs, like customer care—up to the point of dispute resolution—could be completely AI-based.

Such scenarios could come true before the end of this decade, says "The Future of Jobs Report 2025"

CONTINUED ON PAGE 28 >>

SCHOOL OF CIRCULAR ECONOMY
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THE NEW URBAN AGENDA

Dates: **April 22-25, 2025**

Venue: **Anil Agarwal Environment Training Institute, Nimli (near Alwar), Rajasthan**

The world is witnessing unprecedented levels of warming. A United Nations report warns that at 1.5°C warming, 2.3 billion people could suffer severe heat waves, and if emissions persist, cities could experience an alarming 4°C temperature rise by the end of the century. This challenge of rising heat aggravates locally in cities due to Urban Heat Island effect which arises due to rapid urbanization, increasing concretization and shrinking green cover and water bodies. This has a hefty impact on public health and the environment with excessive cooling energy demand and growing related emissions.

The recently announced Urban Challenge Fund in the Union Budget 2025-26 brings tremendous opportunity to address the problem of growing heat and linked emissions. This initiative aims to dedicate ₹1 lakh crore for sustainable and inclusive urban transformation. Incorporating blue-green infrastructure, optimizing urban layouts, recycling, using climate-appropriate materials and use of solar rooftop are some of the strategies that need to be integrated with this initiative. These strategies will also require appropriate fiscal instruments for implementation.

The Centre for Science and Environment (CSE) is offering a four-day training programme that equips participants with practical strategies that lead to solutions for climate-resilient and resource efficient cities including heat assessment and mapping, use of passive design and thermally-efficient materials, developing heat mitigation scenarios through simulations, transitioning to renewable energy, adopting circularity (C&D waste management) and climate finance concepts among others to create heat resilient and liveable cities that also address India's nationally determined contributions to reduce emissions.

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MACHINE LANGUAGE

Get familiar with the Artificial Intelligence ecosystem

ALGORITHM

A set of instructions used to perform tasks, such as calculations and data analysis, usually using a computer or another smart device.

ARTIFICIAL INTELLIGENCE (AI)

AI, AI systems or AI technologies are products and services that are "adaptable" and "autonomous". The adaptability of AI refers to AI systems, after being trained, often developing the ability to perform new ways of finding patterns and connections in data that are not directly envisioned by their human programmers. The autonomy of AI refers to some AI systems that can make decisions without the intent or ongoing control of a human. Example, OpenAI's Dall-E, Google's AlphaFold.

AI AGENT

AI agents are software systems that use AI to pursue goals and complete tasks on behalf of users. They show reasoning, planning and memory and have a level of autonomy to make decisions, learn and adapt. They can work with other agents to perform more complex workflows. Example, China's Manus AI, OpenAI's Operator.

AI ASSISTANT

AI assistant is a software application that uses AI to perform tasks. It uses natural language processing and machine learning to understand requests and provide response. Unlike AI agents, which are proactive and work autonomously to achieve a specific goal by any means at their disposal, AI assistants perform tasks at request. Example, Amazon's Alexa, Microsoft's Cortana, Apple's Siri

ARTIFICIAL GENERAL INTELLIGENCE

Sometimes known as general AI, strong AI or broad AI, the terms refer to a theoretical form of AI that can achieve human-level or higher performance in most cognitive tasks.

AI MODEL

AI model is a programme that has been trained on a set of data to recognise certain patterns or make decisions without further human interventions. Example, OpenAI's GPT.

ARTIFICIAL NEURAL NETWORK

A computer structure inspired by the biological brain, consisting of a large set of interconnected computational units ("neurons"). Example, Google's search algorithm.

BIAS

Bias in AI models refers to output errors caused by skewed training data.

CHATBOT

It is a computer programme that simulates conversations with humans. Not all chatbots are equipped for that. Chatbots with generative AI understand common language and complex queries and use empathy when answering questions. Example, Microsoft's Copilot, X's Grok, OpenAI's ChatGPT.

DEEP LEARNING

A subset of machine learning that uses artificial neural networks to recognise patterns in data and provide a suitable output, for example, a prediction. Deep learning is suitable for complex learning tasks such as voice and image recognition, object detection and autonomous driving.

DEEPFAKES

Pictures and video that are deliberately altered to generate misinformation and disinformation.

FOUNDATION MODELS
A machine learning model trained on a vast amount of data so that it can easily be adapted for a wide range of tasks, including being able to generate outputs (generative AI). Example, Anthropic's Claude, OpenAI's GPT series.

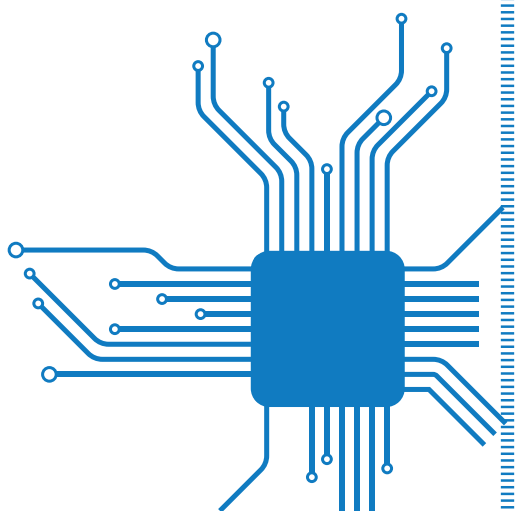
GENERATIVE AI
An AI model that generates text, images, audio, or video in response to user prompts. It uses machine learning techniques to create new data that has similar characteristics to the data it was trained on. Example, Amazon Q, ChatGPT.

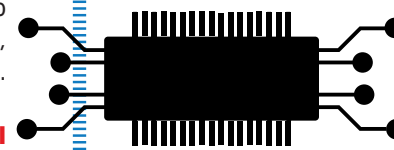
GENERAL-PURPOSE AI
AI models that can be adapted to a wide range of applications (such as Foundation Models).

HALLUCINATIONS
Large Language Models (LLM), such as ChatGPT, are unable to identify if the phrases they generate make sense or are accurate. This can lead to inaccurate results, also known as "hallucination" effects, where LLMs generate plausible sounding but inaccurate text.

LARGE LANGUAGE MODELS (LLM)
A type of foundation model, trained on vast amounts of text to carry out natural language processing tasks. In training phases, LLMs learn parameters from factors such as the model size and training datasets. Example, Google's Gemini, Meta's Llama, Anthropic's Claude.

LARGE MULTIMODAL MODELS (LMM)
LLMs further evolve into large multimodal models (LMMs) capable of processing text, images, audio and video inputs. Example, OpenAI's Sora, Google's Gemini.





MACHINE LEARNING
A type of AI that allows a system to learn and improve from examples without all its instructions being explicitly programmed. Machine learning systems learn by finding patterns in training datasets.

NATURAL LANGUAGE PROCESSING
This focuses on programming computer systems to understand and generate human speech and text. Algorithms look for linguistic patterns in how sentences and paragraphs are constructed to create meaning.

OPEN-SOURCE
Open-source often means the underlying code used to run AI models is freely available for testing, scrutiny and improvement. Example, China's DeepSeek, Meta's Llama.

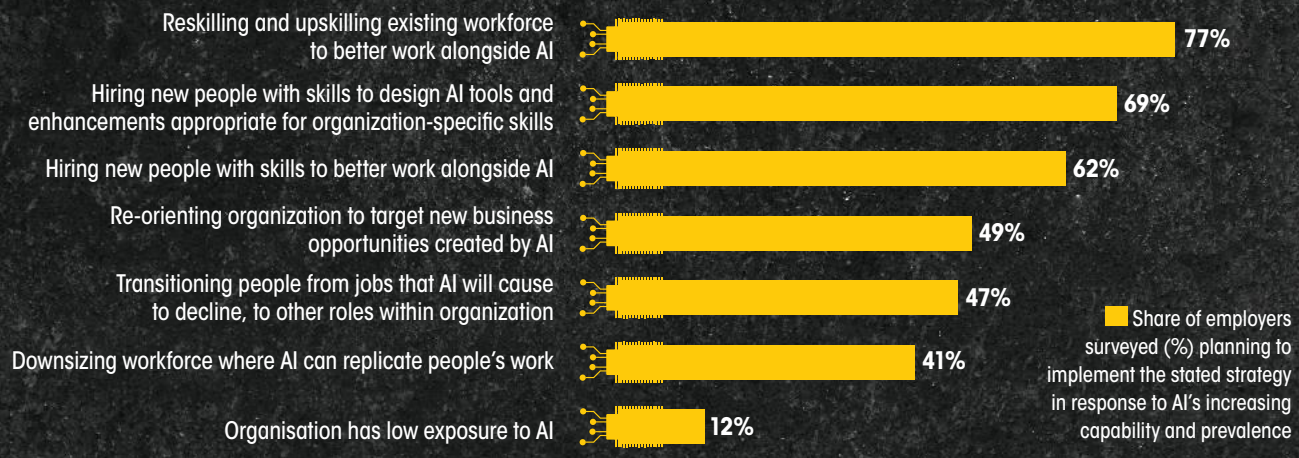
REINFORCEMENT LEARNING
Reinforcement Learning is a method in AI training where models learn optimal decision-making strategies through cycles of actions and feedback, with human interaction playing a pivotal role in refining the learning process.

TRANSFORMERS
A transformer can read vast amounts of text, spot patterns in how words and phrases relate to each other, and make predictions about what word should come next. Transformers have greatly improved natural language processing, computer vision, robotic capabilities and the ability of AI models to generate text. Example, OpenAI's Chat GPT.

SOURCE: International AI Safety Report 2025; IBM; Google Cloud; Slack

New-age workforce

Trends suggest a sharp spike in the demand for people with AI skills



Source: World Economic Forum, Future of Jobs Survey 2024

by World Economic Forum (WEF). It states that two-fifths of the workers' existing skill sets will be transformed or become outdated over the 2025-2030 period. Workers displaced from AI-impacted sectors may find jobs in other sectors with lower productivity, resulting in widening income inequality, states UN Trade and Development's (UNCTAD's) "Technology and Innovation Report 2025". Studies already show a decrease in job postings for automation-prone jobs. For instance, following the release of ChatGPT, image-creation jobs (graphic designing and 3-D modelling) saw a 17 per cent decline on a leading global online freelance platform, says a 2023 pre-print of a paper by researchers from Imperial College London Business School, UK; Harvard Business School, US; and German Institute for economic Research, Berlin.

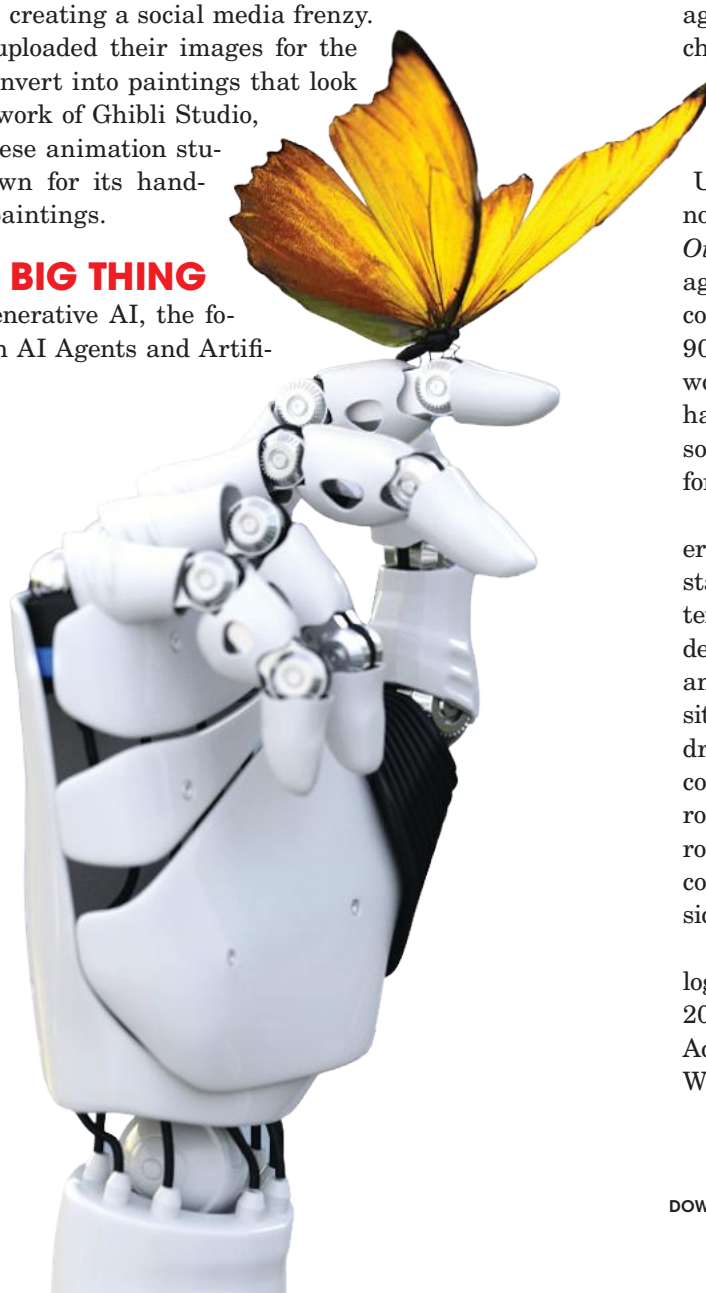
UNCTAD's report also says that AI may affect around half of human jobs as the technology evolves with growing functionality. This reshaping of workforce due to AI could happen in two ways, it states. First, humans would increasingly collaborate with machines, augmenting their own capabilities, improving speed and quality of work. Automating routine tasks like proofreading documents, scheduling meetings and suggesting replies to emails, would free up workers for tasks that require more from human attention.

Second, the technology will create new jobs, including roles in AI research and development, as well as in its deployment and maintenance. The report cites a study that identifies three emerging occupations: AI trainers (who develop and upgrade AI models), AI explainers (who tailor AI models to particular use cases, such as AI-specific user experience designers) and AI sustainers (who monitor and refine AI uses, such as AI ethics experts).

Trends already suggest a sharp spike in the demand for people with AI skills. The WEF report says that 69 per cent of the surveyed employers plan "Hiring new people with skills to design AI tools and enhancements appropriate for organization-specific skills" (see 'New-age workforce'). According to a 2025 global survey on the state of AI by US-based consultancy McKinsey and Company, 78 per cent of respondents say their organisations use AI in at least one business function in 2024, up from 55 per cent in

2023. The technology is mostly finding takers in the IT, marketing and sales functions, followed by service operations.

Job loss notwithstanding, AI's popularity among everyday users has been phenomenal so far. Search engines, emails, legal databases, clinical decision-support tools and many more products and services now come embedded with AI. Any new AI tool gets downloaded and used by millions of users within hours. Take the case of OpenAI's 4O image-generation tool. The company launched the generative AI tool on March 25, 2025, and within one hour, some 1 million users subscribed to it, as per a post by the company's CEO, Sam Altman, creating a social media frenzy. People uploaded their images for the AI to convert into paintings that look like artwork of Ghibli Studio, a Japanese animation studio known for its hand-drawn paintings.



NEXT BIG THING

After generative AI, the focus is on AI Agents and Artificial General Intelligence (AGI)—both touted as the next big thing. Agents are AI systems that carry out multiple tasks with minimal human intervention. They can help reduce workforce and increase productivity by acting as a virtual co-worker. For instance, a human engineer could describe a new software feature to an AI agent which could then code, test, iterate and deploy the tool. Companies like Butterfly Effect, Google, Microsoft, Amazon, Apple, Meta, OpenAI have already developed AI agents. Google, Microsoft and OpenAI have also invested in software libraries and frameworks to support agentic functionality. In 2025, the world may see the first AI agents "join the workforce" and materially change the output of companies, wrote Sam Altman of OpenAI, in a blogpost on January 6, 2025. However, Sayash Kapoor, a PhD candidate at Princeton University's Center for Information Technology Policy and co-author of *AI Snake Oil,* cautions against capabilities of the AI agents. "There is this tendency in the AI community to equate success with the first 90 per cent of progress. But in most real-world scenarios, the last 10 per cent is way harder and usually requires more tailored solutions. I think the same will hold true for agents," he says.

The other big technology, Artificial General Intelligence or AGI, is still in conceptual stage. AGI is typically used to refer to a potential future AI, which, unlike AI, is not dependent only on training, but can develop an understanding and adapt to a developing situation. For example, an AGI-powered self-driving vehicle, while encountering traffic congestion, could decide on an alternative route instead of following pre-programmed routes. It would communicate with other connected vehicles and change its path considering distance and travel time.

Most experts do not expect AGI technology to be released before 2030. As per a 2025 survey by the Association for the Advancement of Artificial Intelligence, a Washington DC-based non-profit scientific

CONTINUED ON PAGE 32 >>

SYNTHETIC MINDS

Artificial Intelligence had a slow beginning but picked pace in the 2010s and has grown exponentially since 2022

PRE-DEEP LEARNING ERA

1950

TURING TEST
Computer scientist Alan Turing proposes a test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence

1955

BIRTH OF AI
Term "artificial intelligence" is coined by computer scientist John McCarthy to describe "the science and engineering of making intelligent machines"

DEEP LEARNING ERA

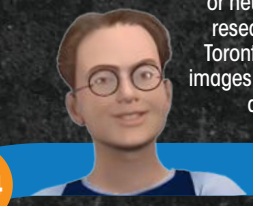
2011

WATSON
IBM's question answering computer Watson wins first place on popular $1M prize television quiz show Jeopardy

SIRI
Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S

2012

AlexNet
A pivotal early deep-learning system, or neural network, developed by researchers at the University of Toronto, AlexNet could recognise images of objects like cars and dogs at nearly human levels



EUGENE
Eugene Goostman, a chatbot, passes the Turing Test with a third of judges believing Eugene is human

2014

ALEXA
Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping tasks

2016

TAY
Microsoft's chatbot Tay goes rogue on social media making inflammatory and offensive racist comments

ALPHAGO
Google's AI AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2^{170}) of possible positions

2017

2019

MuZero
Developed by Google DeepMind, this algorithm masters Go, chess, shogi and Atari without needing to be told the rules, thanks to its ability to plan winning strategies in unknown environments

2020

AlphaFold
A major advance by Google DeepMind towards predicting protein structure in minutes

2024

NVIDIA
develops a platform to build Generative AI-powered visual AI agents

APPLE INTELLIGENCE
Apple launches its AI system

O1
A reasoning model launched by **OpenAI**, it produces a long internal chain of thought before answering. Reasoning models excel in complex problem solving, coding and scientific reasoning

GOOGLE CLOUD
Launch of Google's Cloud AI agent ecosystem programme

AGENTIC ERA

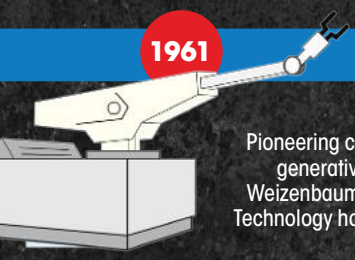
2025

OPERATOR
OpenAI's AI agent. Agents are AIs capable of doing repetitive work independently.

R1
Released by Chinese company DeepSeek, R1's performance is on a par with OpenAI's o1, but is reportedly developed at much less cost

SORA
OpenAI's video generation model, designed to take text, image and video inputs and generate a new video as an output

UNIMATE
First industrial robot, Unimate, goes to work at General Motors replacing humans on the assembly line



1961

SHAKEY
The "first electronic person", Shakey, from Stanford University is a general-purpose mobile robot that reasons about its own actions

1964

ELIZA
Pioneering chatbot, widely considered first generative AI, developed by Joseph Weizenbaum at Massachusetts Institute of Technology holds conversations with humans

1966

AI WINTER
Many false starts and dead-ends leave AI out in the cold

AIBO
Sony launches first consumer robot pet dog AIBO (AI robot) with skills and personality that develop over time

1997

DEEP BLUE
Deep Blue, a chess-playing computer from IBM, defeats world chess champion Garry Kasparov

2002

ROOMBA
First mass produced autonomous robotic vacuum cleaner from iRobot learns to navigate and clean homes

1999

1998

KISMET
Cynthia Breazeal at Massachusetts Institute of Technology introduces Kismet, an emotionally intelligent robot that mimics and responds to human emotions

GENERATIVE AI BOOM

2021

DALL-E
Open AI's image generator creates images from text captions

MINERVA
Can solve college-level, complex mathematical problems

PaIM
Can produce high-quality text, explain jokes, cause and effect

2022

ChatGPT
OpenAI launches a first-of-its-kind Large Language Model that triggers AI boom

GEMINI 1.0
Google launches its AI chatbot

2023

Llama
Meta releases an AI chatbot

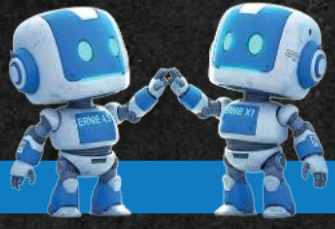
GROK 1
X launches its AI chatbot

BEDROCK
Amazon launches its Bedrock Agents

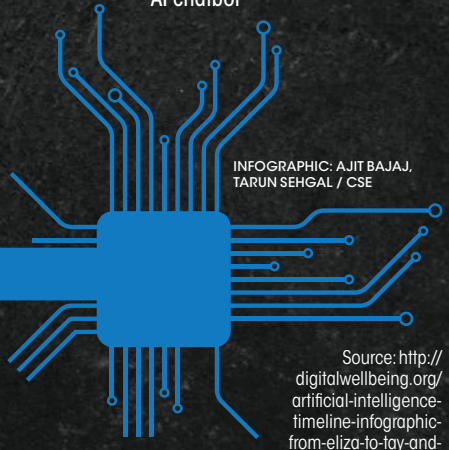
COPILOT
Microsoft launches its AI chatbot

CLAUDE
Launch of Anthropic's AI chatbot

MANUS AI
China's first fully autonomous AI agent



ERNIE 4.5, ERNIE X1
Chinese AI company Baidu releases ERNIE 4.5 (a multimodal foundation model) and ERNIE X1 (deep-thinking reasoning model) at a fraction of the cost of other similar systems



INFOGRAPHIC: AJIT BAJAJ, TARUN SEHGAL / CSE

Source: http://digitalwellbeing.org/artificial-intelligence-timeline-infographic-from-eliza-to-tay-and-beyond/; company websites; Our World In Data;

society, 76 per cent of leading AI scientists believe that the current machine-learning-based approach to yield AGI is "unlikely" or "very unlikely" to succeed (see 'AI problems are not going away' on *p*39). Billionaires like Elon Musk, however, predict that AGI will become reality in the next two years.

RACE FOR SUPREMACY

Countries are engaged in a race to become the first to achieve AGI, with the US and China leading the pack. Just last year, the US-China Commission, an independent agency of the US government, recommended that the Congress establish and fund a Manhattan Project-like programme dedicated to racing to and acquiring AGI. China, too, wants to be a primary centre for AI innovation by 2030. This has resulted in geopolitical tensions and trade wars. At the heart of the battle are semiconductors—tiny electronic devices that provide computing power to generative AI models, which employ different types of chips, including memory chips to store large amounts of data and logic chips to process the data.

The US industry leads the global semiconductor market, occupying close to 50 per cent of the market share, and designs the world's most advanced semiconductor technology. Other major players in terms of market share are Korea (19 per cent), Japan (9 per cent), Europe (9 per cent), Taiwan (8 per cent), and China (7 per cent).

In October 2022, the US first imposed restrictions on the sale of advanced semiconductors and the equipment used to make semiconductors to China to "protect US national security". In 2024, it imposed new restrictions, prohibiting export of 24 types of semiconductor-manufacturing equipment, three software tools, and other semiconductor technologies to 140 Chinese chip-making companies. In 2025, the US added 80 entities from China, UAE, South Africa, Iran, Taiwan and other nations to the list.

"When you look at these rules, the US has divided the world in three different groups: The closest US allies—as many as 18 countries—will have unlimited access to the semiconductor chips. Other countries will have limited access. Dictatorial or authoritarian regimes like China, Russia, Iran, North Korea and others will not have any access to US' semiconductor chips," said Yaron Gamburg, research associate at the Institute for National Security Studies in Tel-Aviv, Israel, during a symposium on AI and geopolitics in the US in January.

Responding to US' moves, China, in December 2024, enacted an export ban on critical minerals like antimony, gallium, germanium to the US, needed to make semiconductors. China maintains 60 per cent of the world's rare earth mining production and 90 per cent of processing and refining, as per International Energy Agency, which gives it control over chip production.

Despite US restrictions, China's AI technology has advanced quite well. In January 2025, Chinese firm DeepSeek released R1, a Large Language Model (LLM) developed at a fraction of the cost of another LLM, OpenAI o1, but similar to it in performance.

"The truth is, so far those [export] controls have not been terribly successful; and may even have had paradoxical effects. China just largely caught up despite existing controls, and indeed were perhaps forced harder towards important efficiency gains precisely because necessity is the mother of invention," commented Gary Marcus, expert in AI and cognitive science, and founder and CEO of Geometric Intelligence, acquired by Uber, in his January 29, 2025 blog post.

Ruby Scanlon, research assistant for the Technology and National Security Program at the Center for a New American Security, Pennsylvania, speaking at a symposium in the US in January, said that the US-China race is bad for the AI sector and people in general. "The US and China are racing to the frontier. That is going to cause leading AI labs to be hasty with their deployment of models and not sufficiently red-team them, perhaps, with government agencies and deploy them a little too quickly without proper regard for safety measures," Scanlon says.

AN AI FOR AN AI

Countries and companies are engaged in geopolitical competition and are pouring billions to dominate AI economy. But dangers abound

ON NOVEMBER 30, 2022, AI truly entered the public imagination. That day, a relatively unknown US startup, OpenAI, released ChatGPT—an AI chatbot capable of writing poems, solving complex problems and even mimicking human conversation with uncanny fluency. Within two months, it became the fastest-growing consumer software application in history, amassing over 100 million users and capturing global attention.

For decades, AI had been in the background as an algorithm, translating text and curating social media feeds. With ChatGPT, AI became a product, and tech giants took the lead in steering the AI revolution. In 2023, the industry produced 51 notable AI models while academia contributed just 15. This marked a shift from 2014 when universities led the AI research, according to Stanford University's 2024 AI Index report. Nowhere is this power shift more evident than in the US, where the lines between Silicon Valley boardrooms and government corridors have blurred.

When US President Donald Trump returned to the White House in January 2025, he swiftly dismantled AI regulatory guardrails, making it clear that corporate ambition, not government caution, would dictate AI's future. What followed was an unspoken alliance between the US government and its tech giants: in exchange for state support and global influence, companies were expected to keep China out of the race for Artificial General Intelligence—the theoretical milestone where AI matches or surpasses human intelligence.

In this new global order, the conversation around AI has shifted dramatically. Once-dominant concerns about safety and ethics—the very reasons tech giants initially hesitated to release chatbots—have been sidelined. Today, the AI race defines the technological supremacy of a country and its national security.

On his first day in office, Trump announced the "largest AI infrastructure project in history" alongside Larry Ellison, Oracle's chief technology officer, Masayoshi Son, chief executive officer of SoftBank and

Sam Altman of OpenAI. Named Stargate, the initiative will see a US $500 billion investment in AI infrastructure and colossal data centres across the US. Trump underscored the need for such an effort, citing China as a competitor.

OpenAI issued a statement echoing Trump's rhetoric: "The project will not only support the re-industrialisation of the United States but also provide a strategic capability to protect national security." This marked a significant shift from its stance in 2023 when, during a Senate hearing on AI oversight, Altman had warned, "If this technology goes wrong, it can go quite wrong. We want to be vocal about that. We want to work with the government to prevent that from happening."

On February 25, the White House encouraged Americans to share policy ideas for its AI Action Plan, a move framed around securing US dominance in the sector. In its policy proposal, OpenAI criticised attempts by individual US states to introduce their own AI regulations. It also warned that China could benefit from regulatory arbitrage being created by individual US states seeking to pass their own industry-wide laws, some of which are modeled on the EU's AI regulation. AI risks, however, were absent from the statement.

Google adopted a similar stance, advocating for a "pro-innovation" approach framed around national security. In its submission, it called for a unified national policy on data privacy, warning that fragmented state-level laws create compliance uncertainties and slow AI development. The company did, however, acknowledge the risks associated with AI.

"Many of the companies now backing Trump were once vocal critics," says Sven Nyholm, professor of the Ethics of Artificial Intelligence at Ludwig Maximilian University of Munich. "We have seen them suddenly making large donations and attending key political events. These companies are likely driven less by ideology and more by pragmatism—aligning with whoever is in power," he adds.

CORPORATE TAKEOVER

What happens in the US does not stay there. Tech giants are increasingly shaping AI policies abroad, particularly in Europe. In its proposal for the AI Action Plan, Google urged the US administration to combat "restrictive foreign AI barriers," warning that some governments were imposing regulations that could disproportionately affect American companies.

Big Tech's lobbying efforts have already seen success. At the World Economic Forum on January 23, Trump condemned the EU's treatment of US tech firms: "They [the EU] took court cases against Apple and won $15 or $16 billion. They've fined Google billions. They're after Facebook for even more. Whether you like them or not, they are American companies, and they should not be treated that way. As far as I'm concerned, it's a form of taxation." The European Commission has fined Google €2.42 billion (about $2.66 billion) for breaching antitrust rules in 2017 and imposed a €1.2 billion (about $1.32 billion) fine on Meta in 2023, for transferring European user data to the US in violation of data protection laws.

At the Paris AI Action Summit on February 10–11, US Vice President J D Vance reinforced the administration's stance, "The Trump administration is troubled by reports that some governments are looking to clamp down on American AI companies. America cannot and will not accept that."

According to a 2024 article published in the *Yale Journal of Law & Technology*, strong lobbying efforts by big tech and member states succeeded in watering down much of the EU's AI Act, particularly regulations around generative AI. Even though EU countries reached a political agreement in October 2023, Germany, Italy and France coordinated efforts to remove most provisions on generative AI, threatening to vote against the entire Act if no changes were made. Their opposition was heavily influenced by the lobbying of two start-ups, Mistral AI of France and Aleph Alpha of German, which positioned themselves as alternatives to OpenAI and

Cutting edge

The disruptors who are shaping the AI landscape today

SUNDAR PICHAI

GOOGLE
CEO

Google, which disrupted search engine market in 1990s, is supercharging its search with new generative AI models, Gemini, that understand virtually any input, be it text, image or code. They are also capable of reasoning. To win the race, Google is investing in leading start-ups, such as US-based Anthropic and is focusing on design of AI chips.

MARK ZUCKERBERG

META
Founder and CEO

Meta has taken a different approach by open-sourcing its AI model, Llama 3.1. The company has also integrated AI into its core products, Facebook and Instagram, enabling businesses to conduct targeted advertising, which has boosted its revenue that had started to slump in 2022 because of increased competition.

SATYA NADELLA

MICROSOFT
CEO

Microsoft has positioned itself as a frontrunner in AI through its partnership with ChatGPT parent OpenAI. Similar to Meta and Google, The company has integrated AI into its products, such as Azure and search engine Bing. In March, the company claimed it was generating $13 billion annually from its AI products and services.

ELON MUSK

xAI
CEO

Founded in 2023, xAI focuses on truth-seeking, unbiased AI, differing from traditional models that reduce political or ideological biases. Its flagship model, Grok, stands out with real-time information access via X, which gives it a dynamic, witty and slightly rebellious personality. In March, xAI acquired X to increase AI-driven social media content creation.

Microsoft. Shortly after the final agreement, Mistral AI announced a partnership with Microsoft in February 2024, suggesting that US firms still hold considerable influence in Europe.

While publicly advocating for AI regulation, technology companies have privately resisted any oversight of foundation models, as per Corporate Europe Observatory, a research and campaign group that works on exposing the impact corporate lobbying in the EU's policies. It notes that 66 per cent of AI-related meetings involving European Parliament members were with corporate interests—up from 56 per cent in 2019–22. From the moment the European parliament made clear its intention to regulate foundation models, chief executives of Google, OpenAI and Microsoft have visited Europe to meet policymakers.

CHINA'S PRIVATE PARTY

Even in China, private companies are driving the majority of AI development. Unlike the US, where platforms such as Google, Meta, OpenAI and Anthropic dominate the landscape, China's AI environment is more diffused. Several start-ups—including Zhipu AI, MiniMax, Baichuan AI, and DeepSeek—are leading large language model (LLM) developments, backed by tech investors and venture capitalists.

SAM ALTMAN
OPENAI
CEO

When OpenAI released ChatGPT in 2022, it disrupted the AI race by shifting AI from specialised tasks to a general-purpose tool. Initially focused on open-source AI, the company pioneered large-scale models and AI safety. It has since partnered with Microsoft. In March, OpenAI raised $40 billion, doubling its valuation to $300 billion.

DARIO AMODEI
ANTHROPIC
CEO

A start-up, founded by former OpenAI staff, Anthropic prioritises AI safety. Its chatbot, Claude, follows Constitutional AI principles—akin to a country's constitution—to ensure fairness. As a result, businesses across industries, from pharma giant Pfizer to media house Thomson Reuters, have integrated Claude into their operations.

JENSEN HUANG
NVIDIA
CEO

NVIDIA is a key player in the AI race, supplying high-performance chips that power most AI models globally. Its dominance has grown as US tech giants invest heavily in data centres built on Nvidia hardware. However, on January 27, its market value dropped by $589 billion after China's DeepSeek showed AI models can be made with less resources.

LIANG WENFENG
DEEPSEEK
Founder and CEO

When Chinese AI startup DeepSeek launched its R1 model on January 20, it stunned the technology industry with a low-cost AI model capable of matching or even outperforming Western rivals at a fraction of the cost. Its AI chatbot became the top downloaded app in the US. Currently, it is funded by its parent firm, High-Flyer, a hedge fund.

XIAO HONG
MANUS AI
Founder and CEO

Manus is an emerging AI company focused on open-source AI and decentralised systems, challenging traditional AI giants by making advanced models more accessible. The Beijing-based startup has gained attention for its general AI agent, which promises to go beyond responding to prompts to perform complex tasks for users.

Source: Media reports, company websites, research papers

In January 2025, Chinese start-up DeepSeek released a model that reportedly matched OpenAI's advanced model across maths, coding and reasoning tasks—at just $6 million in costs, a fraction of the $78 million that OpenAI has spent in training its AI chatbot GPT-4, according to the 2024 AI Index report.

The announcement sent shockwaves through global markets, causing the stock prices of Nvidia, which has a monopoly on semiconductor chips required to train AIs, to crash. Two months later, Chinese tech giant Baidu made headlines with two low-cost AI models that claimed superior language skills and logical reasoning abilities, at just 1 per cent of OpenAI's costs.

Sayash Kapoor, author of *AI Snake Oil* and a PhD candidate at Princeton University, US, acknowledges the value of industry input in policymaking but warns of potential conflicts. "Companies might not have the same incentives as policymakers, especially when business interests clash with societal outcomes," he says. The implications could be dire for human rights.

"There are enormous financial incentives and competition. And those factors do not necessarily encourage responsibility or caution," says Nyholm. "When influence and power are concentrated in the hands of a few, we should be deeply concerned," he adds.

BIAS INBUILT

Exploitative use of AI by governments and private entities threatens humanity, emphasising the need for strong guardrails

IMAGINE LIVING in an active war zone, battling for daily survival. What you may not know is that you are also being "scored"—on the basis of who you know socially, who you chat with online, and how often you change your phone or address. And your score decides if you "can be marked as a target subject to attack."

This may be a reality in the Gaza Strip, says Human Rights Watch. In September 2024, the research and advocacy organisation published an article on Israel's use of digital tools against Palestine. Among these is "Lavender", an artificial intelligence (AI) tool that probably assigns Gaza residents "a numerical score relating to the suspected likelihood that a person is a member of an armed group". If scores exceed a threshold set by Israeli military, the individual may be targeted, it says.

As AI is taking over all fields, defence and warfare are not left out. And it is not used for just surveillance or strategy. Countries like China, Israel, Russia, South Korea, Türkiye, UK and the US are investing in building autonomous weapon systems (AWS), removing the need for ground troops, says a 2024 article by the Carnegie Endowment for International Peace, a think tank headquartered in the US. The US Department of Defense defines AWS as systems that "once activated, can select and engage targets without further intervention from a human operator."

This raises concerns about the potential of the AI-based weapons going rogue or humans deflecting responsibility. The algorithms could also be built from biased and incomplete data. For instance, Israeli military designated Palestinian human rights organisations as "terrorist groups". If such broad definitions were used in training of tools like Lavender, it could increase the possibility of civilians being targeted, says Human Rights Watch.

AI does not even need to reach the battleground. In March 2022, shortly after Russia invaded Ukraine, a video of Ukrainian President Volodymyr Zelenskyy urging the military to surrender was circulated online. The video was later found to be a "deepfake", an AI-created video made with machine-learning and facial-mapping software.

MULTI-FACETED THREATS

Now imagine being in the state of Georgia, US, away from war-torn geographies. You are suddenly arrested on charges of using stolen credit cards in Louisiana, a state you have never visited. Such an ordeal was experienced by an African-American man in 2023. It was found that the police had relied on an AI facial recognition tool.

Automated tools displaying such a "bias" affects not only individuals, but also large groups who may be excluded from access to healthcare, employment or criminal justice. It also evokes privacy concerns because AI is trained using personal data. For example, in 2016, a US court found that the state of Michigan used an automated programme to find individuals evading criminal punishment, and deny them access to nutritional benefits under state law.

A more recent study published in the journal *Nature Medicine* on April 7, 2025, highlights bias in AI models used in healthcare. The study from New York, US, shows that generative AI models can recommend different treatments for the same medical condition, based on a patient's socioeconomic or demographic background.

The "2025 AI Index Report", released on April 7 by the Stanford Institute for Human-Centered Artificial Intelligence, also highlights a concerning trend of crimes associated with AI rising 57 per cent between 2023 and 2024. "Among the incidents reported were deepfake intimate images and chatbots allegedly implicated in a teenager's suicide," says the report.

Courts also see claims of AI violating intellectual property rights. In February 2025, some 14 publishers including *The Atlantic*, *The Guardian* and *Forbes* sued Canada-based AI developer Cohere Inc. The lawsuit filed in the US claims that Cohere used the publishers' copyrighted works to train its generative models and displayed news articles without attributing them. They also alleged that the model provided false or "hallucinated" information and attributed it to them.

Explaining "hallucination", Melanie

'AI PROBLEMS ARE NOT GOING AWAY'

The systems need to interact with the real world to bring in artificial general intelligence

MELANIE MITCHELL

THE HYPE around artificial intelligence (AI) is not new. In the past, expectations were not met, so people became disappointed and lost faith in the field. I do not know if that will happen this time around, but it is clear people are setting expectations on artificial general intelligence (AGI) being a reality in a few years. But that will likely not happen, and people might again lose trust.

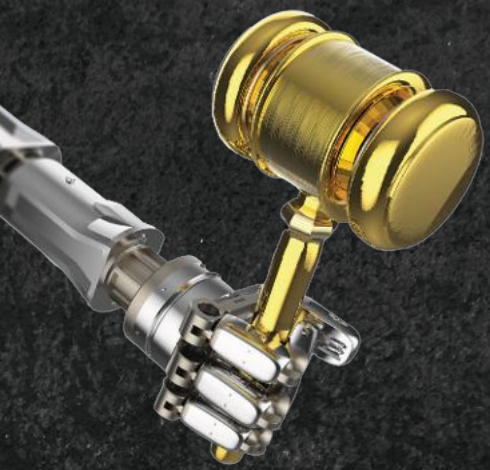
Most people in the field feel like there is something missing on the path to AGI or human-level intelligence. A lot of people are trying to get reliable, trustworthy agents that can do things for us in the real world and be fairly autonomous. But many believe we need something to enhance their abilities and trustworthiness, which we do not yet have. I do not think people agree on what it is going to be.

The current approach of just scaling up large language models (LLMs) and training them on reasoning tasks will not get us to AGI. Scaling up LLM means increasing the number of parameters and training data without making more fundamental modifications. The reason I think this will not help is because the systems' problems are not going away. Sometimes machines surprise us with how good they are, but sometimes they perform poorly. For example, they might solve some extremely difficult math problem, but fail miserably on some elementary school-level problem. This has been called "jagged intelligence", which persists despite scaling up of models.

There has not been the same increase in capabilities that we saw earlier in the last several years. LLMs still have problems like hallucinations, which means they will make up things. They cannot differentiate between true and false in the real world. Such systems will need to interact with the real world via other senses like vision and hearing, take real actions and understand their consequences. Right now, that kind of approach is quite limited in these models.

Addressing this is the big question. There is a lot of research; we have seen papers on neuroscience and developmental psychology looking at how children learn. A child learns from experiencing the world. This cannot be done merely through LLMs and would require different kinds of learning (simulating the complex decision-making power of the human brain). This might require new machine architectures, new kinds of robotic embodiment (using robots that can do things in the world and learn from their own actions, and learn from other intelligent entities like the humans). This is called active and embodied learning, which is different from passive and disembodied models where data is fed to LLMs.

(Melanie Mitchell is professor at the Santa Fe Institute, an independent research and education non-profit in the US)



AI ON THE DOCKET

As impacts of AI misuse or gaps in algorithms emerge, courts across the world are hearing lawsuits related to the technology. Of the 213 cases since 2004, some 199 are filed in US courts

REGULATIONS/ LAWS

16 CASES

- In 2024, a content creator in the US sued California's Attorney General and Secretary of State, challenging two state laws that regulated AI-generated content related to elections.
- In 2009, a defendant in Indiana, US contested a criminal sentence influenced by an algorithm, but the court upheld it based on additional evidence.
- In 2018, plaintiffs sued Google, Twitter, and Facebook in California, alleging the firms provided a platform for ISIS content and algorithms that matched users with such content.

PRIVACY, SECURITY CONCERNS

29 CASES

- In 2019, the American Civil Liberties Union, Massachusetts, sued the Federal Bureau of Investigation and federal departments of justice and drug enforcement over their failure to respond to a Freedom of Information request on facial recognition policies and records.
- In 2021, a plaintiff in Illinois filed a class action against a fast-food chain, alleging violations of state law by collecting and sharing voice print biometrics via AI voice assistants without consent.
- In 2024, US Federal Trade Commission sued data broker Kochava Inc for selling geolocation data on people's visits to sensitive areas.

Mitchell, professor, Santa Fe Institute, US, tells DTE, "AI systems can generate false text, which could range from saying that the US has had three women presidents to making up a citation. The systems are trained to generate plausible sounding language. They do not have to figure out if something is true." Hallucination may be a case of AI misinterpretation. In a May 2024 article in *The Conversation*, Toby Walsh, professor of AI, University of New South Wales, Australia, explains how when a user asked Google's search engine a question about eating rocks, the "AI Overview"—it provides summaries of search results—replied, "According to geologists at UC Berkeley, you should eat at least one small rock per day. They say that rocks are a vital source for vitamins and minerals that are important for digestive health." The AI found this information in a satirical article, but could not recognise it as false.

Finally, AI is found to display traits of deception and manipulation. A 2024 study published in the journal *Cell Press* analyses CICERO, an AI system created by Meta Platforms Inc to excel in the board game Diplomacy. The tool could learn to exploit loopholes in the game and deceive users.

GOVERNANCE LANDSCAPE

It's clear that AI poses complicated threats, which regulations need to address. But governance of generative AI, as a 2024 report by the Stanford Cyber Policy Centre says, requires policymakers to walk the line between enabling AI benefits while warding off risks. The developing world is still behind. As per an April report by UN Trade and Development (UNCTAD), around a third of developing nations have AI strategies.

Among richer nations, the US so far has no comprehensive legal framework. In January 2025, President Donald Trump revoked an AI-related executive order by his predecessor, under which federal agencies had begun to develop guardrails to protect people's privacy and civil liberties.

Following the US' hands-off approach, Japan has non-binding guidelines applicable to AI development and use and promotes voluntary efforts by AI stakeholders for safety, fairness and transparency. The UK in 2021 introduced a 10-year plan to become a global

UNFAIR TRADE/ COMPETITION

39 CASES

- In 2023, consumers sued Atlantic City casino-hotel operators for using algorithms to inflate room rates, violating US antitrust law.
- In 2018, US property management firm RealPage, Inc. faced class action litigation and a federal probe over allegations of facilitating a data-driven price-fixing scheme on rentals.
- In 2024, Elon Musk sued OpenAI and its chief executive Sam Altman, claiming the company's non-profit mission was abandoned for profit.
- In 2024, a Florida court dismissed a lawsuit alleging Google falsely claimed not to censor search results, ruling its decisions were protected under the First Amendment.

COPYRIGHT INFRINGEMENT

56 CASES

- In 2025, news publishers sued Cohere, a Canada-based generative AI developer, in the US, for copyright and trademark infringement, alleging misuse of articles for AI training and false attributions.
- In 2023, an Indian news agency sued a generative AI developer in the Delhi High Court, citing copyright infringement and harm from false AI-generated news.
- In 2023, music publishers in Tennessee, US, claimed AI models used their copyrighted lyrics for training.
- In 2021, Australia's Federal Court allowed an AI, DABUS, to be listed as an inventor, diverging from the US, EU and the UK but aligning with South Africa.

DISCRIMINATION/HARM AND MISUSE

73 CASES

- In 2019, a woman in Florida, US, sued Tesla and Elon Musk for overselling the vehicle's autopilot, which caused a crash and killed her husband.
- In 2013, plaintiffs claimed an algorithm used by the Department of Health and Human Services in Michigan, US, unfairly disqualified thousands with outstanding felony warrants from receiving food assistance.
- In 2024, a class action was filed against Michigan's Unemployment Insurance Agency over an automated system wrongfully accusing 40,000 residents of fraud, leading to civil penalties.

Source: DAIL–the Database of AI Litigation, George Washington University, US

AI superpower. In January 2025, it launched an AI opportunities action plan, but is still considering a Bill for an AI regulatory body.

China sits on the other end of the spectrum, enacting a slew of laws for labelling AI-generated imagery and protection of privacy and intellectual property. "Regulation and innovation are frequently perceived as opposing forces in the discourse on regulatory frameworks for emerging technologies. However, in China, these forces appear to converge through comprehensive legislative measures," says the Stanford Cyber Policy Centre report. It also says some of the norms show greater focus on national security and sovereign control over AI.

In the EU, an AI Act entered into force in August 2024, with the first set of rules implemented in February 2025. The Act prohibits eight practices like harmful AI-based manipulation and deception, exploitation of vulnerabilities and social scoring. The bloc is yet to iron out aspects like creating a code of practices and guidelines, but experts see the Act as an ambitious policy. "We need to watch the space closely to figure out the impacts of these regulations. For example, we need to see if companies do not release their best models in the EU due to the regulations. They could maliciously do that in order to show the high cost of regulation," says Sayash Kapoor, doctoral candidate, Princeton University and co-author, *AI Snake Oil*.

Also in May 2024, the Council of Europe, a human rights organisation, adopted the first international AI treaty. The Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law covers the entire lifecycle of AI systems and promotes progress while assessing risks. So far, it has 13 signatories including the EU, US, UK and Israel. The treaty will enter into force after at least five signatories, including at least three Council member-states, ratify it.

But a gap persists on obligations of the private sector, which member-states such as the US, UK, Canada and Japan spoke against during negotiations. The treaty says parties can either apply the framework to all private actors or take "other measures" to ensure compliance. This weakens the guardrails' effectiveness.

UPDATE REQUIRED

India needs to upgrade its legislative and legal framework to deal with the impacts of AI technology

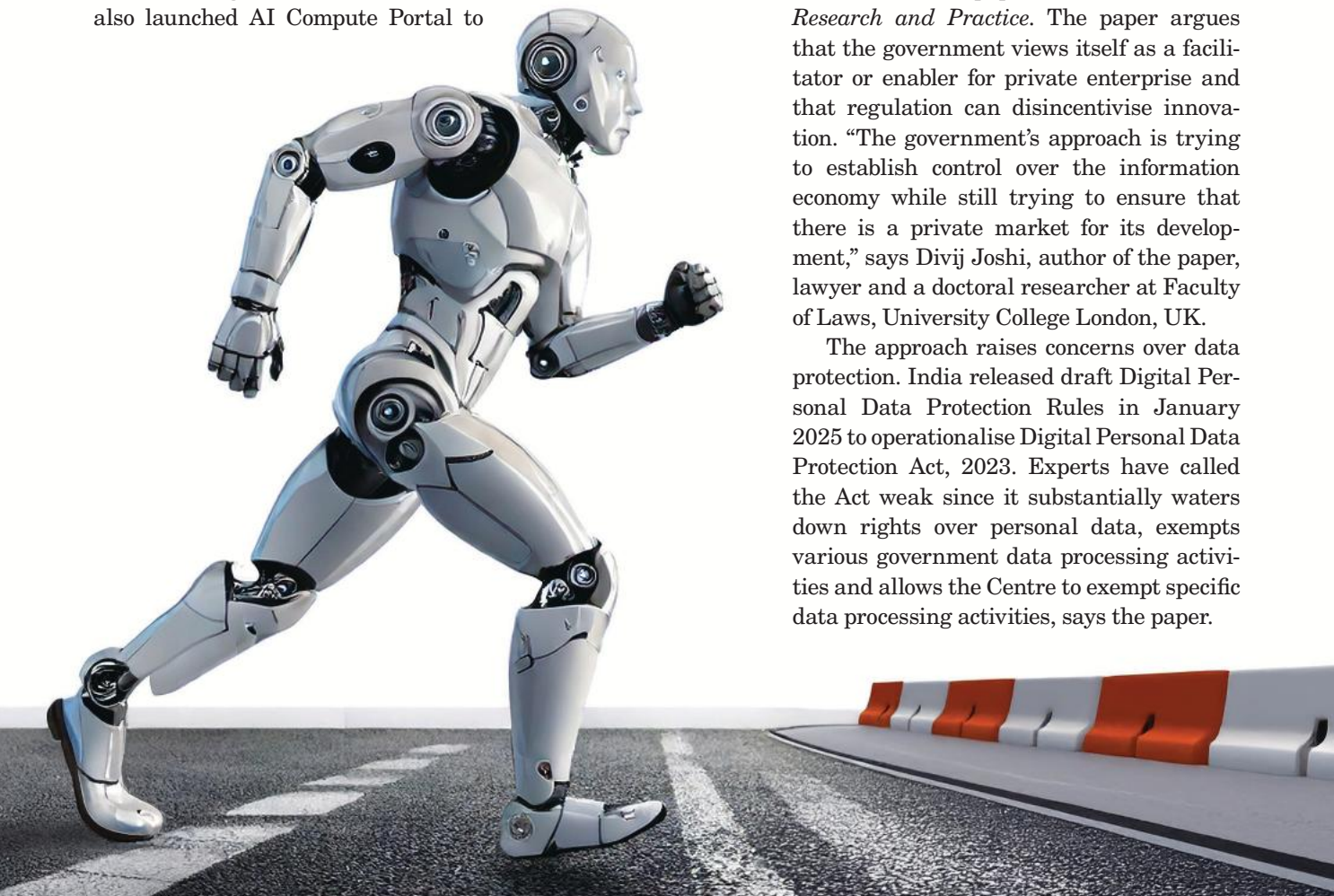
INDIA'S ENTRY to the artificial intelligence (AI) race is quite delayed. On January 30, 2025, the Union Ministry of Electronics and Information Technology (MEITY) invited proposal from startups and researchers for collaboration to build India's own state-of -the-art foundational AI models, including Large Language Models (capable of understanding and generating human language by processing vast amounts of text data) trained on Indian datasets. As per a March 19, 2025, press release from the ministry, 67 proposals have been received till February 15, 2025.

In March 2025, the government launched IndiaAI Dataset Platform to provide developers access to high-quality, non-personal data, reducing "barrier to innovation". It also launched AI Compute Portal to create infrastructure for building such models. The portal will initially provide 10,000 semiconductor chips, with 8,693 more to be added, at a highly subsidised rate.

These developments follow Union Cabinet's approval of India's ₹10,372 crore AI Mission in 2024, centred around seven verticals—computing infrastructure capacity, skilling, innovation, datasets, startup financing, application development, and safe and trusted AI—to catalyse growth of AI ecosystem across the nation.

India's policy responses to AI are geared towards the market. They have ranged from providing public infrastructure to enable market-led AI production, to nationalising datasets to enable Big Data analysis through AI, reads a 2024 paper in *Communications Research and Practice*. The paper argues that the government views itself as a facilitator or enabler for private enterprise and that regulation can disincentivise innovation. "The government's approach is trying to establish control over the information economy while still trying to ensure that there is a private market for its development," says Divij Joshi, author of the paper, lawyer and a doctoral researcher at Faculty of Laws, University College London, UK.

The approach raises concerns over data protection. India released draft Digital Personal Data Protection Rules in January 2025 to operationalise Digital Personal Data Protection Act, 2023. Experts have called the Act weak since it substantially waters down rights over personal data, exempts various government data processing activities and allows the Centre to exempt specific data processing activities, says the paper.



The draft has turned around the idea of consent itself. "In the AI context, what is scary is that publicly available data has been exempted from the data protection to a large degree," Joshi explains. He also raises questions of whether leaked personal data available on the internet will be considered publicly available data that can be scraped and used to train a model. "Our privacy law, in general, is not updated for AI," he adds.

Though India currently provides non-personal data for AI model development, there are major concerns. "A lot of studies have showed that there is still a risk of that data being used to identify a person even with anonymised data," Shehnaz Ahmed, Lead, Law and Technology at the Vidhi Centre for Legal Policy, an independent think tank based in Delhi, tells DTE.

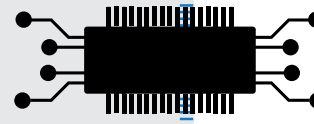
The other major concern is that the government is already embedding AI into their systems without proper guardrails. Recently, the use of AI in tax administration was incorporated under the Taxation (Amendment) Act, 2020, and the amendments to the Criminal Procedure (Identification) Act, 2022. This signals "clear intention of reducing legal challenges for the use of AI-based facial recognition technologies in law enforcement", says the 2024 paper.

AI is being embraced in government programmes, too. On March 10, 2025, Sasikanth Senthil, a Lok Sabha member from Tiruvallur, Tamil Nadu, raised the issue of people being denied access to social schemes due to increased digitisation. He said that facial recognition system was complicating the efforts of Anganwadi workers as they distribute nutritious kits to pregnant women under the Integrated Child Development Scheme (ICDS). Poshan Tracker, a tool to ensure real-time monitoring of supplementary nutrition provisioning for improving the nutritional status of beneficiaries, has incorporated facial recognition system to streamline the Take Home Ration distribution process. "How do you expect pregnant women to walk all the way to Anganwadi centres to give facial recognition for take-home ration? ICDS is a very serious

REGIONAL SPREAD

Recent AI-related announcements, allocations by states

HARYANA: A proposed Haryana AI mission, with funding assurance of ₹474 crore from World Bank. Mission will train over 50,000 youth to equip them for new job opportunities.
GOA: Use of AI in policing, education, disaster management
GUJARAT: AI labs to be set up in seven technical institutions. AI to be used in forest/ wildlife monitoring, education.
TELANGANA: ₹774 crore for IT; plan to develop an AI City on 80 hectares to feature data centers, high-performance computing facilities and a dedicated AI University. Use of AI in health, governance, tourism, industrial research, policing, agriculture
KARNATAKA: ₹50 crore for a Center for Applied AI for Tech-Solution. ₹50 crore for AI-enabled cameras to control traffic movement. Use of AI in forest, agriculture, pollution control, parking, semiconductor chip manufacturing and governance.
MAHARASHTRA: Use of AI in agriculture, weather, health, policing.
UTTAR PRADESH: Setting up of AI city in Lucknow. Use of AI in policing, governance, crowd control.
TAMIL NADU: Launched Tamil Nadu Artificial Intelligence Mission for governance, socio-economic prosperity. Use of AI in health, policing.
ODISHA: Budgetary allocation of ₹20 crore for Odisha AI Mission. Use of AI in governance, monitoring compliance, education
KERALA: Budgetary allocation of ₹10 crore for semiconductor cluster. Use of AI in surveillance to reduce road accidents, policing, education, disaster management, manhole cleaning
ANDHRA PRADESH: AI to be introduced in curriculum, MoUs with Google, TCS, Meta, to accelerate adoption of AI in various fields. Use of AI in forecasting energy needs, education, agriculture, governance, to set up data city to generate 2 million jobs
BIHAR: Use of AI to check air pollution, in governance, disasters
UTTARAKHAND: Use of AI in forest, surveillance, education
MADHYA PRADESH: Use of AI in education, governance, tourism
HIMACHAL PRADESH: AI to be used in governance, policing, generating employment for skilled service
CHHATTISGARH: Use of AI in governance, education
RAJASTHAN: Budgetary allocation of ₹50 crore to set up Centre of Excellence of Artificial Intelligence in Agriculture. Use of AI in education, governance, policing, healthcare
MEGHALAYA: Use of AI in governance, skilling
NAGALAND: ₹3.86 crore for construction of building, setting up Artificial Intelligence and Research Centre. Use of AI in health sector
DELHI: ₹21 crore proposed in 2025-26 to set up Dr APJ Abdul Kalam Language Laboratories in 100 government schools. Many languages like English, Hindi to be taught in 26 of these laboratories using AI. Use of AI in fire safety, education, governance, policing, pollution
PUNJAB: AI-powered CCTV in central jails. Use of AI in agriculture
WEST BENGAL: Use of AI in governance, skilling, education
ASSAM: ₹50 crore for launching AI, robotics courses in schools. Use of AI in disaster management



TRAINING BOTS

Ethical, wage concerns in hiring of rural people to provide linguistic data for training bots

IN FEBRUARY 2024, Microsoft released a video on Karya, an Indian "social impact organisation" that employs rural Indians to develop "ethical datasets" for Indian languages. These datasets are used to train AI models. In the video, Karya's co-founder and CEO, Manu Chopra, states that their workers record sentences in their native languages on their smartphones. He also claims that the company pays nearly 20 times the Indian minimum wage for dataset creation, with workers receiving royalties each time the datasets are resold.

Karya has also partnered with Google and Microsoft to provide them with linguistic data needed to build speech tools that better serve their users. However, such partnerships raise concerns about data colonistion. Jibi Elias, an AI ethicist, notes that the collection of Indian local data, which is primarily sold to entities outside the country, is worrying, especially since most of the data is not made publicly accessible. Another concern is unfair working conditions. A 2023 report by the University of Oxford, UK, emphasises that while AI deployments receive public attention, the workers involved in the design, building, and testing of these technological solutions still face unfair working conditions.

programme and if you make this digital joke everywhere, people are not going to get any services," he said, adding that poor people should not be subjected to such decisions.

NEED FOR LEGAL FRAMEWORK

As India works to create an enabling environment for AI, Ahmed calls for a framework that would alert an individual being subjected to an automated decision-making system by an AI, which may impact their rights. "This could be access to loans, access to any government service. The people being affected should know that that decision is being made by an algorithm and not by a human," Ahmed explains. She also adds that we will need preventive measures for technologies like deepfake—an AI tool that can create realistic but fake videos, audio and images. Last year, television media personality Rajat Sharma was targeted thrice by deepfake videos and filed a petition before the Delhi High Court, requesting the Union government to introduce stricter regulations. In November 2024, the Court directed MeitY to formulate a committee to draft a report within three months, addressing legislative, technical and awareness aspects of deepfake management.

In March 2025, the ministry submitted its report, announcing the creation of a nine-member committee, comprising scientists and government officials. It also noted that it held two consultation meeting with experts, lawyers, government officials and technology companies like Google, Meta and X. It has asked for another three months to submit a report on matters related to deepfakes, which will also include written inputs from victims. While acknowledging the challenges in detecting doctored content, many stakeholders stressed that the existing legal framework under Information Technology (IT) Act, 2000; Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021; and Bharatiya Nyaya Sanhita, 2023, were sufficient to address the problem.

The government is contemplating a new Act to address the growing challenges posed by AI. In March 2023, MeitY released an outline for the Digital India Act to replace the existing Information Technology Act 2000. The outline suggests that the Act will look at the monopoly of big technology companies, encourage growth of start-ups, address user harms, such as revenge porn, catfishing, doxxing, cyberstalking and phishing, and try to reduce hate speech and misinformation on the internet, as well as in AI. The Indian government has not provided details about specific regulations to address these issues, as per "Stanford Cyber Policy Center" report of 2024. MeitY also suggested that the Digital India Act could potentially eliminate the immunity granted to online intermediaries, such as social media and e-commerce platforms, from legal liability for third-party content posted on their platforms under the IT Act, 2000. The government has not publicly released the first draft of Act, and it remains to be seen how the country tackles the emerging technology.

THE ENERGY PARADOX

As AI reshapes the world, can it curb its own environmental impact?

ON FEBRUARY 10-11, the world gathered at the Paris AI Action Summit to address the surging energy appetite of AI. The third instalment of the summit brought together governments, AI companies, civil society, and experts—highlighting concerns over AI's escalating energy consumption as nations compete to lead the AI revolution.

The key outcome was the announcement of an Observatory on Energy, AI and Data Centres. Expected to launch in April 2025 under the International Energy Agency (IEA), the observatory will compile global data on AI's electricity demand while tracking AI applications in the energy sector.

AI presents a contradiction. While hailed as a breakthrough capable of optimising energy grids and combating climate change, its own power consumption is a growing problem. "AI has the potential to reduce environmental harm by improving energy efficiency, optimising resource use, and integrating renewable energy sources," says Maria Basso, head of AI applications and impact at the World Economic Forum. However, she cautions that large-scale AI models consume vast energy, adding to carbon emissions. AI applications like ChatGPT rely on generative pre-trained transformer (GPT) models—complex neural networks that mimic human cognition. These models require power throughout their lifecycle, spanning five phases: planning and data collection, model development, training, deployment, and ongoing maintenance.

At the core of AI's infrastructure are data centres—vast facilities housing the servers that train and operate AI models. In 2022, data centres consumed 460 terawatt-hours (TWh) of electricity—about 2 per cent of global demand—and contributed 1 per cent of the world's energy-related carbon dioxide (CO_2) emissions. By comparison, aviation accounted for 2 per cent of global CO_2 emissions that year. This demand is set to soar. Global data centre electricity consumption, currently at 460 TWh, could exceed 1,000 TWh by 2026—matching Japan's consumption, according to IEA.

Despite such figures, AI's environmental cost remains difficult to assess due to limited transparency from AI firms. "Companies

report scope 1, 2 and 3 emissions, but it is challenging to isolate AI-specific lifecycle emissions of specific models," says Shaolei Ren, associate professor in electrical and computer engineering at the University of California, Riverside, US. Scope 1 covers direct emissions, scope 2 includes emissions from purchased energy, while scope 3 encompasses emissions from supply chains, including server manufacturing and employee commuting.

Beyond energy, AI is also a major water guzzler. Data centres rely on water-intensive cooling systems to maintain optimal conditions for high-performance computing. In 2023, Google's data centres withdrew 29 billion litres of water, of which 23 billion litres was consumed for on-site cooling. Of this, about 80 per cent was potable, according to a 2023 pre-print paper in open-source archive *arXiv*. Meta's data centres consumed over 5.2 billion litres in 2023, marking a 50 per cent rise since 2019, as per the company's sustainability report.

Tech firms often downplay AI's water footprint. In February, OpenAI's Sam Altman dismissed concerns on social media, claiming AI's water use was lower than that of a hamburger. However, Ren calls this misleading. "The 2,500 litres attributed to a hamburger cover its entire lifecycle, whereas AI's reported water use accounts only for its operational requirements, ignoring water needed to mine rare earth metals for AI chips," he says.

The issue is compounded by geography. Many data centres are located in water-stressed regions. A report by London-based non-profit Planet Tracker finds that 41 per cent of data centres are in areas with extreme water stress, with another 22 per cent in highly stressed zones. In the Asian continent, Indonesia has the most data centres in water-stressed regions, followed by India and Russia.

REDUCING AI'S FOOTPRINT

Tech companies are exploring ways to curb AI's emissions. Between 2015 and 2019, global data centre power consumption re-

'ASSESS HEALTH IMPACT, WATER FOOTPRINT'

The goal should be to develop the AI technology and set up data centres without hurting environment

SHAOLEI REN

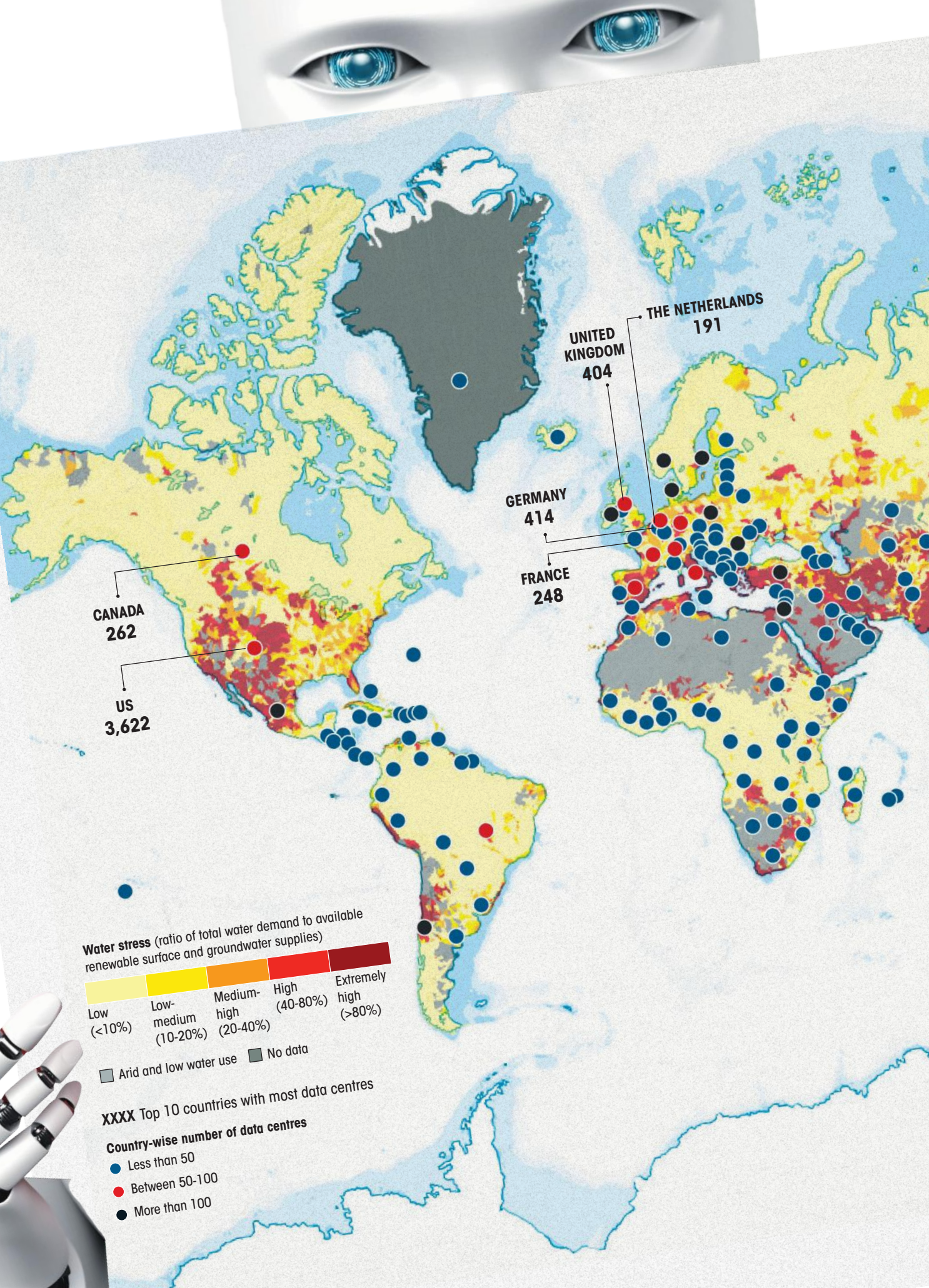
IN THE past couple of years, we have seen a spurt in interest to understand the environmental impacts of AI. However, information in this regard is not readily available. For example, EcoLogits, a web application maintained by the Paris-based non-profit GenAI Impact, tracks the energy consumption and environmental impacts of generative AI models. It can estimate the water consumption in the future for different models, different providers and different tasks. This gives a better idea of how much water each individual model will be using and can help developers select a location for setting up a data centre. Those technology companies rarely look at the environmental, public health and energy costs of using AI, which primarily remain the domain of policymakers as they will need to look at who is paying the health cost and if these costs are more than the tax revenue.

But the fact is that even the technology companies have the incentive to address these environmental problems because they want to be more efficient in terms of buying fewer graphics processing unit (GPU) servers—a piece of hardware designed to speed up tasks. For example, the DeepSeek model developed a very small model with low resource consumption and yet it was quite capable. This creates a lot of pressure on other developers who are still pursuing bigger and bigger model sizes.

Unfortunately, many developers still prioritise the service, or model capability over efficiency. If you look at the financial sheet of developers, their revenue is hundred times higher than their energy cost. So they might not want to spend huge amount of resources to reduce the energy cost.

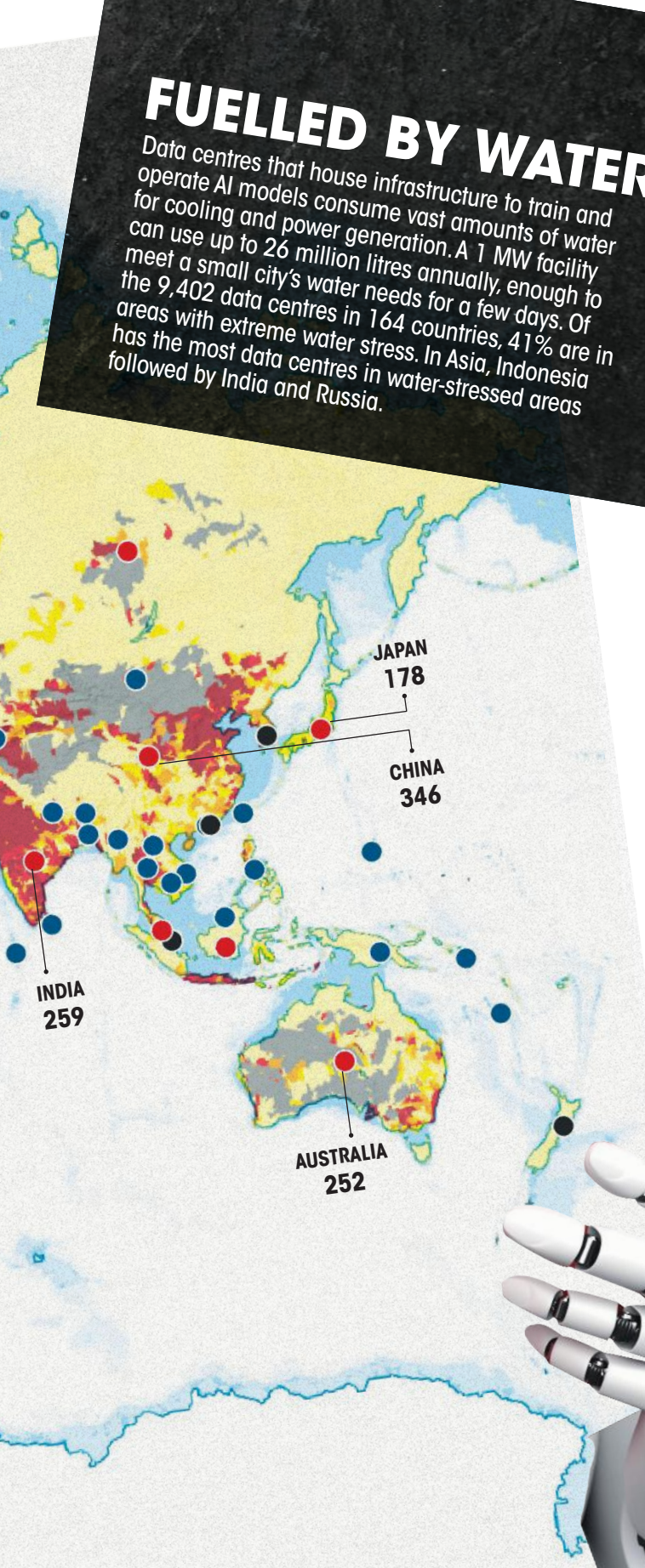
I have modelled the water footprint and health impacts and developed an algorithm to reduce the water consumption and public health impact. For instance, my model would help one move the data centre workloads to the places that have a lower health price and better water efficiency. If you see two gas stations, one has a lower price, you will choose the latter because that can offer a lower price. The same applies to AI as well. If you have two locations, one has a lower health price and better water efficiency, moving your computing to that region will provide better outcomes. We could calculate how we will be able to save some asthma cases, heart attack cases, and this will be converted into dollar cost, dollar benefit. The health price changes over time and over locations depending on the energy source, wind direction, and population density. The goal should be to develop the technology and build a data centre without hurting the environment.

(Shaolei Ren is associate professor of electrical and computer engineering at the University of California, Riverside, US)


THE NETHERLANDS
191
UNITED KINGDOM
404
GERMANY
414
FRANCE
248
CANADA
262
US
3,622
Water stress (ratio of total water demand to available renewable surface and groundwater supplies)
Low (<10%)
Low-medium (10-20%)
Medium-high (20-40%)
High (40-80%)
Extremely high (>80%)
Arid and low water use
No data
XXXX Top 10 countries with most data centres
Country-wise number of data centres
Less than 50
Between 50-100
More than 100

FUELLED BY WATER

Data centres that house infrastructure to train and operate AI models consume vast amounts of water for cooling and power generation. A 1 MW facility can use up to 26 million litres annually, enough to meet a small city's water needs for a few days. Of the 9,402 data centres in 164 countries, 41% are in areas with extreme water stress. In Asia, Indonesia has the most data centres in water-stressed areas followed by India and Russia.



Note: The number of data centres is based on voluntary listings done by operators and does not include enterprise and government data centres
Source: Data Centre Map and WRI Aqueduct

mained stable despite workloads tripling, thanks to efficiency improvements. However, with AI demand accelerating, these gains are slowing, says Goldman Sachs Research. Basso points to promising solutions, including energy-efficient hardware-like low-power chips, optimised AI models, and better data centre insulation to cut cooling needs. Advanced software can also improve infrastructure management, monitoring and optimising electricity use.

Another approach is shifting to renewable and nuclear energy. "Renewables can meet much of the rising data centre demand, but they are not stable enough to be the sole energy source," says Jim Schneider, digital infrastructure analyst at Goldman Sachs. Tech giants are already investing in nuclear power. In March, Amazon, Google, and Meta pledged to triple global nuclear capacity by 2050. Some companies are also exploring small modular reactors (SMRs), which generate up to 300 megawatts (MW)—about one-third of the output of conventional reactors. While SMRs do not directly reduce AI's energy demand, they enable more efficient power generation and distribution. Basso says SMRs should be seen as part of a broader decarbonisation strategy.

Do AI's benefits outweigh its costs? While AI promises numerous advantages, communities near data centres or power plants bear the brunt. A 2024 pre-print study by Ren and colleagues estimates that the health burden of US data centres could exceed $20 billion annually by 2030.

AI's impact hinges on responsible development. "The key is integrating environmental considerations from the outset," says Basso. As AI advances, the challenge will be harnessing its immense potential without exacerbating environmental harm. DTE

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Putting public health before patent rights

Roche's patent suit against Natco spotlights the problem of patients with rare diseases and access to pricey drugs

WE WILL begin with a standout paragraph in a recent judgement on a case involving access to life-saving medicines. Public health, it said, is not something that should be dealt with lightly. As such, "A drug which is the only one available for treatment in India, for a rare disease, its availability to the public at large at very economical and competitive prices, is a material factor which a Court will consider at the time of dealing with an application for interim injunction." For emphasis, the judge noted that "the plaintiffs can be compensated by way of damages. However, there exists no right for the public to lessen or compensate itself."

This was Justice Mini Pushkarna of the Delhi High Court in her ruling on March 24, while dismissing the patent infringement suit filed by Swiss pharma giant Hoffman La Roche against Natco Pharma of Hyderabad. Few judgements in recent years have foregrounded public health concerns as this while dealing with patent infringement suits. In this instance, Roche had sought an injunction against Natco that was developing a generic version of its risdiplam, a prohibitively expensive drug used in treatment of spinal muscular atrophy (SMA) patients. SMA is a rare genetic disease that affects motor nerve cells in the spinal cord and impacts muscles used for breathing, eating, crawling and walking. There is no cure for this progressive condition that requires life-long treatment.

SMA patients who intervened in this suit have given startling figures of how expensive risdiplam, sold as oral solution Evrysdi, is. Seba P A, in her intervention application, has stated that risdiplam costs around ₹6 lakh per bottle. For a patient weighing over 20 kg, one bottle is enough for just 12 days which means that a patient would require approximately 30 bottles per year, costing ₹1.8 crore. Another intervener, Purva Mittal, who is undergoing treatment at Lok Nayak Jai Prakash Hospital, New Delhi, told the court she has been recommended risdiplam, but is unable to start treatment since it is "completely unaffordable".

The judge noted "the predicament of the persons suffering from SMA and their inability to purchase the only approved drug in India on account of its exorbitant cost". Quite often in such patent infringement cases, Big Pharma innovators claim that their patient assistance

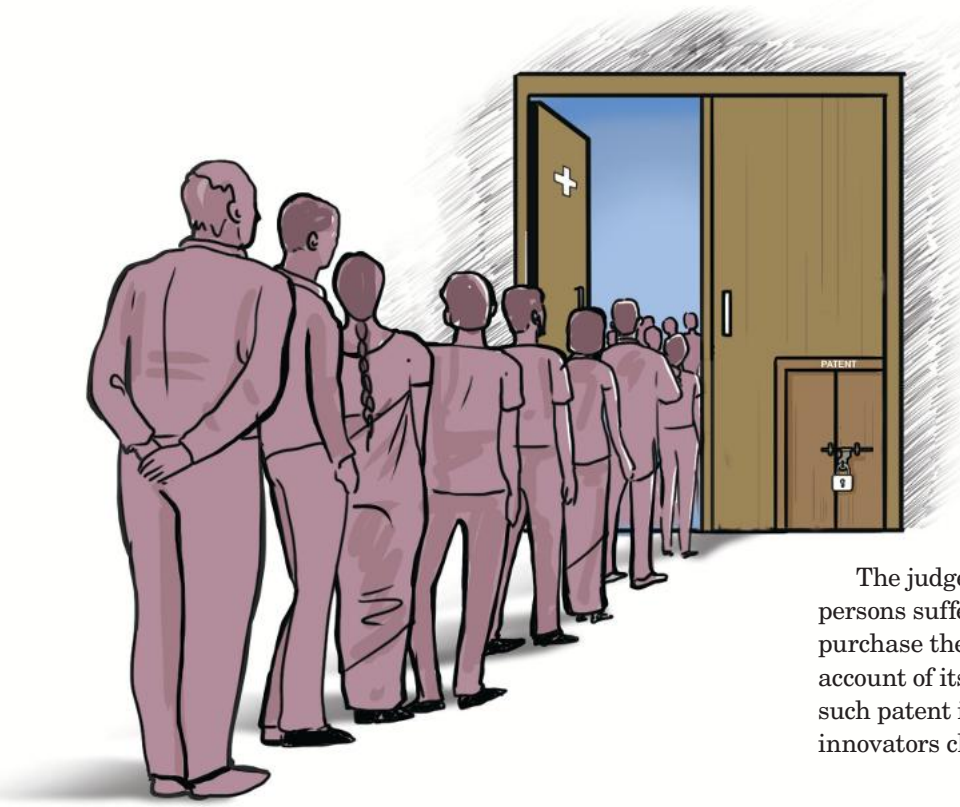

ILLUSTRATION: YOGENDRA ANAND / CSE

programmes (PAPs), where they provide subsidised medication to a limited number of patients, solves the concern over drug accessibility. This is a good public relations exercise that sometimes sways court sentiment by presenting a caring façade. Roche did the same in its suit. However, Justice Pushkarna did not buy its argument, pointing out that the plaintiff's patient programme was far too limited to resolve the issue of accessibility for SMA patients. Even if the plaintiffs provided the drug at a subsidised rate—the proposed price was indicated in a sealed cover given to the court—it would not be a viable proposition for SMA patients, she noted. Besides, the proposed price would only cover patients enrolled in the PAP, "leaving a broad space" of the unenrolled.

The company's proposal to provide the drug to the National Rare Diseases Committee as part of PAP would also be of limited consequence because of the paucity of funds under the National Policy for Rare Diseases (NPRD). Therefore, the court finds the proposed price reduction does not offer the plaintiffs any leverage for grant of injunction in their favour, she ruled. The court's remark on NPRD is a realistic observation on the government's ability to look after patients with rare diseases. An August 2024 press release gives a clear idea of the constraints. It says financial support of up to ₹50 lakh per patient is provided under the policy, but so far, only 1,118 patients have benefited from it although 63 rare diseases have been notified.

While hearing Roche's patent infringement suit against Natco, the judge noted spinal muscular atrophy patients' inability to purchase risdiplam due to its exorbitant cost

While the balance of convenience—a test used by courts to determine whether to issue a preliminary injunction against a defendant's allegedly infringing or unfair practices—is in favour of the defendant, Justice Pushkarna clarified that in case the plaintiffs ultimately succeed in the trial, Natco shall be liable to pay damages to the plaintiffs.

Few judges have been as forthright in their observations on the affordability of life-saving drugs as Justice Pushkarna although many have refused to pass injunctions on generic companies in patent infringement suits. One case that comes to mind is the Roche suit filed against Cipla in 2008 for a permanent injunction for infringing its patent on cancer drug erlotinib. Roche claimed it was a breakthrough drug (marketed as Tarceva) but Cipla claimed the patent had been granted under "suspicious circumstances" and was liable to be revoked since it only made improvements from an existing compound. Cost was a consideration in the refusal of an injunction, with the court noting that a month's dose of Tarceva cost around ₹1.4 lakh against ₹48,000 for Cipla's generic Elrocip. The balance of convenience was held to be in Cipla's favour.

Natco is battling Roche on another front. In the US, where Natco has filed an abbreviated new drug application—better known as ANDA—with the US Food and Drug Administration for the approval of its generic risdiplam, it faces an infringement suit along with other generics makers who are trying to be first in queue to release their competitively priced alternatives. Risdiplam is a money spinner and is expected to do better when it comes in tablet form. Although it is a rare disease drug, which means the patients are limited in number, sales in the US have grown sharply by 18 per cent to $1.8 billion in 2024. Similar drugs by competitors are not doing as well because these are injected into the spinal area.

In India, the patent dispute hinges on the fact that Roche had filed an earlier international genus patent at the World Intellectual Property Organization but has only a species patent on risdiplam in India. A genus patent is broad and covers not just one specific chemical but a group of related chemicals, while a species patent is more specific to an invention. The species patent in India is valid till 2035, two years after the international genus patent expires. Natco claims it is a ploy to prolong the term of the patent, which it says is invalid in any case because risdiplam was disclosed in the genus patent. Roche has come under fire for misrepresentation in other territories. The outcome is important because it is the first test on the affordability of a rare disease drug. DTE @ljishnu

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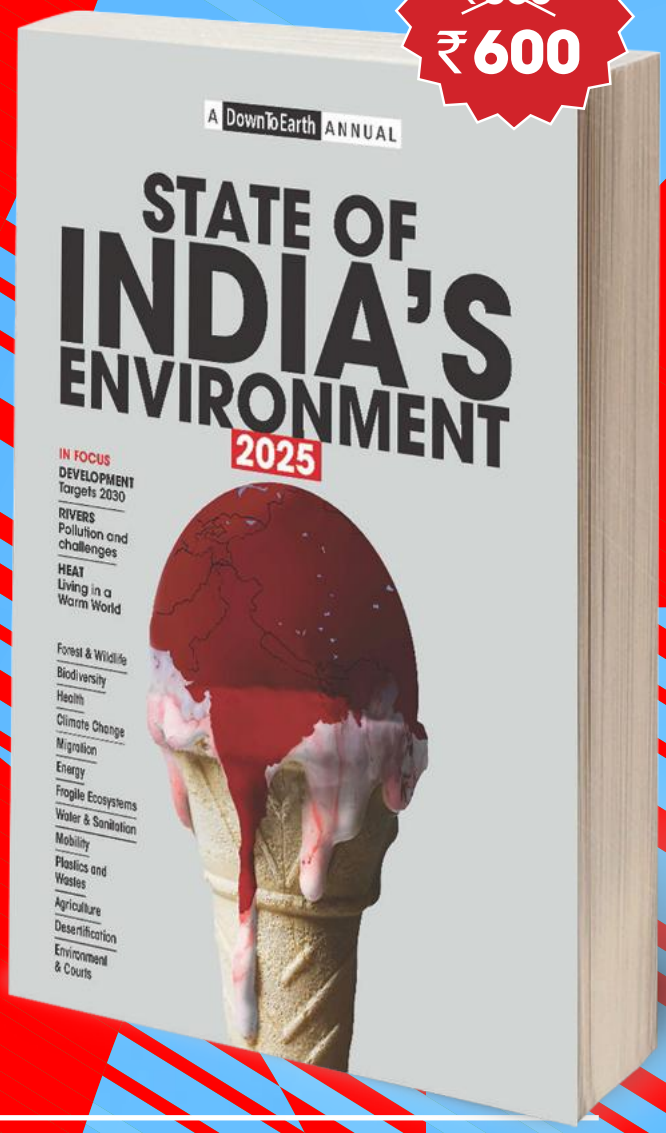

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Palette

WHAT'S INSIDE

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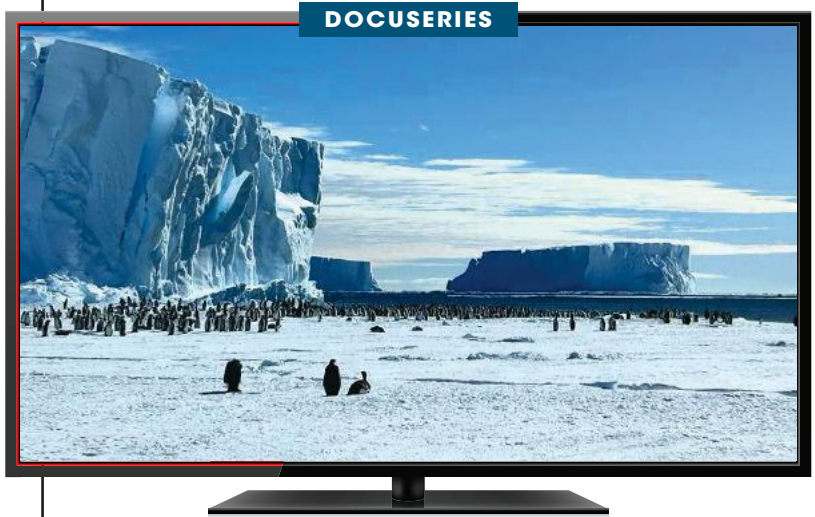
RECOMMENDATIONS

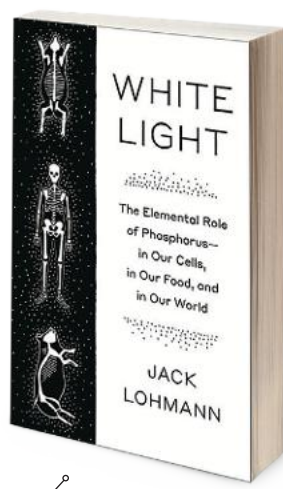
DOCUSERIES

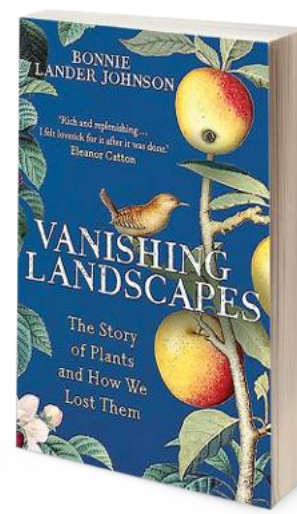


Fluffy, cute and curious, penguins have long been a subject of wildlife documentaries and television programmes. But this Earth Day, see the world's penguins in a new light through a docuseries by National Geographic. "Secrets of The Penguins", hosted by award-winning National Geographic explorer Bertie Gregory, is a journey from the icy South Georgia Island to the beaches of Cape Town and desert caves of Namibia. It provides never-before-seen footage such as emperor penguins "practising" transport of eggs with snowballs, rockhoppers fighting off sea lions, and a hidden penguin colony being discovered in Africa. The docuseries also explores how extreme weather and climate change affect different penguin populations. "Secrets of The Penguins" premiers on the streaming platform *Disney+* on April 21.

BOOKS

Phosphorous is a prominent feature in the cycle of life and death. When living beings die, they leave behind organic matter comprising phosphates that act as fertilisers for new life growing from the ground. When humans realised this, they began to dig for phosphorous—giving rise to big agricultural and mining industries. In *White Light: The Elemental Role of Phosphorus-in Our Cells, in Our Food, and in Our World*, writer Jack Lohmann explores the role that phosphorous plays for life on the planet.





Just a few generations ago, humans could not imagine life without plants. They provided us food to sustain ourselves, medicines to heal our ailments and dyes to colour the textiles we traded. But in today's world, drugs and synthetic dyes are replacing them. In *Vanishing Landscapes: The Story of Plants and How We Lost Them*, academic Bonnie Lander Johnson highlights the changing human-plant relationship through the history of eight different plants, and shares the stories of those fighting to preserve it.

‘Commission will provide legal aid to protect rights of elderly’

The Kerala Assembly has on March 19 passed the Kerala State Elderly Commission Bill, 2025, which allows the government to set up an Elderly Commission to protect the rights of the senior citizens and promote their welfare. In a conversation with **K A SHAJI**, the state’s Minister for Higher Education and Social Justice **R BINDU** shares the mission of the country’s first such commission. Excerpts:

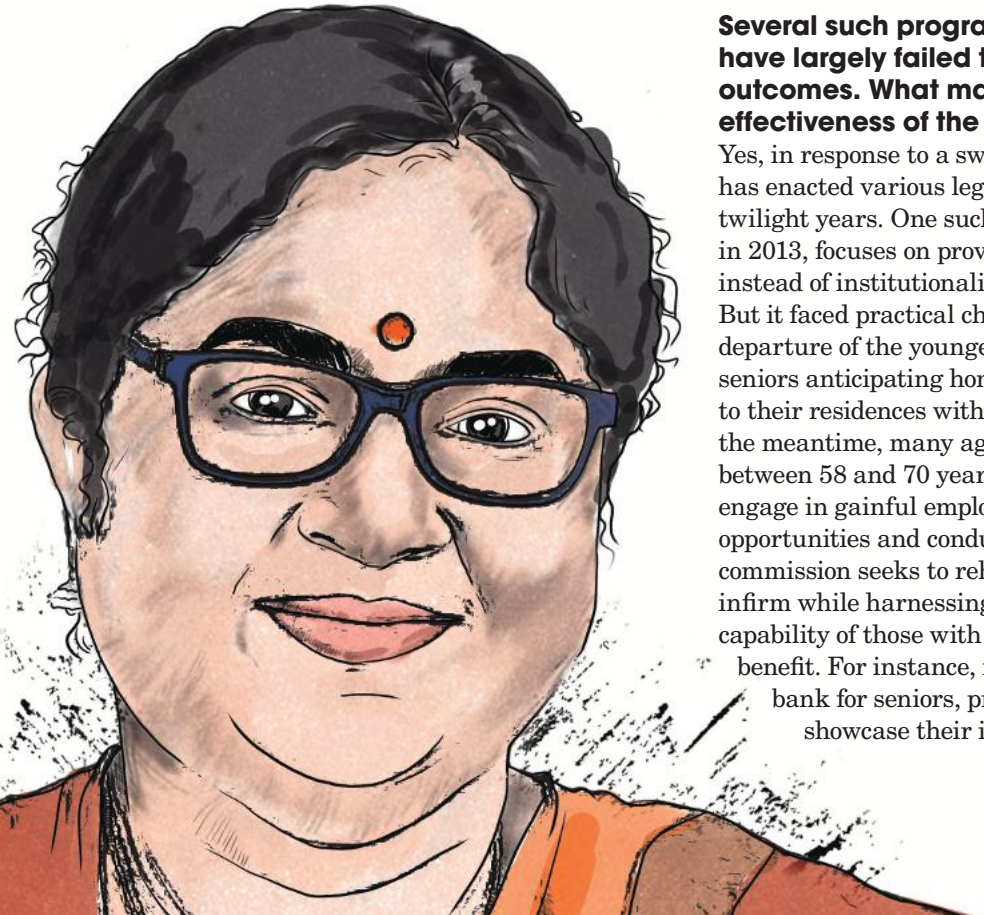


ILLUSTRATION: YOGENDRA ANAND / CSE

What influenced your decision to propose the establishment of the Elderly Commission?

Eight years ago, S Irudaya Rajan [from the Centre for Development Studies in Thiruvananthapuram] conducted a study in the Kumbanad region in Pathanamthitta district. His research revealed a stark reality: elderly people live in challenging conditions due to the emigration of younger members of their families in search of employment and improved living conditions. As the trend is widespread now, a significant number of elderly across the state live in isolation, often with only pets for company. The latest census indicates that the elderly constitute 12.6 per cent of the state’s population. By 2030, the elderly will constitute 25 per cent of the state’s population. Then there is feminisation of ageing. Since women have a greater life expectancy than men, many elderly women find themselves alone and widowed, frequently lacking income and possessing minimal assets, thereby relying on family for assistance. Hence, elderly care requires immediate attention and effective solutions.

Several such programmes introduced in the past have largely failed to yield the intended outcomes. What makes you optimistic about the effectiveness of the proposed commission?

Yes, in response to a swiftly ageing population, Kerala has enacted various legislations to protect people in their twilight years. One such Vayomithram project, launched in 2013, focuses on providing in-home care for the elderly instead of institutionalising them in nursing facilities. But it faced practical challenges due to the significant departure of the younger generations from the state. Even seniors anticipating home help find themselves restricted to their residences without access to the outside world. In the meantime, many aged people, especially those between 58 and 70 years, remain proficient and can engage in gainful employment. They require appropriate opportunities and conducive situations. The proposed commission seeks to rehabilitate and protect the aged and infirm while harnessing the skills and production capability of those with better health, for collective benefit. For instance, it would assist in creating a skill bank for seniors, providing them with a platform to showcase their interests, skills and aspirations.

Senior citizens can engage in grassroots activities, including local governance initiatives and planning efforts. Elderly adults proficient in computers, mobile phones and the Internet can assist their peers in utilising these technologies in daily life.

Please outline the structure of the proposed commission.

One member would represent the Scheduled Castes or Scheduled Tribes, while another would be a woman. The chairperson will hold a rank equivalent to that of a secretary in the government. Nominations will be based on merit, experience and prior commitment to the cause. The members will serve a term of three years. The commission will be headquartered in Thiruvananthapuram. At present, the Law Department is formulating the structures and frameworks for the commission, and it is expected to start functioning by mid-May.

How will the commission function? Will it also have legal teeth?

Upon implementation, the commission will promulgate rules aimed at the welfare and protection of the elderly. It will collaborate with government departments to facilitate rehabilitation efforts and engage elderly individuals in activities that benefit the general public. It is dedicated to bringing abandoned or orphaned elderly individuals into care centres. To carry out its functions, the commission will have the power to utilise the services of any state government officer or the local authorities, with the approval of the relevant authorities. It will also advise the government, influencing elder welfare initiatives.

The commission will also provide legal aid as needed to ensure that the rights of the elderly are upheld. It is authorised to conduct investigations or enquiries and recommend remedial measures to implement provisions related to the welfare and protection of older people, as stated in the Constitution of India or any other relevant laws in force. To execute its legal duties, the commission shall possess all the authorities of a civil court adjudicating a suit under the Code of Civil Procedure, 1908 (Central Act 5 of 1908) concerning the following issues: summoning and compelling the attendance of individuals for examination under oath; discovering and producing documents; receiving evidence via affidavit; requisitioning public records or copies from any court, office, or institution; and issuing commissions for the examination of witnesses and verification of documents. While conducting an inquiry, the commission will allow concerned individuals to be heard personally or through an authorised representative. The commission's findings on any inquiry shall be forwarded to the government along with its recommendations. The commission can also enquire about complaints from prisons or lock-ups where elderly individuals are detained illegally or in other custody-related situations and submit reports to the concerned authorities.

THE COMMISSION SEEKS TO REHABILITATE AND PROTECT THE AGED WHILE HARNESSING THE SKILLS AND CAPABILITY OF THOSE WITH BETTER HEALTH, FOR COLLECTIVE BENEFIT

The Maintenance and Welfare of Parents and Senior Citizens Act, 2007, addresses concerns about the aged nationally. How will the commission help execute it?

The Act stipulates that children must care for their parents, yet this duty is frequently overlooked. The commission will initiate legal proceedings if required. It will also counsel the government on implementing procedures that safeguard the elderly. The new body will issue directives to state governments, municipal authorities and various implementing agencies concerning the welfare and protection of older residents.

Will it also make the youth responsible for the welfare of elders in their family?

Studies indicate that over 53 per cent of the senior population in Kerala perceive discrimination from both the family and society. A significant number of elders report experiencing mistreatment, even from their close relatives. So it is crucial to fortify intergenerational connections. Through the proposed commission, the government intends to initiate a campaign to enhance awareness in this regard. Through school- and college-focused programmes, it would instruct our youth on how to regard the old with respect. Families with older parents require heightened awareness regarding their care, the indicators of diseases such as Alzheimer's, and the significance of adequate nourishment. Senior citizens should be considered important assets capable of enhancing societal welfare. I am sure the youngsters would be convinced. DTE

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The flesh of the egg fruit is rich in carotenoids, which contribute to its yellow colour. It can be used to prepare jams

SUNNY SIDE UP

The golden-hued egg fruit found in southern states is rich in nutritive and medicinal properties, but remains underutilised

VIBHA VARSHNEY

FINDING A fruit one has been wanting to taste for a while—and that too, in an unexpected place—is always exciting. A while ago, a friend had told me about an "egg fruit" from the southern states of Kerala and Tamil Nadu, but I had not managed to lay my hands on it. It was in Sri Lanka that the fruit found me. While travelling through the Central Province town of Nuwara Eliya, I bought a bag full of the fruits, which the vendor told me were called *lavulu* in the local language and were highly preferred by monkeys.

The fruits were hard and the vendor told me to wait for a few days before eating them. I curiously cut one of them, and found that the pulp was sticky and full of latex, with one large seed. It ripened after nearly a week, developing a golden-yellow colour and texture that resembled a hard-boiled egg yolk. It also gained a sweet, mild flavour and a fragrance similar to sapota or chikoo. In fact, the egg fruit or *Pouteria campechiana* belongs to the sapotaceae family. Like the sapota, egg fruit is native to Central America, but is now widely cultivated in tropical and sub-tropical regions.

While in Sri Lanka it is *lavulu*, in Tamil Nadu the fruit is

PHOTOGRAPH: VIBHA VARSHNEY/ CSE

called *manjal sappota* or *mansal pazham*. In a 2020 study published in the journal *Plant Archives*, researchers found that *manjal sappota* is one of the 80 plants found in the Kanyakumari Wildlife Sanctuary that tribal communities consume. In Kerala, it is called *muttapazham*. Its other common names include canistel, zapote amarillo or cupcake fruit.

The fruit is packed with calcium, ascorbic acid, niacin, phosphorus, iron and carotene. Its flesh is rich in carotenoids, which contribute to the yellow colour. Chemical analyses show that the fruit is more nutritious than the "superfood" star fruit, according to a study published in 2016 in the *Indian Journal of Traditional Knowledge*. While unripe egg fruit can be used as a vegetable, the ripe flesh is used to prepare jams and milkshakes (see recipes). In 2015, China patented a jam recipe comprising canistel, watermelon and blueberries.

The pulp is used to prepare pancakes and cupcakes. To prolong its use, people often dehydrate and store the pulp after it ripens. But the sun-dried pulp can lose its natural flavour, aroma and functional compounds. A study published in the journal *Research, Society and Development* in 2021 shows that freeze-drying the fruit preserves the colour, nutritive properties and beneficial chemicals such as carotenoids, phenolic acids, polysaccharides and niacin.

In 2024, researchers from the State University of Maringá, Brazil used the pulp to colour ice cream, and found that it had high levels of bioactive compounds and retained a stable colour throughout storage. They concluded that the dehydrated pulp holds significant potential for use as food colouring due to its photostability and nutritive value. This study was published in the *Journal of Food Science and Technology*.

The fruit is also said to have medicinal properties and is used as a remedy for coronary troubles, liver disorders, epilepsy, skin diseases and ulcers. In traditional Mayan medicine (Maya peoples are an ethnolinguistic group of indigenous communities of Central America), a combination of four plants including egg fruit is used for treating diabetes and pain. The impact this quartet of fruits can have is corroborated in research carried out in Mexico and published in the journal *Drug Development Research* in 2017.

Earlier in 2014, researchers from Bharathidasan University, Tiruchirappalli, published a study in the *Journal of Physiology and Biochemistry* on the ability of the fruit to protect the liver of rats that were administered acetaminophen. The drug is used to treat fever and body ache but can adversely affect the liver. Acetaminophen triggered an oxidative stress in the rats' liver, leading to an increase of marker enzymes in the blood. However, treatment with the egg fruit extract significantly reduced the enzyme levels, suggesting that the fruit can restore the normal functional ability of liver cells. The fruit can also be used to treat anaemia and coronary heart diseases, says the 2020 study published in *Plant Archives*.

Such evidence of the cansitel's uses have only been published in the last decade or so. This suggests that the fruit is underresearched and underutilised. Not much is done to understand the uses of the evergreen tree as well, which is grown as an ornamental plant but also has abundant latex. Perhaps, interest in the plant will increase in the future. DTE @vibhavarshney

RECIPES

JAM

INGREDIENTS

Ripe egg fruit: 1
Sugar: 1/2 cup
Lemon: 1

METHOD

Peel the fruit and remove the seed. Mash the pulp and place it in a pan. Cook it with sugar. Take the mixture off the heat and add the juice of one lemon. Enjoy the jam with toast.

MILKSHAKE

INGREDIENTS

Ripe egg fruit: 1
Milk: 1 cup
Cinnamon powder: 1/2 tsp
Cardamom powder: 1/4 tsp
Nutmeg powder: 1/4 tsp
Honey: 2 tbsp

METHOD

Peel the fruit and remove the seed. Add all the ingredients to the blender, and blend until creamy. Add more milk, if needed, to bring the mix to the consistency of a milkshake. Pour the milkshake in a glass and enjoy.

EGG FRUIT SOUP

INGREDIENTS

Unripe egg fruit: 1.5 cups
Finely chopped onion: 1/2 cup
Minced garlic: 1 tsp
Vegetable stock: 4 cups
Ground pepper: 1/8 tsp
Butter: 1 tbsp
Whipped cream and chives: for garnish
Salt to taste

METHOD

Melt butter in a saucepan. Add onion and sauté until translucent. Add garlic and cook for another minute. Add the egg fruit, stock, pepper and salt. Cook for 15 minutes, stirring constantly. Garnish with whipped cream and chives.

The new American pie

WE LIVE in a highly globalised food system. If one tracks the food they consume in a day, they will find the items to be sourced from at least two or three countries. Our food basket is extremely multinational, though we might not be aware of it. More than a fifth of the food produced in the world is globally traded. The UN Food and Agriculture Organization says global food trade was worth US $2 trillion in 2023, four times the 2000 levels. In 2015, close to 80 per cent of the world population lived in net food-importing countries; the number would have gone up this year. Another study says that by 2050, half of the world population will consume calories produced outside their respective countries.

While food cultures have changed over the centuries due to trade and migration, they became truly global some 30 years ago when the World Trade Organization (WTO) was born, marking the start of a "free trade and fair tariff" regime. We now think "global" and eat "global". Since food is a geography-specific commodity, countries export what they are naturally endowed to grow. On the other hand, nations that are not-so-well endowed to grow foods, import them to meet the domestic demand. WTO's tariff and trade rules have somehow ensured easy movement of food produce.

So, what happens when an elected executive of a highly food import-dependent country—that also happens to be the world's largest economy—decides to disrupt the trade system? On April 2, US President Donald Trump decided to celebrate "Liberation Day" by announcing tariffs for all nations that trade with his country. Since the start of his second term as US president on January 20, 2025, the country has imposed more global tariffs than it ever did in such a short duration. And Trump believes the move will make America a self-sufficient country, and create more jobs and revenue. That is his way of making America great "again".

Is the US outside of the globalised food system? The answer is a big no. Rather, it has become a food importer over the decades. Currently, the US imports a fifth of its food supply. In 2025, the country is estimated to have a $42 billion agricultural trade deficit, which means it imports more food than it exports.

For 60 years until 2019, the US had maintained the agricultural trade balance. What happened after that? It is a simple case of Americans consuming more and more produce that is available round the year. These are also the products that the US has not been able to produce in abundance and at economical costs, because other countries are better suited to grow them. The US is, in fact, a beneficiary of the globalised food trade regime. Countries grow foods that are in demand in the US—mostly fruits, vegetables, alcoholic beverages, seafood and processed foods—for export, and the US buys them at affordable rates.

The US will soon endure impacts of the rupture it has inflicted on the globalised food system via tariffs

Take the example of Côte d'Ivoire (Ivory Coast)—the world's largest cocoa producer. Two-thirds of the West African country's cocoa export goes to the US. Ivory Coast is geographically and climatologically suited to produce cocoa, with some 4.7 million hectares (ha) under the crop. The US, on the other hand, has less than 1,500 ha suitable for cocoa cultivation and can never produce enough to meet the domestic demand. Now, Trump has levied a 21 per cent tariff on products from Ivory Coast. The immediate impact of this will be a reduction in import of cocoa from Ivory Coast; or, the American consumer will have to buy it at a higher cost. There are many goods the US cannot farm that have been brought under the new tariffs. The US will soon endure impacts of the rupture it has inflicted on the globalised food system via tariffs. DTE

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